

电力系统

地区电网输电安全水平在线评估算法与系统设计

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摘要:

随着中国城市化进程的不断推进, 越来越多的有关地区电网输电安全性的问题被人们关注, 其中输电安全水平的在线评估就是其中之一。提出了地区电网输电安全水平在线评估的相关数学模型, 并在此基础上建立了相应的评估策略, 采用重复潮流法对地区电网当前运行方式下的输电安全水平进行了评估。以上述方法为核心, 应用实时数据库与关系数据库相结合的方法设计了地区电网输电安全水平在线评估系统的硬件网络结构与软件架构, 并对数据传输方式作了描述。最后按照文中所述方法在某地级市尝试搭建了该在线评估系统, 并利用在线数据对所提方法进行了验证, 结果证明所提模型与评估策略的可行性。

关键词: 地区电网 安全性 在线评估 最大输电能力 实时输电安全系数

An On-Line Assessment Algorithm of Transmission Security Level for Regional Power Grid and Its Design

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Abstract:

Along with the unceasing and rapid development of urbanization in China, more and more attentions are paid to the transmission security of regional power grid, and one of the most critical issues is the on-line assessment of transmission security level. A mathematical model related to the on-line assessment of transmission security level of regional power grid is proposed, and on this basis a corresponding strategy is built and the repetitive power flow analysis is utilized to assess the transmission security level of regional power grid under current operation mode. Regarding the presented strategy as the core, an approach, in which the real-time database is combined with relational database, is adopted to design the hardware structure and software architecture of the on-line transmission security level assessment system for regional power grid, and the mode of data transmission is described. Finally, utilizing above-mentioned strategy and approach, an on-line assessment system for a certain prefecture-level city is set up, and the proposed methods are verified by on-line data. Verification results show that the proposed model and assessment strategy are feasible.

Keywords: regional power grids security online assessment total transfer capability real-time transmission security index

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参考文献:

[1] 薛禹胜. 时空协调的大停电预防框架(一)从孤立防线到综合防御[J]. 电力系统自动化, 2006, 30(1): 8-16. Xue Yusheng. Space-time cooperative framework for defending blackouts Part I from isolated

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Sensitivity of transfer capability margins with a fast formula[J]. IEEE Trans on Power Systems, 2002, 17(1): 34-40. [6] 韩学山, 李晓波. 考虑元件长期载荷容许条件的最大可用输电能力的使用计算方法[J]. 电网技术, 2004, 28(24): 10-15. Han Xueshan, Li Xiaobo. Practical calculation method of maximal available transfer capability considering long-term load permissible condition of power transmission components[J]. Power System Technology, 2004, 28(24): 10-15(in Chinese). [7] 能源电[1993]228号城市电力网规划设计导则[S]. 北京: 中国电力出版社, 北京. [8] 李欣然, 李培强, 朱湘有, 等. 基于最优化原理的高压配电网建设规模评估[J]. 电力系统自动化, 2007, 31(4): 46-50. Li Xinran, Li Peiqiang, Zhu Xiangyou, et al. Evaluation construction size of district high voltage distribution networks[J]. Automation of Electric Power Systems, 2007, 31(4): 46-50(in Chinese). [9] 王伟, 张粒子, 麻秀范. 基于结构元理论的重压配电网接线模式[J]. 电力系统自动化, 2006, 30(11): 35-40. Wang Wei, Zhang Lizi, Ma Xiufan. Connection modes in medium-voltage distribution systems based on configuration-unit theory [J]. Automation of Electric Power Systems, 2006, 30(11): 35-40(in Chinese). [10] 张建波, 罗滇生, 姚建刚, 等. 基于经济性分析的城网变电容载比取值方法研究[J]. 继电器, 2007, 35(13): 39-43. Zhang Jianbo, Luo Diansheng, Yao Jiangan, et al. Research on value of capacity-load ratio in urban power network planning based on the economical analysis[J]. Relay, 2007, 35(13): 39-43(in Chinese). [11] 李振坤, 陈星莺, 刘皓明, 等. 配电网供电能力的实时评估分析[J]. 电力系统自动化, 2009, 33(6): 36-39. Li Zhenkun, Chen Xingying, Liu Haoming, et al. Online assessment of distribution network loading capability[J]. Automation of Electric Power Systems, 2009, 33(6): 36-39(in Chinese). [12] Ou Yan, Singh C. Assessment of available transfer capability and margins[J]. IEEE Trans on Power System, 2002, 17(2): 467-468. [13] Gravener M H, Nwankpa C. Available transfer capability and first order sensitivity[J]. IEEE Trans on Power Systems, 1999, 14(2): 512-518. [14] 刘皓明, 倪以信, 吴军基, 等. 计算电网可用输电能力的方法评述[J]. 继电器, 2003, 31(10): 45-50. Liu Haoming, Ni Yixin, Wu Junji, et al. Review of available transfer capability calculation in electricity market[J]. Relay, 2003, 31(10): 45-50(in Chinese). [15] 花蕊, 秦红星, 刘斌. 基于关系型数据库的变电站两票专家系统[J]. 高电压技术, 2007, 33(9): 85-89. Hua Rui, Qin Hongxing, Liu Bin. Expert system for substation working arrangement & switching sequence by using a relational database[J]. High Voltage Engineering, 2007, 33(9): 85-89 (in Chinese). [16] 张艳, 翟学明, 胡华威. 基于DTD在关系型数据库中存储XML文档[J]. 计算机工程与设计, 2008, 29(19): 5073-5076(in Chinese). Zhang Yan, Zhai Xueming, Hu Huawei. Storing XML documents in relational database based on DTD[J]. Computer Engineering and Design, 2008, 29(19): 5073-5076(in Chinese). [17] 张海宁, 笃峻, 祁忠, 等. 稳定控制信息管理系统的Web发布系统[J]. 电力自动化设备, 2009, 29(2): 128-131. Zhang Haining, Du Jun, Qi Zhong, et al. Web publishing system of power security and stability control system[J]. Electric Power Automation Equipment, 2009, 29(2): 128-131(in Chinese). [18] 高强, 童晓阳, 刘志刚, 等. 基于AJAX的变电站嵌入式Web发布系统的设计与实现[J]. 电力系统自动化, 2008, 32(9): 57-60. Gao Qiang, Tong Xiaoyang, Liu Zhigang, et al. Design and implementation of an embedded web publishing system based on AJAX in substations[J]. Automation of Electric Power Systems, 2008, 32(9): 57-60(in Chinese). [19] 陈星莺, 孙恕坚, 钱锋. 一种基于追踪技术的快速电力网络拓扑分析方法[J]. 电网技术, 2004, 28(5): 22-24. Chen Xingying, Sun Shujian, Qian Feng. A fast power system network topology based on tracking technology[J]. Power System Technology, 2004, 28(5): 22-24(in Chinese). [20] 吴文传, 张伯明. 基于图形数据库的网络拓扑及其应用[J]. 电网技术, 2002, 26(2): 14-18. Wu Wenchuan, Zhang Boming. A graphic database based network topology and its application[J]. Power System Technology, 2002, 26(2): 14-18(in Chinese). [21] 朱文东, 刘广一, 于尔铿, 等. 电力网络局部拓扑的快速算法[J]. 电网技术, 1996, 20(3): 30-33. Zhu Wendong, Liu Guangyi, Yu Erkeng, et al. The fast calculation method of local power network topology[J]. Power System Technology, 1996, 20(3): 30-33(in Chinese). [22] Draft IEC61970, Energy management system application program interface(EMS-API)-Part1: Guidelines and General Requirement[S]. [23] Draft IEC61970, Energy management system application program interface(EMS-API)-Part301: common information mode(CIM)base [S]. [24] Draft IEC61970, Energy management system application program interface(EMS-API)-Part501: CIM RDF schema[S].

本刊中的类似文章

1. 束洪春 胡泽江 刘宗兵. 城市电网最大供电能力在线评估方法及其应用[J]. 电网技术, 2008, 32(9): 46-50

2. 殷小祥 吴隗平 陕华平.交流特高压变电站的监控系统建设[J]. 电网技术, 2008,32(4): 31-35
 3. 席 晶|李海燕|孔庆东.风电场投切对地区电网电压的影响[J]. 电网技术, 2008,32(10): 58-62
 4. 王立永, 张保会, 王克球, 郭 振, 李彦龙, 谭伦农, 陈 建.市场环境下的N-1原则的经济效益评价[J]. 电网技术, 2006,30(9): 15-20
 5. 张 强|韩学山|张元鹏|潘 珂|王明强.静态安全约束下基于分解最优潮流的最大输电能力计算方法[J]. 电网技术, 2006,30(23): 26-31
 6. 任保瑞 蔡兴国.基于相量测量的电压稳定裕度在线评估[J]. 电网技术, 2009,33(3): 39-43
 7. 龚滨平 彭建春 杨帮宇.综合考虑交易对电网依赖性和安全性影响的输电固定成本分配[J]. 电网技术, 2009,33(19): 66-71
 8. 唐晓骏 刘东冉 陈麒宇 马敏 马世英 措姆 次旦玉珍 陈云.青藏直流接入后西藏地区电网电压/无功控制[J]. 电网技术, 2010,34(9): 94-99
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 10. 姚诸香 郑富永 田校军 石立宝.江西电网极限传输容量在线评估的网格技术实现[J]. 电网技术, 2011,35(4): 87-91
 11. 何鑫 李国庆.基于混沌内点法可用输电能力的计算[J]. 电网技术, 2011,35(11): 130-135
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