



IEA Wind Task 36

Forecast Game Introduction:

Offshore wind power decision making in extreme events



IEA Wind Task 36 Workshop

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Introduction to trading practices using uncertainty forecasts

Thumb rules for trading with uncertainties



Use the **appropriate approach** for your target:

- one that is looking forward in time
- not a statistical/climatology based forecast
- not one that has specific target times



The **incentive** MUST be **avoidance of imbalance costs** while increasing your income



Become a price maker to **reflect real system costs**

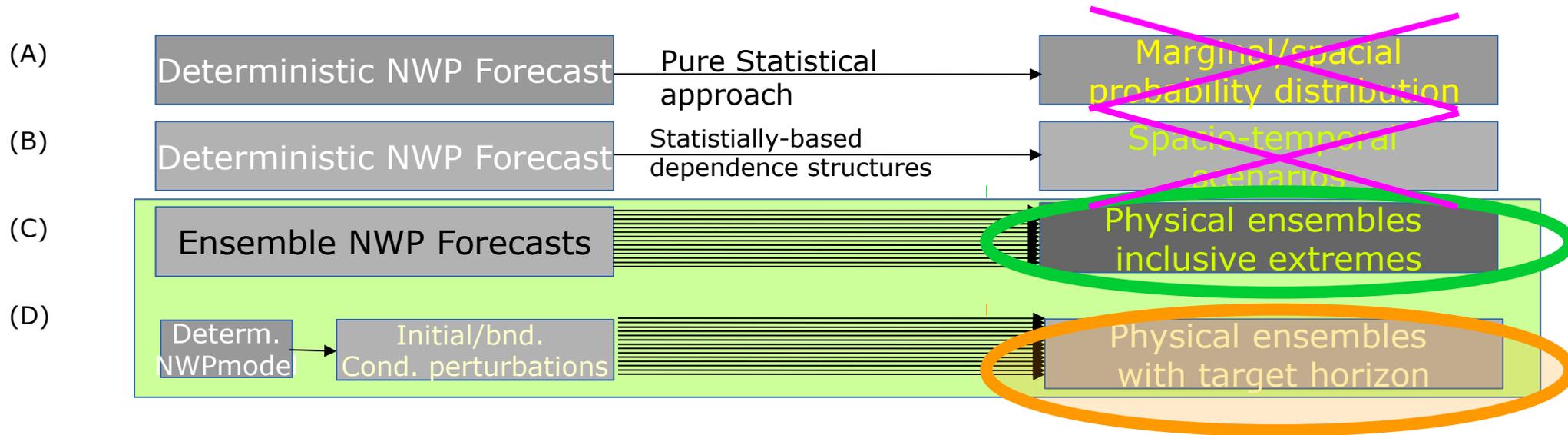
Only **trade when it make sense**

- avoid trading every hour/time interval
- only trade within the uncertainty band
- the most current forecast is not always the best !!!

High Speed Shut Down

– also a question of methodology ? –

Know, which methodology works for your target problem !



For high-speed shutdown forecasts you need **to capture extremes**:

(A) + (B): statistical methods can only capture and predict, what has been there in the past

(A): Captures only climatology and cannot be aggregated over larger areas

(D): target horizons need calibration for the time component

3 Postulates:

- (1) Success in the trading is highly dependent on the costs of the balancing power needed due to forecast errors
- (2) 5% of the cases, where there are large forecast errors are responsible for 95% of the costs in a month or a year.
- (3) Reducing these costs is more important than improving the general forecast by 1-2%.

The Game:

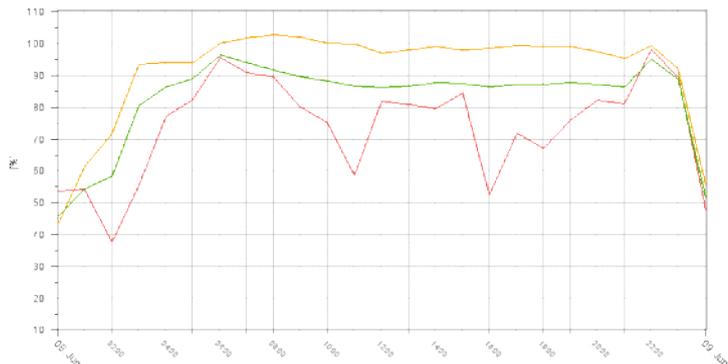
Decide in 12 cases whether to trade 50% or 100% of the generating power of an offshore wind park according to an available forecast given the possibility of a high-speed shutdown, where the wind park stops generating due to excessive wind conditions.

Definition of a “high-speed shutdown” (HSSD) or “cut-off wind” event :

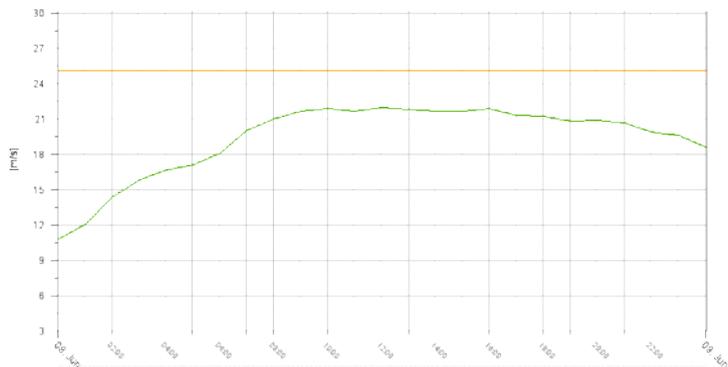
A high-speed shutdown event occurs typically in the wind range above 21-27m/s, mostly known as the cut-off wind threshold of 25 m/s. Note that wind turbines use both wind gusts and the mean wind to determine, whether or not they turn into high-speed shutdown (HSSD).

Type of forecasts used in the game

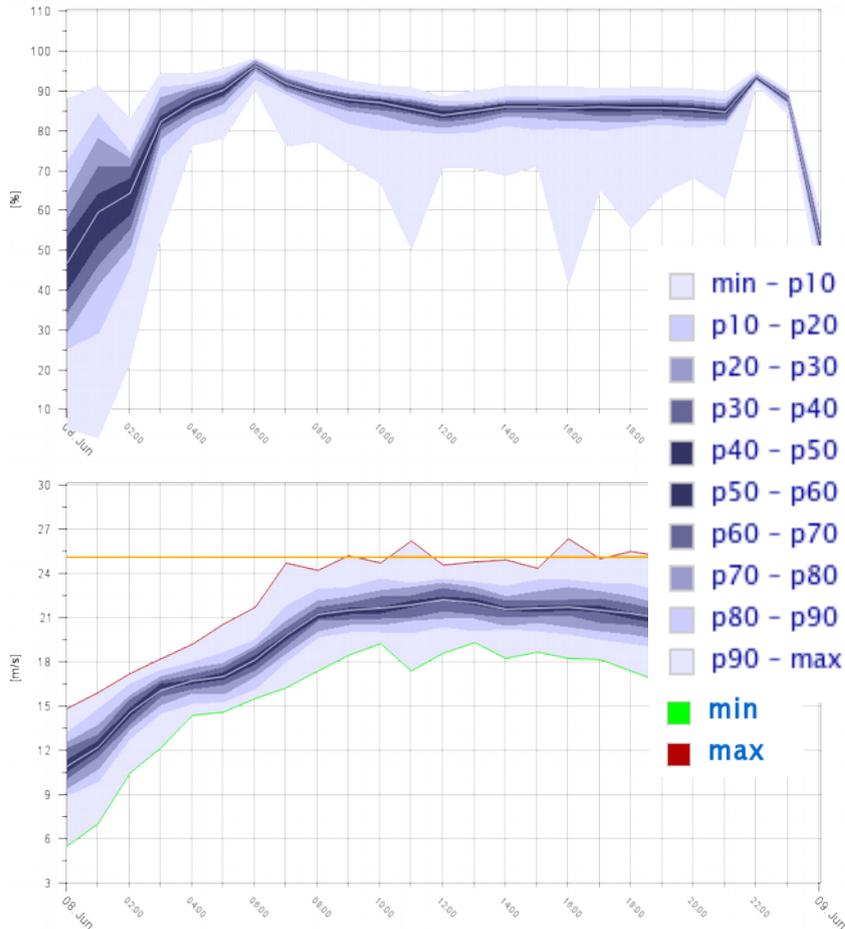
In the game are deterministic and probabilistic forecasts for the **day-ahead horizon**. All forecasts are generated with input of NWP (numerical weather prediction) forecasts from the 00UTC cycle the day before.



3 independent deterministic wind power forecasts in the unit [% of installed capacity] based on 3 different NWP (numerical weather prediction) models



1 wind speed forecast in the unit [m/s], which is a mean forecast from 75 ensemble members and smoother than a typical deterministic forecast. **Additionally, you see a reference line for the 25m/s threshold reference value** for high-speed shutdown or also sometimes called cut-off wind speed threshold.



9 wind power percentiles (P10..P90) and a mean (white line) in the unit [% of installed capacity] generated from 75 NWP forecasts of a multi-scheme ensemble prediction system.

9 wind speed percentiles P10..P90 and a mean (white line) in the unit [% of installed capacity] generated from 75 NWP forecasts of a multi-scheme ensemble prediction system.

Note: The percentiles here are physically based uncertainty bands and provide an overview of the uncertainty of the forecast.

Definition: A percentile indicates the value below which a given percentage of forecasts from the 75 available forecasts falls. E.g., the 20th percentile is the value below which 20% of the forecasts are found.

Forecast Game: Offshore wind power decision making in extreme events - The cost profile -

To reflect the costs of large and small errors we have defined a simplified cost function for the period, where high-speed shutdown (HSSD) can take place.

Definitions:

- the wind farm is 100MW and the spot market price is 50 Eur/Mwh.
- balance costs are equivalent to spot market prices
- The cost function will only consider your choice for the hours, where the actual generation is full load or no generation

Trading	HSSD*	No HSSD*
100%	-5.000	5.000
50%	0	2.500

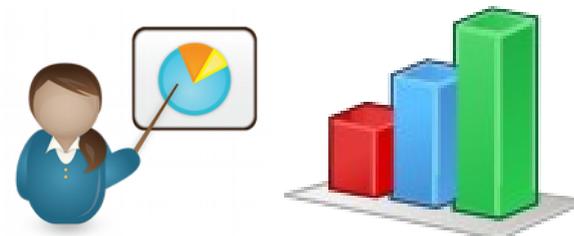
* High-Speed Shutdown == cut-off winds

Note that trading **100% is a risky choice** that can both increase your income and loss. The more conservative **50% trading strategy eliminates the risk of a loss**, because **balance costs are equal to spot market prices** and **you can curtail the wind farm to avoid balance costs.**

Any questions ? ... if not ...



We are back later with some analysis...



Questions or Comments ?

Please talk to us or
Contact us...
We appreciate any
kind of feedback

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