ABSTRACT

Market-based policies are the cornerstones of the present day climate change mitigation policies across the world. In 2012, India devised a market-based energy efficiency scheme—Perform, Achieve and Trade (PAT)—with an objective of energy saving and emissions reduction. Under the PAT scheme, unit-wise targets are set to reduce specific energy consumption within a cycle of three years, and those units, which exceed their targets, earn tradable Energy Saving Certificates.

The current research is driven by the need to evaluate the effectiveness of the PAT scheme in stimulating investment for enhanced energy efficiency of coal-based thermal power plants in India. The thesis examines the rationality of key design features of the scheme—energy efficiency target and normalization mechanism. It also finds out the optimal investment choices for two plants (with widely varying degrees of efficiency) under market inefficiency.

Data envelopment analysis is used as the main analytical tool for examining the target rationality and the target normalization mechanism, and the compliance choice strategies are explored by applying the Monte Carlo simulations of decision trees formulated for two contrasting practical cases.

The study finds out that the target set by the PAT scheme for the heat rate reduction in the thermal power sector is significantly less than the potential heat rate reduction of the sector, and that the targets for the more efficient plants are substantially more than their potentials, which will penalize these proactive, early action takers. The study also finds out that about 24% of energy saving can be realized from improved managerial practice. Most of the investment for energy efficiency is likely to take place in the inefficient plants.

Keywords: Market-based policy, Energy efficiency, Perform Achieve and Trade, PAT Compliance Options, Data Envelopment Analysis.