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燃煤发电的净化与减排

基于多阶段减排规划的发电厂碳捕集系统优化配置

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摘要：

根据二氧化碳减排规划的要求，并充分考虑目前二氧化碳捕集和封存(carbon capture and storage，CCS)技术发展的阶段性与不确定性，建立以阶段综合费用最小为目标函数的发电厂减排规划模型。引入技术成熟度因子，并考虑到发电厂运行参数未来的变化，将CCS技术的阶段性与不确定因素进行量化，依据技术进步率对碳捕集系统减排指标进行分解。采用离散细菌群体趋药性算法(discrete bacterial colony chemotaxis，DBCC)进行求解，通过对实际算例的方针分析，得到系统在不同减排场景下的碳捕集系统最优配置方案与碳捕集系统投资策略。最后通过灵敏度分析得到在不同减排场景下各因素对减排成本的影响。结果证明了所提模型以及优化算法的有效性和正确性。

关键词： 二氧化碳捕集和封存 技术成熟度因子 离散细菌群体趋药性算法 最优配置 灵敏度分析

Carbon Capture Systems Optimal Allocation Scheme for Multi-stage Emission Reduction Planning in Power Plants

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Abstract:

According to the requirements of the carbon dioxide emission reduction planning and taking full account of the progressive and uncertainty of the development of the current carbon dioxide capture and storage technology (CCS), a model of emission reduction planning in power plants with the goal to minimum general expenses was developed. By introducing technology readiness level factor and considering the future changes in power plants operation parameters, the progressive and uncertainty of the CCS technology were quantified. Emission reduction index of the carbon capture systems was decomposition by the rate of technological progress. An algorithm based on the discrete bacterial colony chemotaxis (DBCC) was used to solve this problem, the optimal allocation and investment strategy of carbon capture systems under different emission reduction scenarios was obtained by the simulation analysis on the practical example. Finally, the impact of different factors on the mitigation costs in different emission reduction scenarios was obtained by sensitivity analysis. The results demonstrate the effectiveness of the model and the optimization algorithm.

Keywords: carbon capture and storage (CCS) technology readiness level factor discrete bacterial colony chemotaxis (DBCC) optimal allocation sensitivity analysis

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