ABSTRACT

About 70 percent of electric power generation in India is coal based. The power plants emits large amount of pollutants and during 2010-11, 450 million tons of CO_2 was emitted. The instrument for reduction of gross pollutant like greenhouse gases is moving towards participatory and market- based approaches in Kyoto Protocol from a still existing command and control approach. India today is a signatory of Kyoto Protocol, which is currently under implementation. With its participation, Indian coal based energy industry is going to face both opportunities and challenges arising out of complexity of size and capacity variations, age of thermal power plant, technology and other political and regional settings etc. In the foreseeable future, careful selection of instrument are required to reduce the pollutants as well as improving financial benefits, overall efficiency and cost reduction.

In this work the impact of pollution reduction instrument on Indian coal based industries has been analyzed for 81 thermal power plants located all over the country. Based on the collected data like actual air supply, electric power generation per day, coal grade etc, the annual emission of 81 thermal power plants have been calculated. The cost optimization model based on convex optimization technique has been used to analyze the emission reduction analysis, cost analysis and cost-effectiveness analysis of the studied plants with 14 standard pollution reduction technologies of coal based thermal power generation in comparison to pollution trading. The cost analysis of thermal power plant shows that the investment cost of all mitigation technology is 1.1 to 2.4 times of the base technology cost.

The cost-effective analysis shows that the cost-effectiveness of a particular power plant with the selected technological option is in the range of 3 to 424 % of total investment cost of that technology varying largely due to size, base technology, age of the plant and reduction technology choice. From these analysis, allocation of emission reduction target vis- a - vis the adoption of technology for studied thermal power plant has been put forward.

Analysis of allocation of emission reduction target from 2 to 16 % shows that for achieving 6 % emission reduction target, a power plant of any size, location and other complexities can adopt either cogeneration technology or participate optimally in emission trading. Apart from that with the present technological options, the maximum reduction target can be achieved up to 15 % -beyond that it is not economically viable currently.

Key Words: Power plant, Convex Optimisation, Market Based Instruments, Emission Reduction Technology