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Ensemble forecasting for renewable energy applications - status and current challenges for their generation and verification

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The operational management of renewable energy generation in power systems and electricity markets requires forecasts in various forms, e.g., deterministic or probabilistic, continuous or categorical, depending upon the decision process at hand. Besides, such forecasts may also be necessary at various spatial and temporal scales, from high temporal resolutions (in the order of minutes) and very localized for an offshore wind farm, to coarser temporal resolutions (hours) and covering a whole country for day-ahead power scheduling problems.

As of today, weather predictions are a common input to forecasting methodologies for renewable energy generation. Since for most decision processes, optimal decisions can only be made if accounting for forecast uncertainties, ensemble predictions and density forecasts are increasingly seen as the product of choice. After discussing some of the basic approaches to obtaining ensemble forecasts of renewable power generation, it will be argued that space-time trajectories of renewable power production may or may not be necessitate post-processing ensemble forecasts for relevant weather variables. Example approaches and test case applications will be covered, e.g., looking at the Horns Rev offshore wind farm in Denmark, or gridded forecasts for the whole continental Europe. Eventually, we will illustrate some of the limitations of current frameworks to forecast verification, which actually make it difficult to fully assess the quality of post-processing approaches to obtain renewable energy predictions.