Title:	LVRT and Stability Enhancement of Grid-Tied Wind Farm Using DFIG-Based Wind Turbine
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Abstract:

According to the grid code specifications, low voltage ride-through (LVRT) is one of the key factors for grid-tied wind farms (WFs). Since fixed-speed wind turbines with squirrel cage induction generators (FSWT-SCIGs) require an adequate quantity of reactive power throughout the transient period, conventional WF consisting of SCIG do not typically have LVRT capabilities that may cause instability in the power system. However, variable-speed wind turbines with doubly fed induction generators (VSWT-DFIGs) have an adequate amount of LVRT enhancement competency, and the active and reactive power transmitted to the grid can also be controlled. Moreover, DFIG is quite expensive because of its partial rating (AC/DC/AC) converter than SCIG. Accordingly, combined installation of both WFs could be an effective solution. Hence, this paper illustrated a new rotor-side converter (RSC) control scheme, which played a significant role in ensuring the LVRT aptitude for a wide range of hybrid WF consisting of both FSWT-SCIGs and VSWT-DFIGs. What is more, the proposed RSC controller of DFIG was configured to deliver an ample quantity of reactive power to the SCIG during the fault state to make the overall system stable. Simulation analyses were performed for both proposed and traditional controllers of RSC of the DFIG in the PSCAD/EMTDC environment to observe the proposed controller response. Overall, the presented control scheme could guarantee the LVRT aptitude of large-scale SCIG.

Keywords: low voltage ride-through (LVRT); wind farm (WF); squirrel cage induction generator (SCIG); doubly fed induction generators (DFIG); PI controller