

继电保护、通信及自动化

电力系统多区域复杂环网的最小断点集计算

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摘要:

为从根本上改善最小断点集(minimum break point set, MBPS)适应系统结构非预设性变化的水平, 提出多区域复杂环网最小断点集求取及更新算法。在静态网络拓扑情况下, 利用保护关联矩阵并行计算各子区域的最小断点集, 在此基础上, 优化计算主区域的最小断点集, 并据此确定全网最小断点集。在网络变结构的情况下, 基于广义断点集提出单区域最小断点集更新方案, 并将其推广至多区域网络, 在主区域、子区域及单线路联络节点发生变结构情况下, 快速更新最小断点集。典型的5区域68节点系统计算结果表明: 该方法在最小断点集求取方面, 不但能够保证全网断点数目合理, 还能提高最小断点集的计算速度; 在最小断点集更新方面, 该方法仅需处理变结构所关联区域的最小断点集, 即可实现全网最小断点集更新, 有效地降低了复杂环网最小断点集更新的复杂性, 计算量小, 适用于多种网络变结构情况。

关键词: 多区域电网 网络变结构 最小断点集 保护关联矩阵 广义断点集

Calculation of Minimum Break Point Set for Multi-area Complex Loop Network of Power System

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Abstract:

In order to basically improve the minimum break point set (MBPS) to adapt to the non-predictive change level of system structure, a novel scheme of calculating and updating the MBPS for multi-area complex loop network was proposed in this paper. According to static network topology, the MBPSs of sub-area are parallel calculated based on the relay-incidence matrix. Then, the optimization calculation for the MBPS of main-area is calculated and the final MBPS of the whole network is obtained. When the network topology is varied, a single-area MBPS updating algorithm was firstly proposed based on the generalized break point set. Then the method was applied to rapidly update MBPS in the multi-area when the network topology of the sub-area, main-area or single-line connection node is varied. The typical test system with 5-area, 68-bus study demonstrates the proposed method has the following advantages. In the aspect of calculating MBPS, this method not only can guarantee the reasonability of the number of break points, but also can accelerate the calculation of MBPS. In the aspect of updating MBPS, this method is able to update the MBPS of the whole network only by dealing with the MBPS of the varied region. Furthermore, the method is adapted to a lot of variation conditions of network topology with less computational burden.

Keywords: multi-area network variation of network topology minimum break point set (MBPS) relay incidence matrix generalized break point set

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