Forecasting, Balancing and Selling Wind Production

From R&D to commercial offering – a 360° view of present and future
3 & 4 December 2013
DONG Energy is one of the leading energy groups in Northern Europe.

Our business is based on procuring, producing, distributing and trading in energy and related products in Northern Europe.

DONG Energy has nearly 7,000 employees and is headquartered in Denmark.

* Customers & Markets from 1 May 2013
DONG Energy UK portfolio

- Irish Sea, Walney Island (184MW)
- Irish Sea, Walney Island (184MW)
- Irish Sea, Near Liverpool (90MW)
- Clacton-on-Sea, Essex (172MW)
- Skegness, Eastern UK (270MW)
- Near Kent Southeast of London (630MW)
Forecasting wind...how hard can it be?
Wind Turbine – Power Curve

20m/s – 10min avg. Re cut-in

25m/s – 10 min avg. cut out
The simple wind trader equation

A certain wind speed gives a certain production, multiply it by numbers of turbines and you have the production…

Turning out to be not so simple when you add forecast error, availability error, wave effect, lack of liquidity, curtailment, trip etc.
The Market Structure

The market is based on bilateral trading between generators, suppliers, traders and customers across a series of markets operating on a rolling half-hourly basis. Under these arrangements generators self-dispatch their plant rather than being centrally dispatched by the System Operator. There are three stages to the new wholesale market, plus a new settlement process.
Crushing numbers into Trading Decision
TDST: Trading Decision Support Tool

(Black) Actual availability: Available Turbines multiplied with nominal production, Adjusted with actual curtailment.

(Pink) Forecast availability: The availability prognosis from site managers multiplied with nominal production/turbine. Adjusted for planned curtailments.

(Dark blue) Mean value: the most likely production forecast.

Vertical black line separates present GH-forecast from the old GH-forecasts made 2 hours before the specific period. Warning: Actual availability is based on number of online turbines provided by Scada.
The forecast, the actual and the imbalance.
Monitoring wind farms online

### LAST 1-2 hour history

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<th>unit</th>
<th>UK-time</th>
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<th>Total capacity</th>
<th>Act prod. x EM share</th>
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</table>

DE TOTAL WINDPOWER UK MW:

|                           | 1272.0 | 27.6 | 431.6 |

Confidential information
Transmission system has to be stable @ 50hz

You are charged by causing imbalance

SSP: System Sell Prices (Long)

SBP: System Buy Prices (Short)

It's far more expensive being short.

We face these cost every single day
The importance of correct availability

Just an example…

Given the forecasted wind speed is between 12 and 15 m/s each wind turbine should produce 3,6 MW.
With 50 WTG's all announced "ok" in the availability report the production should be 90 MWh in a half hour.

Given the high wind speed it's decided to sell all 90 MWh in a HH at the price of 40£ a total of 3600£
For some reason only 45 wind mills produce power, so actual production is 81 MWh, meaning 9 MWh has to be bought back from the market at…
The importance of correct availability

The 9 MWh has to be bought at SBP for 80£. Which give a decrease in revenue of 720£.
Traded value now equals 2880£.

The next HH we still need to buy 9 MWh but now the price is 150£. Which give a decrease of 1350£
Traded value in this HH is now 2250£

Had we sold the 81 MWh at 40£, the traded value would have been 3250£
....that's it. Any questions?