

ANALYSIS OF WIND POWER POTENTIAL ON COMPLEX TERRAIN BY FLOW MODELLING AND TIMES SERIES CHARACTERISTICS

**NILESH DIWAKAR, SUBRAMANYAM GANESAN, SIRAJ AHMED
AND V. K. SETHI**

Abstract

In this paper the recorded time series wind data for a period of ten years from Indian Meteorological Department near airport at $77^{\circ} 35'$ east longitude and $23^{\circ} 28'$ north latitude is analyzed for predicting wind energy potential at hilly site near Bhopal, and wind flow modeling over complex terrain by considering influence of roughness of terrain, obstacle and topography in terms of contour were analyzed for determining regional wind climate and annual energy production by using Wind Atlas Analysis and Application Program (WAsP). Recorded daily wind speed data in metre per second and its direction of flow in degree at two hub heights of 10 m by a wind monitoring mast and 70 m by weather balloons. The recorded wind speed data is extrapolates and interpolate at 120 and 50 m heights by applying well known $1/7$ power law. The site had an elevation of 530 m above mean sea level. It is seen from the analysis of the wind speed data and keeping the topographical variation of terrain, exploitable wind speed is experienced at 70 m or more. Also from the monthly average of wind speed, it can safely be recommended that a wind turbine generator with a cut in speed of 4 m/s would be able to achieve economical levels of wind energy generation. It is also seen that the Annual Energy Production in the area from one MW WTG 2.040 GWh at 70 m hub height, indicating a satisfactory wind power density. This paper describes the methodology adopted for the evaluation of wind energy potential for the site.

Keywords: Weibull distribution, Regional wind climate, wind atlas, orthography, roughness, wind monitoring, cut in speed and annual energy generation.