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Impact of Higher Fidelity Models on Simulation of Active Aerodynamic Load Control For Fatigue Damage Reduction

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ABSTRACT

Active aerodynamic load control of wind turbine blades is being investigated by the wind energy research community and shows great promise, especially for reduction of turbine fatigue damage in blades and nearby components. For much of this work, full system aeroelastic codes have been used to simulate the operation of the actively controlled rotors. Research activities in this area continually push the limits of the models and assumptions within the codes. This paper demonstrates capabilities of a full system aeroelastic code recently developed by researchers at the Delft University Wind Energy Research Institute with the intent to provide a capability to serve the active aerodynamic control research effort, The code, called DU_SWAMP, includes higher fidelity structural models and unsteady aerodynamics effects which represent improvement over capabilities used previously by researchers at Sandia National Laboratories. The work represented by this paper includes model verification comparisons between a standard wind industry code, FAST, and DU_SWAMP. Finally, two different types of active aerodynamic control approaches are implemented in order to demonstrate the fidelity simulation capability of the new code.

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