

Examination of EMT-Type Impedance Scanning Techniques for Small Signal Stability Assessment of Inverter Based Resources

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Modern power grids that incorporate inverter-based resources (IBRs) may be vulnerable to persistent oscillations and instability incidents, which jeopardize the reliable operation of the system. Unstable operation conditions can be identified via impedance-based stability assessment (IBSA) methods, provided that accurate frequency-dependent impedance models of the system are available. A promising approach for obtaining such impedance models is to use time-domain simulation scanning techniques based on electromagnetic transient (EMT)-type software. This paper studies and compares five EMT-type impedance scanning methods in terms of their application procedures, analytical relationship between obtained impedances, IBSA accuracies, and computational burdens. Critical technical notifications and guidelines for the selection and application of these scanning methods, considering different types of instabilities, are provided. For accuracy assessment, the IBSA results are compared with EMT simulations on a practical test system.