

Generated Power-Based Composite Security Index for Evaluation of Cascading Outages

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Abstract

This paper addresses the presenting and implementation of a composite performance index (PI) for contingency analysis to identify critical components (lines and/or generation units), initiating event, shortest path for cascading, and cascading chains. The proposed PI has obtained in terms of thermal transfer capacity of transmission lines, bus voltage profile, generation units active and reactive power. The proposed index offers a simple method to identify and rank critical contingencies in an efficient way. It assesses the development of cascading outages by categorizing and visualizing of cascading events. The proposed PI is immune to masking effect irrespective of the network topology and loading condition. As a diagnostic tool, the proposed index capable of identifying the location of limits violation (bus voltage, line flow, generator active and reactive power) inside the network, for feasible corrective control actions, and it can be added to existing contingency analysis tools in order to evaluate the impact of contingency event, whether on-line or offline. Extensive simulations have been carried out using 6-bus, and IEEE 14-bus systems and all results ensure the robustness and effectiveness of the proposed PI in contingency analysis.

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