

**A new algorithm for Upscaling and Short-term forecasting of wind power  
using Ensemble forecasts**

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Weather dependent renewable energy sources and especially wind power are frequently the cause of imbalances on the electrical grid. In order to ease the integration of wind and reduce the balance cost it is therefore necessary to estimate how much energy is produced in the following hours.

Most power systems have online data on a subset of the renewable energy sources as it is not technically feasible to send frequent reports from all smaller distributed energy sources. Consequently the operator has a incomplete picture of the generation.

State-of-the-art methodologies combine measurements and forecasts to generate a state estimate. However, the weather forecast often suggests a different state than the online measurements indicate.

A first order approximation to the problem is to find a forecast that resembles the online measurement and then trust in this forecast for the next hours. Practical experience however shows that one cannot always find such a matching forecast even within a large ensemble of forecasts.

Nevertheless, it is possible to feed the online estimate together with calibrated forecasts into an algorithm, which adapts the model state to fully match the online measurements. The resulting model state is then used as a starting point for the short term forecast covering the next 12 hours.

The algorithm compute quality index, spatial transformation and coupling in time with the help of all available ensemble forecasts.

The methodology is equally applicable to variables with low and high inertia. It is designed to support forecast updates several times per minute to capture rapid changes in the weather development that may have impact on the power system.