Title:	Fuzzy Logic based Virtual Inertia Control of DFIG based Wind Generator for Stability Improvement of Hybrid Power System
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Abstract:
Large integration of renewable energy sources (RESs), such as wind power and solar photovoltaic (PV) plants, into the power systems, impacts the system frequency stability. Normally, a wind farm (WF) and PV system do not provide frequency support because of the uncontrollability of the input energy. Moreover, overall system inertia will be reduced due to massive integration of RES because conventional generation units that provide reserve power need to be decreased. To overcome the problems of frequency stability as well as power system transient stability resulting from the insufficient inertia response, this paper proposes a new method to enhance the transient stability of the power system with RESs introduced, in which variable speed wind turbine with doubly fed induction generator (VSWT-DFIG) supplies its kinetic energy (KE) during generation outage to stabilize conventional synchronous generators (SGs). A suitable fuzzy logic based virtual inertia controller (VIC) is proposed to release the stored KE efficiently during transient period. This fuzzy logic controller (FLC) can continuously adjust the VIC gain depending upon the incoming wind speed. To verify the effectiveness of the proposed VIC, simulation analyses are performed on a multi-machine hybrid power system model composed of PV plant, VSWT-DFIG, fixed speed wind turbine with squirrel cage induction generator (FSWT-SCIG), and conventional SGs.

Keywords: fuzzy logic controller (FLC); PI controller; low voltage ride through (LVRT); power system