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MODELLING, CONTROLLING AND SIMULATION OF A WIND TURBINE DRIVE TRAIN IN 'SimulationX' PLATFORM

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The research describes the design process of wind turbine controllers in a computer simulation platform. A wind turbine drive train is examined to implement a control system satisfying some of the standard site operative parameters. Wind turbine controllers are designed to regulate the output power of the rotor for different operational regions of wind speed. The wind turbine is mainly operated in four regions, i.e, cut-in region, torque controller region, pitch controller region and cut- off region, where each control strategies are implemented to extract the maximum power. Two main controllers; pitch controller and torque controller are configured in order to satisfy the power requirement. Firstly, the power coefficient is estimated for all regions and the available power of the rotor is investigated through output power characteristics. Subsequently, the available power in the rotor is input to the synchronous generator and converted by estimating the efficiency of electrical power conversion, in order to finalize the output power of the whole system. Some of the main parameters are specified at the beginning. Here, two Proportional Integral Derivative (PID) controllers are implemented in SimulationX software platform as the pitch controller and torque controller. PID Gains are turned on trial and error basis in order to obtain the maximum power. The implemented controllers are capable of handling all possible power variations under ordinary weather conditions. Finally the controllers' performance are investigated at different operative regions by analyzing step response and impulse response for sudden changes in wind speed. The results show that controllers drive generator torque and generator speed to stable values when wind speed is suddenly varied.

Keywords: *Controller, Pitch, Power, Torque, Wind-Turbine*