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From short term power forecasting to nowcasting – Benefiting from meteorological forecasts and measurements

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Today, wind and solar power forecasts with time horizons from zero to about three hours are essential for the reliable grid and market integration of wind and solar energy. With respect to closure times of German intra-day markets, power forecasts with time horizons of about one to two hours and an update frequency of 15 minutes are required for final trading activities, reducing the uncertainty of the day-ahead forecast of the previous day. Regarding grid security aspects, grid operators utilize such forecasts to create continuous intra-day grid congestion forecasts. In addition to these preventive measures, wind and solar power become more and more important for the provision of ancillary services by wind and solar farm operators. This use case mainly requires power forecasts with time horizons of less than one hour.
In general, forecasts with time horizons below three hours are investigated within the nowcasting research area. Nowcasting models are mainly based on current observations and extrapolation methods. With respect to wind and solar power forecasts with horizons of up to three hours, it has been shown in studies that real-time power measurements have the highest information content as compared to other potential model input parameters.
We will present results from studies focusing on the benefit of meteorological data (forecasts and/or measurements) in the field of solar and wind power forecasts with time horizons of up to a few hours. Wind farm forecast errors are for example reduced by using numerical weather prediction (NWP) data in the wind power prediction model along with real-time wind farm power measurements. Furthermore, spatially distributed NWP data in combination with German total wind power measurements helped in the reduction of extreme forecast errors. By using global radiation forecasts as an input for wind power forecasts, forecast error during sunrise and sunset could be reduced. In the field of German total solar power, nowcasting experiments using a combination of satellite data and NWP show promising results.
Altogether we will emphasize that there is still much potential for the improvement of wind and solar power nowcasting by the use of energy-oriented optimized meteorological nowcasting and forecasting models, as well as by the use of in-situ and remote sensing measurements.