Wide-Area Assessment of Aperiodic Small Signal Rotor Angle Stability in Real-Time

This paper presents the details of a new real-time stability assessment method. The method assesses a particular mechanism of stability: each generator's capability to generate sufficient steady state electromechanical torque. The lack of sufficient steady state torque causes aperiodic increase in rotor angle and a loss of synchronism, referred to as aperiodic small signal instability. The paper provides the theoretical background of the method and an analytical assessment criterion. Furthermore, a mathematical mapping of the generators' operating points that enables informative visualization of multiple operating points is derived in the paper. Finally, results from timedomain simulation of instability scenarios in the Nordic32 test system are presented and results used for testing the assessment method. The results illustrate the method's capability to efficiently identify the location of the emerging problem and to quantify margins to stability boundary.

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