Simulation and Control of the Flywheel System in the Rotor of a Wind Turbine Using Simulink and OpenFAST for Assessing the Effect on the Mechanical Loads

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Abstract : This work presents the simulation and control of the flywheel system in the rotor of a wind turbine using Simulink and OpenFAST for assessing the effect on the mechanical loads. This concept allows the flywheel system to serve two main tasks: supporting the power system and mitigating the mechanical loads in the wind turbine. These tasks are grouped into four control scenarios; scenario 1 represents steadying the power infeed in the Flywheel, scenario 2 represents steadying power with FW and grid loss, scenario 3 represents mitigating excitations from gravity, and scenario 4 represents damping in-plane blade vibrations. The s-function of the OpenFAST model was used to substitute the given 1st Eigen mode model of the WT. After that, the simulations were run for the above-listed scenarios. Additionally, the effects of the control options on the mechanical loads were assessed, and it was established that the FW system assists in steadying infeed power and mechanical load mitigation.

Keywords : simulation, control, wind turbine, OpenFAST
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