S. Frandsen, I. Antoniou, J.C. Hansen, L. Kristensen, H.Aa. Madsen, P. Chaviaropoulos, D. Douvikas, J.A. Dahlberg, A. Derrick, P. Dundabin, R. Hunter, R.Ruffle, D. Kanellopoulos & G,Kapsalis, "*Redefinition Power Curve for More Accurate Performance Assessment of Wind Farms*", Journal Wind Energy, 3, 81-111 (2000)

Abstract

The lack of accurate methods for assessment of the productive capacity of wind power plants is becoming a bottleneck in an increasingly commercialized wind power industry. In this article the inherent components of performance assessment are identified and analyzed and ways of minimizing uncertainties on the components are investigated. The main components are identified as 'site calibration', 'wind turbine sensitivity to flow variables', 'plant blockage effects' and 'uncertainty analysis'. Site calibration is the action of estimating the flow variables at the wind turbine position from measurements of these quantities at another (reference) position. The purpose of sensitivity analysis is to clarify which and how flow variables influence power output. Plant blockage effects refer to the power plant's influence on the reference measurements of flow variables. Finally, the component uncertainties and in turn the integrated uncertainty on the average productive capacity of the wind power plant are investigated. It is found that uncertainties can be reduced (1) by including several more flow variables in addition to hub-height wind speed, (2) by carrying out site calibration with utmost care and by inclusion of more variables, (3) by taking plant blockage into consideration, (4) by aiming at 'plant-average' power instead of looking only at individual machines and, possibly, (5) by introduction of remote-sensing anemometer techniques.

Keywords

Wind Farms, Performance Assessment