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A STUDY OF IMPROVEMENT OF SMALL-SIGNAL STABILITY ANALYSIS OF POWER SYSTEM

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ABSTRACT

Small disturbance such as load changes will affect stability of power systems. Small signal stability problem refers to the stability problems caused by small disturbances. Power oscillation appears in the system because of the effect of small disturbances. Oscillation's property is the key to analyze the stability of power system. In order to learn the oscillation's mode, two methods are applied to analyze the oscillation caused by small disturbances. The first method is referred to as model-based analysis for small signal stability problem. It uses mathematical model to indicate whether the system is stable based on the eigenvalue calculation for the mathematical model. The other method is the measurement-based analysis for power system. This method is more popular for today's power system analysis. It uses real-time synchrophasor measurement collected from Phasor Measurement Units (PMUs) that are installed at various buses to estimate the mode of oscillations based on prony method. This method requires the system to be visible using PMUs. In addition, the mode of oscillation for every bus can be detected with the time stamp. The introduced supplementary controls allow increasing the penetration of renewable energy sources without jeopardizing the frequency and small-signal stability. Eigenvalue analysis and nonlinear hybrid simulations combining DIgSILENT and Python are performed to validate the proposed control strategy.