Literature Survey for Predicting the energy output of wind turbine based on weather condition

Literature Survey – 1

Title: Energy Modeling Output of Wind System based on Wind Speed

Year: 2019

There are many renewable energy sources that can be used to obtain electrical energy from natural sources in the world. Especially, wind energy plays an increasing role thanks to its feasibility and efficiency. Due to the source of wind energy, efficiency of wind farm is highly depending on the weather conditions. The main issue to obtain maximum performance is to predict the output. This situation provides collaborative production of different energy sources more efficiently with avoiding over-cost and overproduction. In this paper, there are three different wind models are modelled and simulated with choosing the complete and correct models.

Literature Survey – 2

Title: Predicting the Wind Turbine Power Generation based on Weather Conditions

Year: 2021

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 from 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. The prediction model has been developed using Bidirectional Long Short-Term Memory which is a unique kind of RNN (Recurrent Neural Network). It performs admirably in terms of capturing long-term dependencies along with the time steps and is hence ideal for wind power forecasting.

Literature Survey – 3

Title: The Use of Machine Learning and Performance Concept to Monitor and Predict Wind Power Output

Year: 2022

Monitoring and predicting wind power output more precisely can be very beneficial for an increasingly competitive Wind Power industry. Although many advances have been made throughout the last decades, the production forecast is still based mainly on the manufacturing power curve and wind speed. Even though this approach is very useful, especially during the design phase, it does not consider other factors that affect production, such as topography, weather conditions, and wind features. A more precise prediction model that is able to recognize production fluctuation and is tailored using current operational data is proposed in this paper. The model analyzes the performance through Meteorological Mast Data (Met Mast Data) and then uses it as an input to monitor and predict power output. As a result, the model proposed achieves high accuracy and can be key to understanding the wind turbine asset’s behavior throughout its lifespan, assisting operators in decision making to increase overall power production.

Literature Survey – 4

Title: Optimal configuration of hybrid solar-wind distributed generation capacity in a grid-connected microgrid

Year: 2013

Reasonably selecting the capacity of different types of DGs is the key element to guarantee that microgrid system can operate economically and reliably. Firstly a grid-connected hybrid wind/solar/storage micro-grid system is constructed and the output models of various distributed generations are built. On the basis of correction of wind speed and atmospheric density, the power of wind turbine is predicted by linear interpolation. The output of the photovoltaic generation system is calculated by using the Hay, Davies, Klucher and Reindl model(HDKR model). In order to determine the amount of energy that can be absorbed by or withdrawn from the battery bank each time step, this paper uses the Kinetic battery model. Then considering tax collection of greenhouse gas emission and reliability of the system, an optimal configuration design method is proposed, taking minimizing the whole life cycle cost of the system as the optimization objective. Finally, based on the weather conditions in Yantai city, a simulation analysis is performed, the optimal configuration scheme meeting the load is given. According to Chinese meteorological conditions, a sensitivity analysis of the wind speed and solar resource is given and optimal results are obtained on different conditions. The results are conducive to Chinese planning and design work of the micro-grid.

Literature Survey – 5

Title: Bayesian CNN-BiLSTM and Vine-GMCM Based Probabilistic Forecasting of Hour-Ahead Wind Farm Power Outputs

Year: 2022

The importance of the accurate forecasting of power outputsof wind-based generation systems is increasing, as their contributions to the total system generation are rising. However, wind energy resource exhibits strong and stochastic spatio-temporal variations, which further combine with the uncertainties in WF operating regimes, i.e., numbers of wind turbines in normal operation, under curtailment, or that are faulty/disconnected. This paper presents a novel approach for efficient dealing with uncertainties in hour-ahead forecasted WF power outputs. It first applies Bayesian convolutional neural network-bidirectional long short-term memory (Bayesian CNN-BiLSTM) method, which allows for a more accurate probabilistic forecasting of wind speed, air density and wind direction, using the nearby WFs as additional input data. The WF operating regimes are also predicted using the same Bayesian CNN-BiLSTM structure. Afterwards, a high-dimensional Vine-Gaussian mixture Copula model is combined with Bayesian CNN-BiLSTM model to evaluate uncertainties in the WF outputs based on a cross-correlational conditioning of the forecasted weather variables and operating regimes. The proposed combined model is applied and validated using the actual field measurements from two WF clusters in close locations in Croatia and is also benchmarked against several other models.