Impact of fault ride-through requirements on fixed-speed wind turbine structural loads

The emphasis in this article is on the impact of fault ride-through requirements on wind turbines structural loads. Nowadays, this aspect is a matter of high priority as wind turbines are required more and more to act as active components in the grid, i.e. to support the grid even during grid faults. This article proposes a computer approach for the quantification of the wind turbines structural loads caused by the fault ride-through grid requirements. This approach, exemplified for the case of a 2MW active stall wind turbine, relies on the combination of knowledge from complimentary simulation tools, which have expertise in different specialized wind turbines design areas. Two complimentary simulation tools are considered i.e. the detailed power system simulation tool PowerFactory from DIgSILENT and the advanced aeroelastic computer code HAWC2, in order to assess of the dynamic response of wind turbines to grid faults. These two tools are coupled sequently in an offline approach, in order to achieve a thorough insight both into the structural as well as the electrical wind turbine response during grid faults. The impact of grid requirements on wind turbines structural loads is quantified by performing a rainflow and a statistical analysis for fatigue and ultimate structural loads, respectively. Two cases are compared i.e. one where the turbine is immediately disconnected from the grid when a grid fault occurs and one where the turbine is equipped with a fault ride-through controller and therefore it is able to remain connected to the grid during the grid fault. Copyright © 2010 John Wiley & Sons, Ltd.
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