Stochastic based analysis for wind power extracted by a wind turbine.

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ABSTRACT

This work deals with the development of stochastic analysis that can aid for reliable prediction of wind energy potential in a given site where wind speed instantaneous records are available. The objective is to rationalize site selection for wind farm implementation by using enhanced characteristics of wind data rather than its average speed alone. Accurate assessment of wind potential can then be performed. The extracted energy from wind depends strongly on the wind speed characteristics existing in a given site such as the intensity of turbulence and stability state of the atmospheric boundary layer. Estimating this energy by deterministic approaches is a difficult task due to the highly unpredictable nature of the wind. Considering wind speed data through exhibiting its stochastic nature is a suitable way to represent more realistically wind resource. This can be used to estimate more reliably the expected amount of electric energy that is available for a given implementation site of wind farm.
In this work, we have conducted a stochastic based analysis for modeling wind fluctuations that are generated by a turbulent wind flow. Langevin equations based procedure was used in this analysis. The extracted electric power from wind was then assessed by taking into account the dynamic response of a standard wind turbine under these wind field speed fluctuations.

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