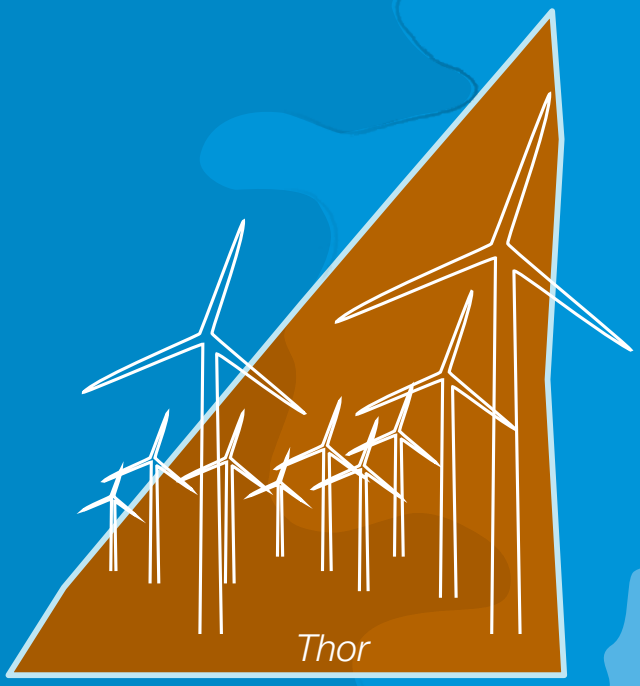
Invitation to dialogue

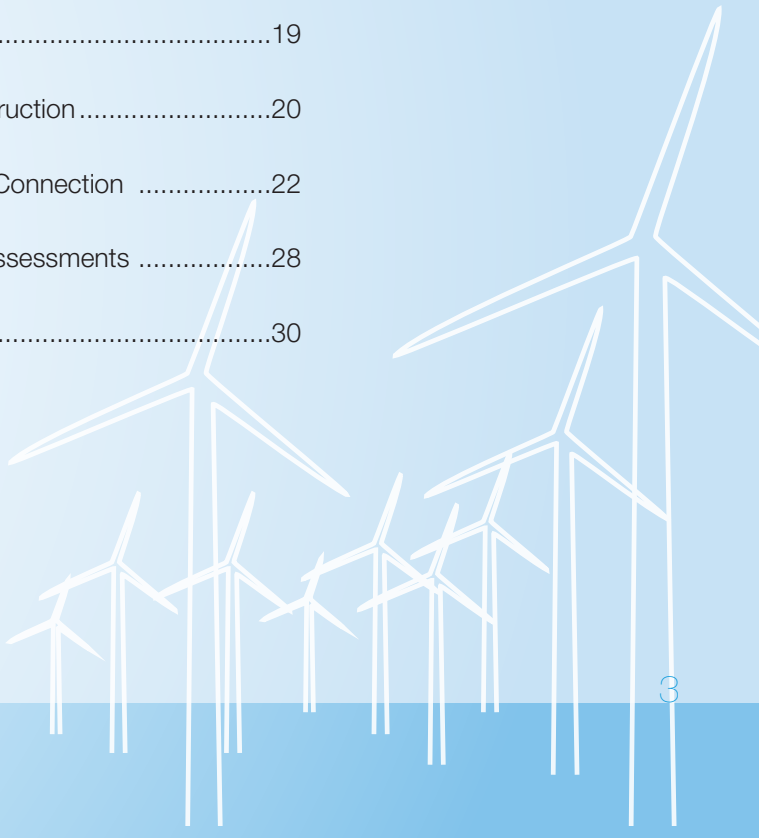
The tendering procedure for Thor Offshore Wind Farm project



Market Dialogue Conference
on 25 November 2019 in Copenhagen

Danish Energy Agency

Contents



Introduction

In June 2018 all the political parties in the Danish Parliament entered into a new Energy Agreement in order to maintain the rapid pace of the green transition and provide security for long term investments. As part of the agreement the parties decided to establish three new large-scale offshore wind farms in Danish waters before 2030. These new offshore wind farms will expand the supply of energy from offshore wind by at least 2,400 MW. If technologically and economically feasible, even larger wind farms can be established.

The first of the three offshore wind farms is named *Thor Offshore Wind Farm*. Thor will be located in the North Sea west of Thorsminde by Nissum Fjord, at a distance of minimum 20 km from the shore, and with a capacity of minimum 800 MW and maximum 1000 MW. This will make Thor Offshore Wind Farm the largest offshore wind farm in Denmark.

The call for tender for Thor takes a point of departure in the latest Danish offshore wind farm tenders, except for on three important points;

- A new design for the subsidy scheme (section 3)
- Inclusion of the offshore substation and the grid connection from the offshore substation to the point of connection at the nearshore substation (section 7)
- An adjusted approach to environmental assessments (section 8)

As in the previous Danish offshore wind farm tenders the tendering model will be a negotiated tendering procedure with pre-qualification and preliminary dialogues with potential tenderers and investors. This process has proved successful in allowing potential tenderers and investors to influence the tender conditions, thus ensuring optimal sharing of risk between tenderer and the contracting authority (the Danish Energy Agency), and ultimately achieving competitive bid prices.



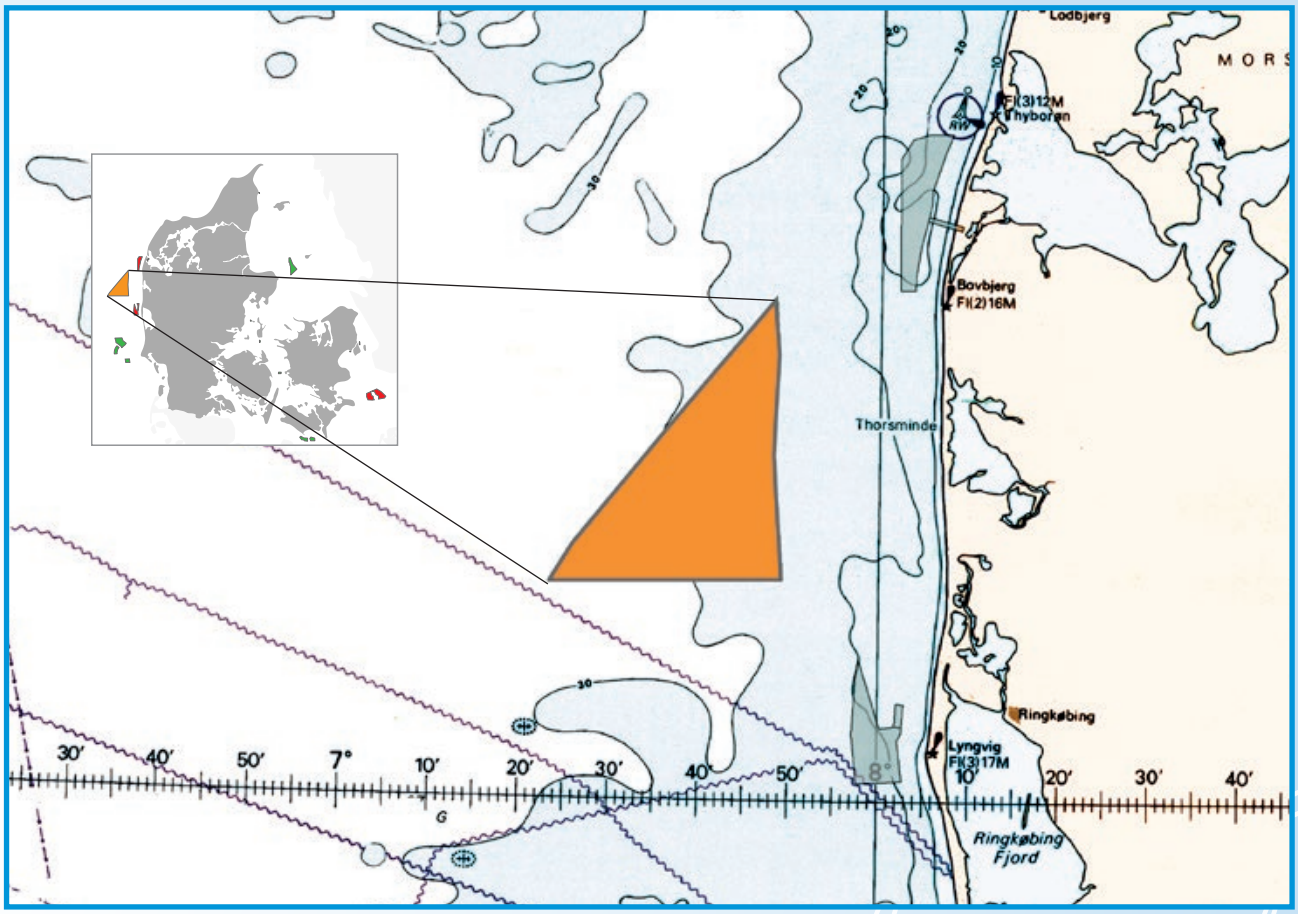


Illustration: The location of the site for Thor offshore wind farm

Building an offshore wind farm is a complex investment project carrying both financial as well as technical risks. In order to ensure that a broad, international competition of tenderers and investors can offer their views on the tendering procedure and contribute to making the content of the conditions as attractive as possible, the Danish Energy Agency (DEA) and Energinet (the Danish TSO) will conduct a market dialogue asking market specific questions based on selected themes outlined in this paper. For each section and theme there is a set of questions posted by the DEA to the market players.

Process for the Market Dialogue

The Market Dialogue Conference will take place on 25 November 2019 at the Danish Energy Agency in Copenhagen. In addition to this plenary meeting on 25 November 2019, potential tenderers and investors are also invited to provide their views in bilateral meetings of a more confidential nature with the DEA/Energinet Thor offshore wind team. The bilateral meetings can take place between 26 and 29 November 2019.

The market feedback provided at the plenary Market Dialogue session as well as the bilateral meetings will subsequently be published anonymously on the Thor website along with the DEA´s response to questions raised in the dialogue.

If potential tenderers request that certain information be kept confidential for the sake of competition, the DEA will be able to meet such requests, provided they do not infringe the obligations of the Freedom of Information Act (Access to Public Administration Files Act), the Danish Public Administration Act and the Environmental Information Act. Information received will under no circumstances be used in any way to provide competitive advantages to a single market player.

This discussion paper only contains key elements of the draft tendering conditions as well as important topics for discussion. The complete tendering conditions will be set out in the tendering documents themselves, which are expected to be published by Q3 2020.

For further information on the Thor call for tender, including the programme for the Market Dialogue Conference, please visit our website https://www.ens.dk/thor.

1. Timetable for tendering procedure for Thor Offshore Wind Farm

The preliminary timetable for the tendering procedure is outlined in the following. Please notice that the timetable can be amended to accommodate possible changes arising from the market dialogue or unforeseen circumstances.

A Prior Information Notice specifying the overall nature and scope of work will be published in Q1 2020. Later on, in Q3 2020, a Contract Notice describing the basic terms and conditions for the call for tender will be published together with the tendering material and the pre-qualification material – this will officially launch the tendering process with an application period of 120 days. The deadline for submission of applications for pre-qualification is set at Q4 2020. The tendering material comprises a complete set of tendering conditions, including draft concession agreement, draft licences, etc., although these have not yet been approved with regards to state aid (European Commission).

When publishing the Contract Notice in Q3 2020, the DEA will provide information on all relevant and exist-

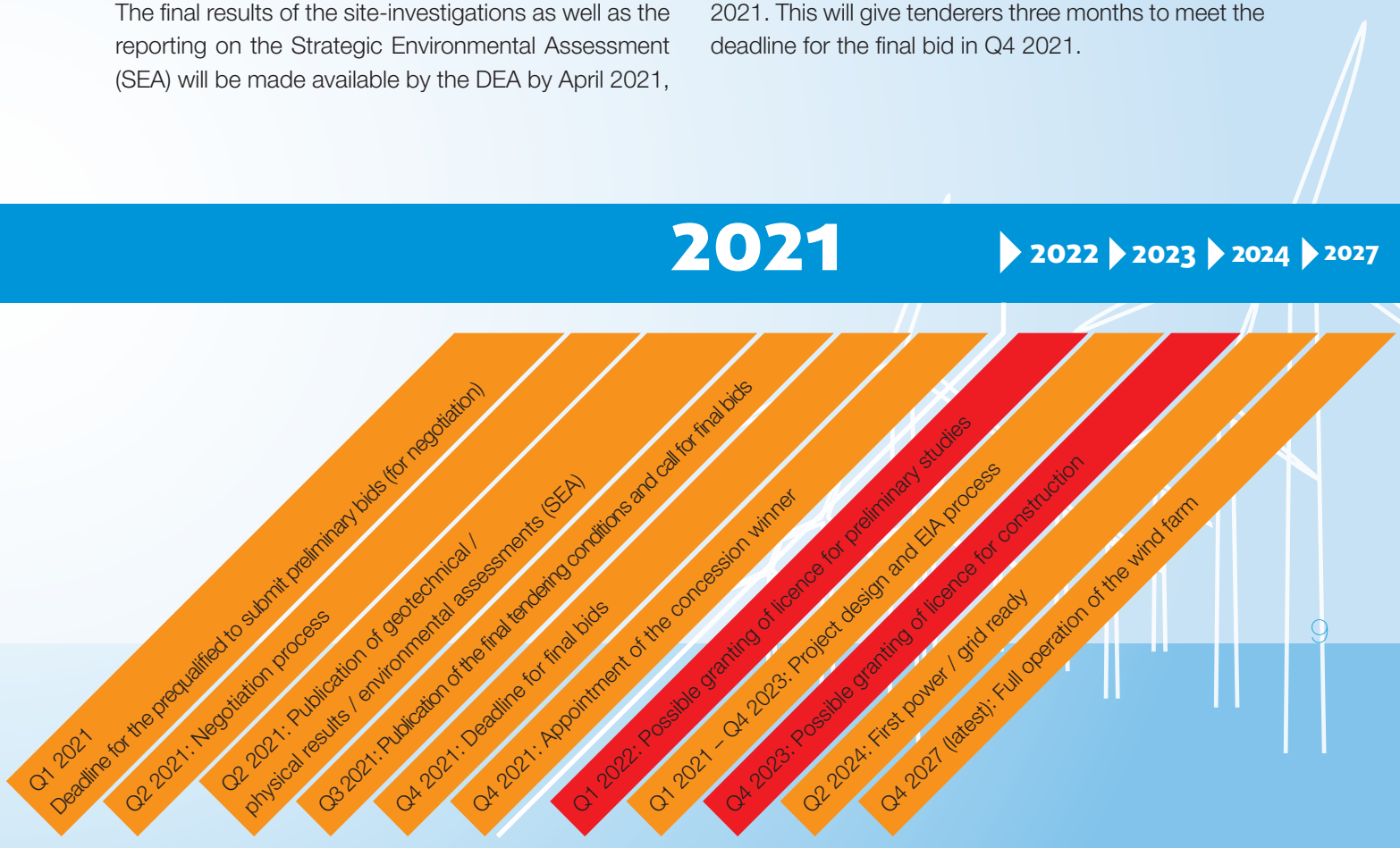
Timeline

ing data and reports available at the time. Since some of the data and environmental assessments will be published after the pre-qualification, the DEA will also provide a list of expected conditions concerning all elements of site-investigations and environmental assessments at the time of publishing the Contract Notice (e.g. results of completed geotechnical and geophysical surveys, MetOcean data collection as well as the environmental assessments, which are supplementary to the Strategic Environmental Assessment).

The final results of the site-investigations as well as the reporting on the Strategic Environmental Assessment (SEA) will be made available by the DEA by April 2021, in good time for the prequalified tenderers to take these inputs into account before finalizing their final bid.

Moreover, it is important to stress that the tendering conditions can be modified in accordance with the negotiation process planned to begin in Q2 2021, based on confidential dialogues with each individual pre-qualified tenderer.

On the basis of the results of the negotiated procedure, the final tendering conditions will be published in Q3 2021. This will give tenderers three months to meet the deadline for the final bid in Q4 2021.



The tendering procedure for Thor Offshore Wind Farm project

The state aid aspect and legislative amendments

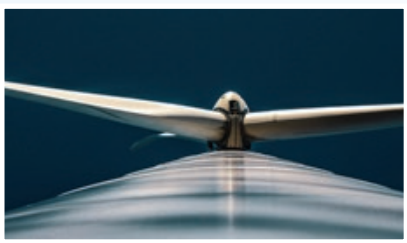
Notification of state-aid to the European Commission will be carried out from Q1 2020 to Q2 2021 on the basis of a standing dialogue between the DEA and the European Commission. The call for tender will therefore be conditional upon approval from the European Commission, since any aid design stipulated in the call for tender must be compatible with EU state aid regulations. The DEA expects this approval process to be finalized by the time the final tendering conditions are published in Q3 2021.

In addition, the call for tender will be conditional on legislative amendments with regard to certain conditions for the concession. The DEA expects these legal amendments to enter into force in January 2021. As all political parties have agreed on the changes (e.g. including grid connection in the call for tender) on which these legal amendments are based on, no major issues are foreseen in this legislative process.

When to start construction of the Thor Offshore Wind Farm

Shortly after the concession winner has been announced, the winner will obtain a licence to pre-investigate the site for the offshore wind farm in order to carry out detailed site-investigations and the Environmental Impact Assessment (EIA) for the project. When the concession owner has completed the EIA process and delivered all other necessary documentation, provided that the EIA can be approved, the DEA will issue the construction licence. The owner of the concession is thereafter obliged to establish the wind farm before the end of 2027, when the last turbine must be connected to the collective grid. In parallel, Energinet will build the onshore grid connection allowing for possible first power already by Q2 2024.





Questions

The proposed timetable provides 120 days for pre-qualification (beginning Q3 2020), 90 days for submission of preliminary bids (beginning Q4 2020) and 70 days for submission of final bids (beginning Q3 2021). Is this enough time for applicants to meet these deadlines?

Will tenderers be able to submit preliminary bids by end of Q1 2021 given that parts of the results of the preliminary site-investigations as well as the Strategic Environmental Assessment report will not be ready before April 2021, at the latest?

In the proposed timetable the TSO will have the grid connection ready already by Q2 2024, when first power can be delivered to the grid. Is it realistic that the concession owner will be able to use the grid at this point in time?

Overall, does the timetable provide a sound and realistic time horizon for establishment of the wind farm?

2. Conditions for pre-qualification

In order to ensure that only serious, professional project developers will be invited to submit tenders, DEA will conduct pre-qualification with a number of minimum requirements regarding the financial, economic and technical strength of the applicants. The minimum requirements the DEA will be applying are in their nature similar to the ones required in previous pre-qualification processes for Danish offshore wind tenders. The DEA considers to prequalify a maximum of 5-7 applicants.

Applicants for pre-qualification may be a single company, a consortium of several companies, a joint venture or a company established specifically for the project – a so called Special Purpose Vehicle (SPV).

In order to meet the minimum requirements for financial and economic capacity and technical capacity, the applicant may rely on other economic operators, e.g. a partner, a parent company, subcontractors, founding companies/future owners or one or more affiliated companies. In this case, the applicant must prove that the applicant has at its disposal the necessary experience or resources, and to some extent the supporting entities will have to undertake joint and several liability, see also section below.

The DEA considers the following minimum requirements

Minimum requirements on financial and economic capacity

- The applicant must have an annual overall turnover (in IFRS: 'revenue') of minimum DKK 27 bn.*, (calculated as an average of the last three financial years available), corresponding to approx. EUR 3.7 bn., *and*
- The applicant must have an equity ratio (total equity/total assets X 100) of 20% or more OR a long term credit rating of BBB- or above (Standard & Poors and Fitch) and/or Baa3 or above (Moody's) or an equivalent rating from another reputable international credit rating agency.

If the applicant consists of more than one economic operator or the applicant relies on the financial capacity of other economic operators in order to meet the financial minimum requirements, the combined sum of annual overall turnover of all of the economic operators must pass the threshold for overall turnover (on average over the last three years). Also, the combined equity ratio will have to pass the threshold (as opposed to applying it individually to each economic operator), OR each economic player must pass the threshold for the credit rating.

The same will apply for the founding companies/future owners if the applicant has not been established at the time of application for pre-qualification.

*) This number is calculated on the basis of 2 x the contract value for the Thor project, where the DEA estimate of the contract value is EUR 13.7 bn. for 800 MW and EUR 17.1 bn. for 1,000 MW. The number for the 800 MW estimate has been used.

The DEA will adjust the level of the rating if the market situation changes.

Minimum requirements on technical capacity

In order for the DEA to be able to decide whether an applicant has adequate technical capacity, the following requirements are proposed. Consequently, the applicant must document the applicant´s experience in projects similar to the Thor Offshore Wind Farm. The DEA is considering that this could be done by documenting experience in:

- Project development, procurement and management of construction of at least one large-scale offshore wind farms with the capacity of 150 MW or more, completed within the last five years, *and*
- Project development, procurement and management of at least one offshore AC-substation servicing an offshore wind farm completed within the last five years.

Joint and several liability

If the concession agreement is awarded to a tenderer that consists of more than one economic operator (e.g. a SPV, consortium or joint venture), these other economic operators will be required to undertake joint and several liability. If the tenderer is a SPV or joint venture, the founding companies will be required to undertake joint and several liability with the SPV or joint venture.

If the tenderer relies on the economic and financial capacity of other economic operators in order to be prequalified, these other economic operators will be required to undertake joint and several liability together with the applicant.

If an applicant relies on the technical capacity of other economic operators (e.g. subcontractors), these other economic operators are not obliged to undertake joint and several liability with the applicant.

The scope of this liability will be explained in more detail in the tendering conditions.

Questions

Are there any comments or suggestions on the requirements under consideration for financial and economic capacity or technical capacity?

3. Subsidy scheme and award criteria

The concession owner of Thor Offshore Wind Farm can receive aid in the form of a price premium from the Danish State for a 20-year period commencing at the time of grid connection, meaning the time at which the wind farm supplies the first kWh to the collective grid. The subsidy will be granted in accordance with the Contract-for-Difference principle, see the description below. The bid price will not be indexed with inflation.

Contract-for-Difference

In this Contract-for-Difference (CfD) for Thor Offshore Wind Farm, the size of the premium will be calculated as the difference between the bid price and a reference price. The reference price is calendar-fixed annually settled, meaning that it is calculated as the simple average of the electricity spot prices in the previous calendar year running from 1 January to 31 December. The electricity spot prices are the hourly spot price in electricity price area DK1 Stated by the Nordic electricity exchange, Nord Pool.

The difference between the price offered and the reference price will be granted as a fixed price premium which is a fixed amount for one whole calendar year, but may vary in size year by year, depending on the electricity prices in the previous year.

The total premium in a given hour is the product of the price premium and the output measured for that same hour. Following the State aid regulations, premium will be discontinued in hours with non-positive prices on the spot market in Nord Pool price area DK1.

The CfD model has been designed with symmetric payment. This means that the concession owner receives premium in years in which the bid price is higher than the reference price, but correspondingly pays the State in years in which the reference price is higher than the bid price. For example, this will happen if the bid price is DKK 0.30 per kWh, while the reference price for a given year is DKK 0.40 per kWh. In this event, the concession owner will be liable to pay the State DKK 0.10 per kWh production delivered throughout the year. There is no opt-out option.

However, the symmetric payment is modified to improve the incentive for the concession owner to produce electricity. This means that in years when the concession owner has to pay the State for production delivered, this requirement will lapse in hours in which the spot price in DK1 on Nord Pool is lower than the size of the concession owner's payment per kWh that year. In the example above, this will apply in hours when the spot price in DK1 is lower than DKK 0.10 per kWh.

Total premium from the State or total payment from the concession winner will be settled on a monthly basis. Caps have been included on how much the State can

pay to the concession owner and how much the concession owner can pay to the State, see below.

Award criteria

When evaluating the tenders, both the price per kWh and the total subsidy costs over the 20-year period are relevant, due to a budget evaluation threshold. See calculation of the total subsidy costs and description of the budget evaluation threshold of DKK 3.7 bn. below.

The tenderer should submit a tender for Thor Offshore Wind Farm with a statement of which capacity between 800 and 1000 MW is to be established and quote a price in "øre" per kWh.

If the best bid causes expected total subsidy costs over the 20-year period that are lower than the budget evaluation threshold of DKK 3.7 bn., the award criterion is:

Lowest price per kWh

Such a bid will automatically be accepted and will not require further approval from the parties to the Energy Agreement of June 2018.

However, in the event that no bids has total subsidy costs, which are within the budget evaluation threshold, there is a chance that the bids can still be accepted by the parties to the Energy Agreement of 2018. In this event the aim of the Danish State is to minimize the total costs of the offshore wind farm, and therefore the award criteria is:

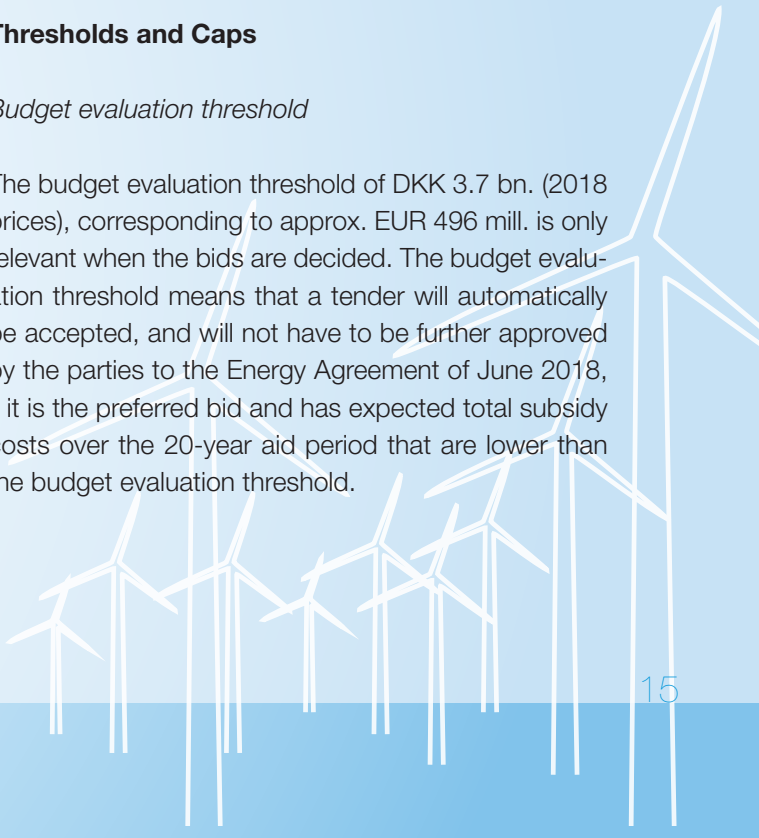
Lowest total expected subsidy costs over the 20-year period

Such a bid can only be successful if accepted by the parties to the Energy Agreement of June 2018, and thus, there is a risk that the tender will not be accepted.

Thresholds and Caps

Budget evaluation threshold

The budget evaluation threshold of DKK 3.7 bn. (2018 prices), corresponding to approx. EUR 496 mill. is only relevant when the bids are decided. The budget evaluation threshold means that a tender will automatically be accepted, and will not have to be further approved by the parties to the Energy Agreement of June 2018, if it is the preferred bid and has expected total subsidy costs over the 20-year aid period that are lower than the budget evaluation threshold.



The expected total subsidy costs over the 20-year aid period is to be calculated on the basis of the following:

- Installed wind farm capacity
- Estimated 4,500 full-load hours production per year for 20 years starting from 1st January 2025
- Electricity price development in DK1 based on the electricity price projection from the Danish Energy Agency
- The gross value-added deflator

Examples of how these calculations are performed will be included in the tender documents as well as the latest relevant electricity price projection.

State payment cap and payment cap for the concession winner

While the budget evaluation threshold of DKK 3.7 bn. will only be applied when bids are decided, there is a cap on the amount of subsidies the Danish State can actually pay over the 20-year aid period. This cap is DKK 6.5 bn. Similarly, there is a cap on the symmetric payment that the concession owner can be required to pay to the Danish State of DKK 2.8 bn. over the 20-year period.

Questions

Will the subsidy scheme described cause reluctance or concerns with regards to tender participation?

Are there any unforeseen risks within the subsidy scheme described that could be mitigated by the DEA?

Are there any concerns regarding size of the budget evaluation threshold and regarding the two award criteria? Furthermore, will the budget evaluation threshold allow for tenders with a capacity of more than 800 MW within the threshold?

4. Penalty for defective performance

In order to ensure that only serious tenders are submitted, the DEA will require a penalty for defective performance as part of the tendering procedure for Thor. The penalty for defective performance will take effect if, irrespective of the reason, the concession winner withdraws from the project or fails to construct the wind farm and connect it to the grid. A penalty for defective performance has been a standard requirement in recent Danish call for tenders and in call for tenders in other countries e.g. The Netherlands and Germany.

The DEA is considering a penalty of 0.75 mill DKK/MW, corresponding to EUR 0.1 mill./MW. The DEA is also considering whether the penalty should be phased in as in some previous Danish call for tenders.

The penalty for defective performance will cease to apply when the first kWh from the first turbine has been delivered to the collective grid.

Guarantee for the penalty for defective performance

As security for payment of the penalty a guarantee shall be provided by a recognized financial institution, insurance company or similar, approved in advance by the DEA. Moreover, it will be required that the guarantor has a long-term credit rating of at least A- (Standard & Poor's and Fitch) or A3 (Moody's) or equivalent rating from another recognized international rating agency. The level of the rating will have to be adjusted, if the market situation changes.

Moreover, the DEA is considering allowing a parent-company guarantee to supplement the guarantee as described above.

The DEA is proposing that the guarantee obligation will expire fully when:

- The concession owner has either documented to have paid costs after the award of the concession of at least DKK 1 bn. corresponding to approx. EUR 130 mill. for planning, design and construction of the wind farm, or
- When the first kWh from the first turbine has been delivered to the collective grid.

Questions

Will the described set-up for penalty, guarantee and obligations influence interest in the call for tender?

Are there any other ways than the described set-up, that will provide the same level of assurance for the Danish State and at the same time allow the tenderer to offer a competitive price?

5. Compliance with deadline for completing the wind farm

According to the Energy Agreement of 2018, Thor must be connected to the collective grid by no later than 2027. DEA is considering to provide an incentive to complete the Thor wind farm in time by inserting a condition that if 95% of the farm is not connected by 31 December 2027, the concession winner will have to pay a fine for every 3 or 6 months the completion of the wind farm is delayed. The size of the fine will correspond to the size of the penalty for previous Danish offshore wind farm tenders.

Questions

Is the proposed set up with fines an optimal way of ensuring that the wind farm is completed by 2027?

If using fines, will it be optimal if more fines are added after 3 or 6 months? Previously, the incentive was doubled after 6 months.

6. Capacity of the wind farm and designated area for construction

The parties of the Energy Agreement 2018 have decided that Thor should be tendered with flexibility in the capacity ranging from minimum 800 MW to maximum 1000 MW. The main reason for this span in capacity is to ensure full utilization of the capacity of the transmission cables and thereby ensuring a lower cost of energy.

The ultimate designated area for the construction of Thor will be located within the gross area for pre-investigations shown in the figure below.

The gross area, which is located west of Thorsminde in the North Sea, and which is currently being pre-investigated, consists of a 440 km^2 triangular area and additional areas around four potential export cable corridors leading to two potential landfalls on the coast (marked with four orange lines in the figure).

The net area (designated area for construction of the wind farm) to be included in the call for tender should have a size of between 176-220 km^2 (800 – 1.000 MW) based on the DEA capacity density factor of 4.54 MW/km^2 used in earlier Danish call for tenders. In order to narrow down the gross area based on the ongoing investigations, the DEA and Energinet will select the most economically optimal part of the gross area and identify any critical parts of the area in terms of environmental and natural habitat considerations, most importantly protected birds.

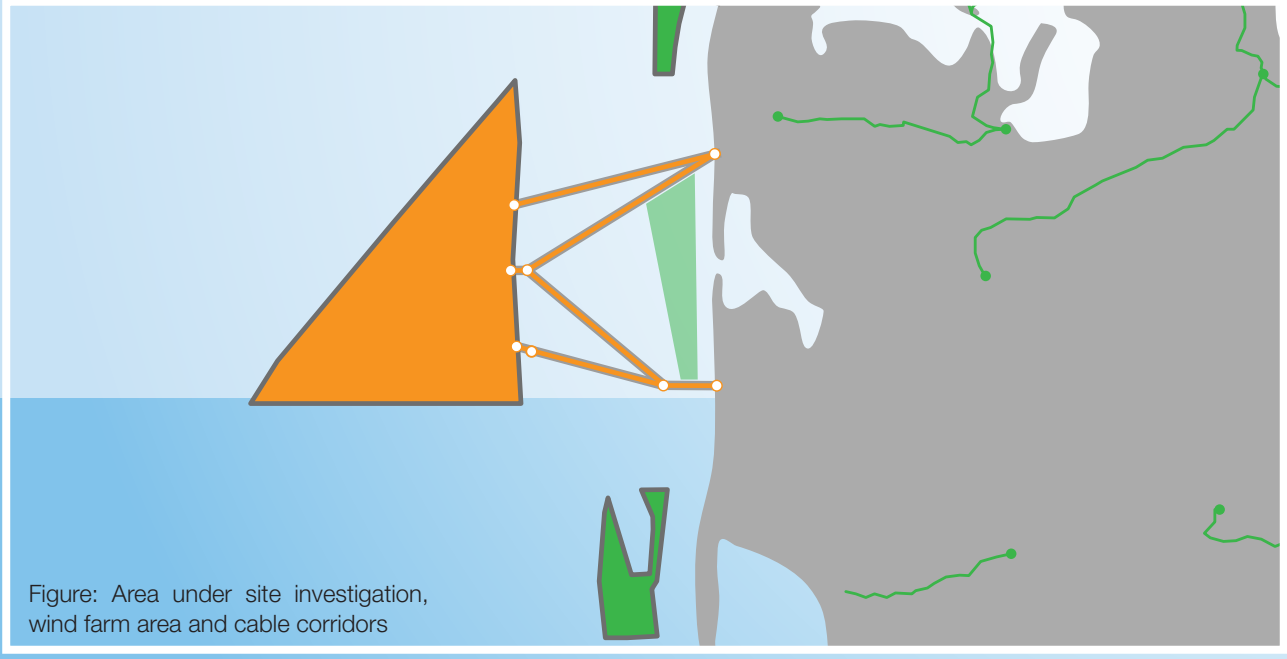


Figure: Area under site investigation, wind farm area and cable corridors

The winner of the concession will be able to decide where the turbines, inter array cables and offshore transformer platform should be located within the net area. Energinet will decide which of the two potential landfalls Thor Offshore Wind Farm is going to use, as described in section 7.

As proposed by the DEA, the call for tender will specify that the net area to be used will be scaled according to the amount of MW specified in the winning bid. Accordingly, 800 MW will be assigned 176 km^2, 900 MW will have 198 km^2, and so forth.

The DEA is also planning to allow the concession winner to pre-investigate an area 30% larger than what is ultimately needed in order to allow the concession winner to select the best site-conditions, ultimately facilitating lowest possible bid prices. In this case, the concession owner will be allowed to pre-investigate a total of 228 km^2 (176 km^2 x 1.3) for an 800 MW wind farm, although the concession owner ultimately only will be allowed to use 176 km^2.

It can also be pointed out here, that the DEA is planning on using a 6 km buffer zone area in all directions around the net Thor area. The buffer zone area will apply for 20 years, after which it will be reduced to 4 km, in line with previous Danish call for tenders. The establishment of the buffer zone area means that no licences will be granted to construct new offshore wind turbines in this buffer zone area without prior consent from the concession owner.

Questions

Is the DEA capacity density factor of 4.54 MW/km^2 sufficient in terms of receiving lowest possible bid prices or could a higher turbine density be allowed in order to economise on km^2 used?

Does the additional area of 30% for pre-investigation provide value to the tenderers?

7. Offshore grid connection, onshore facilities and Point of Connection

The offshore substation and the grid connection from the offshore substation to the Point of Connection (POC) at the nearshore substation will be included in the call for tender. Since this is a new and fundamentally different approach compared to earlier Danish call for tenders, it is relevant to describe more in detail how the environment- and planning process is being managed. It is also relevant to describe a number of technicalities, which the tenderer should be aware of early in the tendering process.

With the new approach, the tenderer should take the following into account:

- it will be the responsibility of the concession owner to decide on the voltage level at wind turbine generator terminals
- it will be the responsibility of the concession owner to decide on design, layout, construction and operation of the offshore platform and substation, the offshore transmission cables, the onshore transmission cables up to the nearshore substation and connection to the POC provided by Energinet. In the following this is referred to as the export facility (see figure 7.1)

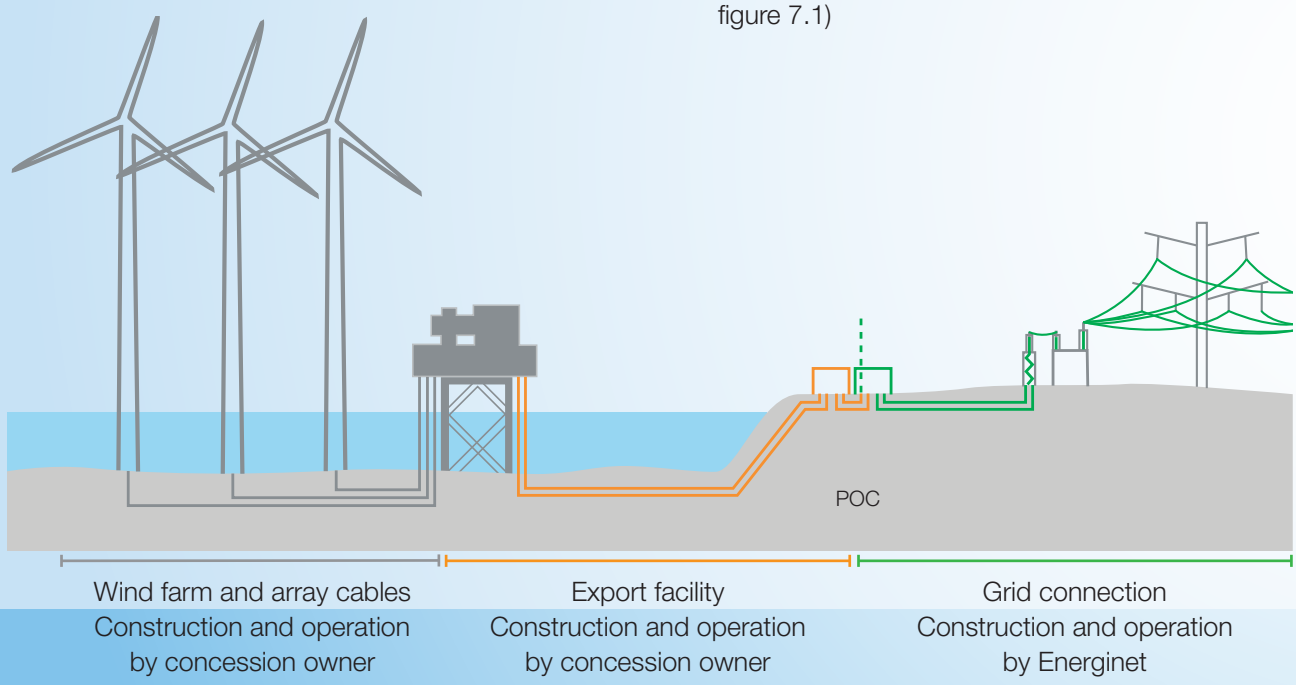


Figure7.1 Responsibility of the concession owner includes all facilities up to and including the termination of the land cable from concession owner nearshore substation and to the POC provided by Energinet

The POC will be located either north or south of Nissum Fjord approximately 2-5 km inland from shore as shown in the figure below. Based on an evaluation of pros and cons, Energinet will make the final decision on the most suitable location, which then will be included in the call for tender.

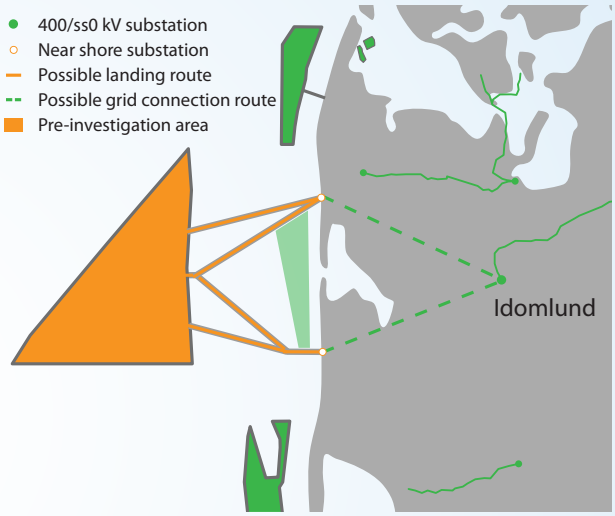


Figure 7.2 The two solutions for establishing a POC being investigated – one north and one south of Nissum Fjord.

Energinet will provide two 220 kV bays for connection and the POC is defined on the busbar. The concession winner will be responsible for construction and operation up to and including the termination (HV-connex connector) of the cables at/in the bays for a GIS solution. The busbars will define the POC (one POC).

Specific requirements for the design of the wind farm and the export facility:

1. The wind farm and the export facility must be compliant with all grid code requirements in POC. National RfG appendix and applicable technical regulations are available at https://energinet.dk

2. The wind farm and export facility must be constructed and at all times operated in such a way, that no incident can cause loss of more than what equals dimensioning fault in the West Danish balance area (DK1) – currently 682 MW.

3. Energinet will facilitate the Environmental Impact Assessment (EIA) for all onshore activities including the land cables and nearshore substations. The concession winner will be responsible for handling any adjustments needed on their part, if design and solution is outside the scope described in the EIA (see further on this in section 8).

4. Purchase of land needed for construction of the nearshore substation and cables to the POC will be the responsibility of the concession owner.

5. Other permits than the EIA permit and the addendum to the municipal spatial plan needed for construction of the nearshore substation will be the responsibility of the concession winner.

The above requirements will be updated and detailed in the process up to final call for tender.

With reference to the EU Regulation 2016/631 and 2017/1485, table 7.1 shows the minimum time periods during which the Thor wind farm must be capable of operating for voltage deviating from the reference 1 p.u. (per unit) at the connection point without disconnecting from the transmission system.

Parameter	p.u.	Voltage kV
60 min. operation	1.118 – 1.15	253
Maximum voltage for continuous operation	1.118	246
1 p.u.	1	220
Minimum voltage for continuous operation	0.9	198
60 min. operation	0.9 – 0.85	187

Table 7.1 Voltage range for ”220 kV” system in Vest Denmark (DK1)

High level scope assumption of concession winners nearshore export facilities

In order to save time and efforts in the project-specific EIA (to be carried out by the concession winner, see further explanations in section 8), the complete onshore EIA will be carried out by Energinet, including the EIA of the nearshore facility of the concession owner (nearshore part of export facility). Since this means that onshore EIA will be carried out before the concession winner has designed and built the nearshore substation, it is extremely important that Energinet´s assumptions about dimensions and requirements of the yet-to-be-built facility are within the scope of the EIA. If the design of the concession winner´s nearshore substation turns out to be significantly different from the scope proposed in the EIA process, there is a high risk that the concession owner will have to carry out a supplementary EIA later, including a new addendum to the municipality plan. This will be quite time consuming and should be avoided.

To deal with this situation Energinet has estimated the maximum extent of the concession winner´s onshore facilities in the following, and this will be included in the EIA process – unless the market players propose otherwise.

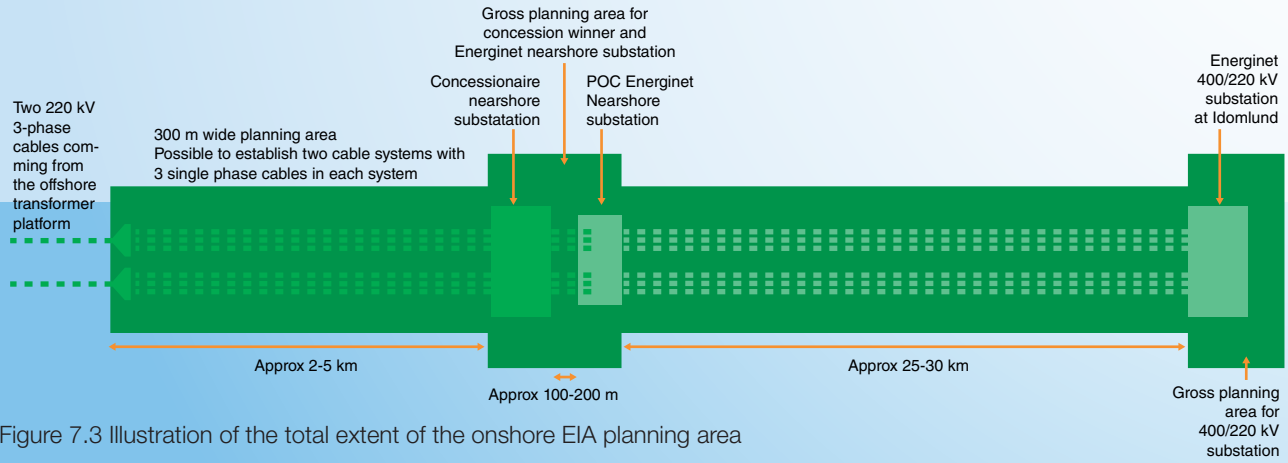


Figure 7.3 Illustration of the total extent of the onshore EIA planning area

The concession winner´s onshore transmission cables from landfall to the nearshore substation must be placed within the cable routes defined in the EIA permit. If the owner of the concession decides to place the cables somewhere else, there is a high risk that they will have to carry out a supplementary EIA.

Estimate of maximum technical content of concession owner´s substation:

- Voltage level of 220 kV
- Double busbar with breaker divided busbar and one-breaker bays
- Busbar coupler in each of the two sections of the busbar – two bays wide each
- Two bays for tenderer´s cables coming from landfall
- Two bays for tenderer´s cables going to the POC
- Three bays for shunt reactors
- Two bays for STATCOM's / harmonic filters
- Three shunt reactors
- Two STATSCOM's / harmonic filters
- Auxiliary supply (10/04 kV and battery back-up). No diesel generator included
- Protection, SCADA and communication housed in building together with auxiliary supply
- Fence and approx. 10 meter plant belt around the substation

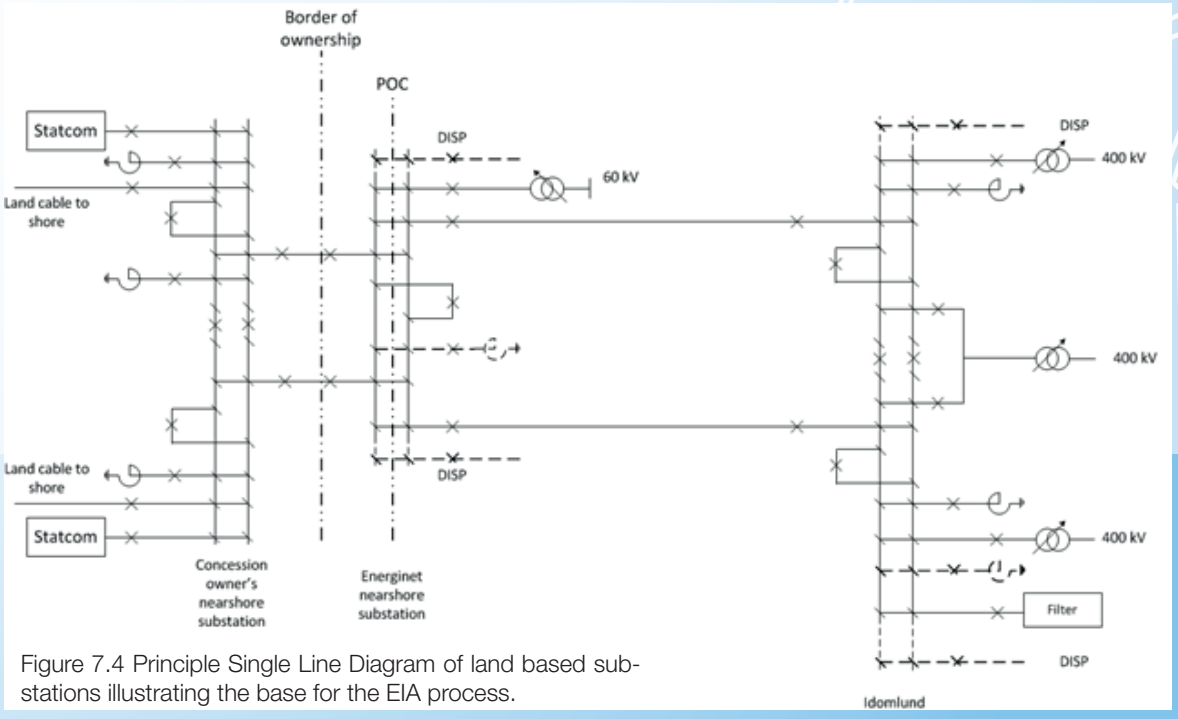


Figure 7.4 Principle Single Line Diagram of land based substations illustrating the base for the EIA process.

Two possible switchgear technologies

Depending on the space available at the specific location, it will be possible to establish the required switchgear with Air Insulated Switchgear (AIS) or a housed Gas Insulated Switchgear (GIS) approach. A solution with both technologies has been estimated with the content described above and this resulted in the worst case footprint and height estimate listed in Table 7.2.

Based on evaluation of the two technologies for this specific project, Energinet has decided that the nearshore substations shall be established using GIS technology.

Parameter	GIS	AIS
Total substation max. footprint incl. plant belt, m^{2*}	22,000	65,000
Building max. height, m	12	7
Busbar max. height, m	–	11
Lightning protection max. height, m	–	30

Table 7.2 Dimensions of the nearshore substation to be built by concession winner

*) Plant belt of 10 meters and a buffer of 20% is included in the show estimate of the total substation footprint

The POC will be provided in a housed 220 kV GIS substation through two 220 kV bays and will be constructed by Energinet. The POC reference will be at the busbars. The nearshore substation owned by Energinet will most likely also support transformation from 60 kV to be able to pick up land based renewable energy production from the area around the nearshore substation and this will be included in the dimensioning of the transmission grid that Energinet will build from POC and forward to Idomlund. Other use of the Energinet nearshore substation might also be relevant.

Energinet will be responsible for the onshore EIA consenting process. A district plan for the nearshore substation area is needed to obtain the EIA permit. Therefore a choice between AIS and GIS has been made early in the process resulting in a decision to use GIS.

Compensation for loss of production

Compensation in connection with delayed access to the grid

The DEA intends to continue the principle that owners of concessions should be compensated for losses of production if Energinet does not meet the deadline for completion of Energinet's part of the onshore grid connection. A maximum limit could be set for the liability for compensation.

The compensation will be calculated according to the price premium plus market price for the production that the operating wind turbines would have delivered under the actual site conditions pertaining over the time period, if the spot prices are positive in that time period.

Compensation in connection with limits on production

Compensation will be granted for losses of production in the event of faults or maintenance work on facilities in the transmission grid belonging to Energinet. In these situations, Energinet can order a reduction or cut-off of electricity production.

The compensation will be calculated according to the price premium plus market price for the production that the operating wind turbines would have delivered under the actual site conditions pertaining over the time period, if the spot prices are positive in that time period.

No compensation will be granted for force majeure.

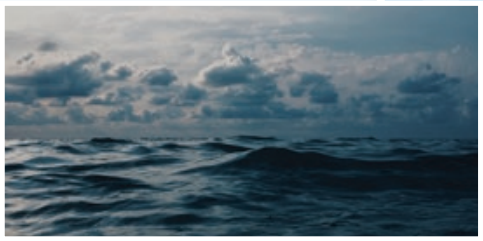
Questions

Is the described set-up for the solution onshore (dimensions for nearshore substation, footprint (m^2), building height, HV-equipment etc.) within the expectations of developers?

If the tenderer decides to use a voltage level different from 220 kV, the tenderer will need to install transformers in the nearshore substation. Is that a plausible possibility?

Is it likely, that the tenderer will need STATCOM's in the nearshore substation?

Is it likely, that the tenderer will need harmonic filters in the nearshore substation?



8. Process and responsibilities concerning environmental assessments

The DEA is using an approach to environmental assessments for the Thor Offshore Wind Farm that is different to the one used for the latest tendering processes for Horns Rev 3, Vesterhav Syd, Vesterhav Nord as well as Kriegers Flak. The need for this new approach is a result of the Danish Energy Appeal Board decision on Vesterhav Syd offshore wind farm of 20 December 2018, after which the environmental impact assessment process and permit for that project were rejected.

In order to provide a more solid process, the new approach is designed with two key objectives in mind: to minimize the process-risk as much as possible for the developer in terms of claims and appeals over the permitting process, and to minimize the environmental and planning risk as much as possible in terms of mitigating such key risk-factors prior to submitting final bids.

The new approach to environmental assessment is based on a Strategic Environmental Assessment (SEA) prior to final bids of the plan for the offshore wind farm in line with the Executive Order on environmental assessment of plans, programmes and specific projects. The plan to be assessed consists of the political decisions regarding the Thor Offshore Wind Farm, namely, the Energy Agreement 2018 and related decisions concerning the call for tender (the selected site, capacity of the wind farm in MW, and the decision to include the grid connection in the call for tender).

In addition to the SEA, Energinet, who at the operational level will be responsible for carrying out the SEA-process, will also carry out a range of additional environmental assessments as has been practiced previously. The purpose of these additional assessments is to provide critical data for as much risk-mitigation as possible for the Thor offshore wind site prior to final bids. These additional assessments focus on bird surveys, safety of navigation, radio links and radar, fisheries, marine archaeology, noise and cumulative impacts. Presumably, data from these additional assessments can be reused in connection with the final EIA of the concrete project offshore (see below).

It will be the responsibility of the concession owner to carry out the Environmental Impact Assessment (EIA) of the concrete project offshore – i.e. the wind farm, offshore substation and export cables forward to the landfall. The DEA is the responsible authority for EIA-approval of the project offshore.

In addition to this, Energinet will undertake the EIA of the concrete project onshore, that is, from the landfall and onwards to the nearshore substations, the nearshore substations themselves as well as onwards to the 400 kV transmission grid at Idomlund. The Danish Environmental Protection Agency (EPA) is the responsible authority for EIA-approval of the project onshore.

The licence for construction, which is also the environmental permit, for the offshore project cannot be granted before the EIA of the concrete project offshore has been carried out and approved. Prior to the launch of the EIA the public and relevant authorities will be consulted on the scope and content of the EIA-report. The public and relevant authorities will also be con-

sulted, when the EIA-report and a licence for construction has been drafted. Only after this will it be possible to make the final approval about whether a licence for construction can be granted. There will be a four-week limit for complaints after granting the licence.

To sum up, the environmental assessment process for the Thor Offshore Wind Farm will include:

1. Prior to final bids – Completion of a Strategic Environmental Assessment (SEA) of the plan for Thor Offshore Wind Farm that meets the requirements in the Act on the Environmental Assessment of Plans and Programmes (Danish SEA Act)

2. Prior to final bids – Completion of additional environmental surveys and studies in addition to the requirements imposed for a SEA in order to provide critical data for as much risk-mitigation as possible for the Thor offshore wind site prior to final bids.

3. Prior to final bids – An EIA of the specific project onshore from the first landfall in the beach zone and onwards to the onshore substation as well as onwards to the 400 kV transmission grid in Idomlund.

4. After final bids – An EIA of the specific project offshore and up to the first landfall in the beach zone is to be carried out after a concession winner has been appointed, and a specific project has been described in sufficient detail. The concession winner is to carry out and complete the project-specific EIA.

Points 1, 2 and 3 above will be the responsibility of Energinet and will be complete before the deadline for bidding. The additional environmental studies and surveys for the offshore wind farm (point 2 above) are expected to be completed by 1 April 2021 at the latest, and they will be published as soon as they are ready. The concession winner will subsequently carry out the project-specific EIA for the offshore project before the offshore wind farm can be constructed. It should be noted that, in this set-up, Energinet will undertake the EIA of part of the onshore solution, which the concession winner will be responsible for, namely, the cabling from landfall and up to the nearshore substation as well as the nearshore substation. This also means, that if the concession winner would like a different design (different dimensions, etc.), than the one that has been EIA-approved, then a screening of the EIA will have to be carried out, and this could lead to requirements for a supplementary EIA.

For use in the environmental assessments, a set of guidelines for undertaking the SEA and the supplementary environmental assessments were published by the DEA on 24 September 2019 and can be found here: https://ens.dk/en/our-responsibilities/wind-power/ongoing-offshore-wind-tenders/thor-offshore-wind-farm/environmental.

Questions

Will the current description of the planned environmental assessments ensure the flexibility necessary to select technical solutions for Thor Offshore Wind Farm?

Is the process for undertaking environmental assessments clear and understandable?

Are there any considerations, which have been overlooked, and which needs to be taken into account?

Summary point

The questions above are not necessarily exhaustive. There may be risks that have either not yet been identified or sufficiently addressed. Therefore, the DEA is open to relevant proposals and input to ensure that the tendering procedures reflect current market conditions and the most efficient risk allocation between the Danish State and the project developer.

New Offshore Wind Tenders in Denmark

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Other relevant publications include "New Danish calls for offshore wind farms tenders", October 2019.

Go to www.ens.dk/thor in order to read more about the tenders and to subscribe to the newsletter.

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