TradeRES
New Markets Design & Models for 100% Renewable Power Systems

TradeRES Research Bulletin

Enhancing wind power forecast accuracy using the weather research and forecasting numerical model-based features and artificial neuronal networks

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Summary

Forecasting with accuracy the quantity of energy produced by wind power plants is crucial to enabling its optimal integration into power systems and electricity markets. Despite the remarkable improvements in the wind forecasting systems in recent years, large errors can still be observed, especially for longer time horizons. This work focuses on identifying new numerical weather prediction (NWP)-based features aiming to improve the overall quality of wind power forecasts. The forecast methodology incorporates a sequential forward feature selection algorithm. This algorithm was designed to select iteratively the meteorological features which minimize the root mean square errors of the wind power forecasts, improving its performance. The methodology was applied separately to a set of wind parks in Portugal with different climate characteristics.

The proposed approach allowed a reduction between 13% to 37% in the root mean square errors of wind power forecasts, compared with a baseline scenario. Results show to be crucial to select the most relevant features of a specific site to maximize the accuracy of a wind power forecast.

Highlights

- A methodology that explores all the potential information from numerical weather prediction models to improve the power forecast accuracy is presented.
- The methodology proposed is applied separately to a set of wind parks in Portugal with different climate characteristics.
- A reduction between 13% to 37% in the root mean square errors of wind power forecasts is obtained with the methodology proposed, compared with a baseline scenario.
- The results highlight that is crucial to select the most relevant meteorological features for each wind park to maximize the accuracy of a wind power forecast.

Info

The TradeRES project will develop and test innovative electricity market designs that can meet society's needs of a (near) 100% renewable power system. The market design will be tested in a sophisticated simulation environment in which real-world characteristics such as actors' limited foresight into the future and risk aversion are included.

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