Enhanced Operation of Grid Connected Wind Energy Conversion System

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Abstract : In this paper, a novel discrete time predictive control strategy applied to a direct matrix converter (DMC)which allows an optimal control of a variable speed permanent magnet synchronous wind generator ispresented. The commutation state of the DMC in the subsequent sampling time according to anoptimization algorithm given by a simple cost functional and the discrete system model without the needfor any additional modulation scheme or internal cascade control loops. The control goals are regulationof the rotor torque and stator flux of the PMSG according to an arbitrary references established based onthe maximum power point tracker (MPPT), and also a good tracking of the output reactive power to itsreference ensures unitary power factor and improve the system stability. The complete control system hasbeen developed, analyzed, and validated by time domain simulation. The simulation results exhibit goodsystem performance and the efficiency control enhancement of the wind energy conversion system(WECS) using the direct matrix converter structure.

Keywords : Finite Set Model Predictive Control(FS-MPC), Permanent Magnet Synchronous Generator (PMSG), Wind Energy Conversion System (WECS), Maximum Power Point Tracking (MPPT) Control, Direct Matrix Converter (DMC), Grid Connected