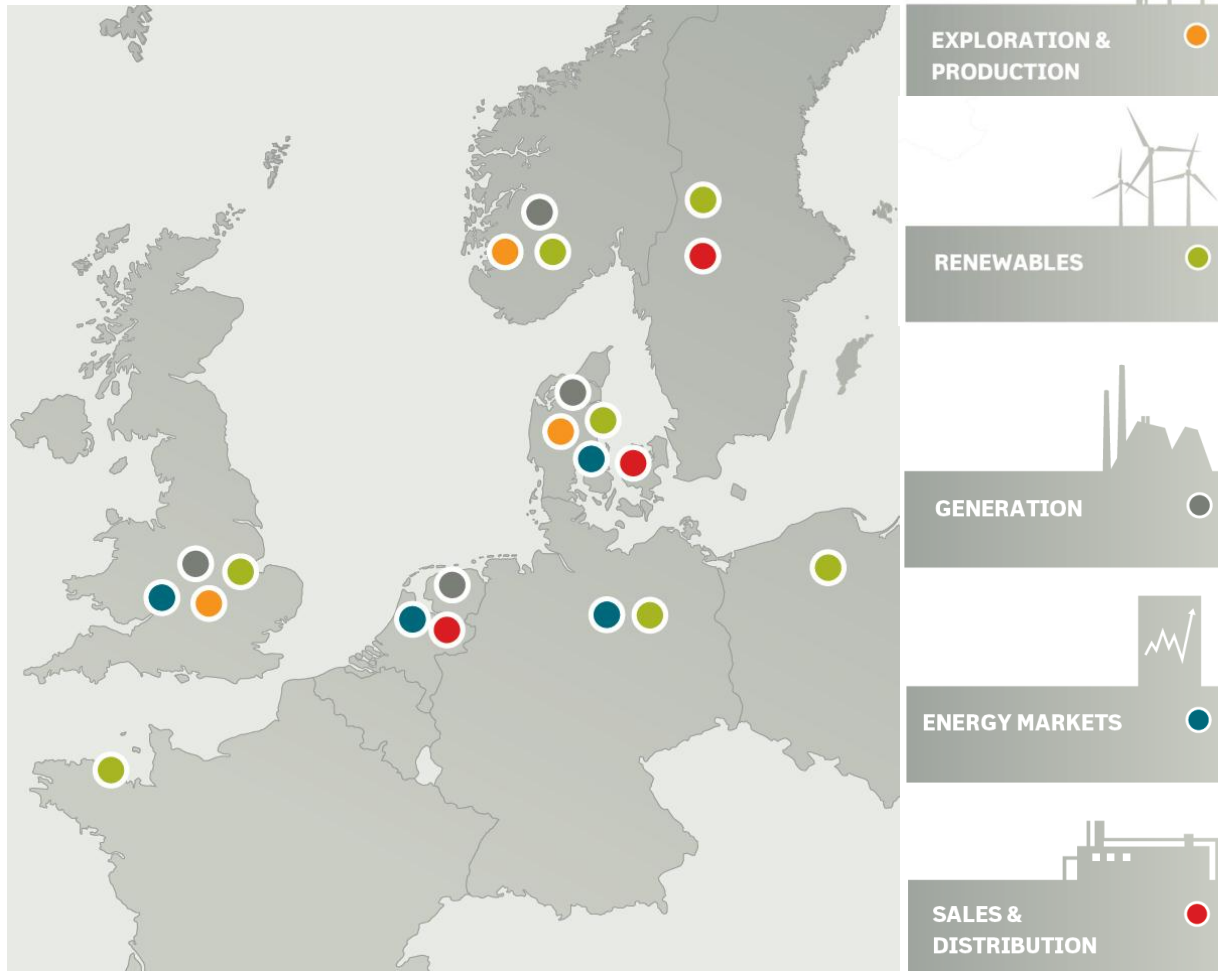


The use of probabilistic forecasts for wind power in the UK market

SafeWind End Users Workshop
Energinet.dk, Fredericia, 2 March 2012

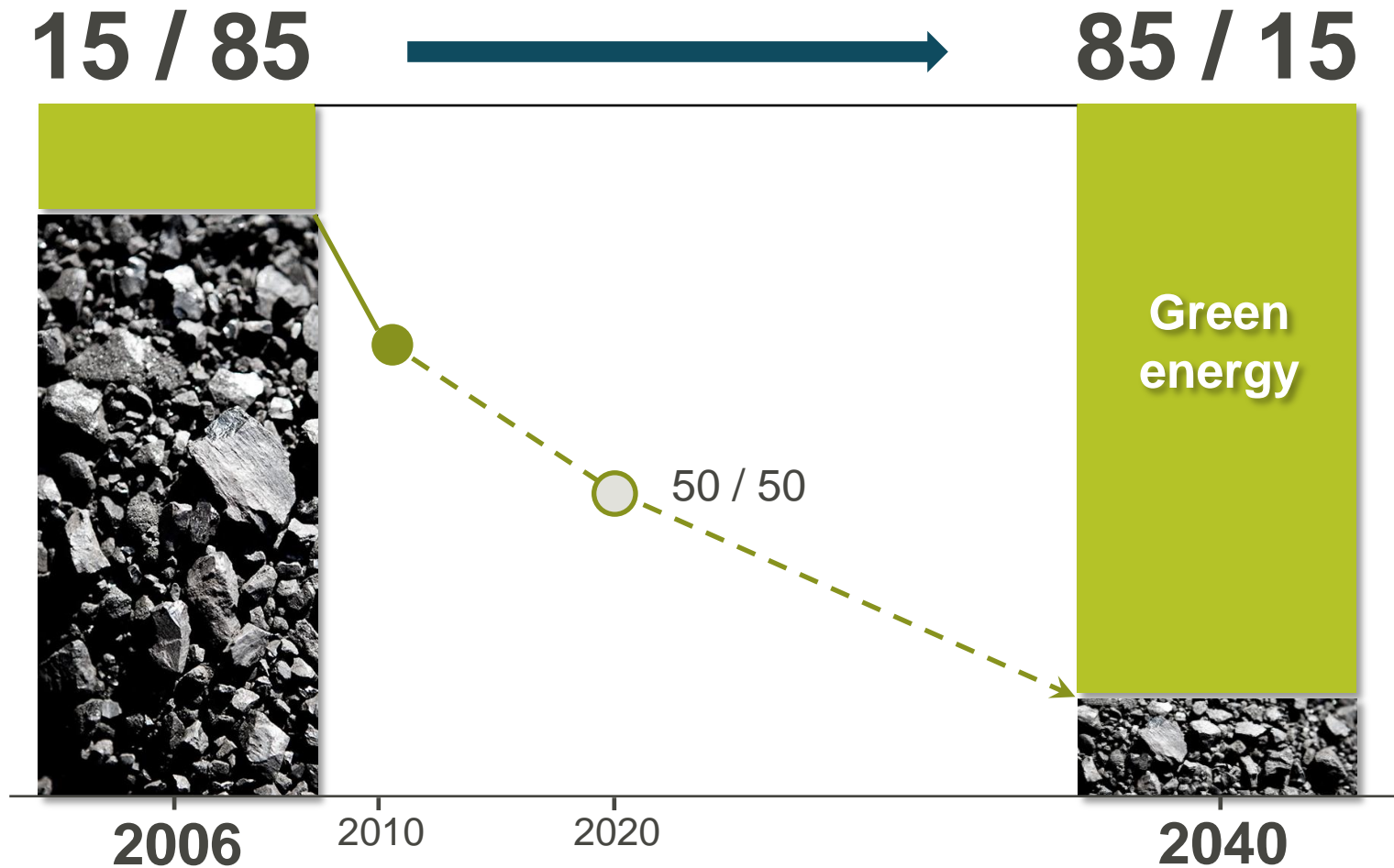


DONG Energy is one of the leading energy groups in Northern Europe

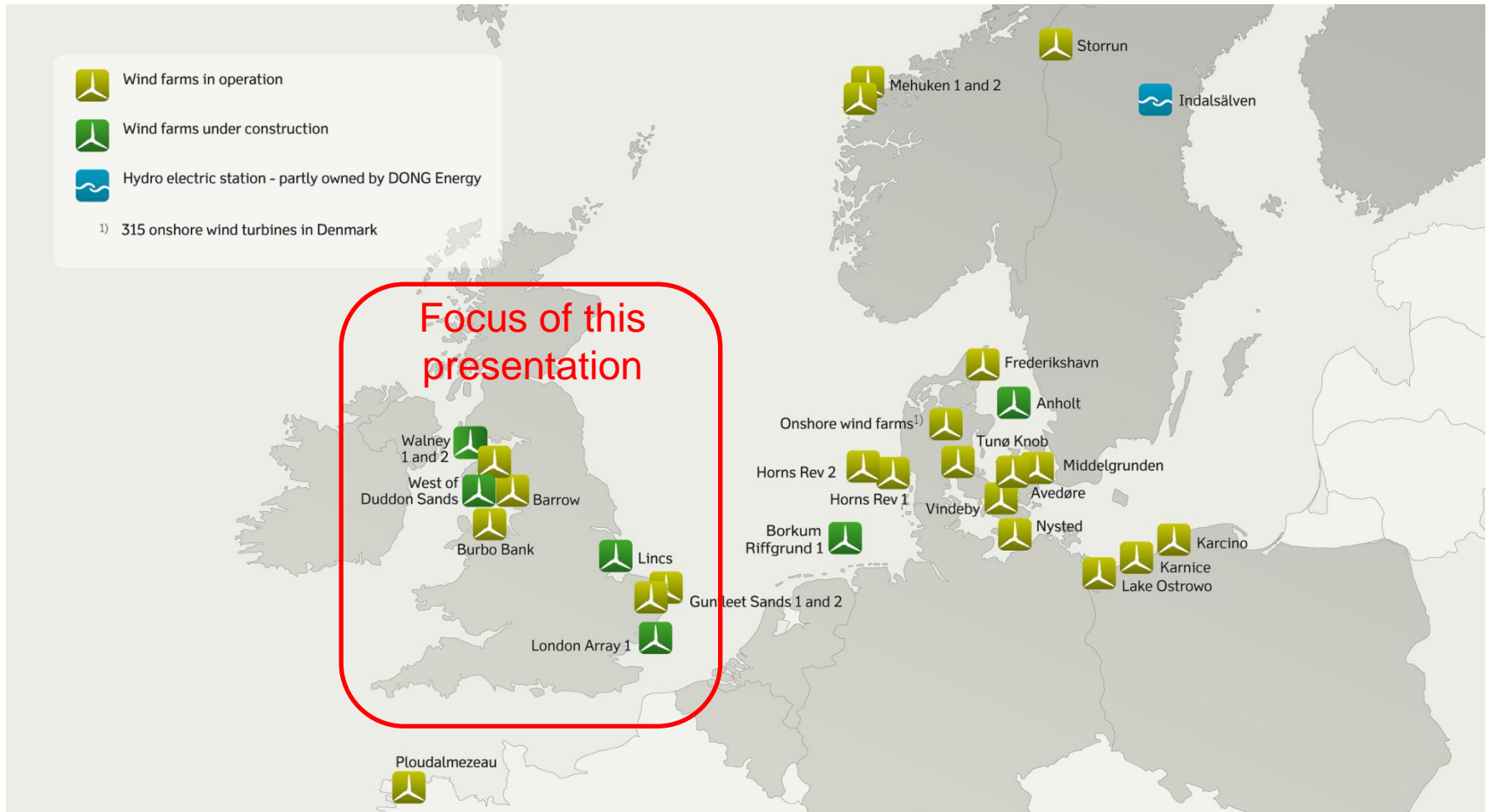


- We are headquartered in Denmark
- Our business is based on procuring, producing, distributing and trading in energy and related products in Northern Europe

DONG Energy's vision is to deliver clean and reliable energy

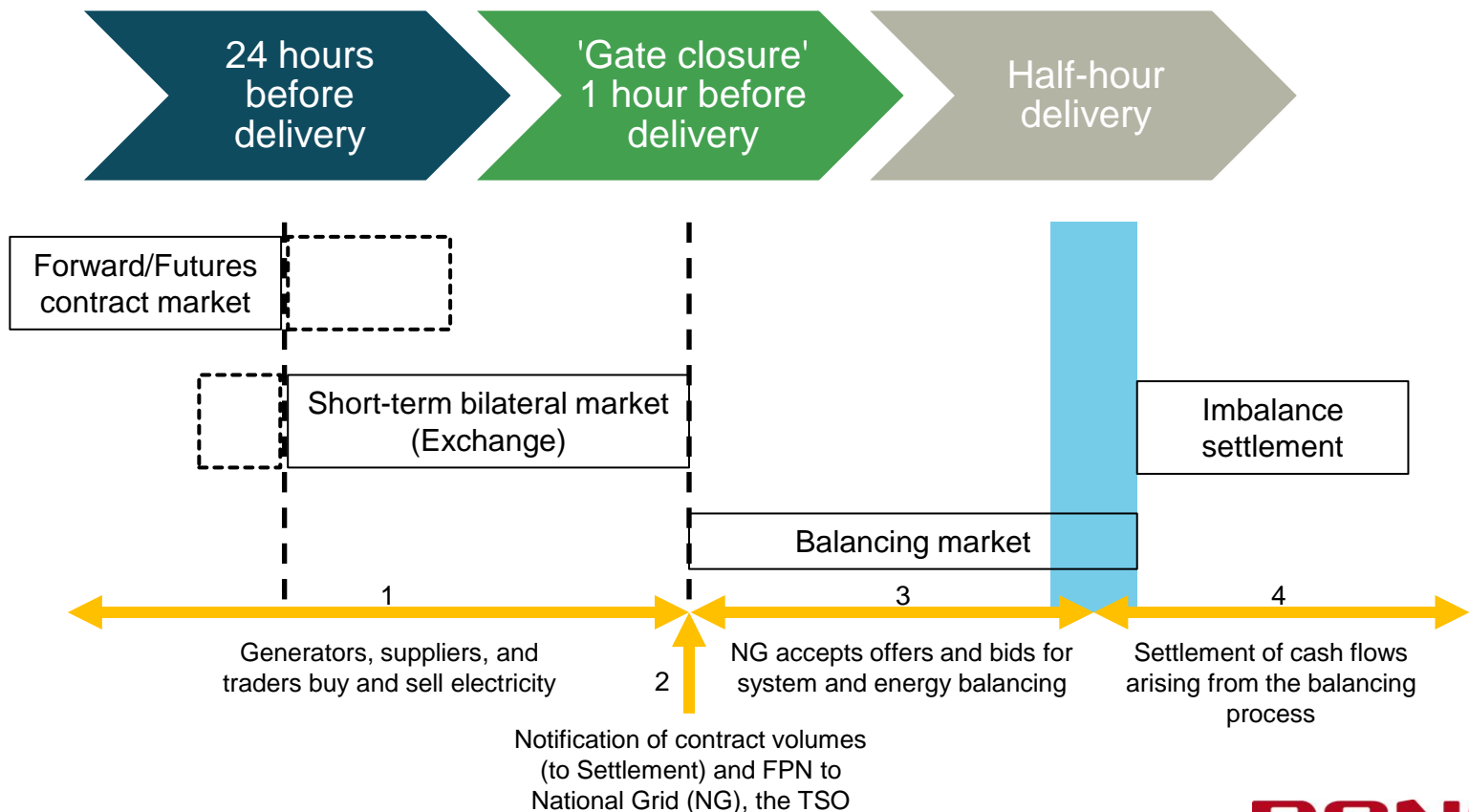


Geographical overview

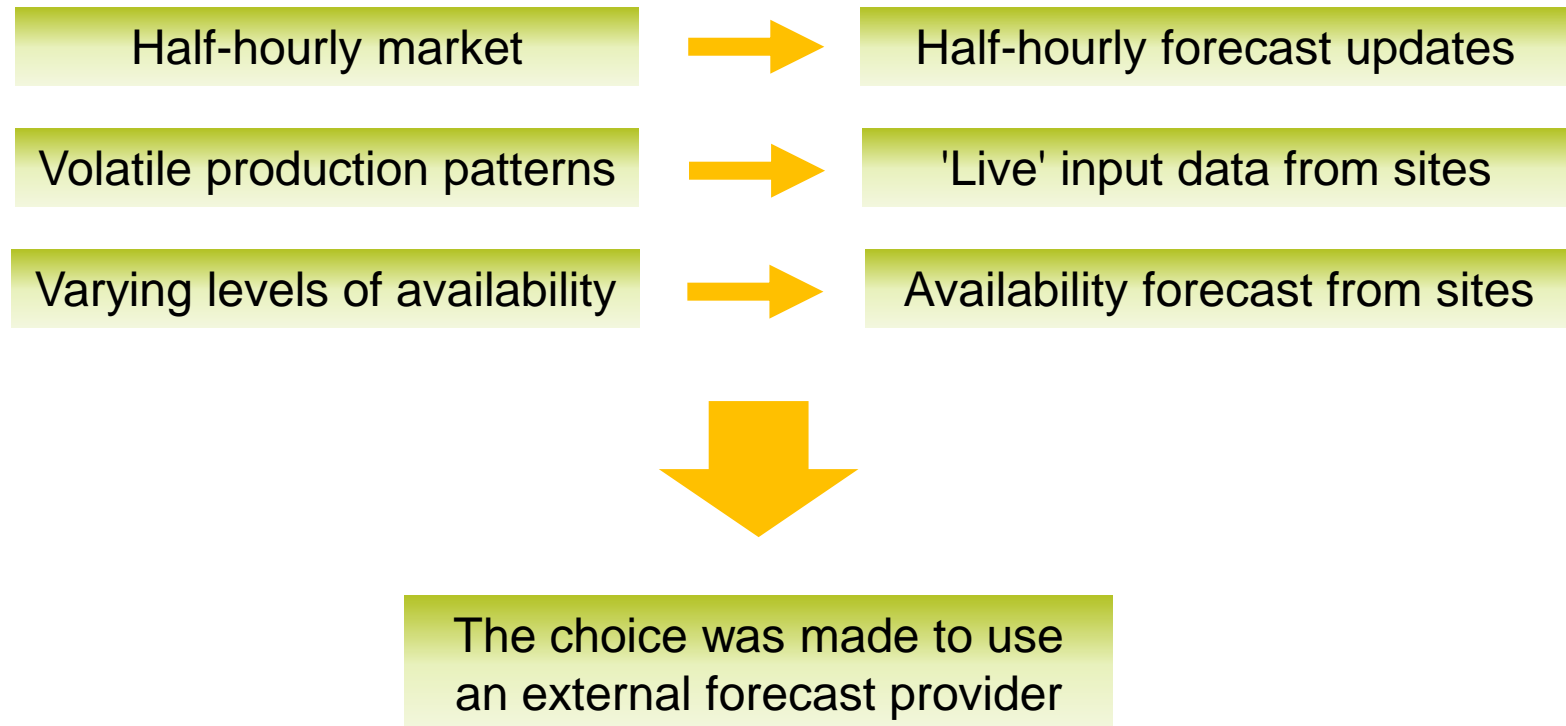


The UK power market

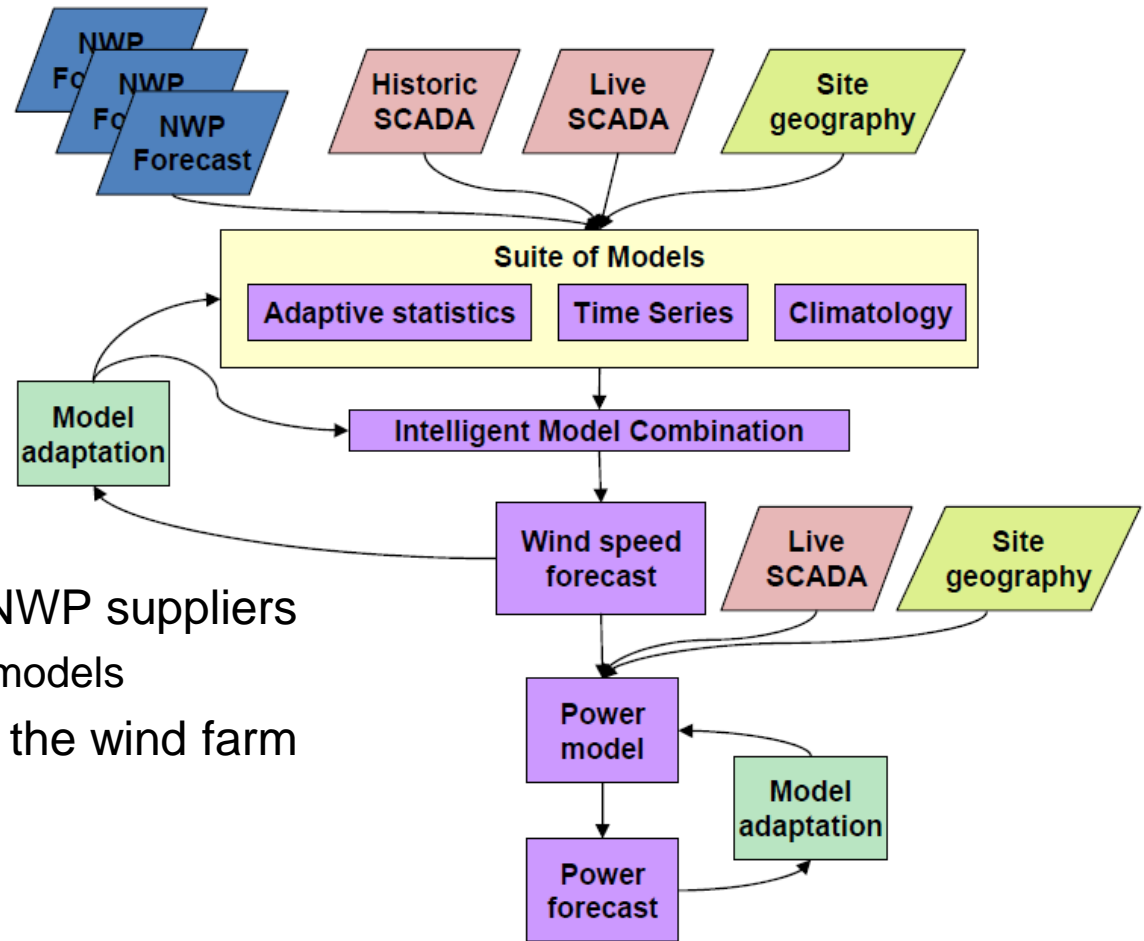
- Based on bilateral trading between generators, suppliers, traders, and consumers
- Trading takes place across a series of markets on a rolling half-hourly basis



Practical trading needs dictate structure of forecasting solution



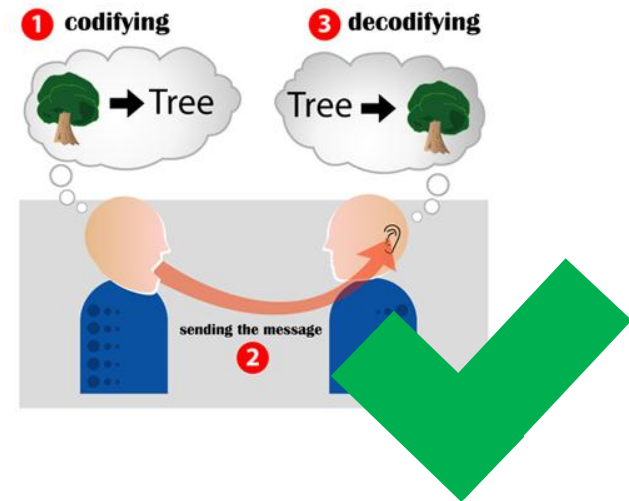
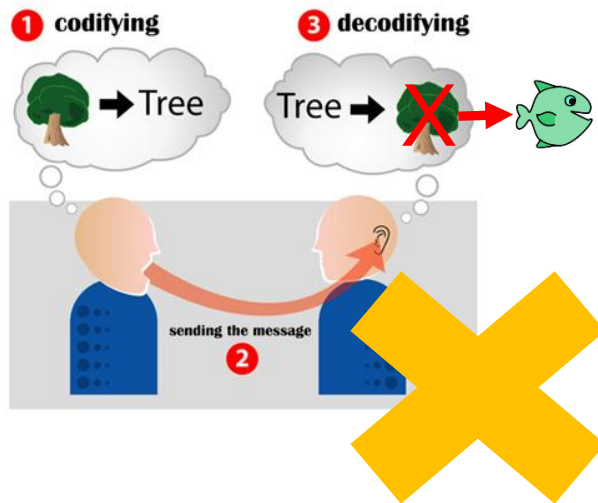
Forecasting model setup



- Optimised combination of NWP suppliers
 - Incorporation of mesoscale models
- Regular live feedback from the wind farm
- "Learning" algorithms for:
 - Meteorology
 - Power models

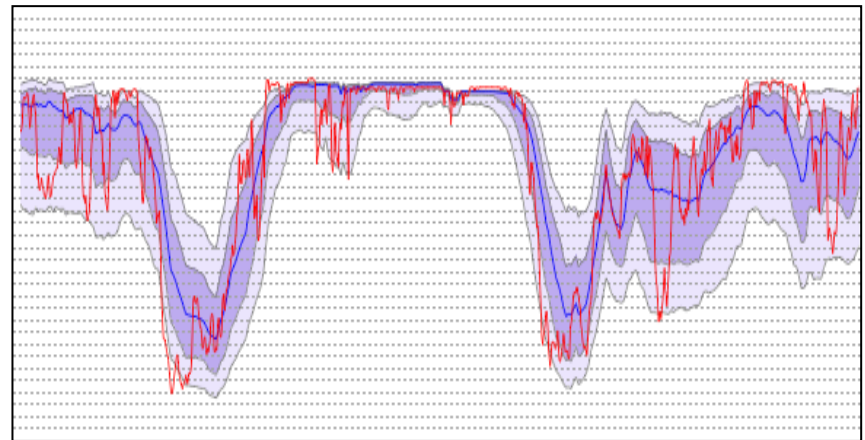
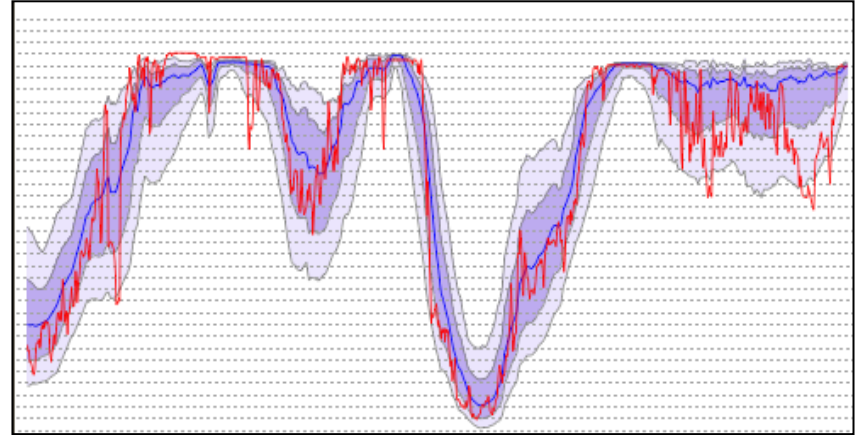
Crucial factors for forecasting quality (apart from the modelling itself, naturally!)

- Input, input, input!
 - Availability forecasts
 - Curtailment information
 - 'Live' SCADA feed from the sites
 - All three with sufficient frequency and quality
- Ensuring that end users (i.e. the traders) understand and interpret the forecasts correctly:



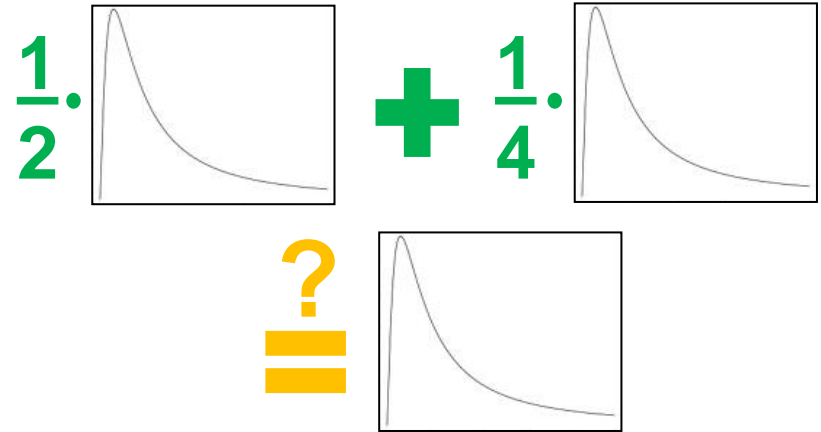
Probabilistic forecasts – what's the big idea?

- A nuanced view on the uncertainties inherent in the forecast, as:
- Given a probabilistic forecast, trading strategies can be made weighing opportunities in day-ahead and intraday against possible consequences in the balancing market
- Uncertainty in power forecast arises from uncertainty in underlying site specific weather forecast
- However, things are not fine and dandy just because there are uncertainty levels given in the forecast...

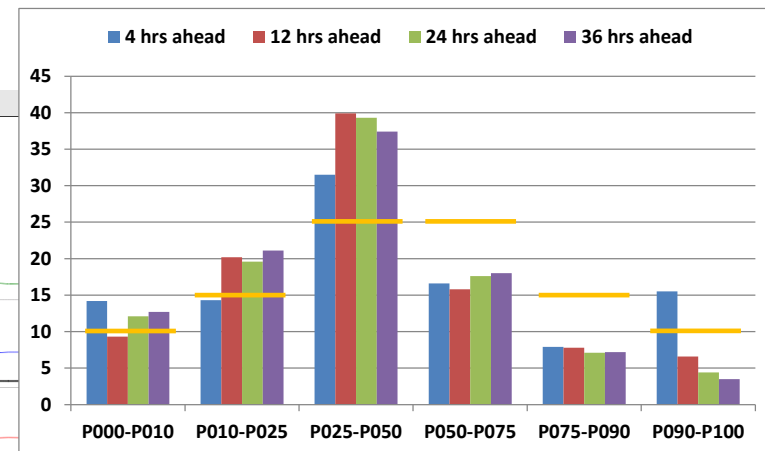
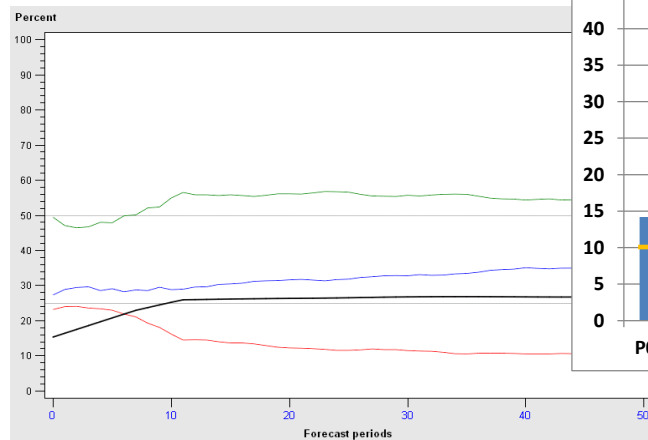


How do you optimise and measure performance for a probabilistic forecast?

- Creating fractiles for a site forecast is one thing – but what about the portfolio?
 - Portfolio production is a linear combination of underlying site production
 - But the portfolio fractiles can/should not be treated in the same manner unless the distributions are independent...



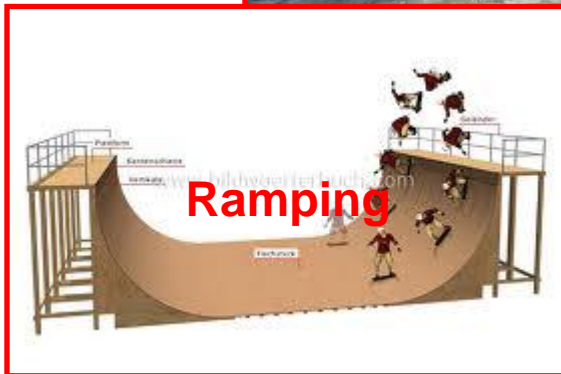
- How to measure the accuracy of the fractile distribution?
 - Talagrand diagram
 - 'Spread' diagram
 - Other?



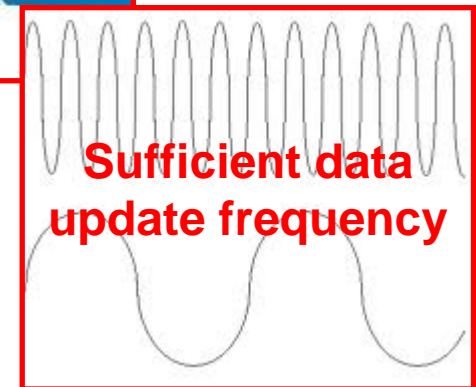
What presents the greatest challenges in wind power forecasting?

Two categories:

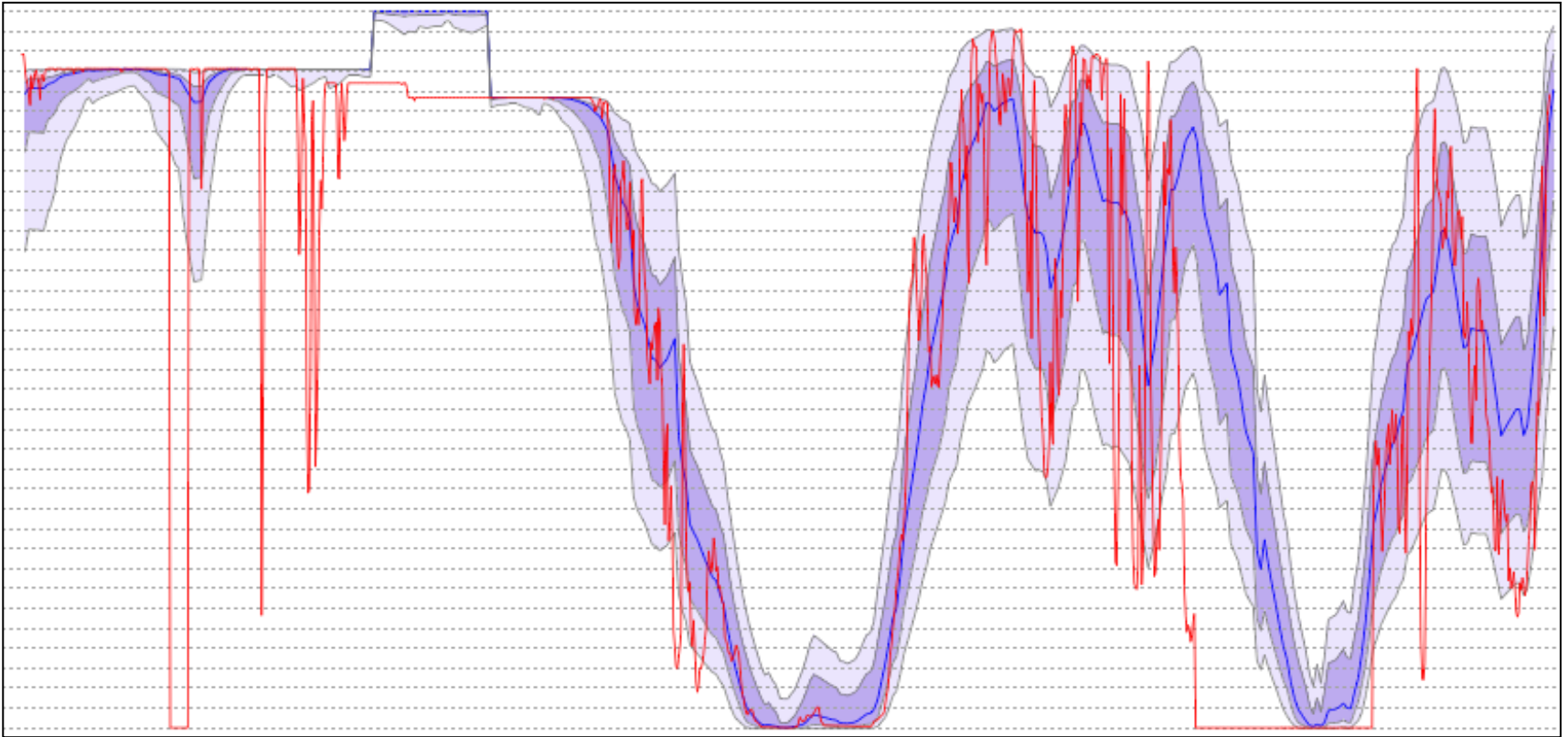
- "Physical" challenges



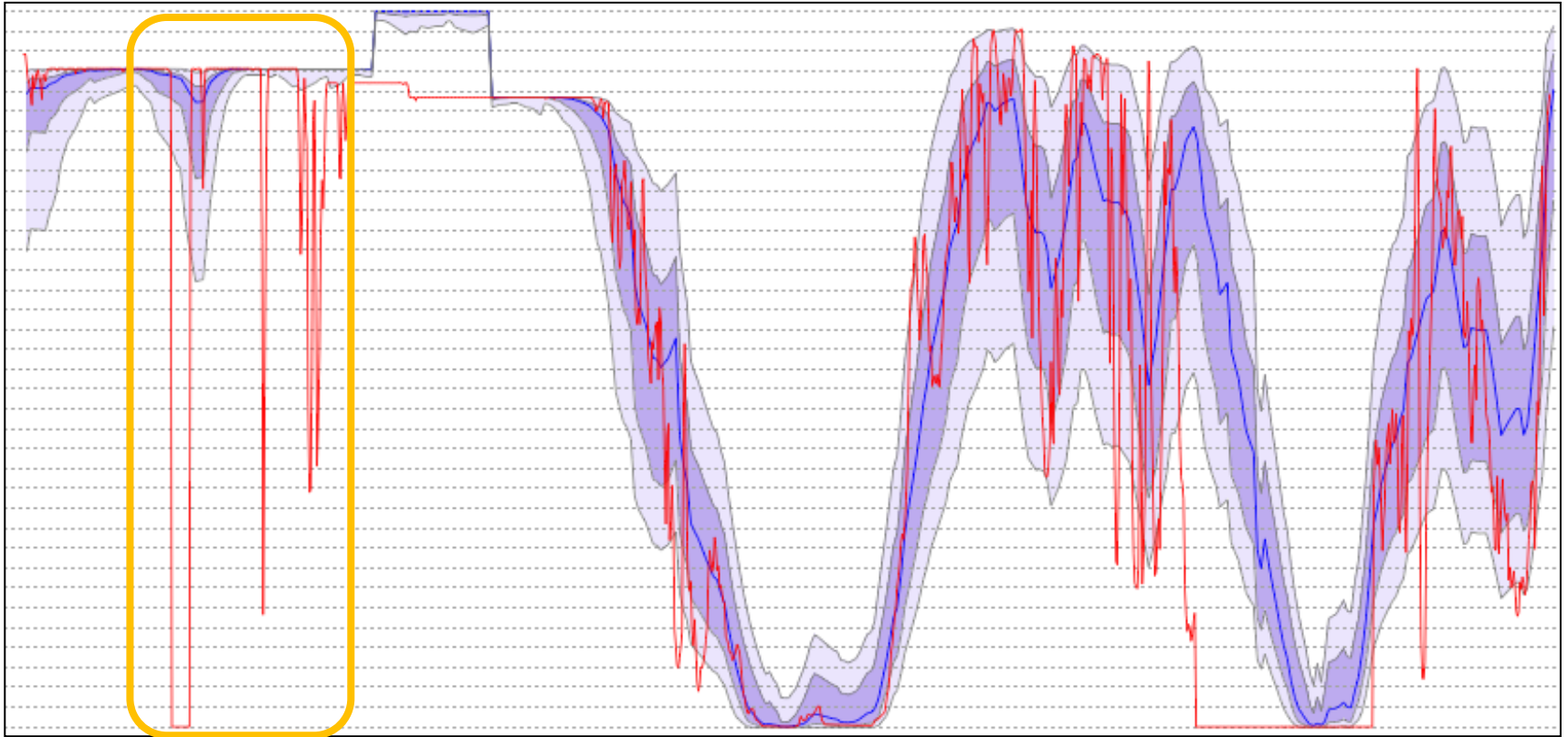
- Modelling/IT challenges



Challenges 'translated' to a real-life off-shore site forecast

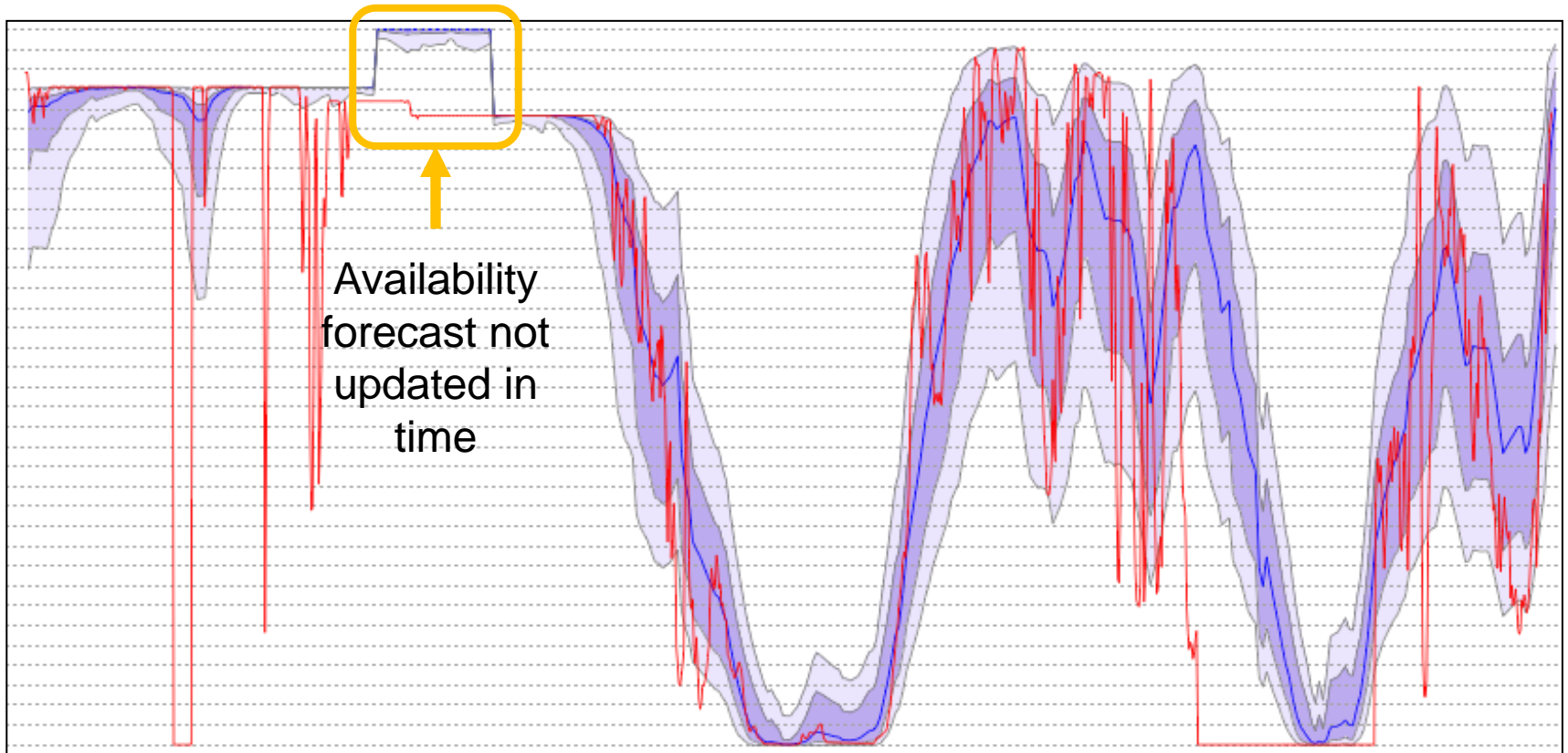


Challenges 'translated' to a real-life off-shore site forecast

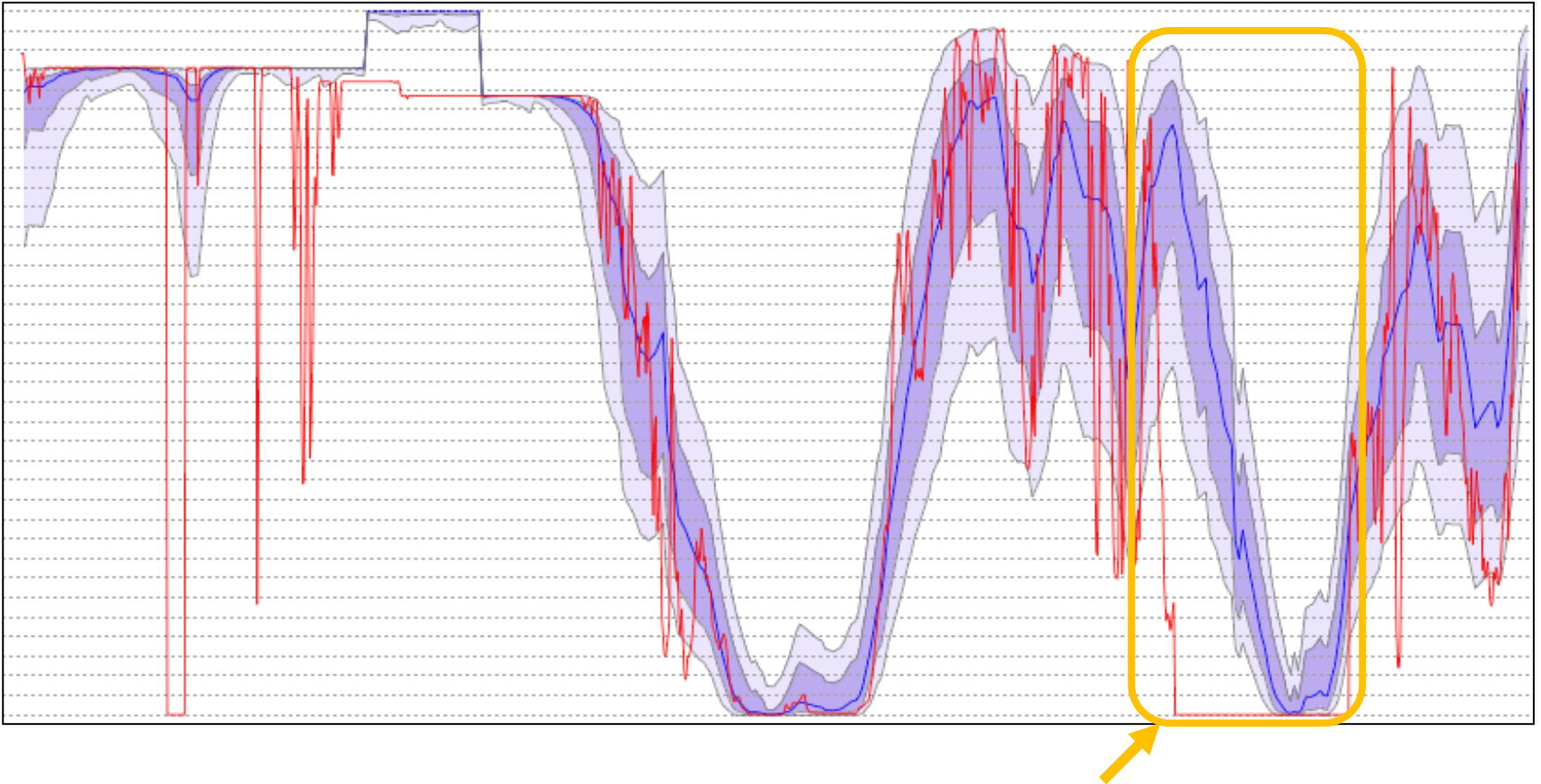


Partial and complete high wind cut-outs

Challenges 'translated' to a real-life off-shore site forecast



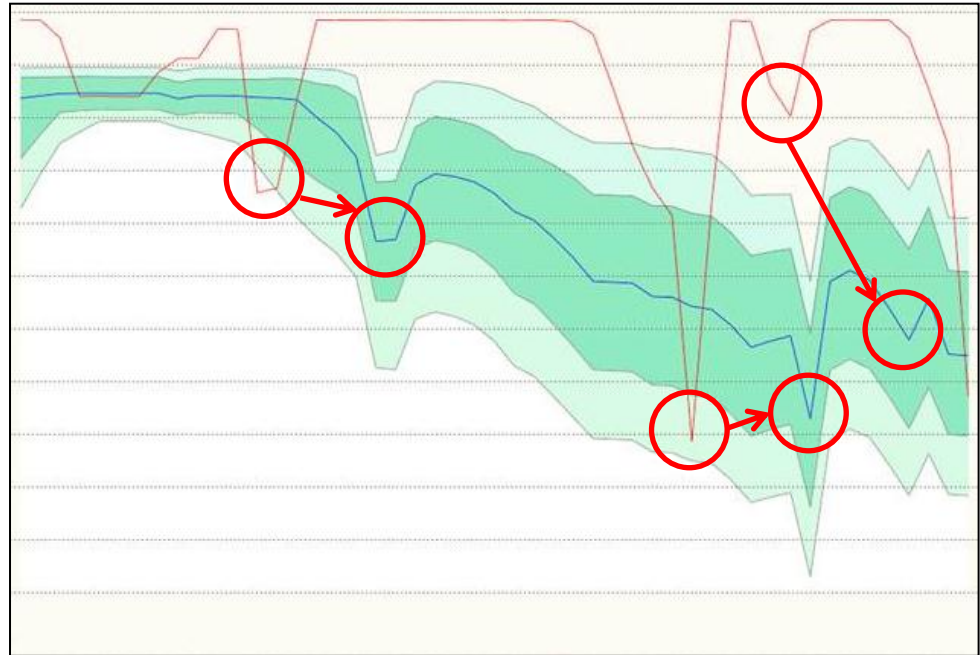
Challenges 'translated' to a real-life off-shore site forecast



Down ramping earlier and steeper than expected – causing unexpected long period of low wind cut-out

Using a 'persistence approach' on the short term – is it a good idea?

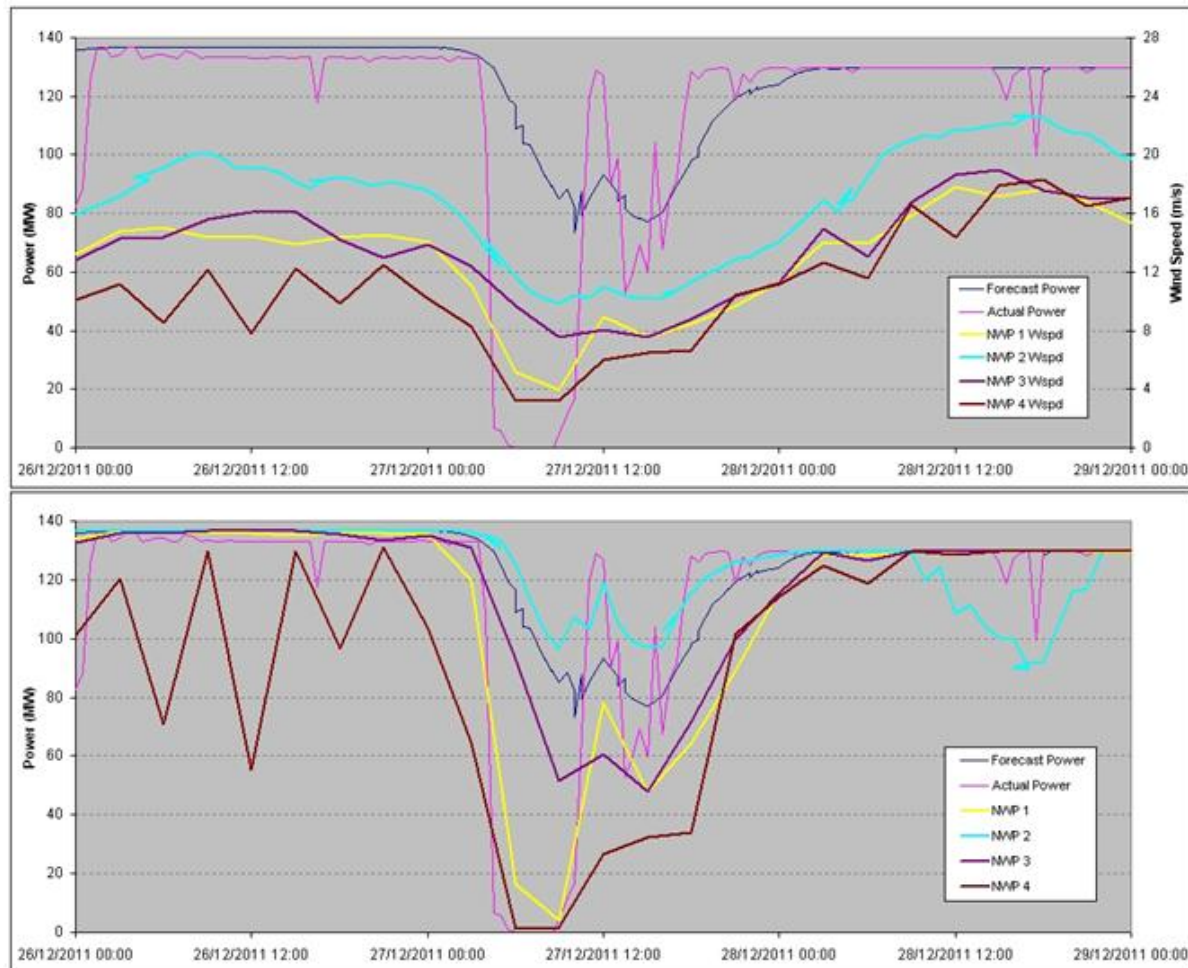
- 'Persistence modelling' on the short term can be a way of correcting the level of the forecast using 'live' SCADA data
- Useful when
 - weather is stable or
 - production is continually increasing or decreasing
- However it may have a detrimental effect during more volatile weather conditions where shifts up and down in production levels perpetuate in the short term forecasts



Weighing the NWP inputs

– how do we ensure we use the right input at the right time?

- Difference of opinions between NWPs
- Historically best performance from NWP 2 but in this case a not good capture of drop in wind speed



Conclusions

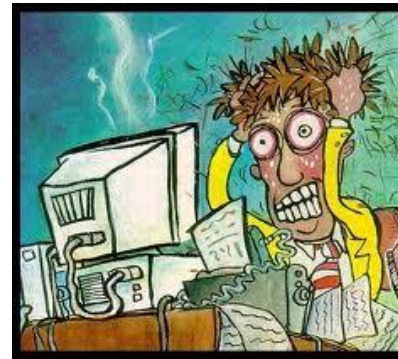
- Quality of input is crucial:



- Use the modelling approach most suitable given the situation – not easy!



- Probabilistic forecasts can provide useful information for traders – but they need to know how to interpret them



Thank you for your attention