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Impacts of Distributed Generators on the Oscillatory Stability of Interconnected Power Systems

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Abstract: Integration of distributed generation is continually and gradually affecting the stability of interconnected power systems. In this paper, the impacts of distributed synchronous generators on oscillatory stability are studied. In various parameter sub-spaces of interest, feasibility regions can be calculated to determine the conditions to sustain the stable operation of an interconnected power system. Through computations of the feasibility boundaries corresponding to Hopf bifurcations of electromechanical oscillatory modes, we determine the operating limits for a stable operation of the system under small and continual disturbances such as predictable changes in loading conditions of generators. Thus, with the case studies given in the paper, under different operating conditions, we investigate the effects of distributed synchronous generators on the oscillatory small-signal stability. It has been shown that penetrations of these generators can cause local or inter-area oscillatory instabilities depending on the system's topology, operating point and control parameters.

Key Words: Oscillatory stability, distributed generation, Hopf bifurcation, feasibility boundaries

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