



南方电网综合防御框架的构思

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摘要: 针对南方电网复杂的交直流混合输电的特点, 构思时空协调的停电防御框架。在广域信息平台、在线量化稳定分析和自适应控制决策等环节上, 提升防御灾变的功能, 即从静态到动态范畴, 从离线到在线, 从定性到定量, 从固定设置到自适应优化; 其中特别强调相继故障的风险预警和多方面的协调。其创新点和工程应用还包括: 在没有数学模型的支持下, 评估实测时间响应曲线的轨迹稳定裕度; 非自治非线性系统的特征根分析技术; 高维受扰轨迹之间的相似度指标, 及以其为基础的模型识别技术; 将气象和雷电等非电力信息整合到停电防御框架中, 对相继故障的风险进行仿真和预警; 基于风险管理概念的协调控制。

关键词: 停电灾变的防御; PMU轨迹数据的挖掘; 时空协调; 混合优化; 风险决策; 相继故障的预警

Design of Blackout Defense Framework for China Southern Power Grid

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Abstract: Aiming at characteristics of complicated AC/DC power transmission, an adaptive space-time coordinative framework of blackout defending is proposed for China Southern Power Grid. Based on the wide area information platform, online quantitative stability analysis and adaptive decision-making techniques, this defending system will upgrade the SCADA system from static category to dynamic one, the EMS from offline security analysis to online one, the stability assessment from a qualitative manner to quantitative one, the decision-making from conservative fashion to adaptive optimization one. New innovations and their engineering applications are expected, such as the stability margin assessment of measured swing curves without using system models and parameters, eigenvalue techniques along the trajectories of non- autonomous strong-nonlinear systems, development of a similarity index for high-dimensional trajectories and model identification techniques based on it, simulations of cascading outages considering weather and thunder information and the early warning of the blackout risk, and risk coordination among different controls.

Key words: blackout defending; knowledge extraction from trajectory data acquired by PMU; adaptive space-time coordination; hybrid optimization; risk-based decision-making; early warning of cascading outages

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