Title:	FRT and Transient Stability Augmentation of Grid-Connected PV Station Using Virtual Synchronous Generator
Author(s) Name:	Md. Kamrul Islam, Mohammad Abdul Mannan, Md. Rifat Hazari
Contact Email(s):	mdmannan@aiub.edu
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Abstract:
Due to the extensive integration of renewable energy sources (RESs), i.e., photovoltaic (PV) system, the future power system is developing into an inverter-based system from a dominated alternator-based power system. This massive penetration of inverter-based PV system reduced the system inertia and damping characteristics of the power grid, impacting the fault ride-through (FRT) capability and causes frequency instability. Modern grid codes require that PV systems should work in the same way as conventional power plants and assist the system during transient state. However, most of the conventional inverter control mechanisms failed to fulfill the requirements of grid codes, especially when the penetration ratio of the PV system is close to the conventional unit. Therefore, this paper proposes a virtual synchronous generator (VSG) control mechanism of PV system inverter to augment FRT competency and frequency stability. The proposed VSG control system mimics the behavior of conventional power plants. To observe and evaluate the proposed controller behavior, simulation analyses were executed in the PSCAD/EMTDC software for both proposed and conventional controllers. The simulation results clearly indicate that the proposed VSG control system has sufficient damping characteristics to ensure FRT capability and frequency stability.

Keywords:
Fault ride-through (FRT), PI Controller, PV plant, Virtual synchronous generator (VSG), transient stability