

The doubly-fed induction generator in the rotor-tied configuration

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Abstract

The demand for electricity from renewable sources continues to rise, and with it, the need for more efficient wind energy conversion systems. Wind turbines equipped with a wound-rotor induction machine can be operated in a more efficient configuration than currently popular, with little to no change in system hardware. By coupling the machine to the grid inversely to the norm, losses in the system can be reduced. The theory describing this configuration and mode of operation is detailed, with steady-state operating conditions calculated. Theoretical analysis shows that core loss due to magnetic hysteresis can be reduced, and efficiency increased. Operation in the proposed configuration is compared experimentally to the conventional one, with results indicating a substantial improvement of energy-conversion efficiency for the machine under test. Losses associated with the electronic power converters and auxiliary hardware are not expected to change significantly, and are not considered.