

Report Release and Panel Discussion on 'Benefit Cost Analysis of Emission Standards for Coal-Based Thermal Power Plants in India'

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Venue: India International Centre, New Delhi

In December 2015, the Ministry of Environment, Forest and Climate Change (MoEFCC) notified emission standards for limiting sulphur oxides (SO_x), nitrogen oxides (NO_x), particulate matter of size <10 μm (PM₁₀), and mercury (Hg) emissions from coal-based thermal power plants (TPPs). The Center for Study of Science, Technology and Policy (CSTEP) estimated that the new standards will reduce SO_x emissions from individual TPPs by 67–95%, NO_x by 41–95%, and PM₁₀ by 50–85%. Further, our study revealed that implementing these standards would significantly improve the ambient air quality in India. The initial deadline for meeting the standards was December 2017. However, as per deliberations in the Supreme Court, the deadline was extended to 2022. Owing to the limited clarity on the technical and economic implications of installing pollution control technologies (PCT), there has been limited progress in compliance with the new standards.

In this context, the CSTEP conducted a study titled 'Benefit Cost Analysis of Emission Standards for Coal-Based Thermal Power Plants in India'. The study analyses the baseline emissions from TPPs, the possible emission trajectories till 2030 (under different compliance scenarios), and cost implications for the government and private sector. It also estimates the avoided mortality and morbidity from reduced air pollution. A report based on the study was released by Shri Bhure Lal, Chairman, Environmental Pollution Control Authority (EPCA); Shri Krishan Dhawan, Chief Executive Officer, Shakti Sustainable Energy Foundation; Shri Harpreet Singh Pruthi, Director, Ministry of Power (Thermal); Shri Satyendra Kumar, Deputy Secretary, MoEFCC; and Dr Anshu Bharadwaj, Executive Director, CSTEP. A panel discussion was also organised as part of the event, where experts in this field shared their experiences and suggestions to enable the implementation of the new emission standards.

The discussion is summarised here under three action items:

- Regulatory mechanisms need to be improved.
- Finance and technology availability needs to be enabled.
- Geographic regions where high social benefits accrue should be prioritised.

Regulatory mechanisms need to be improved

1. Several participants identified the lack of proper tariff guidelines to recover the cost of PCT installation as the reason for implementation delays. They suggested that the new tariff guidelines (2019–2024) should include provisions for PCT cost and pass costs, via tariffs, to end consumers.
 - ✓ This can be done through 'change in law' provisions in Sections 62 and 63 (sub-clause 39b) in the Electricity Act, 2003.
 - ✓ Also, multi-year tariff regulations exist in many states. In some states, tariff hikes over the past 4 years¹ were higher than the estimated tariff increase with PCT (up to 21%). Therefore, the cost of control technology investment can be easily passed on to consumers with the adoption of multi-year tariff regulations.
2. Lack of institutional coordination (to enable the requisite analysis of technology costs) was also identified as a challenge. Several participants felt that there is inadequate assessment even now—three years after the standards were notified.

¹ Tariff has increased from 4.76 INR/kWh to 5.31 INR/kWh for 400 units in 2011–2016 in Karnataka.

- ✓ Tariff regulators mentioned that benchmarking the PCT cost and notifying the generic tariff guidelines are not suitable methods as the PCT options vary from plant to plant. The CERC programme to determine the plant-wise cost for PCT installations and CEA's phased implementation plan were also discussed. On the other hand, many Civil Society Organisations (CSO) participants highlighted the need for tariff guidelines to recover PCT costs in order to expedite the uptake of PCTs.
- ✓ Technical assessment on applicability of certain PCT with Indian coal has not been conducted. Performance and cost of technologies for NO_x reduction, such as selective catalytic reduction (SCR), could be adversely affected with Indian coal, which has high electrical resistivity because of alpha quartz content. Similarly, whether (Electro-Static Precipitators) ESPs can meet the 30 mg/Nm³ PM₁₀ target considering the high ash in Indian coal has not yet been evaluated.

With differing views on the next steps, we felt that more structured coordination between regulatory agencies, pollution authorities, ministry, and organisations such as CIMFR and CSOs is required. This should be factored into any implementation plan by the government to enable the time-bound implementation of the pollution standards.

3. Most participants agreed on the need to identify and implement mechanisms to reduce PCT implementation costs. The competitive bidding of PCT equipment can significantly reduce the cost of investment. The case of a plant in Telangana was discussed, which received a winning bid of INR 19 lakh for FGD—nearly half the cost quoted by the industry. This was the lowest quotation observed in India. Thus, various procurement models can reduce PCT investment significantly.
4. Lack of 'measure, monitor and verify' specifications was identified as a reason for hindering assessment of actual social benefits. Measuring the compliance check is another important stage in emissions standard implementation. Officials indicated that in all existing TPPs, continuous emission monitoring system (CEMS) is installed. However, the measured data from CEMS is not available in the public domain. Moreover, the data from CEMS is not currently accurate. In this regard, Central Pollution Control Board (CPCB) has commenced activities on improving the accuracy of measurements by remotely calibrating the CEMS equipment. If this data from CEMS is made public, it could enable analysis of the actual benefits of implementing new emission standards.
5. Merit order dispatch for inefficient old plants is inadvertently incentivising pollution. Currently, old plants are the cheapest generating sources (based on tariffs). Under a recent Ministry of Power scheme to enable flexibility of generation to reduce costs seen by end consumers, these plants get merit order priority. However, most of these plants are inefficient and highly polluting; hence, the tariff needs to reflect costs of inaction on the emissions front or the current merit order dispatch rules need to be revised.

Finance and technology availability needs to be enabled

1. There was broad consensus on the need to support power producers to finance upfront costs:
 - ✓ Our study estimated that the total costs for complying with emission standards is around INR 2.5 lakh crore. The study recommended providing a one-year grant to accelerate PCT installation.
 - ✓ Government officials cited cases in India where a corpus comparable to total the PCT installation cost was spent to curb emissions. For example, the total investment required to meet the BS VI standards by 2020 is around INR 3 lakh

crore. The government has also spent around INR 72,000 crore for lead-free petrol programme during 1996–2000.

Hence, we feel that financing upfront costs for implementing emission standards in coal TPPs is manageable with the combined efforts of government, stakeholders, and power producers.

2. Some participants highlighted that installing PCT also implies large-scale material requirement and by-product disposal issues:
 - ✓ Government officials highlighted that power producers often sought guidance on providing the limestone required for flue gas desulphuriser (FGD) operations. Based on the current estimated limestone availability in the country (51,000 million tonnes), the MoEFCC is assured that the additional limestone required by FGD (12.5 million tonnes) can easily be met. The mechanisms can hence be worked out.
 - ✓ Further, around 19 million tonnes of gypsum may be generated annually as FGD by-product if the prescribed standards are met by the TPPs. The disposal of gypsum is hence another concern for power plant producers. The current annual consumption of gypsum in India is around 15 million tonnes. The annual gypsum availability through mining as well as industrial gypsum is only 7-8 million tonnes. To provide the additional gypsum requirement, 7-8 million tonnes is currently imported from Oman, Thailand, and Iran. The development of synthetic gypsum market could avoid gypsum imports of 8 million tonnes. The remaining gypsum produced from FGD can be utilised by the gypsum board industries—a rapidly growing construction material manufacturing industry.

Geographic regions where high social benefits accrue should be prioritised

1. Several participants highlighted that localised health costs were very high in select regions with TPP clusters:
 - ✓ Most of the pollution-control strategies are focussed on reducing urban emissions, as cities are densely populated. However, most of the TPP premises are located in highly populated rural areas. A decrease in pollution loads in these regions implies significant health improvements for a large community. For example, the Singrauli area (where around 35 GW of coal TPP capacity is located) has the same population as Delhi. Prioritising these areas would lead to increased health benefits.

Annexure

List of Participants

43 participants from 30 organisations (including various ministries of India, civil societies, and not-for-profit organisations) participated in this event.

Name	Organisation	Designation
Aarti Khosla	Climate Trends	Director
Aman Gupta	Shakti Sustainable Energy Foundation (SSEF)	Programme Assistant (Clean Energy Finance)
Aniruddha Bhattacharjee	Climate Trends	Senior Researcher
Ankush	Economic Times	Correspondent
B Sengupta	Central Pollution Control Board	Member Secretary (Former)
Bhure Lal	Environmental Pollution Control Authority (EPCA)	Chairman
Debayan Gupta	NAMATI-Innovations in Legal Empowerment	Programme Manager, Environmental Justice
Gunjar Jain	GSCC	Communication Strategist
Harpreet Singh Pruthi	MoP	Director, MoP (Thermal)
Jagdish Chander	CERC	Assistant Chief Engineering
Jitendra Sharma	United Nations Environment Programme (UNEP)	Consultant
Kapardhi Bharadwaj	Council on Energy, Environment and Water (CEEW)	Programme Associate
Kishore Kumar Madhipatla	Public Health Foundation of India (PHFI)	
Krishan Dhawan	Shakti Sustainable Energy Foundation	Chief Executive Officer
Lydia Powell	Observer Research Foundation (ORF)	Division head
Mahesh Kendhe	GE Power	
Moutushi Sengupta	MacArthur Foundation	Director, India Office
Mrinal Mathur	The Energy and Resource Institute (TERI)	Fellow
Nitesh Kumar	Coal Controllers of India	Officer (Finance)
Nitin Bajpai	TERI	Temporary Employer
Parthaa Bosu	EDF (Environmental Defence Fund)	India lead Advisor
Preksha Dugar	PLR Chambers	Associate
Priya Sreedharan	United States Agency for International Development (USAID)	Senior Clean Energy Advisor
Puja Tewary	Bloomberg Philanthropies	
Rhea Cordiero	MacArthur Foundation	Consultant
Rohit Pathania	Centre for Science and Environment (CSE)	Programme Manager of the Energy group
S.K. Paliwal	Central Pollution Control Board	Scientist-D
S.Sahu	Coal Controllers of India	OSD (Tech)
Sahil Ali	The Brookings Institution	Non-resident Scholar

Sahil Bhandari	University of Austin	Research Assistant
Samar Verma	IDRC	Senior Program Specialist
Samayita Ghosh	Public Health Foundation of India (PHFI)	
Sandeep Dahiya	Purpose Climate Lab	
Sarath Guttikunda	URBANemissions.info	Founder/Director
Satyendra Kumar	MoEF&CC	Deputy Secretary
Shibani Ghosh	Centre for Policy Research (CPR)	Fellow
Souvik Bhattacharya	The Energy and Resource Institute (TERI)	
Suhaan Mukherji	PLR Chambers	Managing Partner
Sukanta Gupta	Central Electricity Regulatory Commission	Deputy Chief Engineering
Swagat Bam	Observer Research Foundation (ORF)	Advisor
Tarit Baran Das	CSIR-CIMFR, Dhanbad	Senior Principal Scientist
Tirthankar Mandal	World Resources Institute	Manager, Energy Policy
Urmi Goswami	Economic Times	Assistant Editor