Early Prevention Method for Power System Instability

This paper presents a method to determine suitable countermeasures against emerging aperiodic small disturbance rotor angle (ASD) instability. The method utilizes stability indicators, computed in real time, to define a criterion for ASD stability. Sensitivities of these stability indicators are then determined and used to identify the most influential nodes for counter measures. To increase the computational speed, only nodes visited by a self-propagating graph, rooted at the vulnerable generator, will have their sensitivities calculated. The steady state voltages after a given counter measure are then determined, using a grid transformation coefficient (GTC) and a numerical, iterative solution to an equation system. The stability criterian can then be assessed to evaluate the sufficiency of a suggested counter measure. The method is demonstrated on a synthetic 8-bus network and a 464-bus model of the Western Denmark transmission grid. The method successfully demonstrates its ability to efficiently identify and evaluate counter measures for a large, practical system.