



## OFFSHORE WIND IN DENMARK SETTING NEW GLOBAL PRICE RECORD

A tender for a 600 MW offshore wind farm in the Baltic Sea, concluded in November 2016, has shown the lowest price level ever for this emerging technology. The record low price marks a significant leap forward for offshore wind on its journey to become competitive on market terms.

### Background

Denmark commissioned its first offshore wind farm as early as 1991. Since then technology has developed rapidly. One example of this development is that nominal capacity of turbines have increased almost 20-fold, going from 450 kW turbines in 1991 to 8 MW turbines today.

The Danish Energy Authorities applied a structured long-term planning approach early in the 25-year history of offshore wind in Denmark. A map with designated zones for offshore wind has been updated regularly since.

### Support system

Since 2004, large offshore wind farms have been put up for an open, two-stage tendering process. Wind farms are commissioned in a competitive tender process and the cost of production of electricity is reflected in a feed-in tariff given per kWh produced, for the first 50,000 full load hours.

A government tender is carried out to realise a political decision to establish a new offshore wind farm at the lowest possible cost. In the typical government tender procedure, the Danish Energy Agency announces a tender for an offshore wind turbine project of a specific size, e.g. 600 MW, within a specifically defined geographical area.

The Danish independent transmission system operator

(TSO) Energinet.dk is responsible for the Environmental Impact Assessment; geophysical surveys as well as some geotechnical surveys to be carried out in the planning phase ahead of the call for tenders. These in-depth studies of the physical features of the site deepen the knowledge of the sites, and give future investors an insight into the technology choices they can take in the bidding procedure. This early action is implemented in order to reduce the length and uncertainty of the approval process and to give applicants better possibilities to offer a price that is real-cost based. At the same time it provides potential bidders with a high investment security and thus supports a reduced risk premium.

Depending on the nature of the project, the Danish Energy Agency invites applicants to submit a quotation for the price at which the bidders are willing to produce electricity in the form of a fixed feed-in tariff for a certain amount of produced electricity, calculated as number of full-load hours. The winning price will differ from project to project because the result of a tender depends on the project location, the wind conditions at the site, the competitive situation in the market at the time, etc. The areas that are offered for tender are the sites identified in the spatial planning process. The fact that other government



authorities have been involved in the process of identifying the sites for new offshore wind farms and have approved the final report, creates commitment to securing the sites. This, in turn, creates great investor security and up front knowledge about the sites.

The results of the preliminary investigations of an offshore wind site will be published in good time before completion of the tendering procedure. The costs of the preliminary investigations will subsequently be refunded by the owner of the concession. Also the costs will be published well before tenders for the wind farm are to be made. In projects covered by a government tender, Energinet.dk also finances, constructs, owns and maintains both the transformer station and the underwater cable that carries the electricity to land from the offshore wind farm.

In order to ensure rapid and un-bureaucratic application processing, enterprises or consortia awarded concession contracts will be using the Danish Energy Agency as single point of access to assistance on issues related to all permitting. The Danish Energy Agency will grant the required permits, and will coordinate these with other relevant authorities. This means that the permits granted by the Danish Energy Agency also contain terms and conditions from other authorities, such as the Danish Nature Agency, the Danish Maritime Authority, the Danish Coastal Authority, the Danish Agency for Culture, the

Ministry of Defence, etc.

The award criteria is price only which helps ensure a fair and transparent procedure. The wind power developer awarded will thereby receive their winning bid as a guaranteed fixed price/kWh for 50,000 full load hours (approx. 12-15 years). Afterwards they receive only the spot market price. Note that no support is given in hours with a negative spot price, which Denmark typically experiences a few hours per year.

## Auctions conducted and resulting prices

Below is a summary of prices achieved in winning bids, excluding grid connection to shore. The latest award price at Kriegers flak represents a new global record low price, even if grid costs are added. If bidders had been obliged to pay for the grid connection at Kriegers Flak in order to recoup this investment (approx. 3.1 billion DKK) over the first 12-15 years, the price would have been approx. 10 øre/kWh higher.

Read more about the global price record at: [ens.dk/en/press](http://ens.dk/en/press)

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Offshore wind farm	Auction held	Size of wind farm	Winning bid nominal prices	Winning bid fixed 2016-prices
Horns Rev 2	Feb. 2005	209 MW (WT = 2.3 MW)	51,8 øre/kWh 8,6 US c/kWh	64 øre/kWh 9,6 US c/kWh
Rødsand 2	April 2008	207 MW (WT = 2.3 MW)	62,9 øre/kWh 12,3 US c/kWh	70,6 øre/kWh 10,6 US c/kWh
Anholt	April 2010	400 MW (WT = 3.6 MW)	105,1 øre/kWh 18,7 US c/kWh	113,6 øre/kWh 17 US c/kWh
Horns Rev 3	Feb 2015	400 MW (WT = 8 MW)	77 øre/kWh 11,4 US c/kWh	78,2 øre/kWh 11,7 US c/kWh
Kriegers Flak	Nov 2016	600 MW (WT > 8 MW)	37,2 øre/kWh 5,6 US c/kWh	37,2 øre/kWh 5,6 US c/kWh