Changes in design driving load cases: Operating an upwind turbine with a downwind rotor configuration - DTU Orbit (09/11/2019)

This work considers the design driving load cases from a full design load basis analysis on an upwind turbine changed into a downwind configuration. The upwind turbine is a commercial class IIIA 2.1-MW turbine, manufactured by Suzlon. The downwind turbine shows an increase in the normalized tower clearance by 6%, compared with the upwind concept. Removing the blade prebend increases the normalized minimum tower clearance by 17% in the downwind configuration compared with the upwind configuration. The extreme loads on the longitudinal tower bottom bending moment are seen to generally increase by 17% because of the overhanging gravity moment of the rotor-nacelle assembly. The extreme blade root bending moments are reduced by 10% flapwise, because of the coning of the rotor in downwind direction. The fatigue loads suffer from the tower shadow, leading to an overall increase of the fatigue loads in the blades with up to 5% in flapwise direction in the downwind configuration. Because of blade deflection and coning direction, the downwind configuration shows a 0.75% lower annual energy production. Removing the prebend increases the annual energy production loss to 1.66%.

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