

New barriers for export of electricity from West Denmark to Germany

## Export capacity 50% down from 2014 to 2015

Denmark must export electricity during windy periods. Therefore, it is worrying that the border between West Denmark and Germany is closed for export when there is a surplus of wind power in Denmark. Most wind power in Denmark is installed in the western part of the country.

This is not a surprise. In 2003, EON Netz informed Eltra, the West Danish TSO at the time, that the political target for 2010 was 3 GW wind power in the German part of the North Sea. A 3 GW inflow from the North Sea would prevent any export of electricity from Denmark.

### 1.77 GW new German wind power in the North Sea in 2015

The German installation of offshore wind turbines was delayed, but in the first half of 2015 1.77 GW was installed. With a total German offshore capacity in the North Sea at 2.7 GW, there is no room left for Danish export of wind energy via Schleswig-Holstein.

The transmission system operators (TSOs) must every day declare the capacity, which is available for trade in either direction.

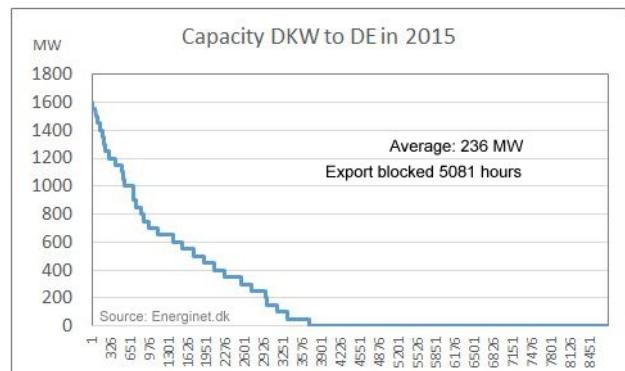
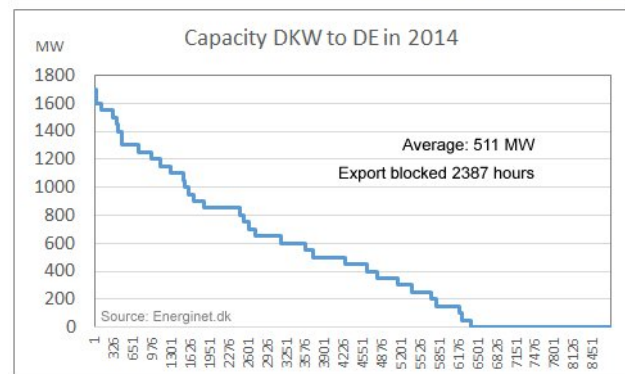
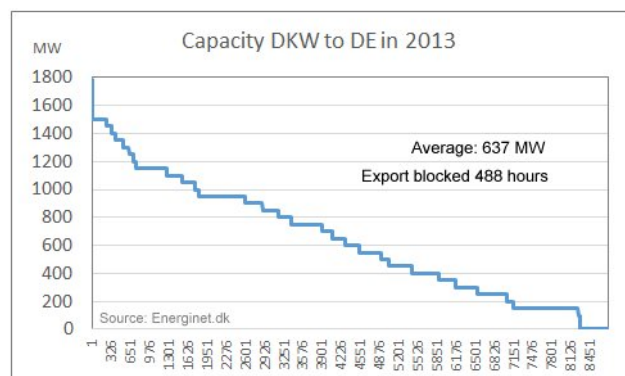
The capacity distribution for a year can characterize the West Danish export channel to Germany.

*Fig. 1 shows how the average capacity has decreased from 637 MW to 236 MW in three years.*

The main reasons for the change are the increasing quantities of fluctuating power (wind and solar) and congested grids in Germany.

During hours with congestion, curtailment of wind power is unavoidable in Northern Germany. The curtailed energy was 555 GWh in 2013 and 1581 GWh in 2014 (Source: energytransition.de).

The congested grids have caused surplus of electricity and decreasing market prices in Northern Europe.



*Fig. 1 - Development of the transfer capability from West Denmark to Germany from 2013 to 2015*

There is a connection between wind power output in Germany and cross border transfer capability.

Fig. 2 shows that it is practically impossible to export electricity from Denmark to Germany when the total German wind power production exceeds 10 GW.

The chart delimits a narrow triangular working space to the left, similar to the capacity distribution in 2015 in fig. 1.

### Grid reinforcements under way

Both the German authorities and Energinet.dk in Denmark have anticipated the problems, but building new wind turbines and solar panels is much easier than establishing the necessary balancing measures. In particular, grid reinforcements can be troublesome and time consuming measures.

Germany has planned two essential reinforcements of the grid in Schleswig Holstein, project TTG-005 and project P25<sup>1</sup>.

Project TTG-005 is an upgrade of an existing 220 kV overhead line to 400 kV. It runs parallel with an existing 400 kV line.

The 700 MW Cobra cable will be a useful link between Denmark and the Netherlands, bypassing the bottlenecks in Germany. It is planned to be ready for operation in 2019.

Project P25 is a new 400 kV line at the west coast of Schleswig Holstein.

There are more details about the German projects in my note from 2014<sup>2</sup>.

### The future

The race between new fluctuating power (wind and solar) and grid expansions will continue. Building new power lines in densely populated areas can be extremely difficult. Therefore, it is my expectation that the grid reinforcements will fall behind.

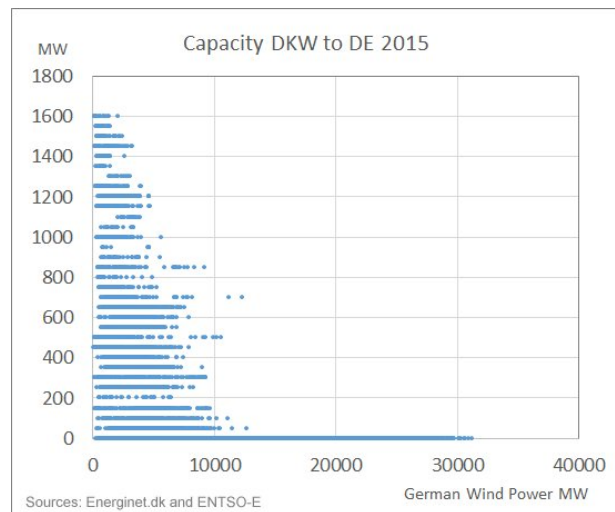


Fig. 2 - Transfer capability from West Denmark to Germany and German wind power output per hour in 2015

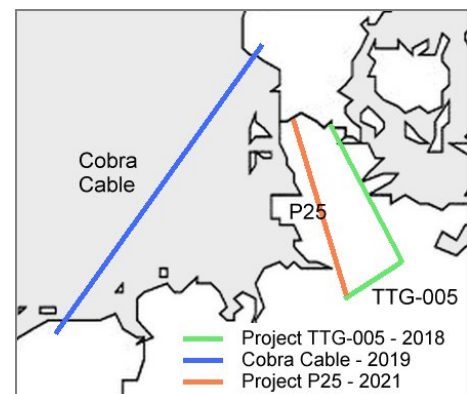


Fig. 3 - Grid reinforcements between West Denmark and Germany

<sup>1</sup> <http://www.netzentwicklungsplan.de/netzentwicklungsplan-2025-version-2015-erster-entwurf>

<sup>2</sup> [http://pfbach.dk/firma\\_pfb/pfb\\_german\\_market\\_policy\\_limits\\_exchange\\_2014\\_04\\_14.pdf](http://pfbach.dk/firma_pfb/pfb_german_market_policy_limits_exchange_2014_04_14.pdf)