Modeling and Simulation of a Variable Speed Wind Turbine Based on a Squirrel Cage Induction Generator

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Abstract:

This work studies a wind energy production system composed of a squirrel cage induction machine (SCIG) driven by a variable speed turbine. This machine is controlled by stator quantities through two converters. The grid-side converter will control the DC bus and improve the grid-side power factor; the statorside converter will control the energy flux generated by the stator during the operation of this system. The wind speed is modeled deterministically as a Fourier series representation, which presents it as a superposition of several harmonics. The MPPT control strategy is used to control the electromagnetic torque to adjust the mechanical speed to maximize the generated electrical power. MATLAB Simulink software is used to develop various blocks for the direct vector control of a variable speed squirrel cage induction generator and DC bus control.

Keywords:

Wind energy - Turbine - SCIG - Converters - Modeling - Vector Control.