FAROW: A TOOL FOR FATIGUE AND RELIABILITY OF WIND TURBINES

P. S. Veers
Wind Energy Technology Department
Sandia National Laboratories
Albuquerque, NM

C. H. Lange and S. R. Winterstein
Civil Engineering Department
Stanford University
Stanford, CA

ABSTRACT

FAROW is a computer program that evaluates the fatigue and reliability of wind turbine components using structural reliability methods. A deterministic fatigue life formulation is based on functional forms of three basic parts of wind turbine fatigue calculation: (1) the loading environment, (2) the gross level of structural response given the load environment, and (3) the local failure criterion given both load environment and gross stress response. The calculated lifetime is compared with a user specific target lifetime to assess probabilities of premature failure. The parameters of the functional forms can be defined as either constants or random variables. The reliability analysis uses the deterministic lifetime calculation as the limit state function of a FORM/SORM (first and second order reliability methods) calculation based on techniques developed by Rackwitz . Besides probability of premature failure, FAROW calculates the mean lifetime, the relative importance of each of the random variables, and the sensitivity of the results to all of the input parameters, both constant inputs and the parameters that define the random variable inputs. The ability to check the probability of failure with Monte Carlo simulation is included as an option.