ENHANCEMENT OF MAXIMUM POWER POINT TRACKING AND LOW VOLTAGE RIDE THROUGH OF DIRECT DRIVE PMSG WIND TURBINE SYSTEM

By

Eng. Haitham Mahmoud Ahmed Yassin

A thesis submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
In

Electrical Power and Machines Engineering

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Title of Thesis: Enhancement of Maximum Power Point Tracking and Low Voltage Ride Through of Direct Drive PMSG Wind Turbine System

Key Words: Direct Drive PMSG Wind Turbine, Low Voltage Ride Through, Interval Type-2 Fuzzy Logic Control

Summary:

The main focus of the thesis is to enhance the maximum power point tracking and low voltage ride through capability of direct drive PMSG wind turbine system by developing a new control strategy, thus improving the operational stability.

In this thesis, a novel low voltage ride through scheme for direct drive PMSG wind turbine system is proposed during the grid faults. The machine side converter controller is used to control the dc-link voltage using interval type-2 fuzzy logic control taking into account the nonlinear relationship between the generator speed and the dc-link voltage.

The simulation results show that the proposed control strategy provides superior performance under normal and faulty conditions when compared to conventional strategies commonly used in the literature.

Hardware in the loop (HIL) concept is used to validate the simulation results during normal and faulty conditions through the experimental setup.

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