PROBABILISTIC ANALYSIS OF LIST DATA FOR THE ESTIMATION OF EXTREME DESIGN LOADS FOR WIND TURBINE COMPONENTS*†

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ABSTRACT

Robust estimation of wind turbine design loads for service lifetimes of 30 to 50 years that are based on field measurements of a few days is a challenging problem. Estimating the long-term load distribution involves the integration of conditional distributions of extreme loads over the mean wind speed and turbulence intensity distributions. However, the accuracy of the statistical extrapolation is fairly sensitive to both model and sampling errors. Using measured inflow and structural data from the LIST program, this paper presents a comparative assessment of extreme loads using three distributions: namely, the Gumbel, Weibull and Generalized Extreme Value distributions. The paper uses L-moments, in place of traditional product moments, to reduce the sampling error. The paper discusses the application of extreme value theory and highlights its practical limitations. The proposed technique has the potential of improving estimates of the design loads for wind turbines.

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