Constant Power Control and Fault-Ride-Through Enhancement of DFIG Wind Turbines with Energy Storage

*Abstract*

With the increasing penetration of wind power into electric power grids, energy storage devices will be required to dynamically match the intermittency of wind energy. This paper proposes a novel two-layer constant-power control scheme for a wind farm equipped with doubly-fed induction generator (DFIG) wind turbines. Each DFIG wind turbine is equipped with a super capacitor energy storage system (ESS) and is controlled by the low-layer WTG controllers and coordinated by a high-layer wind-farm supervisory controller (WFSC). The WFSC generates the active power references for the low-layer WTG controllers according to the active-power demand from the grid operator; the low-layer WTG controllers then regulate each DFIG wind turbine to generate the desired amount of active power, where the deviations between the available wind energy input and desired active power output are compensated by the ESS. Simulation studies are carried out in PSCAD/EMTDC on a wind farm equipped with 15 DFIG wind turbines to verify the

effectiveness of the proposed control scheme.