LITERATURE SURVEY

(1.) The State-Of-The-Art in Short-Term Prediction of Wind Power

Author:Gregor Giebel

This report will give an overview over past and present attempts to predict wind power for single turbines or for whole regions, for a few minutes or a few days ahead. It has been produced for the ANEMOS project [1], which brings together many groups from Europe involved in the field, with up to 15 years of experience in short-term forecasting. The literature search involved has been extensive, and it is hoped that this report can serve as a reference for all further work. One of the largest problems of wind power, as compared to conventionally generated electricity, is its dependence on the volatility of the wind. This behaviour happens on all time scales, but two of them are most relevant: One is for the turbine control itself (from milliseconds to seconds), and the other one is important for the integration of wind power in the electrical grid, and therefore determined by the time constants in the grid (from minutes to weeks).

(2).Validations on wind power plant models

Authors: E Muljadi , A Ellis

Wind energy will continue to grow at a rapid pace and will provide an increasingly large portion of the total electricity generation. To achieve its full potential, the industry needs adequate wind-turbine generator (WTG) dynamic models to determine the impact of adding wind generation, and establish how the system needs to be upgraded .For the most part, WTG manufacturers have sponsored the development of WTG dynamic models. Models developed under this paradigm tend to be proprietary and specific to a particular WTG model. They often disclosed under confidential terms for interconnection studies and design of individual projects. However, once the projects are installed, the use of proprietary models is incompatible with critical grid planning activities that are conducted by regional reliability organizations as a collaborative effort among many stakeholders.

(3).Forecasting of Wind Turbine Output Power Using Machine learning

Authors: Haroon Rashid, Waqar Haider, Canras Batunlu

Most of the countries around the world are facing huge environmental impact, and the most promising solution to mitigate these is the use of renewable energy, especially wind power. Though, the use of offshore wind energy is rapidly increasing to meet the elevating electricity demand. The researchers and policymakers have become aware of the importance of providing near accurate prediction of output power. Wind energy is tied to variabilities of weather patterns, especially wind speed, which are irregular in climates with erratic weather conditions. In this paper, we predicted the output power of the wind turbines using the random forest regressor algorithm.The SCADA data is collected for two years from a wind farm located in France. The model is trained using the data from 2017. The wind direction, wind speed and outdoor temperature are used as input parameters to predict output power. We test our model for two different capacity factors. The estimated mean absolute errors for the proposed model in this study were 3.6% and 7.3% for 0.4 and 0.2 capacity factors, respectively. The proposed model in this study offers an efficient method to predict the output power of wind turbine with preferably low error.

(4).Integrative Density Forecast and Uncertainty Quantification of Wind Power Generation

Authors: Jingxing Wang, Abdullah Alshelahi, Mingdi You, Eunshin Byon, and Romesh Saigal

The volatile nature of wind power generation creates challenges in achieving secure power grid operations. It is, therefore, necessary to accurately predict wind power and its uncertainty quantification. Wind power forecasting usually depends on wind speed prediction and the wind-to-power conversion process. However, most current wind power prediction models only consider portions of the uncertainty. This paper develops an integrative framework for predicting wind power density, considering uncertainties arising from both wind speed prediction and the wind-to-power conversion process. Specifically, we model wind speed using the inhomogeneous Geometric Brownian Motion and convert the wind speed prediction into the wind power density in a closed-form. The resulting wind power density allows quantifying prediction uncertainties through prediction intervals. To forecast the power output, we minimize the expected prediction cost with (unequal) penalties on the overestimation and underestimation. We show the predictive power of the proposed approach using data from multiple operating wind farms located at different sites.

(5) Predicting The Energy Output Of Wind Turbine Based On Weather Condition:

Authors: S Preethi, H Prithika, M Pramila, S Birundha

Extracting electricity from renewable resources has been widely investigated in the past decades to decrease the worldwide crisis in the electrical energy and environmental pollution. For a wind farm which converts the wind power to electrical energy, a big challenge is to predict the wind power precisely in spite of the instabilities. The climatic conditions present in the site decides the power output of a wind farm. As the schedule of wind power availability is not known in advance, this causes problems for wind farm operators in terms of system and energy planning. A precise forecast is required to overcome the difficulties initiated by the fluctuating weather conditions. If the output is forecasted accurately, energy providers can keep away costly overproduction. In this paper, an end-to-end web application has been developed to predict and forecast the wind turbine's power generation based on the weather conditions.