

# Forecasting, Balancing and Selling Wind Production

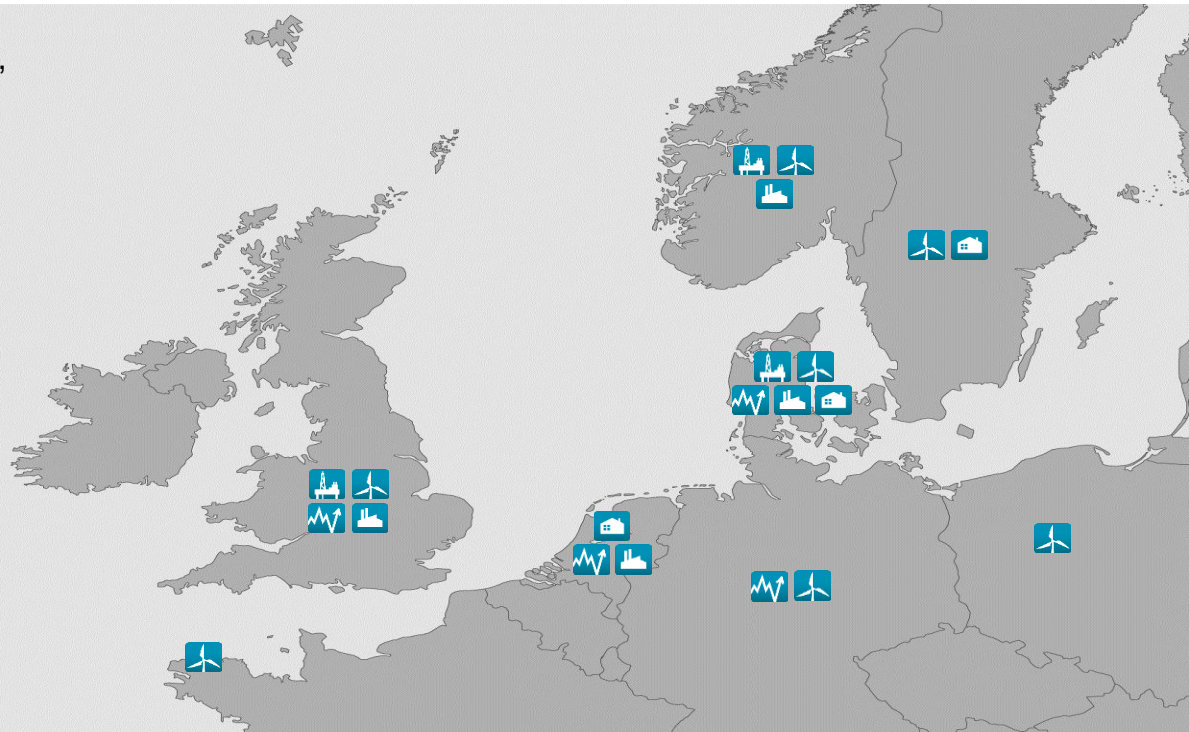
From R&D to commercial offering – a 360° view of present and future  
3 & 4 December 2013

# 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.

-  Exploration & Production
-  Wind Power
-  Thermal Power
-  Energy Markets\*
-  Sales & Distribution\*



\* Customers & Markets from 1 May 2013

# DONG Energy UK portfolio

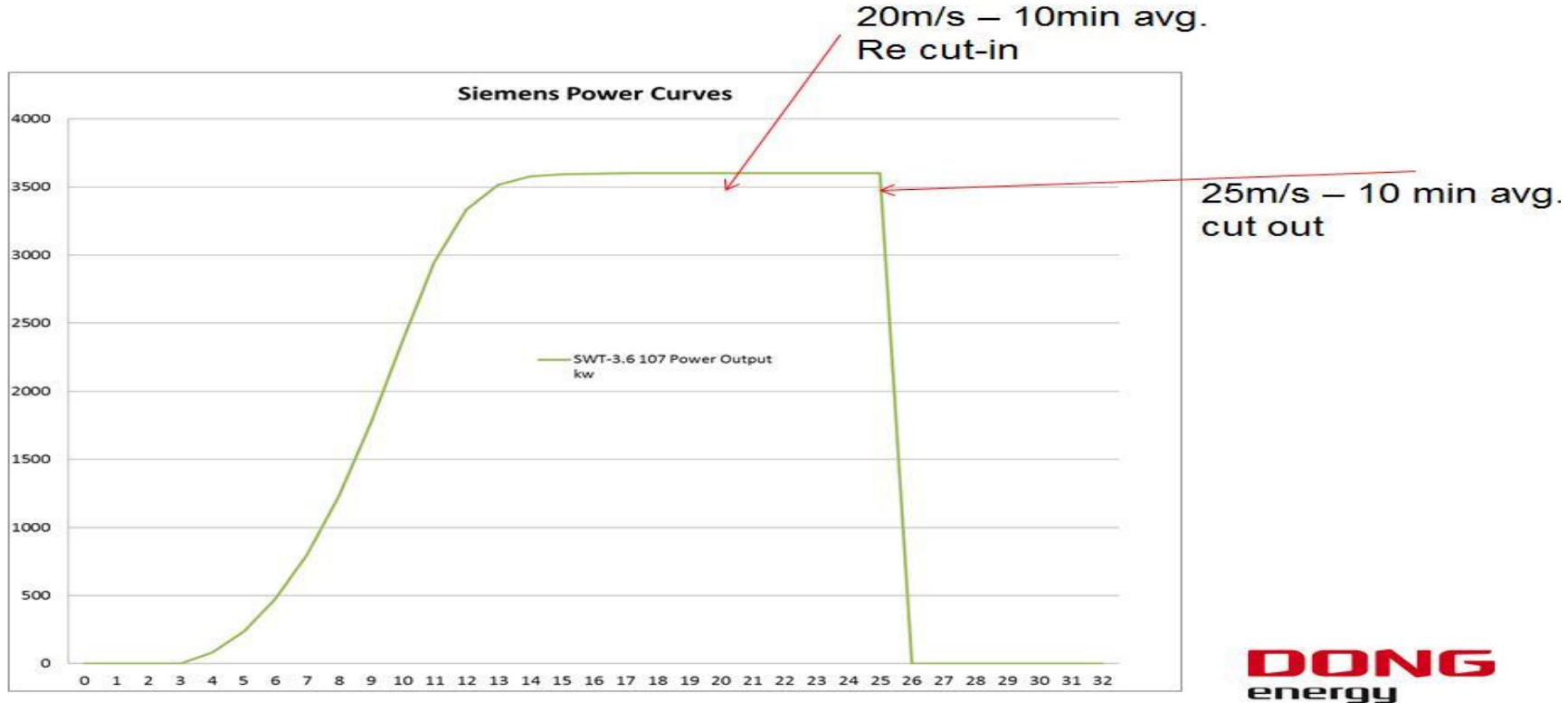


- Walney 1 • Irish Sea, Walney Island (184MW)
- Walney 2 • Irish Sea, Walney Island (184MW)
- Burbo Banks • Irish Sea, Near Liverpool (90MW)
- Gunfleet Sands • Clacton-on-Sea, Essex (172MW)
- Lincs • Skegness, Eastern UK (270MW)
- London Array • Near Kent Southeast of London (630MW)

## Forecasting wind...how hard can it be?

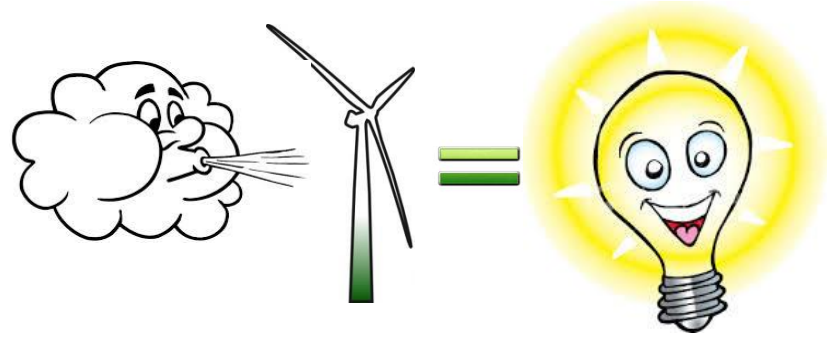


# Wind Turbine – Power Curve



# The simple wind trader equation

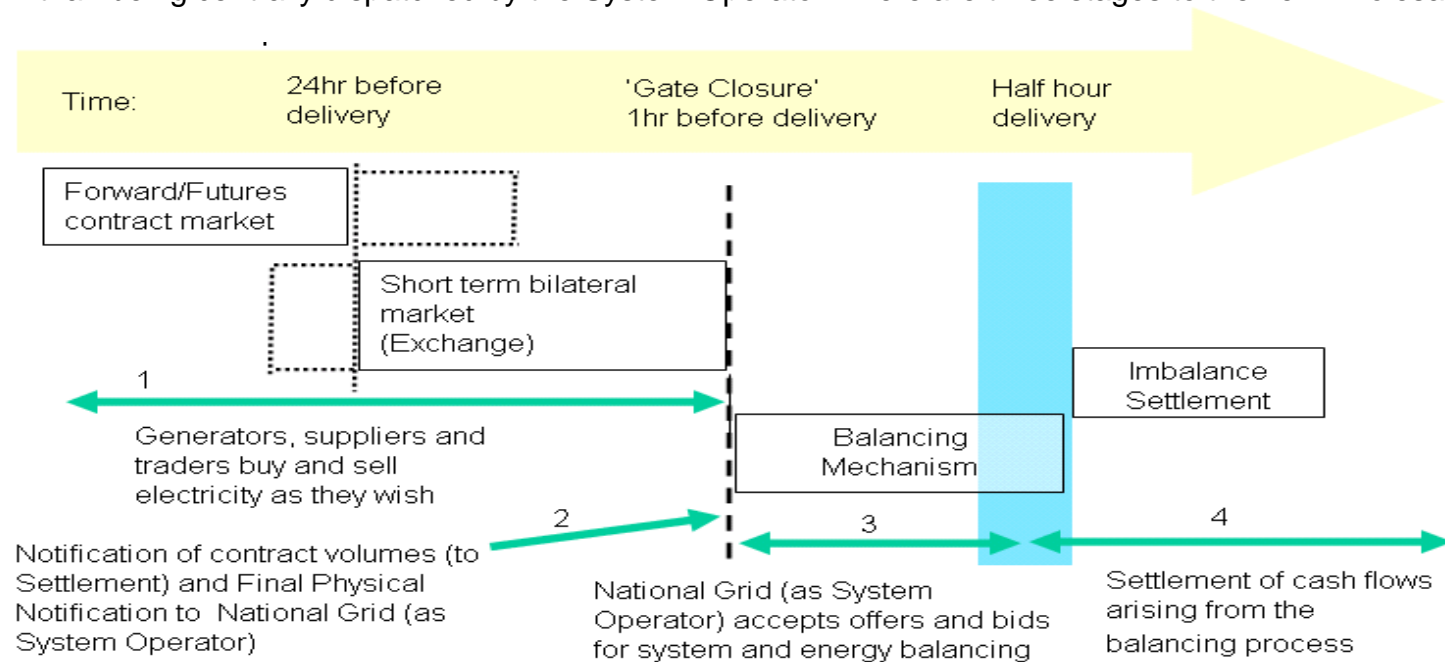
A certain wind speed gives a certain production, multiply it by numbers of turbines and you have the production...



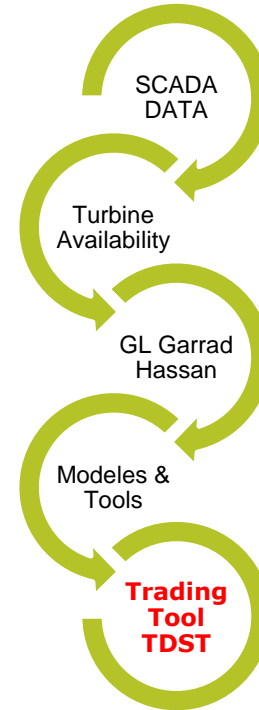
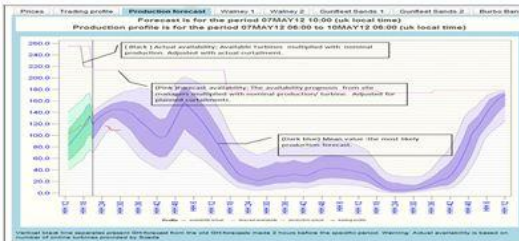
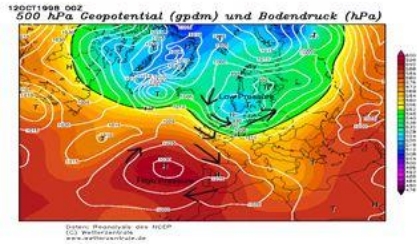
Turning out to be not so simple when you add forecast error, availability error, wave effect, lack of liquidity, curtailment, trip etc.

# 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

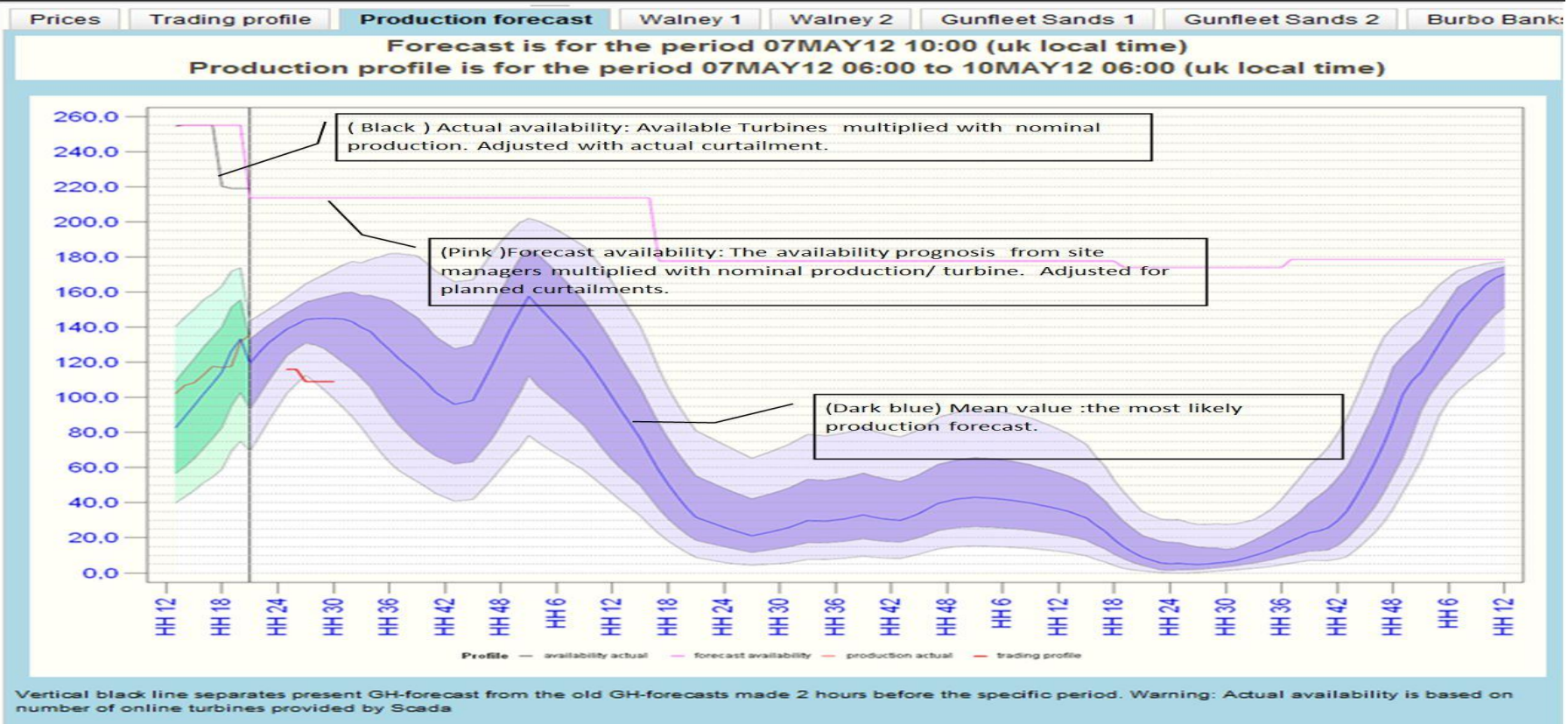


# Crushing numbers into Trading Decision

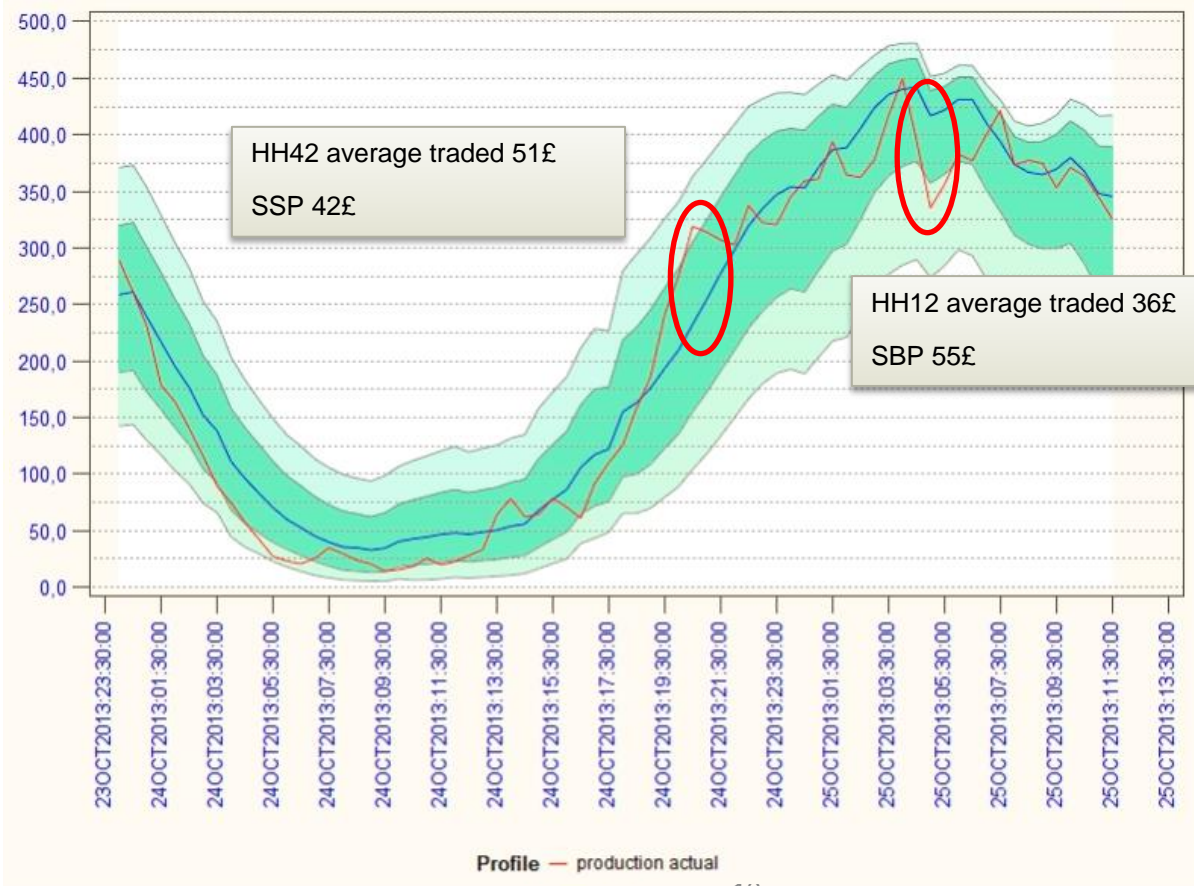




# TDST: Trading Decision Support Tool

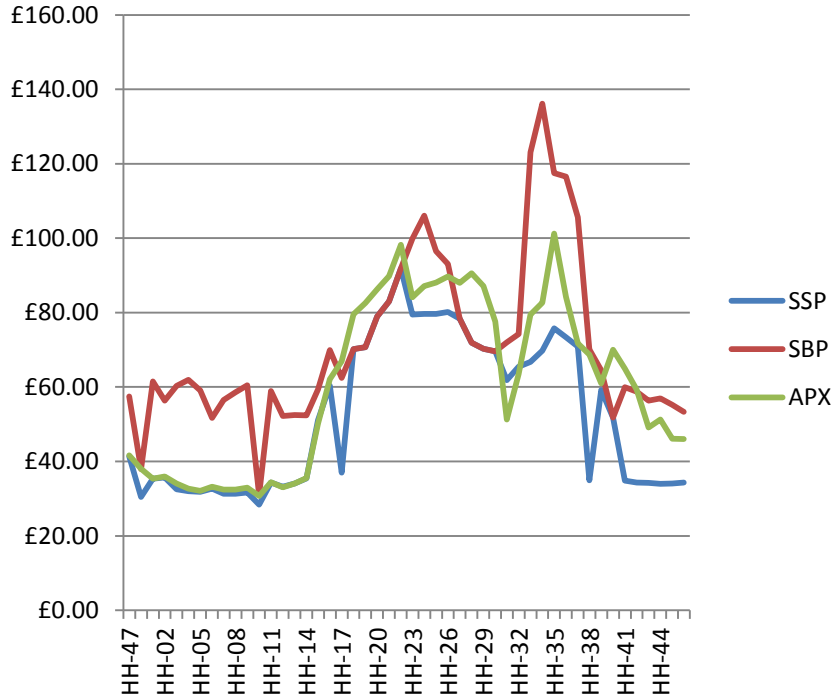


# The forecast, the actual and the imbalance.





# Balancing – why it's so important to be in balance



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

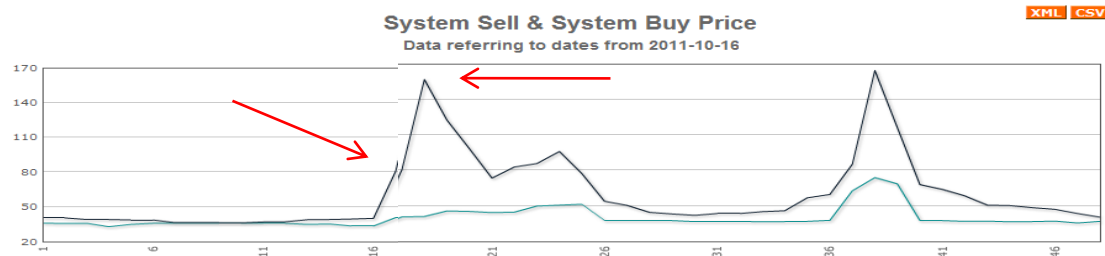
The 9 MWh has to be bought at SBP for 80£. Which give a decrease in revenue of 720£.

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?

