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# Evaluating Electricity Firms' Profitability and Carbon Performance Using a Three-Stage DEA

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## Abstract

This study evaluates the efficiency scores of international electricity companies by explicitly incorporating their greenhouse gas emissions. It examines how these firms can reduce their carbon footprint while maintaining profitability, thus contributing to global climate change mitigation efforts. We employ a three-stage Data Envelopment Analysis (DEA) framework to calculate efficiency, integrating a Stochastic Frontier Analysis (SFA) in the second stage. This SFA step enables us to separate the effects of managerial inefficiency from those of external environmental factors. By analyzing the slack variables obtained from the three-stage DEA results, we identify best practices that offer both economic and environmental advantages. According to the data of DEA slacks, achieving 10% emission reduction target is affordable for most firms. Firms can adopt comprehensive strategies including energy substitution transformation, energy efficiency improvement.

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