World Academy of Science, Engineering and Technology
International Journal of Energy and Environmental Engineering
Vol:12, No:06, 2018

Short-Term Forecast of Wind Turbine Production with Machine Learning Methods: Direct Approach and Indirect Approach

Authors : Mamadou Dione, Eric Matzner-lober, Philippe Alexandre

Abstract : The Energy Transition Act defined by the French State has precise implications on Renewable Energies, in particular on its remuneration mechanism. Until then, a purchase obligation contract permitted the sale of wind-generated electricity at a fixed rate. Tomorrow, it will be necessary to sell this electricity on the Market (at variable rates) before obtaining additional compensation intended to reduce the risk. This sale on the market requires to announce in advance (about 48 hours before) the production that will be delivered on the network, so to be able to predict (in the short term) this production. The fundamental problem remains the variability of the Wind accentuated by the geographical situation. The objective of the project is to provide, every day, short-term forecasts (48-hour horizon) of wind production using weather data. The predictions of the GFS model and those of the ECMWF model are used as explanatory variables. The variable to be predicted is the production of a wind farm. We do two approaches: a direct approach that predicts wind generation directly from weather data, and an integrated approach that estimâtes wind from weather data and converts it into wind power by power curves. We used machine learning techniques to predict this production. The models tested are random forests, CART + Bagging, CART + Boosting, SVM (Support Vector Machine). The application is made on a wind farm of 22MW (11 wind turbines) of the Compagnie du Vent (that became Engie Green France). Our results are very conclusive compared to the literature.

Keywords : forecast aggregation, machine learning, spatio-temporal dynamics modeling, wind power forcast
Conference Title : ICRERA 2018 : International Conference on Renewable Energy Resources and Applications
Conference Location : Paris, France
Conference Dates : June 25-26, 2018