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Variation of Loads on Offshore Wind Turbine Drivetrains During Measured Shutdown Events - DTU Orbit (08/11/2017)

Variation of Loads on Offshore Wind Turbine Drivetrains During Measured Shutdown Events

This paper investigates the frequency of normal shutdowns to be used in the design stage of wind turbines based on measurements at an offshore wind farm and seeks to quantify their impact on the fatigue loads on the drivetrain and tower top. The measured shutdowns observed on an instrumented multi-megawatt wind turbine located at an offshore wind farm are correlated with corresponding observations of shutdowns on surrounding wind turbines. The observed wind turbines have multiple shutdowns at high mean wind speeds due to wind speed variations near cut-out. Through the use of an Inverse First Order Reliability Model (IFORM), the expected annual frequency of normal shutdowns at cut-out isput forth. A simulation model of the wind turbine is set up in the aeroelastic software HAWC2 based on which observed shutdowns are simulated along with normal operation. The simulated tower top moments are compared with the measured loads, thereby quantifying the amplification in the loads due to the shutdown action. The IFORM-determined frequency of shutdowns at cut-out mean wind speed is used as an input to the fatigue load computations in the drivetrain, by which the resulting damage equivalent loads (DELs) are analyzed to quantify their coefficient of variation for varying site-specific wind conditions under both normal operation and with shutdowns.

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