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OPTIMIZING ECO-EFFICIENCY AND CARBON EMISSIONS IN THE ELECTRIC POWER INDUSTRY FOR SUSTAINABLE DEVELOPMENT

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Abstract

This study addresses the research gap in understanding the relationship between energy structure optimization and eco-efficiency enhancement within the electric power industry by presenting a planning model for a power demand energy structure. By employing optimization modelling with response surface analysis, the authors explore the impact of various factors, such as energy growth demand, carbon reduction targets, energy supply potential, and renewable energy policies, on energy supply costs and carbon emissions under different scenarios. The results highlight the potential of renewable energy, particularly solar power, in reducing carbon emissions and enhancing eco-efficiency. The study provides valuable insights into strategies for achieving sustainable development and carbon neutrality in the electric power industry, offering guidance for policy-makers and industry stakeholders. The main contributions of the article are twofold: Firstly, we explored specific measures for the electric power industry to improve ecological efficiency and reduce greenhouse effects; Secondly, we supplemented the literature on the relationship between energy structure optimization and ecological efficiency improvement in the electric power industry.

Key words: eco-efficiency; energy mix; power sector; response surface analysis

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