

**Horns Rev 3 and Kriegers Flak Offshore Windfarm
Responses to detailed questions in the invitation to dialogue**

Energinet.dk, July 2 2013, BHH/PSY

Besides responses to the dialogue questions put forward by the DEA, the potential bidders taking part in the dialogue also asked several other questions and made comments pertaining to many technical aspects of the tenders. This table presents all technical questions and comments and provides concrete answers.

Are there comments on the specific locations of transformer platforms etc. at the locations proposed above, as well as on the turbines being placed such that the transformer platforms are located on the perimeter of the wind farm?

Comment	Answer/comment - ENDK
<p>The more components that are fixed at the tender stage the more likely price will increase as less wind farm design optimisation can take place at the final design stage when procurement has been completed.</p>	<p>Noted.</p>
<p>Location of transformer platforms at Horns Rev 3 and Kriegers Flak?</p> <p>The location of the transformer platforms will very much limit the possible layout for the proposed wind farms. For Horns Rev 3 very much more so, as the proposed location could be within an efficient wind farm layout. The suggestions for Kriegers Flak have less negative outcome, as they allow for full utilization of the areas in question.</p> <p>XX do not yet have available data to text out different layouts. Thus our comment is in principle based on our experience in wind farm development both onshore and offshore. The suggested layouts at Horns Rev 3 seem to have only a few rotor diameter of distance between the turbines and the configuration does not account properly for the issue to avoid</p>	<p>Energinet.dk allows that the Horns Rev 3 platform is surrounded by wind turbines if a zone around the platform and a corridor along the export cable is kept free of turbines. Around the platform a zone of 1000 m shall be kept free of obstacles. The export cable corridor shall be 500 m on each side of the cable and must not be crossed by array cables.</p>

<p>wake effects.</p> <p>Transformer platforms located on the perimeter of the wind farm</p> <p>In particular the platform location of Horns Rev 3 needs to be moved to the perimeter of the area in order to allow for an efficient wind farm layout based on the not yet revealed met-ocean data, geotechnical results, soil conditions, and geophysical reports as well as for inter-array cabling.</p> <p>Otherwise, XX suggest that the Energinet.dk postpones this decision, till the tenderers have received a minimum of data.</p> <p>XX suggest that the platform is either moved to the outskirts of the area or that Energinet.dk allows for a corridor around the platform, both for access and to avoid damages to the export cable.</p> <p>Currently XX have no comments on utilizing the design from the Anholt for the substation Horns Rev C.</p>	
<p>For Kriegers Flak the location will result in more internal cabling and thereby increased costs. XX prefer the location of the transformer stations to be more optimized.</p>	<p>The chosen locations for the platforms will be fixed as the design of the foundations has to start in September 2013 and geotechnical investigations have been carried out for the design.</p>
<p>XX has no comments as such to the location of the transformer station (OSS). However we would like to know the specific coordinates of the OSS and the export cable corridor as well as the requirements to the shape of the wind farm around the OSS (minimum distance to OSS and export cable corridor).</p>	<p>Energinet.dk allows that the Horns Rev 3 platform is surrounded by wind turbines if a zone around the platform and a corridor along the export cable is kept free of turbines. Around the platform a zone of 1000 m shall be kept free of obstacles. The export cable corridor shall be 500 m on each side of the cable and must not be crossed by array cables.</p>

<p>Location of platforms: If the stations are placed on the periphery of the concession areas of KF, it is the assumption that the export cables will be routed through the exclusion zone. What measures are intended to be taken to ensure that the integrity of these cables is maintained, given the fact that sand extraction is licensed in the central part of this area? Will the statutory safety zone around these cables be increased?</p>	<p>The export cable will be located along the exclusion zone but outside the wind park area.</p>
<p>Limiting factors: Are there requirements for the helicopter approach area, meaning a helicopter corridor, limiting possible park layouts?</p>	<p>Around a platform a zone of 1000 m shall be kept free of obstacles to allow for a helicopter corridor</p>

What level of grid connection voltage is expected to be used in connection with building Horns Rev 3 and Kriegers Flak, respectively? Are there comments on the solution to allow Energinet.dk to procure switchgear, which will subsequently be taken over by the owner of the concession? Does the owner of the concession have special requirements, wishes or reservations concerning the procurement of MV switchgear if such is delivered by Energinet.dk?

Comment	Answer/comment – ENDK
<p>We propose to optimise the inter-array cables taking into account lifecycle costs, technology, wind turbine size and supply chain, this is likely to be either 33kv or 66kv. We assume the collector station will be owned, constructed and operated by Energinet.dk and that the wind farm owner will lease an area to accommodate the distribution control, protection equipment and medium voltage switch gear.</p>	<p>Noted. DEA expect in September 2013 to make decision on the voltage level.</p> <p>Yes, the collector platform (substation) will be owned, constructed and operated by Energinet.dk and areas to accommodate the wind farm owner's distribution control, protection equipment and medium voltage switch gear will be available on the platform. A lump sum shall be paid to Energinet.dk for these areas.</p>

<p>Level of inter array grid connection 33kV versus 66kV.</p> <p>Due to the early tender dates in autumn 2014 and spring 2015, both projects will have to be developed based on existing technology. Currently there are no commercial available turbines with 66kV. The tenderers at Horns Rev 3 will have to commence the procurement process for the tender in late 2013 with a design basis based on assumptions, as there are by then no reliable data available. In XX, the use of new technology requires at least one year operational experience with new features before it can be included in XX's design review as part of the approval of projects for development/consolidated bids for development. This there is no room for developing new turbine technology for either of the tenders Horns Rev 3 or Kriegers Flak. This is one of the obvious disadvantages of the early tender for projects to be completed by 2020.</p> <p>Energinet.dk to procure switchgear with will later be taken over by the owner</p> <p>XX would recommend allowing representatives of the tenderers, on a non-disclosure basis, to evaluate the technical specifications, the short listed vendors, and the final bid evaluation by Energinet.dk</p>	<p>Noted. DEA expect in September 2013 to make decision on the voltage level.</p> <p>Energinet.dk will at a technical dialog meeting in September 2013 give technical information about the medium voltage switchgear and the technical data will be included in DEA's tender material.</p>
<p>Choice of grid voltage.</p> <p>XX prefer 33kV. No manufacturers offer 66 kV today to our knowledge. Technically XX of course would like to use 66 kV to decrease the costs (smaller losses and shorter length of cables) but this could harm the competition from the manufacturers and</p>	<p>Noted. DEA expect in September 2013 to make decision on the voltage level.</p>

thereby increase the cost. And in worst case be a "show-stopper".	
Procurement of MV-switchgear. It would of course be an advantage for the Tenderer to buy the switchgear. But current timetable does not give any option except that Energinet.dk buys the equipment which later on is taken over by the successful Tenderer. Any specific requirements will be defined before March 1st 2014.	Noted. DEA expect in September 2013 to make decision on who shall procure the MW-switchgear. Energinet.dk will at a technical dialog meeting in September 2013 give technical information about the medium voltage switchgear and technical data for the MV-switchgear will be included in DEA's tender material.
XX is in favour of 33kV infield cables.	Noted. DEA expect in September 2013 to make decision on the voltage level.
For HR3 and KF, DEA/Energinet.dk should opt for 33 kV voltage levels i.e. stick to existing voltage levels seen at projects today.	Noted. DEA expect in September 2013 to make decision on the voltage level.
Since 66 kV is considered the future standard for off-shore wind parks, 66 kV as the grid voltage is preferred It is a concern that the selection of wind turbines will not necessarily be final as early as in early 2014. Therefore, the number of wind turbines per feeder nor the number of feeders necessary can be defined.	Noted. DEA expect in September 2013 to make decision on the voltage level.
XX recommends designing the platforms for the 33 kV voltage level. With regard to the procurement of switchgears it is our opinion that Energinet.dk will have to take care of this in order avoid unnecessary costs for the bidder. Question from XX: 1. What will be included in Energinet.dk's tender for MV equipment?	Noted. DEA expect in September 2013 to make decision on the voltage level. Answer to Q1: Energinet.dk will at a technical dialog meeting in September 2013 give technical information about the medium voltage switchgear and technical data for the MV-switchgear will be included in DEA's tender material

<p>2. What will be the size of the SCADA room ?</p> <p>3. Will Energinet.dk reserve sufficient space on the offshore transformer station for a container containing an emergency diesel generator and other equipment necessary for the emergency supply of wind turbines in case of a power failure (i.e. fault on the export cable) ?</p> <p>4. Is there room for additional compensation equipment such as Statcom or var compensator to be able to fulfil the Grid code?</p> <p>5. What space on top deck is available for antennas, radar, evt. metmast, what can be available for XX?</p> <p>6. What is the time schedule for the tender on the MV equipment? What are the estimated costs for the MW equipment and when can we have the information?</p>	<p>Answer to Q2: The Scada room for the wind park owner will have following minimum dimensions: LxWxH: 10 x 6 x 4 m</p> <p>Answer to Q3: There will not be reserved space on the platform (offshore transformer station) for emergency supply of the wind turbines.</p> <p>Answer to Q4: There will not be reserved space on the platform (offshore transformer station) for additional compensation equipment.</p> <p>Answer to Q5: On the top deck space will be available for antennas, radar, metmast, etc. In the design Energinet.dk will provide space for same number of antennas etc. as installed on the Anholt platform.</p> <p>Answer to Q6: The MV equipment for Horns Rev 3 will be purchased in 3. Quarter 2014. For Kriegers Flak platforms the purchase will take place in 2. Quarter 2015. An estimated cost will be provided in DEA's tender material.</p>
<p>Medium voltage switchgear: How is the procurement process of switchgear planned by energinet.dk? Will the technical specification be agreed with the potential tenderers prior</p>	<p>DEA expect in September 2013 to make decision on who shall procure the MW-switchgear.</p> <p>Energinet.dk will at a technical dialog meeting i September</p>

<p>to being ordered? A technical meeting between the potential tenderer's and energinet.dk would be appreciated.</p>	<p>2013 give technical information about the medium voltage switchgear and the technical data for the MV-switchgear will be included in DEA's tender material</p>
<p>Time Schedule / HVDC Commissioning: How detailed was the commissioning process of the HVDC link already analysed and the interactions between the wind farm and the link? Background is that according to the experience made in other markets, the wind farm has to deliver power to the HVDC link for final commissioning (tests), only after that the HVDC link will be operational. So how does that fit with the date when the grid connection should be operational (July 1, 2018)? Preference of a wind farm developer would normally be to start erection of turbines only short before or at the point in time when the grid connection is available. Or is it intended to get power for the commissioning of the link via the connector to the German Baltic 2 project?</p>	<p>The intension is to get power for the commissioning via the connection to Baltic 2. The grid connection to Baltic 2 and the AC transformer platforms will be operational 1. July 2018.</p>
<p>Emergency power: Looking at the planned connection by means of a HVDC link to the Danish grid we expect that the grid connection will be down for maintenance several days a year. Is it possible, during that time period, to receive power to keep the wind farm in stand-by via the link to the German Baltic 2 project? Otherwise emergency power generators for the wind farm may have to be considered, leading to a higher investment and therefore higher bids.</p>	<p>The possibility for emergency power via the link to Germany will be provided in the extent possible during the HVDC platforms maintenance periods.</p>
<p>Connection of 200 MW part for Kriegers Flak: Is it intended to have no redundancy in the grid connection for the 200MW part of the wind farm, as only one 150 kV export cable is planned from the substation to the HVDC station? We would suggest</p>	<p>There will be no redundancy in the grid for the 200 MW platform. The wind park owner has to make provisions for emergency power supply.</p>

having a redundant connection, as a single cable failure could lead to a quite lengthy downtime of the grid connection, making provisions for an emergency power supply to the wind farm necessary, leading to a higher bid.	
<p>Connection of 200 MW part by 66 kV:</p> <p>In case 66 kV is selected as the preferred inter array cable voltage, did the DEA / energinet.dk consider connecting the 200 MW part of the wind farm directly from the last turbines of each string to the HVDC station by means of 66kV? That would lead to a partly redundant connection of the 200 MW area. Furthermore there wouldn't be a need for a HVAC station in the 200 MW area. Of course further detailed technical analysis has to be performed to prove technical feasibility and commercial impact has to be discussed.</p>	Noted.

Will the current draft EIA project description ensure the flexibility necessary to select technical solutions for projects on Horns Rev 3 and Kriegers Flak?

Comment	Answer/comment - ENDK
The more components that are fixed at the tender stage the more likely price will increase as less wind farm design optimisation can take place at the final design stage when procurement has been completed.	Noted
<p>Cross border effects/impacts part of EIA?</p> <p>Will cross border impacts be taken into account or assessed by neighbour countries?</p>	Yes, the EIA will cover cross border and cumulative impacts according to requirements from authorities.
Additional impacts covered by EIA?	

<p>Technical description describes a range of installation options or WTG-options. What will happen, if the final design or final solution does not fit into this considered range? (E.g. other kind of foundation or scour protection as described)</p>	<p>The technical project description is not a design description for the final wind farm at Horns Rev 3 or Kriegers Flak. It is merely a realistic and a best guess on how a future concessionaire will design the final wind farm. This technical project description thus provides the framework which a concessionaire can navigate within. The EIA will relate to a worst-case scenario within this framework. A future concessionaire may wish to deviate from the worst-case scenario, and sometimes also from the framework. Whether deviations from the framework can be contained within the EIA permit/authorization for establishment must be determined individually by the authorities on a case by case basis.</p>
<p>What environmental restriction will apply during construction/operation? Will it be the same as previous tender projects?</p>	<p>The environmental restrictions will be outlined in the final permit given by the DEA. The environmental restrictions will be site-specific since they relate directly to the conditions in the specific area. There might however be restrictions from the previous tender projects which also apply for Horns Rev 3 and/or Kriegers Flak.</p>
<p>5.2.2 Dimensions Gravity based foundations at these depths will start from approx 1800 t, not 1300 t as stated in table in sec 5.2.2.</p>	<p>Comment is noted but not implemented in the Technical Project Descriptions. The comment is already covered.</p>
<p>5.2.4 Seabed Preparations Incoming permits consideration must be taken to do soil strengthening methods , such as grouting , concrete piling, lime cement columns</p>	<p>Noted</p>
<p>5.2.4 Seabed Preparations Incoming permit consideration must be taken to additional soil investigations such as core drilling, SPT hammering, CPT test to be performed. This will most likely be performed before the construction works start but additional investigation might be necessary</p>	<p>Noted</p>

during the construction phase.	
5.2.9 The Grouting Process Not relevant for Gravity based foundations, should be placed under monopile section.	Noted and corrected
5.3 Jacket Foundations, 5.3.1 Description Last section; Scour protection will most likely be blasted rock not natural graded stones.	Noted and added
5.4.3 Corrosion Protection Anodes will be used for Gravity based structures as well	Noted and corrected
5.4.4 Scour Protection materials description Generally all different types of foundations have the same scour protection configuration, no need to separate the description for the different foundation types.	Noted
8.2 Construction Vessels For Gravity based foundations it should be added Excavators, Subsea excavators	Noted and added
8.5 Emissions and discharges In the permits it should be planned for no spillage measuring during the excavations for ex gravity based structures. In previous projects such as the Oresund's Bridge and Rødsand this has never been a problem.	Noted
Transport routes to site In the permits it should be planned for possible transport routes to the site from possible "Project	Noted

harbours"	
<p>Met Ocean Data - 8.2. Construction vessels</p> <p>In Figure 3 of the Technical Description, "Seasonal variations in wave height" gives only a limited view of the wave conditions in order to evaluate the amount of expected weather down time & the suitable vessel/installation equipment. Will the planned met ocean campaign provide more details, or alternatively can Baltic 2/FINO2 met ocean data be supplied as a basis for tendering?</p>	<p>ASCII files with relevant weather data such as wind, wave, current and water level will be made available for detail installation simulations.</p>
<p>Cable Installation</p> <p>Please note that in order to achieve burial, cable installation may require seabed preparation such as pre-lay grapnel runs / boulder clearance prior to excavation of trenches and cable lay, and possibly backfill of trenches after the installation. This needs to be recognized in terms of environmental impact. Further, the Technical Project Description mentioned also the external cable protection method by rock dumping. We would assume that other methods can also be considered such as: concrete mattresses, cement bags, cast iron half pipes, pipe cable protection (uraduct iron cast), concrete half pipe or even cable installation directly on the seabed with heavier cable armouring.</p>	<p>Comment noted and topics related to seabed preparation are implemented.</p> <p>The technical project description is not a design description for the final wind farm at Horns Rev 3 or Kriegers Flak. It is merely a realistic and a best guess on how a future concessionaire will design the final wind farm. This technical project description thus provides the framework which a concessionaire can navigate within. The EIA will relate to a worst-case scenario within this framework. A future concessionaire may wish to deviate from the worst-case scenario, and sometimes also from the framework. Whether deviations from the framework can be contained within the EIA permit/authorization for establishment must be determined individually by the authorities on a case by case basis.</p>
<p>5.4.2 Cable Entry: Cable Installation (J- Tubes)</p> <p>It is stated that the most likely guidance of cables to the hang-off point is via J-Tubes. In view of potential ice loads, consideration should also be given to internal J-Tube designs or J-tubeless solutions, leaving</p>	<p>Noted and implemented</p>

more flexibility at the design stage.	
<p>6.1.2 HVAC Platforms: Cable Pull-In at Platforms</p> <p>One of the design criteria which requires consideration is the routing of power cables from the hang-off position to the switchgear, necessitating sufficient space for setting up a winch and associated equipment, fix points, cable trays as well as sufficient deck height and space to comply with the minimum bend radius of the cables (which could be as much as 5m for export cables). Please also note that a considerable pulling force will be exerted on the hold points for the winch gear.</p>	N/A. The topic is related to design and not EIA impact.
<p>7.1. Inter-array cables: Cable Design</p> <p>Cable design: A lead sheath, as indicated in the description, may not be necessary for the inner array cables.</p>	Noted, but too detailed for the technical project description and the EIA.
<p>7.1. Inter-array cables: Cable Installation (Scour)</p> <p>Scour protection: if required at the foundation locations to counteract scour, it is preferable to install the scour protection prior to pulling cables.</p>	Noted. Wordings re-framed.
<p>7.1. Inter-array cables: Cable Installation</p> <p>A barge operation for surface lay is described, followed by a post-lay burial by ROV jet (secondary operation). The use of a barge will require multiple anchor handling in the field. The use of a DP vessel is preferable in terms of environmental impact and weather susceptibility. Having considered the preliminary soil data, with substantial residual deposits (at least on KF), it is not likely that jetting ROVs will be able to penetrate substantially into the seabed. Pre-</p>	<p>A vessel operated by anchors cannot be disregarded. The worst (and reasonable) impact scenario has to be considered.</p> <p>Comments related to seabed preparation has been noted and implemented.</p>

lay clearance of the cable routes may be necessary, particularly to clear out boulders, and excavation of trenches may have to be considered prior to placement of the cables.	
7.1. Inter-array cables: Cable Installation (Burial Depth) It is stated that the final depth of burial is determined at a later date in consideration of the seabed conditions. This is commendable and we assume likewise applies to inter-array cables.	The statement applies also to the Transmission cable
7.1. Inter-array cables: Cable Design Please confirm that the constructor will not be limited to the specified cable size/design figures in the "Technical Project Description"? E.g. the description is mentioning cable weight between 15 and 50kg/m but a 630mm ² /66kV cable weights already 52kg/m, if double armouring needed it will be even heavier.	Noted. Wordings re-framed
8. Offshore Construction: J Tube Design and Cable Cooling Please consider that the design of the J-tubes for the HVAC substation supplies a sufficient natural cooling of the cables.	A design issue. Noted
8.2. Construction vessels: Approach to Platforms Are there any particular vessel requirements from energinet.dk for approaching their substation in terms of crew transfer and cable installation?	Legislation and guidelines from the Danish Maritime Authority must be followed.
General: Preliminary Investigation Data Can the preliminary investigation data from GEMS be made available as shape file information for input into a GIS?	Yes – data will be available in different formats including files ready for GIS (for instance GeoTiffs and ESRI shape-files, ArcInfo Binary Raster grids).

<p>Installation: Boulders - see p.10 in technical description</p> <p>Method for determining boulder sizes, positions and possible impact on installation jacket activities need to be detailed out such that budget estimates on boulder relocation for cable, foundation and WTG installation become precise.</p>	<p>Boulder sizes (larger than c. 1m) and positions – on the seabed – are estimated and target mapped as part of the geophysical surveys.</p> <p>Boulders within the layers in the sub-seabed have not been mapped (even though some indicators remain: diffraction hyperbolae and interpreted till layers).</p>
<p>General: Norms and standards</p> <p>Throughout the document, no reference is made to codes, standards. Are the tenderer's free to choose set of norms, hierarchy of norms. Basis question regarding the design basis.</p>	<p>The question is related to the detailed design and not the EIA. Energinet.net will prepare requirements to the design etc. in separate documents.</p>
<p>Installation: Gravity base foundations</p> <p>Could ballasting material be excavated directly at the site of KF/HR3 or in the central exclusion zone for wind farms on KF?</p>	<p>The ballasting material can be excavated directly from the KF (the Danish part)/HR3 sites but permissions are required.</p>
<p>Installation: p. 24 - In the context of grouting reference is made by the Technical Description: "conform to the relevant environmental standards" - It would be interesting to know these standards. These standards should be known upfront (and available in English) in order to avoid that additional environmental standards are imposed after submission of bid.</p>	<p>Noted</p>
<p>Installation: Cable infield</p> <p>p. 40 - Chapter on submarine cable - confirmation should be sought that tenderer's have the freedom of choice regarding specifications/burial method etc. if no reference is made here. All hidden assumptions should be avoided.</p>	<p>It shall be noted that typical installation procedures solely is mentioned.</p>

<p>Installation: Safety on site</p> <p>p. 43 - limited access to construction site and safety zone for all third parties: no guard vessel is mentioned; consequently it is assumed that no guard vessel is required.</p>	<p>Legislation and guidelines from the Danish maritime Authority must be followed.</p>
<p>Installation: What will be done in terms of UXO reporting/investigation? What type of investigation will be done by the DEA and what is to be done by the winning bidder? Will the DEA give any UXO guarantees e.g. UXO free areas?</p>	<p>The investigation program in this relation is already given in The Project Description.</p> <p>Energinet.dk will advise regarding procedures.</p> <p>DEA does not make any guarantees regarding the UXO threat, however:</p> <p>Both areas: UXO Desk Studies exist: HR3 there is a threat, at KF apparently no threat.</p> <p>Both areas: Detailed acoustical survey data exist from the Geophysical survey (side scan sonar, MBES bathymetry and backscatter)</p> <p>HR3: Very detailed UXO surveys (side scan sonar and magnetometer) have been performed around all geotechnical positions; in 10x10m boxes around separate CPTs, and 80x80m boxes around the boreholes. (and a 900x900 m box around the platform position). These geophysical data as well as signoff clearance certificates will be made public as part of the Geotechnical factual reports.</p>
<p>General: 12 nm zone</p> <p>Parts of KF are within 12 nm zone; parts are in DK EEZ - any difference regarding authorities/legal set-up/concession?</p>	<p>No.</p>
<p>Electrical: Grid connection technology:</p> <p>In the technical project description under clause 7.2 it is mentioned that the grid connection could also be of a HVAC type, 220 kV. Is that still considered? Commissioning of an onshore Back-to-Back HVDC is</p>	<p>Noted.</p>

possibly more hassle free compared to an offshore converter.	
Electrical: Navigational aids: Are there any requirements regarding an UPS system (min. availability) for navigation aids or aviation marking?	The navigational aids shall fulfil the requirements of Trafikstyrelsen
WTG: One main requirement is that the blade tip shall be at min. 23m above MSL. Are there any tip heights/nacelle/turbine heights restrictions?	Not at this stage. Will be part of the permit to establish given by DEA.
WTG: Maximum rotor diameter should be increased to 172m to account for all potential turbines and suppliers.	The maximum rotor diameter is now 190m
10 MW WTG must be included in the EIA In the foundations concepts section, Suction Buckets under both a monopile (UF/MBD concept) and under jackets should be included. Other: The consideration of sea ice and ice loads in the Kriegers Flak Technical Project Description is lacking. Handling of wake loss related to other parks must be described.	Noted. Regarding sea ice and ice loads, the comment is noted and both subjects will be included in the Technical Project Description for Kriegers Flak to the extent possible. Noted. The issue of potential wake loss related to other parks will be covered in the tender documents.

<p>With regard to the turbines specified also the Samsung 7 MW turbine with rotor diameter of 171,2 m and standard hub height of 110,6 MSL (Mean Sea Level) has to be included in the specifications for different turbines.</p>	<p>The Technical Project Description includes a range of turbines from 3 MW to 10 MW. The 7 MW is within this range and is therefore included with regard to the environmental impact assessment.</p> <p>The technical project description is not a design description for the final wind farm at Horns Rev 3 or Kriegers Flak. It is merely a realistic and a best guess on how a future concessionaire will design the final wind farm. This technical project description thus provides the framework which a concessionaire can navigate within. The EIA will relate to a worst-case scenario within this framework. A future concessionaire may wish to deviate from the worst-case scenario, and sometimes also from the framework. Whether deviations from the framework can be contained within the EIA permit/authorization for establishment must be determined individually by the authorities on a case by case basis.</p>
<p>Foundations (monopile, jacket piled, gravity based)</p> <p>It is important also to include jacket with suction bucket foundations as an alternative foundation type to piled jackets, provided the soil conditions are suitable. That we only know when the geotechnical investigations are available. It has possible positive implications for EIA as there will be no piling.</p> <p>Turbine sizes</p> <p>It is important to get an indication of the tentative turbine size limits as soon as possible, as this will very much affect the preliminary commercial calculations.</p> <p>Layout</p>	<p>Comment 1</p> <p>The jacket with suction bucket will be included.</p> <p>Comment 2</p> <p>It is up to the bidder to decide on the turbine size. The technical project description is not a design description for the final wind farm at Horns Rev 3 or Kriegers Flak. It is merely a realistic and a best guess on how a future concessionaire will design the final wind farm. The turbine sizes included in the technical project descriptions range from 3 MW to 10 MW.</p> <p>Comment 3</p> <p>The developer is not limited by the layouts presented in the technical projects descriptions. These are just used as ex-</p>

<p>To what extent is a developer limited by the proposed/likely layouts presented in the technical project descriptions ?</p> <p>An early freeze of substation location and required placement of such at the park perimeter could limit the degree of freedom for optimizing layout.</p>	<p>amples of how the wind farm layout could be. The developer can suggest any layout inside the investigated areas.</p> <p>Comment 4 Noted.</p>
<p>The current draft EIA project description ensures the flexibility necessary to select the optimal technical solutions for both the Horns Rev 3 and Kriegers Flak projects and should therefore not be altered.</p>	<p>Noted.</p>

Comments and recommendations concerning geo-investigations?

Comment	Answer/comment – ENDK
<p>Would it be possible to do site investigations in addition to what is done by Energinet.dk?</p> <ul style="list-style-type: none"> - Geophysical investigations (for example Seismic)? - Geotechnical investigations (boreholes or CPTs)? 	<p>Prior to the Tender all pre-investigation activities must be carried out by DEA/Energinet.dk. It will not be possible to conduct individual site investigations.</p> <p>After the Tender, the winning Contractor will naturally be allowed to carry out further detailed site investigations. The pre-investigation permit will be part of the tender specifications.</p>
<p>According to the information provided in the kick-off conference held on the 13th May 2013, Pressure meter tests will also be included on the geotechnical investigation campaign. Will their locations and quantities be defined previously to the mobilization, or they will be performed whenever there is refusal of the CPT test and/or the special laboratory tests proposed might not properly simulate the behaviour of the deposit (deposits with high content of coarse</p>	<p>The pressure meter tests and locations are performed in boreholes spread over the areas in selected depths, trying to cover different layers with respect to soils suitable for the tests. The selection of boreholes is chosen based on results of the first boreholes at each site.</p>

grained sediments such as cobbles and boulders)?	
The information that more CPT tests will be included in the program, will these be continuous CPT's down to refusal or down the hole CPT's performed to a predefined depth. Also, how many more locations than the previously defined?	<p>At Kriegers Flak 42 CPTs have been performed of which 25 are continuous CPTs and the rest have been performed right next to each of the 17 boreholes. At Horns Rev 28 CPTs have been performed of which 16 are continuous CPTs and the rest have been performed right next to each of the 12 boreholes.</p> <p>The CPTs are performed as seabed CPT to refusal level.</p> <p>At the borehole positions down the hole CPTs will be performed with 1.5 m stroke per 3 m below the level of refusal of seabed CPT.</p>
Is there any chance to increase the number of borehole and CPT sites in order to gain more reliable information for technical planning and to reduce risks as the remaining risks could increase the costs (price of energy)?	No
It is recommended that the site investigation done by energinet.dk is as extensive as optimal from a cost/information perspective to reduce contingencies in the tender bid even if the costs charge to the tender winner is higher. We would be happy to pay more post concession award in order to get more site information pre-bid.	Noted.
Following the information's provided during the kick-off conference, the Acoustic corers were cancelled from the program. Will further boreholes be added in replacement or the inclusion of more CPT's to the program as to do with the cancelation of these tests from the program? If it is planned to include on the program more boreholes in replacement to the acoustic corer, what's the estimated quantity?	<p>No extra boreholes are added as a direct consequence of leaving out the acoustic corer, however more separate CPTs have been added.</p> <p>Please note, that at Kriegers Flak 17 boreholes have been performed, and at Horns Rev 3, as a result of the reduced investigation area, 12 boreholes are planned.</p>
Is it being considered in the planning of the bore-	The geotechnical program covers both apparently "favoura-

holes location to at intercept unfavourable areas identified on the Geophysical surveys (Areas with thicker soft sediments deposits, Paleochannels, etc.)?	ble" and "unfavourable" parts.
On the 27th February meeting it was informed that the Program did not include any UXO survey in KF, prior to the boreholes execution. Will it be done during any other stage or it's not planned to do during this program?	This is true, because no UXO threat was evident according to the UXO Desk Study. No UXO surveys are planned to be performed at Kriegers Flak as part of the pre-investigations, however a UXO Desk Study and detailed acoustical datasets exist and will be provided for the area.
To increase foundation flexibility and allow for new cost reducing technologies the following additional foundation types should be included in the technical project description <ul style="list-style-type: none"> • Drilled monopile (steel and concrete) • Twisted Jacked • Tripod • Suction bucket 	Noted and implemented.
Regarding the raw material dividing the Kriegers Flak wind park: Are there any restrictions in future excavation depth as it may influence the lateral soil stability of the neighbouring "Wind farms"/depending on foundation structure?	Noted. The DEA will make contact to the relevant authorities in order to clarify the restrictions.
DEA: " <i>Will the current draft technical project description ensure the flexibility necessary to select technical solutions for projects on Horns Rev 3 and Kriegers Flak?</i> "	Noted Yes, on the understanding that the technical description is a recommendation only. It is commended to the DEA for the provision of the technical project description to have a good level of operational detail, but work on the assumption that described installation activities do not prevent the constructor from considering alternative options..
With regard to the geotechnical investigations, when will there be a possibility for quality control and inspection of the obtained results both on-site	Data from the geotechnical surveys will be published no later than 1 November 2013 for Kriegers Flak and 15 November 2013 for Horns Rev 3. Factual reports for the two

<p>and in the laboratory for soil testing?</p>	<p>sites will be published no later than 31 December 2013. These data and results, including laboratory results will at that time have been quality checked by both the Provider and Energinet.dk.</p> <p>There may be a possibility to publish raw data from the CPT's earlier, but then it will be data that has not undergone quality assurance. This is not recommended by Energinet.dk. However, Energinet.dk will examine the possibility and describe the possible data delivery on the website in August 2013.</p> <p>Geo-engineering reports and updating of the geological models for the two sites were expected to be published by April 1 2014. Many have found this too later in the tender process. It is not possible to finish this work earlier, due to the time schedule for the input data for this work. It has been decided not to conduct the geo-engineering reports and updating of the geological models for the two sites.</p>
--	---

<p>How will the UXO report be handled in terms of geotechnical investigations?</p>	<p>For both areas UXO Desk Studies have been prepared (published on the webpage of Energinet.dk). For Horns Rev 3 there is a threat. For Kriegers Flak the Desk Study concludes that there is no threat.</p> <p>Detailed acoustical survey data exist from the Geophysical survey (side scan sonar, MBES bathymetry and backscatter) at both Horns Rev 3 and Kriegers Flak.</p> <p>At Horns Rev 3 detailed UXO surveys (side scan sonar and magnetometer) are performed around each and all geotechnical positions; in 10x10m boxes around separate CPTs, and 80x80m boxes around the boreholes, and a 900x900 m box around the platform position. These geophysical data as well as signoff clearance certificates will be made public as part of the Geotechnical factual reports.</p> <p>At Kriegers Flak no specific UXO surveys are performed prior to the geotechnical programme, however detailed acoustical surveys were part of the geophysical survey.</p>
<p>XX would like to strongly underline that any further delay in relation to the specified date for receiving the geophysical survey results will limit the time for interpretation. This will have an impact to the project time schedule.</p> <p>XX would like to strongly underline the importance of keeping the specified date for receiving the geotechnical report (31. December 2013) as the results of the survey will have a direct impact on the design basis and delays will have an impact on the bid price.</p>	<p>Survey Report incl. selected data will be published/available from July 1st 2013</p> <p>KF Survey Report incl. selected data will be published/available from August 15th at the very latest (and most likely earlier)</p>

<p>XX therefore recommends the DEA to submit the factual results as early as possible, as this will have a positive effect on the design procedure.</p>	<p>Data from the geotechnical surveys will be published no later than 1 November 2013 for Kriegers Flak and 15 November 2013 for Horns Rev 3. Factual reports for the two sites will be published no later than 31 December 2013. These data and results, including laboratory results will at that time have been quality checked by both the Provider and Energinet.dk.</p> <p>There may be a possibility to publish raw data from the CPT's earlier, but then it will be data that has not undergone quality assurance. This is not recommended by Energinet.dk. However, Energinet.dk will examine the possibility and describe the possible data delivery on the website in August 2013.</p> <p>Geo-engineering reports and updating of the geological models for the two sites were expected to be published by April 1 2014. Many have found this too later in the tender process. It is not possible to finish this work earlier, due to the time schedule for the input data for this work. It has been decided not to conduct the geo-engineering reports and updating of the geological models for the two sites.</p>
<p>Some developers hold more detailed knowledge on geophysical-, geotechnical and MetOcean data than others in the two areas. When and how will the DEA and Energinet.dk supply this information in order to equalize the advantage potential developers may have compared to others?</p>	<p>The DEA is in a process of dialogue with owners of neighbouring offshore farms. The dialogue is still on-going. The DEA expects to be able to inform about the outcome of this dialogue September 2013 at the latest.</p>

Comments and recommendations concerning metocean-issues?

Comment	Answer/comment – ENDK
Wave: Validation of wave data - p. 19 of METOCEAN	Wave data from Baltic 2 is not the only data set. Data from

<p>document: "Wave data from the German part of Kriegers Flak, approx. 6 months" ECR estimates that 6 month is a very limited time span - would it be possible to extend this validation period to a longer period? What leads to the restriction of 6 months and how can this restriction be taken away?</p> <p>Are Danish buoys available for validation/calibration?</p>	<p>two other German wave buoys are also used to verify the model.</p> <p>Darss Sill from July 2003 to Dec. 2012</p> <p>Arkona from Feb 2002 to Dec. 2012</p>
<p>Weather windows and downtime for combined waves and/or wind (p. 20 of METOCEAN document, left hand side, # 10):</p> <p>The met ocean statistics should also contain information on persistencies (length of respective weather windows) for several percentiles; ideally as detailed below:</p> <p>The probability for a the weather down time criteria ("the met ocean condition which limits workability; when the respective value of the criteria is exceeded, working of respective offshore ops is not possible"):</p> <p>for</p> <p>A) significant wave height $H_{m0} = 4 \sqrt{m_0}$ (GL Wind 2005 – IV – Part 2: 4.2.3 Marine Conditions) $H_{m0} = \{ 0,5 ; 0,75 ; 1,0 ; 1,25 ; 1,5 ; 1,75 ; 2,0 ; 2,5 ; 3,0 ; 3,5 \}$ meter</p> <p>and</p> <p>B) for 10-min average data wind at msl + 90 m v_W for $v_W = \{ 8, 10, 12, 14, 16, 18 \}$ m/s , each over time windows T of the following length $T = \{ 0; 3; 6; 12; 18; 24; 36; 48; 72; 96 \}$ hours, all tabulated per month { Jan; Feb; Mar; ... Dec }</p>	<p>Weather windows give only an indicative picture and shall not be used for more complex installation activities with a mixture of weather windows and weather criteria.</p>

<p>should be given for</p> <p>1) the second quartile; i.e. the 50-percentile P50 (median)</p> <p>2) for the third quartile; i.e. the 75-percentile P75</p>	
<p>Results of met ocean report should also be made available in Excel format for fast evaluation by teams of tenderers.</p>	<p>Will be made available in ASCII format</p>
<p>It would be useful to obtain information on likely subsurface visibility and wave-induced water movement at the seabed as part of the metocean report.</p>	<p>This can be obtained in several ways and it is for the designer to choose which wave model to be the most appropriated; linear wave theory, stream function, etc.</p>
<p>Some developers hold more detailed knowledge on geophysical-, geotechnical and MetOcean data than others in the two areas. When and how will the DEA and Energinet.dk supply this information in order to equalize the advantage potential developers may have compared to others?</p>	<p>The DEA is in a process of dialogue with owners of neighbouring offshore farms. The dialogue is still on-going. The DEA expects to be able to inform about the outcome of this dialogue September 2013 at the latest.</p>
<p>As some developers hold more detailed knowledge on MetOcean data than others in the two areas, XX I expects DEA and Energinet.dk to make all efforts possible to equalize the advantage potential developers may have compared to others.</p>	<p>DEA can ensure that it will make all efforts possible.</p>

Comments related to market conditions

Comment	Answer/comment - ENDK
<p>Please clarify what happens if the hourly spot price is higher than the bid price.</p>	<p>Answer will follow in September 2013.</p>
<p>It is mentioned that concession owners can decide not to receive the price supplement, please specify in what occasions this could be interesting.</p>	<p>Answer will follow in September 2013.</p>

<p>As there is a cable connection planned to Germany, please explain the market and price functionality for how the awarded contractor could benefit from this system?</p>	<p>The awarded contractor will not benefit from the interconnector to Germany. According to EU legislation will all capacity not used for transport of the off-shore wind power to the on-shore grid be used for cross border trade and market coupling. The off-shore wind park will be an integrated part of the spot market price area in Eastern Denmark and will receive the spot price in Eastern Denmark plus any subsidies.</p>
<p>It should be considered to lower the maximum amount of negative hours without subsidies to e.g. 100 to decrease risk.</p>	<p>The DEA will consider the implications of lowering the amount of hours</p>