Title:	Coordinated Control Scheme of Battery Storage System to Augment LVRT Capability of SCIG-Based Wind Turbines and Frequency Regulation of Hybrid Power System
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Abstract:

Fixed speed wind turbine-squirrel cage induction generator (FSWT-SCIG)-based wind farms (WFs) are increasing significantly. However, FSWT-SCIGs have no low voltage ride-through (LVRT) and frequency control capabilities, which creates a significant problem on power system transient and steady-state stability. This paper presents a new operational strategy to control the voltage and frequency of the entire power system, including large-scale FSWT-SCIG-based WFs, by using a battery storage system (BSS). The proposed cascaded control of the BSS is designed to provide effective quantity of reactive power during transient periods, to augment LVRT capability and real power during steady-state periods in order to damp frequency fluctuations. The cascaded control technique is built on four proportional integral (PI) controllers. The droop control technique is also adopted to ensure frequency control capability. Practical grid code is taken to demonstrate the LVRT capability. To evaluate the validity of the proposed system, simulation studies are executed on a reformed IEEE nine-bus power system with three synchronous generators (SGs) and SCIG-based WF with BSS. Triple-line-to-ground (3LG) and real wind speed data are used to analyze the hybrid power grid's transient and steady-state stability. The simulation results indicate that the proposed system can be an efficient solution to stabilize the power system both in transient and steady-state conditions.

Keywords: FSWT-SCIG; battery storage system; power system stability; synchronous generator