

电力系统

机组组合问题中机组状态多胞形的分离不等式分析

徐帆¹, 姚建国², 耿建¹, 杨争林¹

1. 国电南瑞科技股份有限公司, 江苏省 南京市 210061; 2. 国网电力科学研究院, 江苏省 南京市 210003

摘要:

在对机组组合问题建立混合整数规划模型时, 其最小开停时间约束的分离不等式的“松紧”程度直接影响求解算法的性能, 建立一个性质足够好的模型能大幅提高求解效率。本文首先对整数规划的多面体理论进行简要介绍, 并从几何上给出判断分离不等式优劣的直观判据。之后对常用的最小开停时间约束的各种分离不等式进行分析, 揭示其内在联系, 并得到理论上最“紧”的一组机组最小开停时间分离不等式。最后通过IEEE RTS 96系统测试和三个省级实际电网系统测试验证了上述理论分析的正确性, 并对定义边界的分离不等式进行性能测试, 测试结果表明其求解性能较其它不等式有大幅提升。

关键词: 混合整数规划 最小开停时间约束 多面体理论 多胞形 分离不等式 边界面

Valid Inequality Analysis on Polytope of Unit Status in Unit Commitment

XU Fan¹, YAO Jianguo², GENG Jian¹, YANG Zhenglin¹

1. NARI Technology Co. Ltd., Nanjing 210061, Jiangsu Province, China; 2. State Grid Electric Power Research Institute, Nanjing 210003, Jiangsu Province, China

Abstract:

In the mixed integer programming based unit commitment model, the formulations of the valid inequalities for minimum on and off time constraints play an important role in the performance of the algorithm. A tighter formulation can improve the performance remarkably. This paper introduces the polyhedral theory of integer programming, and brings a geometric criterion for the effect of the valid inequalities. Many previously published minimum on and off time constraints are presented, including the facet defining valid inequalities, and the inherent relations between them are analyzed. The IEEE RTS 96 system and three actual provincial systems in China are tested to prove the academic conclusions. The performance of the facet defining valid inequalities are tested as well, which can improve the performance of the algorithm remarkably.

Keywords: mixed integer programming minimum on and off time constraints polyhedral theory polytope valid inequalities facet

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通讯作者: 徐帆

作者简介:

作者Email: xufanseu@sina.com

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