

عنوان مقاله:

Comparison and Evaluation of Two Prediction Models for Speed, Power and Energy Density of Wind in Karaj County, Iran

محل انتشار:

دهمین کنگره ملی مهندسی ماشین های کشاورزی (بیوسیستم) و مکانیزاسیون ایران (سال: 1395)

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خلاصه مقاله:

Prospects of wind energy usage in Iran is promising and by using this type of energy, more saving in petroleum products can be achieved. Due to high populated city of Karaj, this study is conducted for evaluation of wind energy potential as electricity power production source. In this study, using measured wind speed data, at height of 10 meters above the ground surface, from 2004 to 2015, wind energy potential using two methods (Weibull & Rayleigh distribution functions) has been investigated. The highest values of wind speed, power and energy has been seen in 2009. Maximum wind speed in Karaj, reported as 3.08 m/s. annual shape factor and scale factor, regarding Weibull distribution function were 1.78-3.36 and 2.36-3.63, respectively. Mean annual power density value and predicted power density via Weibull and Rayleigh distribution function were 30, 27 and 36 W/m² respectively, and corresponding energy density for those quantities were 261.5, 239.2 and 302.49 J/m², respectively. After evaluating these factors regarding power density and wind energy, it was concluded that data fitting via Weibull distribution was partly better than Rayleigh distribution function. Coefficient of determination of Rayleigh distribution function was more than the corresponding value in Weibull counterpart, so it suggest that, Rayleigh distribution has more precise results in this regard. The RMSE values of Weibull and Rayleigh were 0.018 and 0.013 and R² values of Weibull and Rayleigh were 0.95 and 0.97 in Karaj for years 2004-2015. Also, wind rose charts in Karaj, for 2004-2015, show that the most prevalent wind direction is NW (North-West). Based on the derived results of power density and wind energy, wind energy is not suitable for large-scale wind application in this surveyed area. In this area, wind potential .can be used for non-connected grids, such as local usage for battery charging and water pumping

کلمات کلیدی:

Wind power, Wind energy, Weibull distribution function, Rayleigh distribution function, Karaj

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