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Performance evaluation metrics for very short-term PV forecasting

Louis-Etienne Boudreault, Frederik Kurzrock, Olivier Liandrat, Guillaume Roussel, and Sylvain Cros
Reuniwatt, Sainte Clothilde, Reunion, France (louisetienne.boudreault@reuniwatt.com)

Depending on the meteorological conditions, the power production of a photovoltaic (PV) power plant is subject to strong variability due to ramp events from passing clouds. Very short-term PV forecasting is a useful tool to grid operators for grid planning and control to manage these events. For such applications, the forecasts must be used in such way that they are tailored to the specific application of interest, which itself depends on how the forecasting system is evaluated. For example, the overall mean precision over all forecasting time-horizons might be more important for power production planning than it might be for grid control, where accurate solar drop prediction is a more important key factor. Two of the most widely used metrics for PV forecast evaluation are the Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE). However, these metrics are not sufficient for a complete characterization of the forecast error distribution.

One system providing very short-term (up to 30 minutes) forecasts are sky imagers. In this study, we present a complete statistical distribution analysis of the forecast error using a sky imager for a specific use-case in Europe. We then interpret the meaning of the related statistical moments in light of the various applications of interest.