

Subsidy scheme and other financial issues for Thor OWF

Office/department
Centre for renewables

Date
31 March, 2020

J no. 2019 - 92734

/TKJ/JEL

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This note presents the expected different elements of the subsidy scheme and other financial issues for the tender conditions for Thor Offshore Wind Farm.

The principles of the subsidy scheme

The concession owner of Thor Offshore Wind Farm will receive subsidies in the form of a price premium from the Danish State for a 20-year period. The subsidies will be granted in accordance with a Contract-for-Difference model, which has been designed for this tender.

The CfD-model used for this tender gives the concession owner certainty for the investment in the long run, but places more short-term risk on the concession owner by exposing the concession owner to market signals. This is done to give a stronger incentive to enhance the socioeconomic value of the electricity production.

It is a two-way CfD with caps on both the Danish State's payment to the concession owner and the concession owner's payment to the Danish State, which will prevent that neither one carries the full risk of the electricity price developing fundamentally

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different from the forecast.

The license and authorization relevant for the operation phase will be given for 30 years, with the possibility of 5 years prolongation if allowed at that point in time.

The concession owner himself must sell the electricity on the electricity market and will be responsible for the associated costs. No allowances will be granted for balancing costs of electricity from the wind turbines. However, the owner of Thor Offshore Wind Farm is allowed to optimize imbalances across their assets within DK1, since imbalance settlement is done on a portfolio basis separately for each price zone (i.e. Western Denmark (DK1) and Eastern Denmark (DK2), cf. "Regulation C2: The balancing market and balance settlement", section 3.4. The market regulation C2 can be downloaded here:

<https://en.energinet.dk/Electricity/Rules-and-Regulations/Market-Regulations>

The concession owner can apply for issuing of REC's (Renewable Energy Certificates, in Danish "Oprindelsesgarantier") at Energinet. Issuing etc. of REC's is regulated in Executive Order no. 1323 of 30th November 2010, amended by Executive Order no. 138 of 10th February 2012.

20 year subsidy period

The subsidies will be granted for a 20-year period. This period will commence from the time of the last turbine delivering the first kWh and no later than 31 Dec 2027, but with the possibility that the subsidy period can begin sooner if the concession winner should wish so.

The EU state aid regulations stipulate that no subsidies are to be granted beyond the period of depreciation of the expenses for building the offshore wind farm. As a rule of thumb, the DEA has previously used 20 years as this milestone and this is incorporated in all recent national legislation on subsidies for renewables. This will also be applied in the Thor tender and therefore it will not be possible to add on additional months to account for the installation process or for hours with no subsidies due to electricity prices being non-positive (i.e. the price is zero or negative).

The price premium and the reference price

The price premium will be calculated as the difference between the offered bid price and a reference price. The offered bid price is a fixed amount in DKK and it will not be indexed.

The reference price is fixed for a period of 12 month and will be calculated as a simple average of the electricity prices in the previous calendar year running from 1st of January to 31st of December. The electricity prices are the hourly spot price in electricity price area DK1 stated by the Nordic electricity exchange, Nord Pool.



The price premium 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 price premium will be settled in the beginning of each new year.

Hours with prices of zero or below (i.e. non-positive prices) are included in the calculation of the reference price. This is done to ensure that the reference price reflects a measure of centrality for the full range of clearing prices in the DK1 electricity market.

Following the state aid regulations, price premium will be discontinued in hours with non-positive prices on the spot market in Nord Pool price area DK1. This means, that in every single hour with non-positive prices, the premium will be discontinued, as opposed to the regulation in some countries, where the premium is only discontinued after six consecutive hours. In Denmark, however, the 6-hours clause is not used, since it encourages electricity production even when the market price is negative.

The total subsidies in a given hour is the product of the price premium and the output measured for that same hour. Total premium from the State or total payment from the concession owner will be settled on a monthly basis.

The principle in defining the reference price as the simple average of the electricity prices of the previous year instead of the current year expose the concession owner to short-term risk regarding electricity price fluctuations, while the State carries long-term risks and thus ensures that the concession owner has security for the investment. It is therefore also acknowledged that the increased associated risk may lead to higher offered bid prices and higher overall subsidy costs.

The rationale for the reference price being based on the calendar-fixed annual average of the spot price in DK1 the previous year include the following reasons:

1. The rationale for using a calendar-fixed annual average is to give the concession owner an incentive to maximize the market value of the delivered electricity. This is in contrast to an hourly-based “traditional” CfD where the concession owner instead is incentivized to maximize the quantity of the delivered electricity.
2. The rationale for using the previous annual average of the DK1 spot price is twofold: (1) it ensures greater predictability of the annual state budget spending as the premium each year is known and subsidy payment only varies with production; and (2) it further incentivizes the concession owner to consider feasible design solutions of their offshore wind farm that can maximize the market value of the delivered electricity – especially in years of low wind and thus potentially higher average electricity prices.



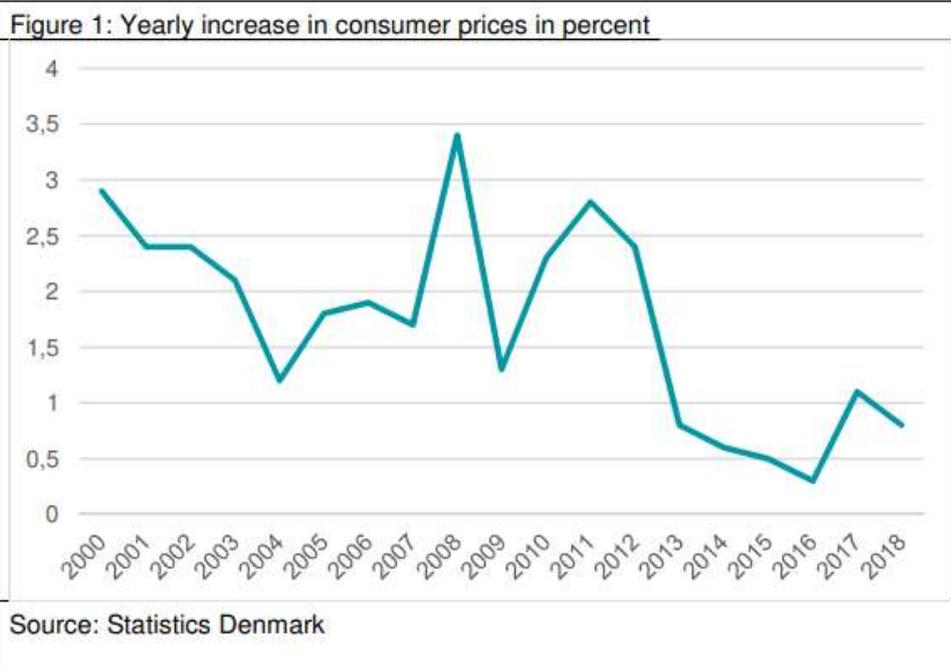
3. The rationale for the reference prices being based on the spot price is to incentivize the concession owner to furthermore consider feasible design solutions of their offshore wind farm, that may help accommodate any potential long-term increases in cannibalization effects of wind energy production. For example, as wind energy may constitute larger proportions of total electricity production in countries situated in the North Sea, there could be an increased downward pressure on the electricity prices during periods where wind turbines in Denmark - and possibly neighboring countries - produce electricity. As opposed to this, if the reference price were instead based on the average wind weighted electricity price (i.e. the average electricity price that wind turbine producers sell for, which is generally lower than the average spot price), the concession owner would not to the same extent be incentivized to accommodate potential long-term cannibalization effects. It can be argued that the concession owner is fit to carry this risk as he can best drive the technical design solutions that can reduce potential long-term cannibalization effects.

It is the DEA's assessment that the subsidy scheme does not lead to any material impacts on the degree of competition in the auction.

The offered bid price will not be indexed

As mentioned above, the offered bid price will not be indexed according to inflation and the tenderers will therefore have to factor in the risk of inflation in the bid price offered. This is in line with previous Danish tenders for offshore wind. The DEA does not index the offered bid price according to inflation in the interest of avoiding potential adverse adjustments related to a specific choice of indexing methodology.

In Denmark, the National Bank of Denmark is responsible for monetary policy. The National Bank operates independently from the Danish government and other political bodies. On its website, the National Bank mentions the following about monetary policy: One of the main objectives of Danmarks Nationalbank is to ensure stable prices, i.e. low inflation. This is achieved through the monetary and exchange policy. Since the early 1980s, monetary policy has been aimed at keeping the exchange rate of the krone stable, initially against the German D-mark and then against the euro. As the monetary-policy target of the euro area is to keep inflation below, but close to 2 per cent in the medium term, the fixed-exchange-rate policy provides a framework for low inflation in Denmark. As can be seen in Figure 1, inflation in Denmark has been low in the last 20 years. On average, inflation has been about 1.7 percent per year over the period 2000- 2018.



Two-way payment

The CfD model is two-way, meaning that the concession owner receives premium in years in which the offered bid price is higher than the reference price, but correspondingly pays the Danish State in years in which the reference price is higher than the offered bid price. The latter will happen if for instance the offered 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 electricity 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 mentioned above, this will apply in hours when the spot price in DK1 is lower than DKK 0.10 per kWh.

Figure 2 below shows the price premium as a product of the difference between the reference price and the offered bid price.

Figure 2: Principle in calculating the price premium

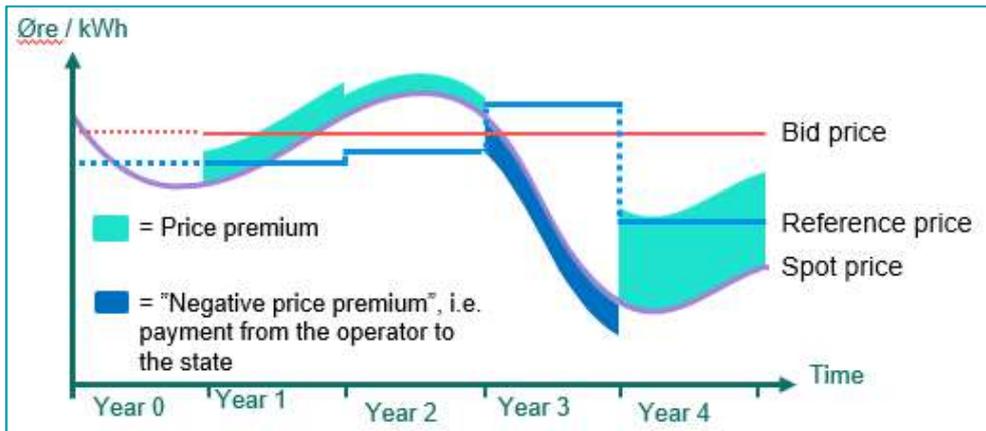


Figure 2 illustrates the price premium from the State to the concession owner in year 1 and 2, since in those years the reference price is lower than the offered bid price, because of the average spot prices in year 0 and 1. However, in year 2, the spot price on average is higher than the offered bid price, which makes the reference price for year 3 higher than the bid price and therefore, in year 3, the concession owner must pay the Danish State the difference between the reference price and the offered bid price. The tables turn again in year 4, where the concession owner again receives payments from the State.

Caps on payment from both the State and the concession owner

Caps have been included on the total net value of the subsidies that the State can pay to the concession owner and the net value of the concession owner's payment back to the State over the 20-year period. The State Cap has been installed to de-risk the project seen from the Danish State and the Danish taxpayers' point of view. And in return the Concession Owner Cap will de-risk the two-way CfD from the concession owner's point of view. Both caps are set at a level so high that with the current electricity price forecasts the DEA does not deem it likely that the caps will be reached.

The State Cap is DKK 6.5 bn., corresponding to MEUR 870 (2018 prices). The Concession Owner Cap is DKK 2.8 bn., corresponding to MEUR 375 (2018 prices).

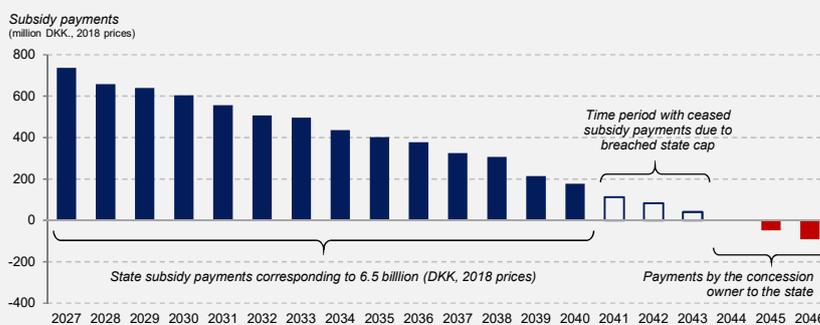
The values of the subsidies or the payment from the concession owner will be settled on a monthly basis. The values of both caps are based on real prices (i.e. 2018 prices) and the subsidy payments will therefore be adjusted for inflation every year to their 2018 value. An example of how this is done will be included in the tender material.

The example in Figure 3 below illustrates a possible subsidy payment profile and application of the State Cap. In this example, the subsidy period starts on January 1st, 2027 and ends 20 years after in December 31th, 2046. In the period from 2027



to 2043 the reference price is lower than the concession owners offered bid price; hence the CfD model warrant subsidy payments by the State to the concession owner as long as the State Cap is not exceeded. However, by the end of year 2040 the accumulated subsidy payments exceeds the cap of 6.5bn DKK (2018 prices); hence, no payments will be made by the State to the concessions owner in the years 2041 through 2043, despite the reference price being lower than the offered bid price. In the years 2044 through 2046 the reference price is higher than the offered bid price and the concession owner thus make payments to the State.

Figure 3
Illustrative example of a possible subsidy payment profile and application of the State Cap



Source: Danish Energy Agency

It should however be noted that both caps are net caps. This means, that in situations where the subsidy payments has ceased because the ceiling of the State Cap has been reached, and the concession owner in subsequent years make payments to the State, the value of these payments will be subtracted from the accumulated subsidy payments by the State.

This means that the concession owner is eligible to receive future subsidy payments from the State corresponding to that value. Suppose for example that the State Cap of DKK 6.5bn (2018 prices) has been exceeded and the concession owner in subsequent years pays a total of 0.5bn DKK to the State where the reference price has been higher than the offered bid price. Then the State Cap is no longer considered to be exceeded and the State is obligated to pay subsidies of a maximum of DKK 0.5bn (2018 prices) in subsequent years where the reference price is lower than the offered bid price.

Award criteria

When evaluating the tenders, both the offered bid price per kWh and the total expected subsidy costs over the 20-year period are relevant, due to a *budget evaluation threshold*. Below is a description of the calculation of the total subsidy costs and description of the budget evaluation threshold.



The tenderer must submit a tender for Thor Offshore Wind Farm with a statement of which capacity between 800 and 1000 MW is to be established and offer a price in “øre” per kWh. If the best bid results in expected total subsidy costs over the 20-year period that are lower than the budget evaluation threshold of DKK 3.7bn., (2018 prices) 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 results in total subsidy costs, which are within the budget evaluation threshold, there is a chance that a bid can still be accepted by the parties to the Energy Agreement of 2018. In this event the political desire is to minimize the budget exceeding while still realizing the plans for offshore wind farms in Denmark, 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 if the political parties behind the energy agreement evaluates that the costs will be too high.

If there are two or more bids with the exact same bidding price, and these are the best bids, the bid with the highest capacity (MW) will be chosen. If there are two or more bids with the exact same bidding price and the exact same capacity, and these are the best bids, the winning bidder will be chosen through lottery.

Budget evaluation threshold and the calculation of the expected subsidy costs of bids

The budget evaluation threshold of DKK 3.7 bn. corresponds to approx. EUR 496 mill. (2018 prices). The budget evaluation threshold value of DKK 3.7 billion is based on real prices, i.e. 2018 prices.

The budget evaluation threshold is only relevant when the bids are evaluated. It has no influence on the actual value of subsidies paid out over the 20-year-period – the constraint on this is based on the caps mentioned above.

When evaluating the tenders, 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 the bid with the lowest price per kWh and has expected total subsidy costs over the 20-year aid period that are lower than the budget evaluation threshold.



For any given bid on MW-capacity (K) and a CfD price (b), the DEA will calculate the bid's associated expected subsidy payments based on assumptions (all of which will be explicitly stated in the tender material) related to: (1) beginning of the 20-year subsidy period; (2) average annual full load hours (FLH), (3) electricity price forecast over the subsidy period (p); and (4) inflation forecast (r). The expected profile of subsidy payments is calculated based on the assumptions and the accumulated payments in 2018 prices is compared to the budget evaluation threshold using this formula:

$$NPV E = \sum_{t=1}^{20} \frac{(b - p_t) \times K \times FLH}{(1 + r)^t}$$

In the illustrative example below, an 800 MW offshore wind farm is assumed to start full capacity production on January 1st, 2027 with average full load hours corresponding to 4,605 hours per year. With a CfD bid price of 530 DKK/MWh (nominal price) the total expected subsidy payments amounts to a value lower than the budget evaluation threshold.

Assumptions	Value	Unit
- Total MW-capacity of park	800	MW
- Average full load hours per year	4,605	Hours per year
- Average electricity production	3.684.000	MWh
- Offered bid price for CfD	575,2	DKK/MWh, nominal prices

Year	Forecast of annual average DK1 spot price (DKK/MWh, nominal prices)	Inflation (GDP-deflator, index 2018=1)	Subsidy payments (million DKK, nominal prices)	Subsidy payments (million DKK, 2018 prices)
2026	449,23	1,10	-	-
2027	457,48	1,12	464,26	414,90
2028	466,03	1,14	433,85	381,24
2029	462,75	1,16	402,37	346,80
2030	459,44	1,18	414,45	350,45
2031	480,98	1,21	426,63	353,89
2032	478,11	1,23	347,28	282,76
2033	487,62	1,25	357,87	285,76
2034	497,39	1,28	322,84	252,89
2035	493,83	1,30	286,82	220,37
2036	530,91	1,33	299,94	226,08



2037	527,45	1,35	163,35	120,79
2038	552,07	1,38	176,09	127,76
2039	562,88	1,40	85,38	60,77
2040	573,95	1,43	45,56	31,83
2041	586,03	1,46	4,79	3,28
2042	598,37	1,49	-39,73	-26,73
2043	610,97	1,51	-85,19	-56,59
2044	623,84	1,52	-131,61	-86,32
2045	636,97	1,54	-179,00	-115,94
2046	650,39	1,58	-227,39	-144,16

Million DKK (2018 prices)	
Budget evaluation threshold	
Net present value of subsidy payments	3.030
Budget evaluation threshold	3.700
Difference	670

Costs to be included in the bid price

Besides the tenderer's own expenses to the project itself, the tenderer should include the following expenses in the bid:

1. The establishment costs of Energinet's nearshore substation at the point of connection and the land cables forward to the point of connection to the transmission grid at *Idomlund* are to be paid by the concession winner. This amounts to a maximum of DKK 625 mill., corresponding to approx. EUR 84 mill. The concession winner will only have to pay the actual amount that the work of Energinet amounts to, meaning that the actual amount paid can be smaller than DKK 625 mill.
2. The cost of site-investigations (geo-technique and geo-physics, MetOcean and environmental surveys) undertaken by Energinet are to be paid by the concession winner. This bill will not exceed DKK 300 mill., corresponding to approx. EUR 40 mill. A more precise figure will be published in the tender material in due time before final bids. The concession winner shall not pay for the undertaking of the SEA, which is not included in the mentioned figure.