

电力系统

基于信息熵的可用输电能力枚举评估方法

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摘要:

大规模电网的互联发展推动了可用输电能力(available transfer capability, ATC)的研究。状态枚举是处理ATC计算中大量不确定性的常规方法。在分析传统ATC枚举评估方法的基础上,在故障筛选环节引入熵权,将视在功率行为指标和电压一无功功率行为指标综合考虑,建立了主、客观相结合的状态排序筛选方法;将最优潮流模型应用到重复潮流法的每次潮流求解中,综合考虑系统的安全性与经济性;为了减少状态筛选带来的偏差,建立了基于最大熵原理的ATC发生概率计算模型,并引入ATC期望值和ATC不足概率作为评估指标。通过IEEE-14节点测试系统的仿真研究,验证了其在状态筛选合理性、计算精度和处理速度上的优势。

关键词: 可用输电能力 枚举法 熵权 重复潮流 最大熵原理

An Information Entropy Based Contingency Enumeration Approach for Available Transfer Capability Assessment

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Abstract:

Rapid development of large scale-power grid interconnection promotes the research on available transfer capability (ATC). Contingency enumeration is commonly used to deal with large amount of uncertainties in ATC calculation. Based on the analysis on traditional contingency enumeration approach, the entropy weight is firstly led into fault screening link, and both apparent power behavior index and voltage-reactive power behavior index are taken into account synthetically to establish a state ordering-screening approach in which subjective and objective factors are integrated. The optima power flow model is applied to each time of power flow solution by repeated power flow method, thus both security and economy of power grid are considered. To decrease the deviation caused by state selection, a maximum entropy based calculation model of occurrence probability of ATC is built, and the expectation value of ATC and the probability of insufficient ATC are led in and regarded as the assessment indices. The superiority of the proposed approach in the reasonableness of state screening, calculation accuracy and processing efficiency is verified by numerical simulation results on the IEEE-14 bus system.

Keywords: available transfer capability (ATC) contingency enumeration entropy weight repeated power flow maximum entropy principle

收稿日期 2011-03-30 修回日期 2011-04-23 网络版发布日期 2011-11-11

DOI:

基金项目:

“十一五”国家科技支撑计划重大项目(2008- BAA14B05); 国家自然科学基金项目(50877027); 中央高校基本科研业务费专项资金资助(10QX35)。

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