Innovation And Solution To Different Problems Faced While Producing Wind Energy

Abstract

This review paper discusses the innovation and solution to different problem faced while producing wind energy, to overcome the use of fossil fuels wind energy system is being implemented. wind energy is one of the most feasible source of energy countries are adopting, wind turbines are being used and research is being done to optimise the wind turbines. Detailed analysis was done on each problem and optimal solutions were found.

Introduction

This paper tells about different problem faced in wind energy and the research done to optimize wind energy system. It analyses wind energy in specific locations such Faya-Largeau and chad using Weibull distribution technique. To minimise the losses occurred due to shape of the blade and to reduce the noise emission from the horizontal wind turbine. One of the ideas was to use concave and convex shapes to optimization the power generation. Small turbine was major focus to counter aerodynamic performance under gust conditions. At last it was discussed how to benefit using storage grid and overcome the problem of forecast errors also theories were presented to mitigate autocorrelation.

Wind Energy System Optimization

As fossil fuel have alarming problems for our environment, we need a renewable energy source such as wind energy to combat this situation, the first step taken to evaluate wind power energy for Sahara zone of Chad was to use weilbill’s Distribution method. It was used to analyse wind speed data for 18 years. By using weilbill distribution different results were concluded, it was found out that Maximum and minimum wind speed was recorded were 4 and 2.2, also it was found that scale parameter was high which tells about the site that it is windy, power generated was about 34 3.31 watt per metre square annually.

The objective of the research was to minimise the sound emission from the wind turbine. Different blades were tested by using aerodynamic and acoustic computational method. William Hawking xenology was used to predict the sound generation from the turbine and then it was validated and compared with the available experimental data for small-scaled model.

Shape optimisation of savonius wind rotor with different convex and concave sides, to optimise savonius rotor different computational fluid dynamics simulations were performed to find the coefficient of power of each plate geometry. A surface model was created which defines the relationship between CP and design parameters, also a particle swarm optimisation algorithm was used to find optimal design based on the surface model.

A study to analyse the effect of an extreme loading event on a horizontal Axis of wind turbine, it was performed on CFD model of a small sized wind turbine which was validated against

experimental data with the help of ANSYS fluent and moving match strategy. The extreme operating cost of the model was considered as inlet condition. Aerodynamic responses from the result of the structure's ultimate check based on IE guidelines were presented for both operating and turbine.

The paper tells about the influence of wind power prediction error autocorrelation on the sizing of the storage with wind farm. The increased penetration of weather dependent and not the dispatchable renewable resource is increasing the interest, Basically, the wind farm should provide accurate information to production otherwise penalties must be paid to the network operator. The methodology is proposed in two parts firstly variance and autocorrelation which is generated by kriging approach. Renewable energy sources such as wind speed for solar radiation presents a challenge for the grid integration of the energy plants. Generally additional reserves are required to maintain the stability of the grade does the whole system is penalized.

Conclusion

To overcome the problem in chad turbine of bonus 1 MW 2/54 with a cut speed of less than 3.25 and hub height of 15 with wind speed of 3 metre per second was required. Weibill shift parameter is between 3.01 and 4.19. Scale parameter C was between 2.44 metre per second and 4.33 metre per second, the shape parameter was found to be greater than 2 to that means wind speed in this station it is stable compared to the other parts. Study found out an acceptable agreement between DES results and experimental results. It was possible to reduce the noise emission by using a specific tip shape. finally, the specific tip shape has an important significance on the noise emission at high-frequency range. For shape it was found out that optimal blade shape has stronger vertices and recovery floors which increases the performance of the motor. In the problem of the gust situation, at the end a successful model was created for gust conditions. The analysis of CFD tells the reliable solution to study 3D phenomena. Different solutions were proposed but most of them were not reliable and had flaws, one of the solution was to use coupling of storage devices with renewable energy plants using the same methodology of managing imbalances and the size storage in order to achieve the level of control controllability is required. The influence of autocorrelation off the battery size was invested in detail and a methodology for producing wind prediction error time series is presented.

References

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