Unbalanced voltage faults: the impact on structural loads of doubly fed asynchronous generator wind turbines - DTU Orbit (02/01/2019)

Unbalanced voltage faults: the impact on structural loads of doubly fed asynchronous generator wind turbines

This paper investigates the impact that unbalanced voltage faults have on wind turbine structural loads. In such cases, electromagnetic torque oscillations occur at two times the supply voltage frequency. The objectives of this work are to quantify wind turbine structural loads induced by unbalanced voltage faults relative to those during normal operation; and to evaluate the potential for reducing structural loads with the control of the generator. The method applied is integrated dynamic analysis. Namely, dynamic analysis with models that consider the most important aeroelastic, electrical, and control dynamics in an integrated simulation environment based on an aeroelastic code (HAWC2) and software for control design (Matlab/Simulink). In the present analysis, 1 Hz equivalent loads are used to compare fatigue loads, whereas maximum–minimum values are used to compare extreme loads. A control concept based on resonant filters demonstrates reduction of the structural loads (shaft torsion and tower top side-to-side moment) induced by an unbalanced voltage fault. Copyright © 2013 John Wiley & Sons, Ltd.