

电力系统

短期电能计划安全校正软约束模型

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摘要:

对比了发电计划安全校正常用2种方法: 灵敏度反向配对法和线性规划法。其中线性规划法由于其各约束条件均为硬约束, 可能存在无解的情况。实际应用中如果不能彻底消除越限, 要给出一个减弱越限程度的解以供决策参考。分析了常规安全校正模型中目标函数和约束条件的特点, 基于摄动原理, 引入不同特性的偏差变量和罚系数作为摄动量, 构造了软约束优化模型, 解决了常规线性规划法无解的问题。新模型简单而通用, 在越限可消除时, 新模型与常规模型的解是相同的, 当越限不能消除时, 新模型能够给出减弱越限程度的解。在某省调的实际应用验证了模型的有效性。

关键词: 电能计划 安全校核 安全校正 软约束

Security Correction Model With Soft Constraints for Short-term Energy Scheduling

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Abstract:

Two methods usually utilized in security correction of generation scheduling, namely equal and opposite quantities in pairs and linear programming, are compared. The linear programming probably has no solution because all its constraints are hard ones. In applications, when out-of-limit cannot be thoroughly eliminated, for decision-making it is necessary to give a solution that can mitigate the extent of out-of-limit. The features of both objective function and constraints in traditional security correction model are analyzed, and based on the principle in perturbation theory the deviation variable and penalty function are led in as perturbations to construct an optimization model with soft constraints to solve the trouble that the model with hard constraints is unsolvable as for traditional linear programming. The proposed model is simple and general, and when the out-of-limit is eliminable the respective solutions by the proposed model and the traditional one are the same; when the out-of-limit is indelible, the proposed model can offer a solution with mitigated extent of out-of-limit. Actual application in a certain provincial dispatching center verifies the effectiveness of the proposed model.

Keywords: energy scheduling security checking security correction soft constraint

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参考文献:

[1] Singh H, Hao S, Papalexopoulos A. Transmission congestion management in competitive electricity markets[J]. IEEE Transactions on Power Systems, 1998, 13(2): 672-680. [2] Lei J, Deng Y, Zhang R. Congestion management for generation scheduling in a deregulated Chinese power system[C]// Power Engineering Society Winter Meeting. Columbus, Ohio, USA: IEEE, 2001: 1262-1265. [3] 韦化, 吴阿琴, 白晓清. 一种求解机组组合问题的内点半定规划方法[J]. 中国电机工程学报, 2008, 28(1): 35-40. Wei Hua, Wu Aqin, Bai Xiaoqing. An interior point semidefinite programming for unit commitment problems[J]. Proceedings of the CSEE, 2008, 28(1): 35-40(in Chinese). [4] 王

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承民, 郭志忠, 于尔铿. 确定机组组合的一种改进的动态规划方法[J]. 电网技术, 2001, 25(5): 20-24.

Wang Chengmin, Guo Zhizhong, Yu Erkeng. An improved dynamic programming method for determining unit commitment[J]. Power System Technology, 2001, 25(5): 20-24(in Chinese). [5] 查浩, 韩学山, 王勇, 等. 电力系统安全经济协调的概率调度理论研究[J]. 中国电机工程学报, 2009, 29(13): 16-22. Zha Hao, Han Xueshan, Wang Yong, et al. Study of power system probabilistic dispatching with security-economy coordination[J]. Proceedings of the CSEE, 2009, 29(13): 16-22(in Chinese). [6] 袁贵川, 王建全, 韩祯祥. 电力市场下的最优潮流[J]. 电网技术, 2004, 28(5): 13-17. Yuan Guichuan, Wang Jianquan, Han Zhenxiang. Optimal power flow under electricity market[J]. Power System Technology, 2004, 28(5): 13-17(in Chinese). [7] 温步瀛. 电力市场条件下发电计划偏差的优化校正研究[J]. 中国电机工程学报, 2007, 27(13): 111-116. Wen Buying. Research on optimal regulation for generation plan deviation under power market[J]. Proceedings of the CSEE, 2007, 27(13): 111-116(in Chinese). [8] 邓佑满, 黎辉, 张伯明, 等. 电力系统有功安全校正策略的反向等量配对调整法[J]. 电力系统自动化, 1999, 23(18): 5-8. Deng Youman, Li Hui, Zhang Boming, et al. Adjustment of equal and opposite quantities in Paris for strategy of active power security correction of power system[J]. Automation of Electric Power Systems, 1999, 23(18): 5-8(in Chinese). [9] 张小白, 高宗和, 钱玉妹, 等. 用AGC实现稳定断面越限的预防和校正控制[J]. 电网技术, 2005, 29(19): 55-59. Zhang Xiaobai, Gao Zonghe, Qian Yumei, et al. Implementation of preventive and remedial control for tie line overload by use of automatic generation control[J]. Power System Technology, 2005, 29(19): 55-59(in Chinese). [10] 沈瑜, 夏清, 康重庆, 等. 电力市场下有功经济安全校正模型及求解策略[J]. 电力自动化设备, 2003, 23(8): 8-13. Shen Yu, Xia Qing, Kang Chongqing, et al. Economic security correction models and optimization strategies in deregulated power system[J]. Automation of Electric Power Systems, 2003, 23(8): 8-13(in Chinese). [11] 赵晋泉, 江晓东, 张伯明. 一种基于连续线性规划技术的在线静态安全校正算法[J]. 电网技术, 2005, 29(5): 25-30. Zhao Jinquan, Chiang Hsiaodong, Zhang Boming. A successive linear programming based on-line static security corrective control approach[J]. Power System Technology, 2005, 29(5): 25-30(in Chinese). [12] Sun D I, Ashley B, Brewer B, et al. Optimal power flow by Newton approach[J]. IEEE Trans on Power Apparatus and Systems, 1984, 103(10): 2864-2880. [13] Wu Y C, Debs A S, Marsten R E. A direct nonlinear predictor-correct primal-dual interior point algorithm for optimal power flow[J]. IEEE Trans on Power Systems, 1994, 9(2): 876-883. [14] 武亚光, 邓佑满, 张锐, 等. 发电侧电力市场中安全核算法的研究与实现[J]. 中国电机工程学报, 2001, 21(6): 48-52. Wu Yaguang, Deng Youman, Zhang Rui, et al. A security correction algorithm for the generation market[J]. Proceedings of the CSEE, 2001, 21(6): 48-52(in Chinese). [15] Stott B, Marinho J. Linear programming for power system network security application[J]. IEEE Trans on Power Apparatus and Systems, 1979, 98(3): 837-848. [16] 郑延海, 张小白, 钱玉妹, 等. 电力系统实时安全约束调度的混合算法[J]. 电力系统自动化, 2005, 29(12): 49-52. Zheng Yanhai, Zhang Xiaobai, Qian Yumei, et al. Hybrid algorithm for real-time security constrained dispatch of power system[J]. Automation of Electric Power Systems, 2005, 29(12): 49-52(in Chinese). [17] 胡清淮, 魏一鸣. 线性规划及其应用[M]. 北京: 科学出版社, 2004: 20-36. [18] 倪明康, 林武忠. 奇异摄动问题中的渐近理论[M]. 北京: 高等教育出版社, 2009: 1-8.

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