

WIND POWER FORECAST ERROR STATISTICS IN SPANISH POWER SYSTEM

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Motivation

Background

Taking into account the penetration of renewable energy in the Spanish power system, some considerations have been taken into account, e.g.:

- Wind forecasting is an important consideration in integrating large amounts of wind power into the electricity grid.
- The Wind Power Forecast Error (WPFE) distribution assumed can have a large impact on the confidence intervals produced in wind power forecasting.

Aim

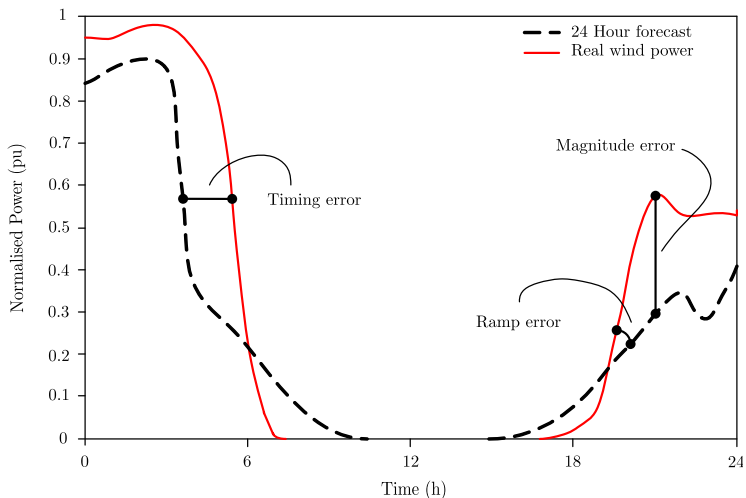
Aim of this work

- Describe error sources and magnitudes to establish their main characteristics.
- Examine WPFE statistics for Spanish power system over multiple timescales.
- Compare WPFE experimental distribution shape and normal distribution shape.

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WPF sources I



WPFE sources II

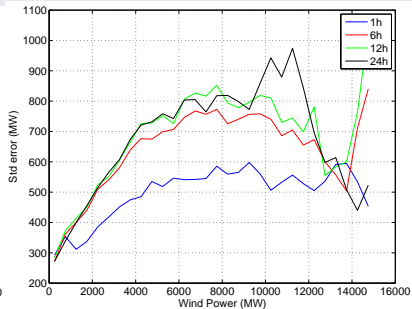
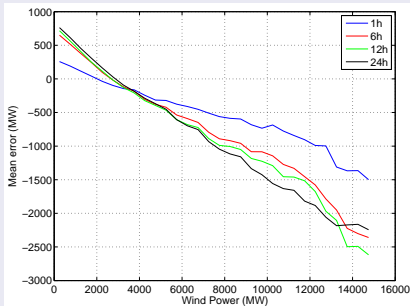
- A timing error is defined as an event that it is accurately predicted in magnitude, but occurs at the wrong time. This kind of error can achieve a considerable absolute error even when event magnitude has been correctly forecasted.
- A magnitude error is defined as an event that is forecast approximately at the right time, but with the wrong magnitude. This can occur in two possible ways; the forecast might be in error about the rate of change or might be in error regarding the overall magnitude of the event.
- A ramp error consists on a ramp event that is forecasted with a different rate of change. This kind of error drives forecast to considerable magnitude errors.

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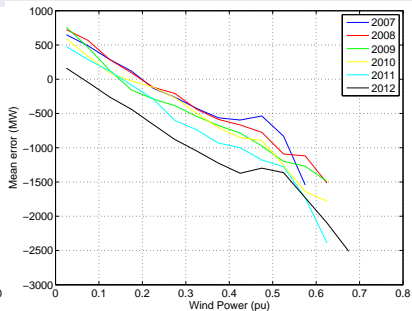
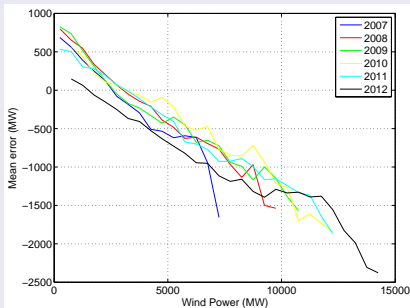
Comparison

Forecast horizon influence



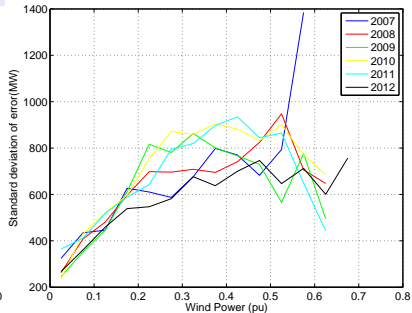
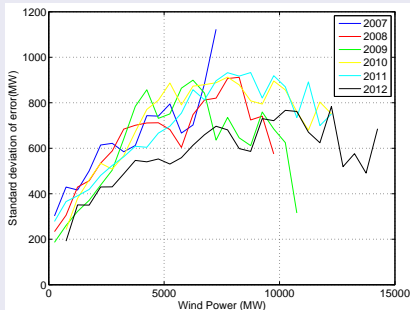
Comparison

Year variability influence. Mean error.



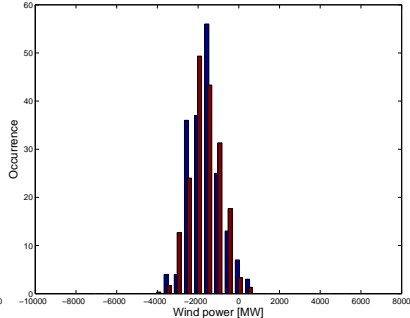
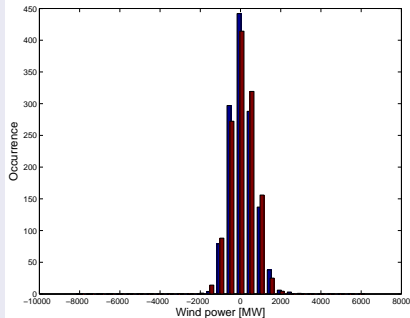
Comparison

Year variability influence. Standard deviation of error.



Comparison

Probability distribution shape. 12h horizon.



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Conclusions

- WPFE sources have been identified and characterized for Spanish wind power. WPFE have been analyzed depending on wind power generation range.
- A statistical analysis was performed for FE, obtaining its trend, seasonal variability and residual variability. A great amount of wind power and forecast data have been used for this analysis.
- Important results have been found by analyzing the relationships of mean and standard deviation of measured forecast error depending on wind power level.
- These relationships could be used to establish a model in order to calculate power system reserves to face wind power FE. Additionally, kurtosis and skewness parameter should be studied to fit distribution probability.

Acknowledgement

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