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Data bank: Nine numerical methods for determining the parameters of weibull for wind energy generation tested by five statistical tools

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Abstract

This study aims to determine the potential of wind energy in the mediterranean coastal plain of Palestine. The parameters of the Weibull distribution were calculated on basis of wind speed data. Accordingly, two approaches were employed: analysis of a set of actual time series data and theoretical Weibull probability function. In this analysis, the parameters Weibull shape factor 'k' and the Weibull scale factor 'c' were adopted. These suitability values were calculated using the following popular methods: method of moments (MM), standard deviation method (STDM), empirical method (EM), maximum likelihood method (MLM), modified maximum likelihood method (MMLM), second modified maximum likelihood method (SMMLM), graphical method (GM), least mean square method (LSM) and energy pattern factor method (EPF). The performance of these numerical methods was tested by root mean square error (RMSE), index of agreement (IA), Chi-square test (X²), mean absolute percentage error (MAPE) and relative root mean square error (RRMSE) to estimate the percentage of error. Among the prediction techniques. The EPF exhibited the greatest accuracy performance followed by MM and MLM, whereas the SMMLM exhibited the worst performance. The RMSE achieved the best prediction accuracy, whereas the RRMSE attained the worst prediction accuracy. © 2021, Institute of Advanced Engineering and Science. All rights reserved.

Author Keywords

Average wind speed; Cumulative distribution function; Numerical analysis; Probability distribution function; Statistical tools; Weibull parameters; Wind energy

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