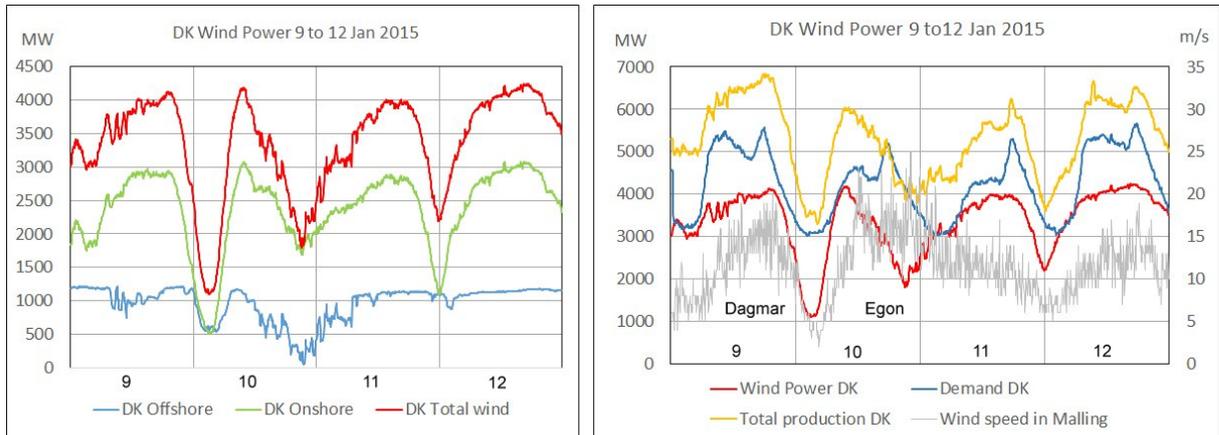


# Wind Power during the Storms Dagmar and Egon

The twin storms Dagmar and Egon passed Denmark on 9<sup>th</sup> and 10<sup>th</sup> January 2015. This note is an overview of the power system response. It is based on data, which are published daily by [www.nordpoolspot.com](http://www.nordpoolspot.com) and [energinet.dk](http://energinet.dk).

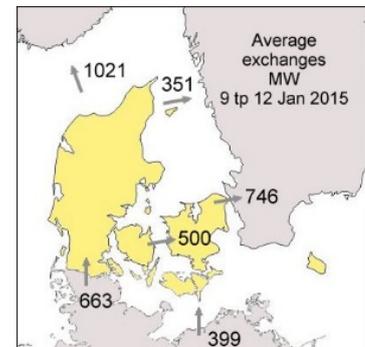
## Fluctuating Wind Power



The charts show considerable wind power fluctuations during the four days. The reason for wind power dips can be too low wind, too high wind or too low spot market prices. All three causes have been active in this case.

The thermal power plants provide heat for the district heating systems. The cold season has maximum of wind power and of CHP production. The result is a Danish overflow of power during the winter.

The average transit from Germany was 1062 MW, which came on the top of the Danish net export. The average Danish export to Norway and Sweden was 2118 MW.

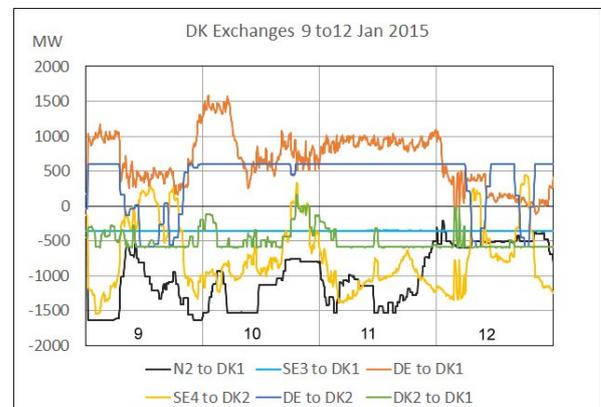


The average exchanges are less informative because even the exchanges were fluctuating.

Exchange characteristics:

From	To	Max MW	Av. MW	Min MW
West DK	Norway	1634	1021	250
West DK	Sweden	353	351	350
West DK	Germany	194	-663	-1591
East DK	Sweden	1542	746	-445
East DK	Germany	586	-399	-601
Bornholm	Sweden	35	3	-17
West DK	East DK	599	500	-161

The steady export from Jutland to Sweden seems to indicate a temporary capacity limit for the Konti-Skan link (capacity 740 MW).

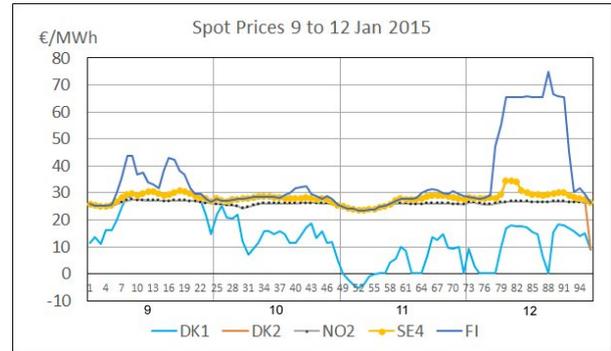


## High bottleneck charges

The spot prices are important indicators.

There are only modest negative spot prices in West Denmark in the night of the 11<sup>th</sup> January. During the nights of the 1<sup>st</sup> and 2<sup>nd</sup> January both Danish price areas had prices lower than € -30 per MWh.

Finland had two spot price peaks on the 9<sup>th</sup> and rather high prices all day on the 12<sup>th</sup> January. The reasons are unknown.



The most remarkable observation is the low spot price in West Denmark from the 10<sup>th</sup>.

The exchanges confirm that the Great Belt interconnection was operating at its full capacity (apart from some hours on the 12<sup>th</sup>).

The exchange between West Denmark and Norway across Skagerrak (total capacity about 1700 MW) was reduced to 500 MW during the 12<sup>th</sup>. The spot price difference indicates a capacity limitation.

The spot prices and the exchanges on the 12<sup>th</sup> January indicate together stressed conditions in the grid. I hope that a report from the system operators will clarify the conditions.

The Danish net export was 102 GWh during the four days or 1059 MW in average. The spot market value of this export was € 1.2 million or € 11.68 per MWh (87 DKK/MWh).

It is possible to estimate the congestion charges<sup>1</sup> for the four days:

Interconnection		Value €
West Denmark	Norway	1.228.132
West Denmark	Sweden	499.173
East Denmark	Sweden	20.728
West Denmark	East Denmark	711.025

We do not yet know the spot prices in Germany. Therefore, we cannot calculate congestion charges (or bottleneck income) for the remaining interconnections. The correct values will be known when Energinet.dk publishes its hourly data for the period.

The large price differences between West Denmark and the rest of the Nordic market are the reasons for the large values. It is remarkable that the bottleneck income by far seems to exceed the market value of the exported energy.

<sup>1</sup> Different spot prices in two price areas occur when the link between them runs at its full capacity. The selling area has the low price. This means that the exporters receive less money for the transferred energy than the importers pay. The difference is the congestion charge or bottleneck fee, which the owners of the link usually share. Congestion charges are the main sources of income for financing new links.