

Abstract

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Assessment of a wind energy conversion system based on a six-phase permanent magnet synchronous generator with a twelve-pulse PWM current source converter

The steady-state and dynamic performances of a new high-power variable speed wind-energy conversion system (WECS) that uses a six-phase permanent magnet synchronous generator (PMSG) with twelve-pulse back-to-back pulse width modulated current source converters is assessed. The proposed WECS inherently has all the features of existing systems based on voltage source converters, such as voltage control and fault ride-through capability, but with increased reliability and improved ac side waveform quality, benefiting from the three-winding phase shifting transformer for further attenuation of the low-order harmonics. PSCAD/EMTDC simulation is used to assess the steady-state and dynamic behaviours of the proposed system under different operating conditions. Experimental results, obtained using a prototype grid side dual current source inverter (CSI), are presented to validate the proposed technique