

ABSTRACT

This thesis describes a method to model wind speed and wind power. Because wind power is a function of wind speed, the methodology is based on the development of a model of wind speed. Values of wind power are estimated by applying the appropriate transformation to values of wind speed. A method of vertical extrapolation of mean wind speed is presented. The model takes into account, several basic features of wind speed data, including autocorrelation, non-Gaussian distribution, and diurnal nonstationarity. The positive correlation between consecutive wind speed observations is taken into account by fitting an autoregressive moving average process to wind speed data transformed to make their distribution approximately Gaussian and standardized to remove diurnal nonstationarity. Three years of data for a given month are used in the model building procedure. Use of the methodology for simulating and forecasting (1 to 6 hours in advance) is discussed. To take into account the uncertainty of wind speed forecasts, techniques are presented for expressing the forecast in terms of confidence intervals. The time series model is compared with a multiregression model with antecedent meteorological parameters.