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Effective use of a novel designed inverter for distributions system to improve power system stability and voltage profiles

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Due to rapid expansions of renewable energy (RE) generations, various problems are arising in power systems. In Japan, a large amount of PV installations are causing frequency and stability problems in interconnected system as well as voltage problems in distribution systems. So far, we have proposed solutions from the viewpoint of system operator such as a reliable dispatch method, feasibility monitoring and control methods, while we have recently developed a new type of single-phase synchronous inverter (SSI) as a demand side countermeasure under laboratory experiment. SSI is designed as a multi-purpose inverter to work as flexible power system stabilizer as well as distributed voltage regulator, while working for the ordinary use for PVs and batteries.

In this presentation, we investigate the effective use of the SSI for solving the grid problems. First, the proposed SSI and its applications are outlined, where the design concept is not only for adding the inertia but also for implementing more effective control performance for stability enhancement. Then, we analyze the steady state and transient stability using test system, where eigenvalue analysis and transient stability simulations are carried out to show the effectiveness for stability enhancement. Finally, based on our recent work, a novel voltage control strategy is proposed for solving voltage problem due to a large amount of PV installations in distribution networks. The method is based on a multi-agent system to coordinate distributed SSIs using real time nodal prices of P and Q.

Please send the Abstract to **dsobajic@gridengineering.com** by April 12