Study of turbulence intensity effect on the fatigue lifetime of wind turbines

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Abstract

In this paper, the effect of variable turbulence intensities on the fatigue lifetime of wind turbines is studied. Time series aeroelastic simulations were carried on the NREL WindPACT 1.5 MW upwind turbine using an open source software FAST. Two turbulence models-von Karman and Kaimal-were used with four different turbulence intensities (1%, 10%, 25%, and 50%). The time series data of the loads were post processed using the tool MLife to estimate the fatigue lifetime of the wind turbine. It is found that high turbulence intensities increase the extreme loadings on the turbine, increase damage equivalent loads, and decrease the estimated lifetime. It is also found that both turbulence modelsô results agree, there is no remarkable difference between them in the fatigue behavior of the turbine, and gave very close results

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