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Solar PV power forecasting in Australia using GFS and ECMWF

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The Australian Solar Energy Forecasting System is a commercial high-availability prediction system, delivered to the Australian Energy Market Operator AEMO. It provides predictions of solar power from 5 minutes to 10 days forecast horizon based on advanced statistical/physical prediction approaches.

Besides the obvious dependence of solar PV production on the irradiance reaching the PV cells, the power production also depends on a number of other factors. These include dust settled on the PV panels, inverter configuration, and PV cell efficiency, which in turn depends on the panel temperature. The environment of the PV panels, primarily via the ambient air temperature, wind speed, irradiance, and installation geometry, determines this temperature. These dependencies and the orientation of the panels might not be exactly known and some dependencies might even change over time. Furthermore, meteorological forecasts of irradiance might be subject to systematic errors and finally information regarding PV panel output might be embedded in other meteorological variables.

For these reasons, we operationally apply methods which combine on-line on-site measurements of actual solar PV power production and meteorological NWP forecasts in order to continuously re-calibrate models describing the relationship between the meteorological forecast and the actual solar PV power production. The method outlined is applied to GFS-HD and ECMWF forecasts and the resulting solar PV power forecasts are treated by a combination model, determining the optimum aggregation of the different prediction inputs into one single forecast. Also, using methods adapted from wind power forecasting, the forecasts are argumented with quantile forecasts.

We will present the performance of this prediction model chain for sites in Australia as part of the Australian Solar Energy Forecasting System project compared to traditional models with static modelling parameters.