

## Danish Wind Power 1<sup>st</sup> and 2<sup>nd</sup> January 2015

I have been asked for comments on the role of wind power in connection with the negative spot prices during the nights of first and 2<sup>nd</sup> January 2015. There is a particular interest for understanding the situation of the power system and the settlement of wind energy in heavy wind. The purpose of this note is to give an overview based on data, which are published daily by [www.nordpoolspot.com](http://www.nordpoolspot.com) and [energinet.dk](http://energinet.dk).

### Settlement of Wind Energy for Negative Spot Prices

The offshore wind parks can have individual agreements on operation and settlement. The Anholt offshore park does not produce if the spot price is negative. In practice, this is achieved by price dependent bidding in the spot market. There are no subsidies for the park when it stands still.

There are similar patterns for onshore wind turbines after expiry of subsidies. Otherwise operators use the negative value of the subsidy as the minimum price for bidding in the spot market. If the subsidy is DKK 100 per MWh and the spot price is DKK -50 per MWh, production will still "generate" DKK 50 per MWh. Without production, there is no subsidy.

Besides, some offshore and onshore wind turbines are active in the market for regulating power. Even in these cases the typical bidding price will be the negative value of the subsidy.

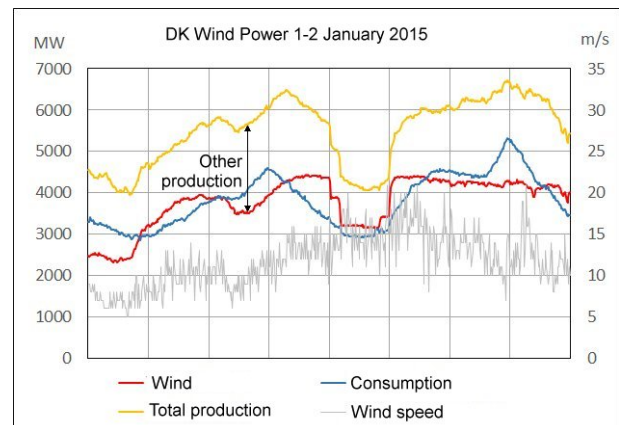
The subsidies come from a PSO<sup>1</sup> tax, which is added to the electricity tariffs.

### 2727 MW in Average Exported to Norway and Sweden

The Danish wind power production on the first and 2<sup>nd</sup> January had the same magnitude as the electricity consumption.

In addition to the wind power, there was a thermal power production at about 1700 MW in average.

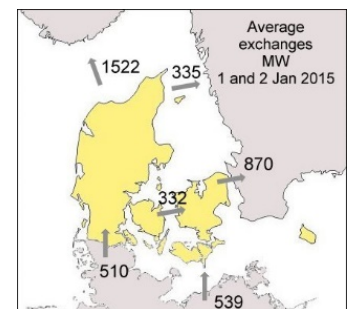
It caused an average net export at 1679 MW from Vest Denmark. The average exchange was close to zero for East Denmark.



The negative spot price was probably the reason for the drop in wind power production the night of 2<sup>nd</sup> January. The wind seems not to have been strong enough for preventing the operation of wind turbines.

Besides the Danish net export at nearly 1700 MW, the Danish grid had to carry a transit from Germany at 1049 MW in average.

The average export from Denmark to Norway and Sweden was 2727 MW.



<sup>1</sup> PSO: Public Service Obligation

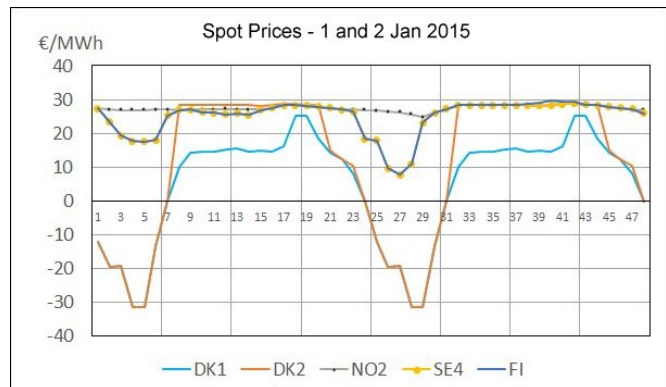
These average exchanges are not necessarily critical to the Danish grids, unless there have been grid limitations.

### The Selling Price was €6.77 per MWh

The spot price varied between about €30 per MWh and €-30 per MWh for both Danish price areas (DK1 and DK2).

Contrary to that, the spot price in Southern Norway (NO2) was quite stable about €27 per MW.

The spot prices in Sweden and Finland were identical. There were minor dips during the nights, but no negative spot prices.



We do not yet know the spot prices in Germany. They are probably similar to the DK1 prices, while the DK2 prices seem to have fluctuated between German and Nordic prices.

Therefore, a surplus of production in Germany is the probable cause of the low night prices. The Danish influence on the spot prices was presumably insignificant.

The Danish net export during the two days was 80,635 MWh or 1680 MW in average. The calculated selling price based on available data was €6.77 per MWh (DKK 50 per MWh).

In addition to that, the transmission system operators (including Energinet.dk) have a considerable congestion income to share.