EMS Annual Meeting Abstracts
Vol. 11, EMS2014-371, 2014
14th EMS / 10th ECAC

Random forests ramp forecasts for groups of wind farms

Pål Preede Revheim and Hans Georg Beyer
University of Agder, Department of Engineering, Grimstad, Norway (palpr@uia.no)

Increasing volumes of wind power in electricity grids leads to an increasing need for reliable and accurate wind power forecasts. One of the major challenges is dealing with sudden large changes in wind power production, normally referred to as wind power ramp events. The sooner and more accurate ramp events can be predicted, the smoother and more efficiently they can be dealt with.

This paper explores the possibilities of forecasting wind power ramps for groups of wind farms using the classification technique random forests. Random forests (see e.g. [1]) is an ensemble learning method for classification that operate by constructing a large collection of de-correlated decision trees, and then classifies observations through a majority vote over all trees. In [2] it was shown that for single sites using random forests for ramp identification gives very clear improvements in forecast precision compared a ramp forecast made by applying a ramp definition directly to a NWP forecast. It was also found that the random forests were able to benefit from measurements from upwind off-sites. Here the random forest method is used to forecast ramps in the lumped output of a group of wind farms, and similar to for the single sites the ability to make use of information from upwind off-sites is examined.

With ramps defined as changes in wind power production of 50 % or more within 3 hours the random forest method is found to give clear improvements in ramp forecast precision, with an increase in the fraction of predicted ramps that actually occur from 0.13 for the NWP-method to 0.48 for the random forest method. In contrast to for the single sites no improvement from the inclusion of upwind off-sites is found. Challenges with regards to the evaluation and comparison of the results are identified and discussed.

[1] Breiman, L. 2001. Random Forests. Machine Learning. 45(2001): 5-32.
[2] Revheim PP, Beyer HG. 2014. Using Random Forests for Wind Power Ramp Forecasting.