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Wind Turbine Reliability: Understanding and Minimizing Wind Turbine Operation and Maintenance Costs

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Abstract

Wind turbine system reliability is a critical factor in the success of a wind energy project. Poor reliability directly affects both the project's revenue stream through increased operation and maintenance (O&M) costs and reduced availability to generate power due to turbine downtime. Indirectly, the acceptance of wind-generated power by the financial and developer communities as a viable enterprise is influenced by the risk associated with the capital equipment reliability; increased risk, or at least the perception of increased risk, is generally accompanied by increased financing fees or interest rates. This paper outlines the issues relevant to wind turbine reliability for wind turbine power generation projects. The first sections describe the current state of the industry, identify the cost elements associated with wind farm O&M and availability and discuss the causes of uncertainty in estimating wind turbine component reliability. The latter sections discuss the means for reducing O&M costs and propose O&M related research and development efforts that could be pursued by the wind energy research community to reduce cost of energy.