Planning of Interconnected Powers Systems Considering Security Under Cascading Outages and Catastrophic Events



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Sinopsis

This dissertation presents a method for assessing the vulnerability of a composite power system. It is based on the modeling of failures and repairs using stochastic point process theory and a procedure of the sequential Monte Carlo simulation to compute the indices of vulnerability. Stochastic point process modeling allows including constant and time-varying rates, a necessity in those scenarios considering aging and diverse maintenance strategies. It also allows representing the repair process performed in the power system as it really is: a queuing system. The sequential Monte Carlo simulation is applied because it can artificially generate all the aspects involved in the operating sequence of a power system and also because it can easily manage non-stationary probabilistic models. The indices of vulnerability are the probability of occurrence of a high-order 1055 of component scenario, its frequency and its duration. A high-order loss of component scenario is that one higher than n - 2. Examples using the IEEE One Area RTS show how the presence of aging and others factors that produce increasing component failure rates dramatically increase the risk of occurrence of high-order loss of component scenarios.

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