FACTSHEET

COAL-BASED THERMAL POWER PLANTS

DISCOUNTING THE EFFECTS OF SULPHUR DIOXIDE EMISSIONS ON AIR QUALITY

1. OVERVIEW

In 2015, the Ministry of Environment, Forest and Climate Change (MoEF&CC) introduced a notification asking coal-based thermal power plants (TPPs) to comply with stringent emission norms. The TPPs were given a fixed deadline of December 2017 to mandatorily comply with the norms. Once the 2017 deadline approached, however, the Union Ministry of Power submitted another phase-in plan to MoEF&CC and requested for further extension of another seven years—till 2024—to meet the norms. The Supreme Court after much deliberation granted another five-year extension to enable power plants to meet the deadlines in a phased manner till December 2022.

So far—in 2021—only one-third of the plants have taken serious initiatives to meet the new norms. Also, an extension provided by MoEF&CC on 1 April 2021 extended the timelines for the majority of coal-based power plants in India, which are now allowed to comply with the emission norms in another three to four years. Failing this, power stations will be allowed to pay a meagre penalty and continue to spew emissions. In this scenario, it seems unlikely that the sulphur dioxide emission norms will be met, particularly the norms that are violated most.

The power sector is in fact lobbying to dilute the norms and have them withdrawn. The Central Electricity Authority (CEA) published in 2020 a report questioning the need to implement the sulphur dioxide norms for the thermal power sector.* It collected for the report data on pollutants in the ambient air quality standards around thermal power stations. The report suggested phased implementation of the sulphur dioxide norms as ground-level concentrations of sulphur dioxide around thermal power stations are very low.

The report was prepared in response to a meeting held on 21 January 2020 by the Union Minister of Power and New and Renewable Energy to review the progress of installation of flue gas desulphurization (FGD) systems in thermal power stations. The meeting was convened to gauge whether thermal power stations were taking adequate measures to meet the emission norms. FGD systems use equipment to reduce emissions of sulphur dioxide from coal-based thermal power stations. The power stations informed through CEA the Minister who was taking stock of the situation that the norms may be unwarranted as most cities in India have no pollution issues with regard to sulphur dioxide build-up. The Minister asked CEA to provide a brief paper on the same, in response to which CEA prepared the report.

CSE notes that the facts in the report are incomplete. Sulphur dioxide gas has the potential to form sulphates and increase particulate matter in the environment—this potential has not been included in the CEA study. CSE wants to point out though this report the missing links in the study and highlight the necessity to implement the norms on an urgent basis.

* https://cea.nic.in/old/reports/others/thermal/trm/Review%20of%20Plant_Emission_Standards%2029.pdf

2. WHAT DOES THE CEA STUDY SAY?

The Ministry of Power at a webinar organized by CSE presented a brief of the CEA analysis of ambient air quality data around power stations for a capacity of 86,272 MW. CEA in its report, however, presented an analysis of the ambient air quality data around power stations for only 35,708 MW.

This CSE report includes both data that CEA shared in its report as well as data picked from slides presented by the Ministry of Power at CSE's webinar in 2020.

The CEA analysis showed that most of the coal-based thermal power stations in their vicinity had very low concentrations of sulphur dioxide (see *Table 1: Sulphur dioxide in ambient air and thermal power capacity*). According to the analysis, about 60 per cent of the installed capacity is located in areas where ambient sulphur dioxide concentrations are less than 30 micrograms per cubic metre (µg/m^3).

Table 1: Sulphur dioxide in ambient air and thermal power capacity
According to CEA, SO_2 maximum range marked in green requires no action with regard to SO_2

SO_2 max. range (µg/m^3)	0–10	11–15	16–20	21–25	26–30	31–35	36–40	>40
MOP PRESENTATION								
Thermal capacity (MW)	10,920	10,160	7,560	6,340	9,834	10,380	2,528	28,550
Percentage	12.66	11.78	8.76	7.35	11.40	12.0	2.93	33.09
CEA REPORT								
Thermal capacity (MW)	6,900	6,700	2,980	2,220	8,250	–	1,598	7,060
Percentage	19.13	18.8	8.3	6.2	23.1	–	4.5	19.8

Source: Central Electricity Authority, 2021
*MoP–Ministry of Power

To conduct this study, in June 2020 CEA sent a request to all large thermal power generating companies to provide ambient air quality data (PM, SO_2 and NO_x) for at least the last one year collected from the ambient air quality monitoring system (AAQMS) located in their plants. After analysing the data, CEA proposed five regions: Regions 1, 2, 3, 4 and 5 (see *Table 2: CEA's five-region proposal*) corresponding to the sulphur dioxide levels in the ambient air in the regions. It concluded that action be taken immediately to implement the norms in power plants in Region 1 and in the next phase for those in Region 2; no action was needed to be taken in power plants whose ambient sulphur dioxide levels in the immediate vicinity was less than 30 mg/Nm^3.

CEA suggested that the aim of the emission norms for thermal power stations should be to achieve uniform air quality throughout the country. According to the CEA report, implementing the air quality norms stipulated by the Ministry of Environment, Forest and Climate Change would not help achieve uniform ambient air quality at different locations across the country. It said that rolling out these norms would result in increased electricity costs for consumers and would not necessarily reflect in reducing ambient air pollution—even if it reduces pollution from chimneys—in some areas.

Table 2: CEA's five-region proposal
CEA advocates that no action to control SO_2 is required if ambient air concentrations are low

Region	Ambient air SO_2 levels	FGD installation
1	>40µg/m^3	Immediately
2	>30µg/m^3 and ≤40µg/m^3	In second phase
3	>20µg/m^3 and ≤30µg/m^3	Not required at present
4	>10µg/m^3 and ≤20µg/m^3	
5	>0µg/m^3 and ≤10µg/m^3	

Source: Central Electricity Authority, 2021

The study presented by the Ministry of Power considered data from about 65 power stations across India. It identified the need for sulphur dioxide control in only two of the 65 power stations: Guru Gobind Singh Super Thermal Power Plant (GGSSTPP)—or Ropar Thermal Power Station—(Punjab State Power Corporation Limited [PSPCL]) and Sanjay Gandhi Thermal Power Station (Madhya Pradesh Power Generating Company Limited [MPPGCL]). The published CEA report doesn't include a list of power stations.

Both studies reached the same conclusion, i.e. in areas where development is high, atmospheric air quality ranges from poor to severe. Strict control of emissions is required in such key areas for thermal power stations in Region 1. In the next phase, FGD systems can be installed in power plants in Region 2. Details on when the next phase is set to begin is unclear and no action is currently needed for power plants in Regions 3, 4 and 5.

3. SUMMARY OF CEA REPORT AND CSE OBSERVATIONS

The CEA report has six sections—the first is the introduction and last the recommendations. We have accordingly condensed our observations section-wise, with our observations placed parallel to key concerns expressed in the study.

SECTION 2—AMBIENT AIR QUALITY (AAQ) DATA

This section summarizes ambient air quality data around thermal power stations and categorizes power plants into five categories based on air quality—Level I: >40 μg/m^3, Level II: 31–40 μg/m^3, Level III: 21–30 μg/m^3, Level IV: 11–20 μg/m^3 and Level V: 0–10 μg/m^3.

Page no. and para	CEA report findings	CSE observations
Sulphur is less in ambient air, so is the control necessary?		
Page 4 of 74, para 1	The latest ambient air quality (SO_2, NO_2, PM_{10}, $PM_{2.5}$) data monitored for the 745 stations located across the breadth of country has been published for the year 2018 by CPCB. Even if only 24 hour average (max.) data is analysed, it can be seen that the SO_2 ground based levels across the country are mostly within a range of 0–40μg/m^3 which is good as per the MoEF&CC standards. This suggests that high particulate matter ($PM_{2.5}$/PM_{10}) levels is a country-wide phenomenon and the particulate matter contribution by the thermal power plants has to be controlled to the new emission standards (Dec 2015).	Sulphur is a mineral that is safe and non-reactive in solid form. On oxidation it turns into sulphur dioxide. Sulphur dioxide typically stays in the atmosphere for four days (residence time). It oxidizes at a rate of <1–5 per cent per hour, depending on sunlight, humidity, strong oxidants such as ozone, and the presence of metal-containing particulates that may act as catalysts. SO_2 may disperse over a long distance from its point of emission before it becomes oxidized or is deposited to a terrestrial or aquatic surface. This kind of dispersal is referred to as long-range transportation of air pollution (LRTAP). Ultimately the gas reacts with air and forms sulphates (SO_4 anions). These ions get attracted on the particulate matter or dust in the ambient air. These sulphate particles commonly comprise over 10 per cent of the fine particulate matter in the ambient air in India, often much more during heavy-pollution episodes. Major cities in India have sulphate component of up to 40 per cent of their total particulate matter (see *Box 1*). Therefore, it is not correct to say that sulphur dioxide is not a problem and that the regulator should only focus on PM. The problem of SO_2 cannot be taken in isolation; it has to be considered along with the PM. If the issue of PM is to be addressed, sulphur dioxide should also be reduced.

BOX 1: SECONDARY PARTICULATE CONVERSION A POTENT RISK

Major cities in India have sulphate component up to 40 per cent of their total particulate matter (see *Table 3: Percentage sulphate particles in particulate matter*).

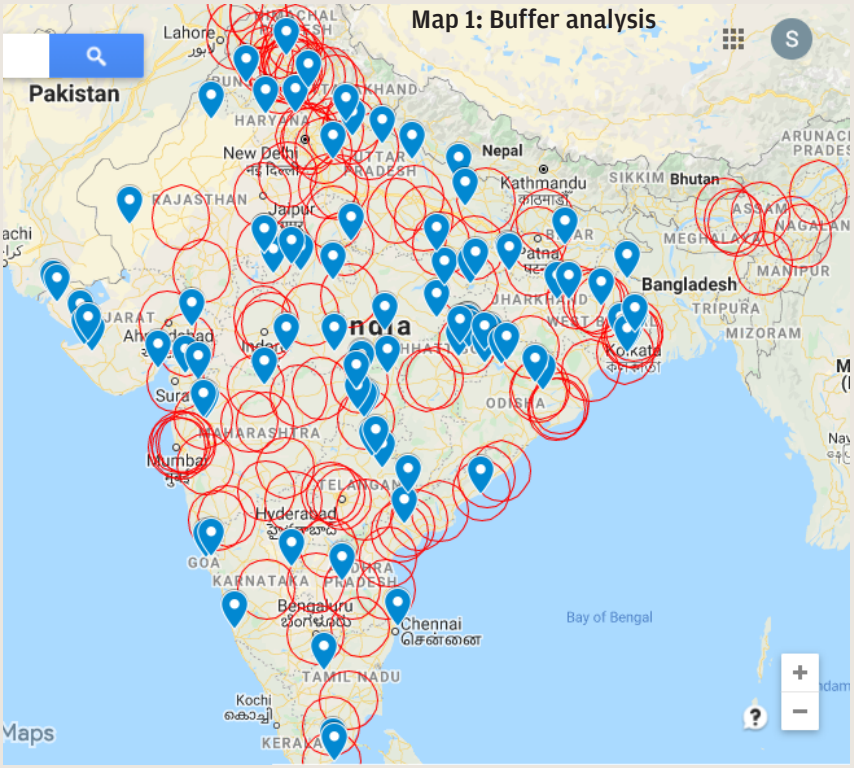
It is to be noted that 123 non-attainment cities have been identified so far—about half of these have coal-based thermal power stations in the vicinity (see *Map 1: Buffer analysis*). If this buffer is extended to a radius of 250–300 km, all the non-attainment cities have coal-based thermal power stations in their radius. The pollution effect can be considered a pan-India issue. Sulphate particles cause over one million premature deaths each year. However, there is no systematic as well as regular monitoring of the dangerous trend of SO_2 converting into sulphate particles as of today.

Table 3: Percentage sulphate particles in particulate matter

Place	Sulphate in PM (µg/m^3), % total of PM
Delhi	55(~20–40%)[1]
Kanpur	Up to 43.6 (14%)[2]
Vadodara	35 (~15–20%)[3]
Kolkata	14[4]
USA	1.9–3.6 (<1%)[5]
Europe	0.34–1.68 (<1%)[6]

References:

1. Mukesh Sharma; PhD and Onkar Dikshit; PhD, Professors, Department of Civil Engineering, Indian Institute of Technology Kanpur, Kanpur, Comprehensive Study on Air Pollution and Green House Gases (GHGs) in Delhi.
2. Mukesh Sharma et al. 2003, Investigations into formation of atmospheric sulfate under high PM10 concentration, Atmospheric Environment, Elsevier Science Limited, UK, Vol. 37, No 14, p. 2005–13
3. Sinha, S.N., et al. A correlation of secondary aerosol (nitrate and sulfate) with respirable particulate matter (RPM) in ambient air at different traffic junctions of Vadodara city. *Journal of environmental biology* 26.2 (2005): 187–90.
4. Dr D. Chakravarty, senior scientist, West Bengal Pollution Control Board, Kolkata, India, CSE conference: The leapfrog factor, April 2004, New Delhi.
5. Sandberg et al. J. Air Pollut. Control Assoc. 26 (1976) 559
6. EMEP, 1991–99



Source: Centre for Science and Environment, 2021

<table>
<tr><th>Page no. and para</th><th>CEA report findings</th><th>CSE observations</th></tr>
<tr><td colspan="3">Thermal power plants (TPPs) situated in remote areas hence pollution doesn't impact people</td></tr>
<tr><td>Page 4 of 74, para 2</td><td>However, power plants located in an area where quality of air is very good in terms of SO_2 can be exempted from installation of additional equipment to control SO_2 emission from stack.

A large number of thermal power stations are located in remote locations away from towns with little habitations around.</td><td>Good air quality in the immediately vicinity of a power plant cannot be the only factor counted to limit SO_2 levels from plants. According to source apportionments studies, in India plumes from power stations travel up to 300 km during which time most gases are converted into secondary particulates. Sulphur dioxide in the atmosphere gets converted into sulphates by a variety of chemical mechanisms, primarily photochemical, oxidation and adsorption reactions. The atmospheric lifetime of sulphur dioxide is about 10 days.

The sulphate thus formed stays in the atmosphere for a longer time. An important factor affecting the total amount of sulphate produced is residence time in the atmosphere—the longer the time for reaction, the greater the conversion of sulphur dioxide to sulphate. Sulphate particulates stay in the air, get dispersed to longer distances for considerable time and their accumulation in the air is a risk to health.</td></tr>
<tr><td colspan="3">Only some states have sulphur dioxide accumulation issue as per satellite imagery</td></tr>
<tr><td>Page 5 of 74, para 1</td><td>The locations can be identified as small clusters in the states of Odisha, Jharkhand, Chhattisgarh, Maharashtra, Tamil Nadu, and Gujarat.</td><td>The small clusters identified in satellite imagery that have high sulphur concentrations in India are where power plants are located. This is a clear indication that coal-based thermal power stations are major contributors of SO_2. No line or other patterns are visible, establishing the fact that vehicles and other mobile sources have switched to lower-sulphur-containing BS6 fuel.
This sulphur dioxide can travel pan-India and sulphates formed can affect the ambient air.</td></tr>
<tr><td colspan="3">Sulphur dioxide control is needed in only power stations located in thermal power stations in Level I regions</td></tr>
<tr><td>Page 5 of 74, para 2</td><td>To achieve tangible results, the SO_2 emission control equipment in the thermal power plants located in level I regions should have to be installed on priority basis. The regions as identified under level II can be covered subsequently under the next phases. Presently no action is required for the plant located in region under level III/IV/V as the SO_2 present in ambient air of this area is very less and as per CPCB the quality of air is good in regards to SO_2.</td><td>This interpretation is erroneous as particulate matter, aerosols and other pollutant levels in the 300 km surrounding radius (impact area) of the plant need to be studied to understand pollutant levels.</td></tr>
<tr><td colspan="3">Sulphur dioxide pollutant doesn't reflect in AAQI index</td></tr>
<tr><td>Page 6 of 74, para 1</td><td>Table 2: Various SO_2 limit values as per air quality index (AQI), MoEF&CC
<table>
<tr><th>Concentration range ($\mu g/m^3$)</th><th>Good</th><th>Satisfactory</th><th>Moderately polluted</th><th>Poor</th><th>Very poor</th><th>Severe</th></tr>
<tr><td>SO_2</td><td>0–40</td><td>41–80</td><td>81–380</td><td>381–800</td><td>801–1,600</td><td>1,600+</td></tr>
</table></td><td>Ambient air quality index is a simplified derivative which assigns weightage and is used by regulators to sensitize public on the ill-effects of pollution. Sulphur dioxide is a sub-index used in the computation of the index. The sub-indices for individual pollutants at a monitoring location are calculated using their 24-hourly average concentration value (eight-hourly in the case of CO and O_3) and health breakpoint concentration range.

The contribution of sulphur dioxide in the form of secondary particulates is not captured in the indices.</td></tr>
</table>

SECTION 3: THERMAL POWER PLANT EMISSIONS

CEA has in this chapter divided power stations into five categories based on the data on sulphur dioxide in ambient air. It demands relaxation from installing FGD plants, i.e. they don't recommend sulphur dioxide control measures, for three levels, and more time for installing one of the levels. It has extrapolated this study based on data from 35,708 MW capacity.

Page no. and para	CEA report findings	CSE observations
Power stations pollute only by generating ash		
Page 7 of 74, para 1	Locally it contributes large quantity of bottom ash, fly ash (PM) and some emissions of SO_2/ NO_x.	The statement in the report misinterprets the environmental issues. As mentioned earlier, 50 per cent of the total sulphur dioxide emissions in the country are emitted from coal-based thermal power stations. NO_x emissions are also a matter of serious concern. Power stations today are able to meet the NO_x norms only post its dilution from 300 mg/Nm^3 to 450 mg/Nm^3. Similarly CSE's recent report *An Ashen Legacy* found over 50 per cent of the thermal power stations in the country were not able to meet 100 per cent of the fly ash generated. This is an issue of fly ash, bottom ash, SO_2 and NO_x norms. Limiting pollution impact only due to fly ash is of no benefit.
Stack height disperses sulphur dioxide pollution		
Page 7 of 74, para 2	The present stack height of thermal power plant is designed to take care of the dispersion of SO_2/ NO_x emissions from thermal power plants and its impact can be seen from the ambient air quality data of various thermal power plants.	Dispersion does not mean no pollution but pollution spread over a large area. As explained above, the effect of sulphur dioxide pollution has to be looked at in totality as it can trigger sulphate formation. The stack height is 200 m and above in power plants. With plume rise of another 200 m, the dispersion at such a height would mean not an immediate concentration of pollution in the vicinity but a spread, dilution and accumulation of pollutants. This gives the opportunity for pollutants to spread and react to form further particulate matter. This is cause for concern and due efforts are needed to reduce the pollutant.
Long-range transport of sulphur dioxide from thermal power stations needs more study		
Page 7 of 74, para 3	The long-range transport of thermal plant emissions (SO_2/NO_x/PM) from the stacks, atmospheric drift/ dispersion, and their period life shall have to be analyzed exhaustively to find their cumulative influence on the surrounding areas, which shall in turn identify the location specific thermal plants which need immediate attention. Therefore, the response to different regions for the effective control of emissions can be different.	Several studies that find sulphur dioxide contributing to pollution pan-India have highlighted the need to limit pollution from thermal power stations. A separate expert appraisal committee evaluates and analyses the impacts of thermal power plants that also takes into consideration long-range transport studies. The long-range transports so far has been adequately analysed post which the Ministry of Environment, Forest and Climate Change notified the standards in 2015.
In the case of Talwandi Sabo thermal power station, it is stipulated that SO_2 control is not necessary		
Page 7 of 74, para 4	In one of the air quality dispersion modelling studies conducted recently by IIT Kanpur for the impact of Talwandi Sabo thermal power plant (District Mansa, Punjab) emissions to the ambient air quality has shown that SO_2 levels of about 45.9µg/m^3 at the plant drop significantly to 1µg/m^3 at a distance of 40 km … Thus, beyond 40 km the impact of SO_2 becomes insignificant. Similar trend is seen in the case of NO_x.	The result indicates that the plant requires an FGD system as the immediate surroundings have such high levels of SO_2 levels. Else no other industrial activity or human activity that can lead to minor SO_2 emissions should be muted from the region. Also, the results have been cherry picked from the report. The modeller has clearly established that up to 1 per cent of PM in the NCR region, which is 250 km away, is because of the SO_2 emissions from this plant. Due to the absence of FGD in the plant, the plant affects people in its surroundings and up to a radius of 250 km.
Immediate action to limit sulphur dioxide is needed in only a fraction of power stations		
Page 8 of 74, para 4	[It] may be stated that the immediate action has to be taken for thermal capacity of 7,060 MW and next phase for 1,598 MW as per Table-3. But as per Table-4 these thermal capacities are 1,460 MW and 5,048 MW for immediate action and next phase respectively.	Data is not consistent and the conclusion is hence error-ridden. If implementation is not done, it can potentially pose a threat to health and cause damage to material and property.

SECTION 4: APPROACH ACCORDING TO AAQ

This chapter is a mere repetition of the earlier chapter, with additional reasons cited for requesting delay in implementation of the emission norms.

Page no. and para	CEA report findings	CSE observations
Technology experience not available, need more time to comply		
Page 9 of 74, para 2	The phasing will help in understanding the impact of these control equipment on their effectiveness and give a time for future course correction.	Since early 2017, CEA has been consulting thermal power stations and working on the phasing plan after which the 2017 deadlines were extended to 2022. It takes three years to construct a power plant today. In the last five years, not a single power plant has been retrofitted with FGD to comply with the 2015 norms. Therefore this statement by CEA is simply an attempt to delay implementation indefinitely.
FGD suitability in Indian conditions needs to be ascertained		
Page 9 of 74, para 2	There are different technologies available to control the flue gas emissions and their suitability needs to be ascertained in the Indian conditions.	CEA could have already spoken about various technologies in 2015. This is not the right juncture to discuss this and can be seen only as a delay tactic. FGD is already operating in India and other parts of the world. Suitability to technical parameters such as coal quality, age of the plant, plant load factor, limestone quality, etc. needs to be ascertained—these are not mentioned clearly.
Thermal power stations cannot construct the technology within the stipulated deadline		
Page 9 of 74, para 2	Installing the pollution control equipment in one go in all the thermal power stations may not be the best option to adopt	In 2015, the norms were announced and plants were to comply by 2017. The Supreme Court noted the non-compliance and the power stations thereafter committed to meeting the norms by 2022. In other words, seven years have been granted to adopt the technology—it is not an announcement that was to be adopted in one go.
Market not established		
Page 10 of 74, bullet 1	Lack of time for developing indigenous manufacturing facility	According to the manufacturers, over 90 per cent of the components are manufactured indigenously in India and the concerned manpower to manufacture the same is available. Only sophisticated components are imported. It would be wrong to say that FGD systems use entirely imported equipment.
Page 10 of 74, bullet 2	Resorting to import of equipment thus creating market for mainly foreign companies	
Page 10 of 74, bullet 3	Huge investment of over one lakh crore required. Majority of which will lead to the foreign exchange drain for outsourcing of new technology, skilled manpower and equipment as there is lack of time to develop the facility indigenously.	

SECTION 5: INTERNATIONAL EMISSION NORMS

This chapter has attempted to summarize the international emission norms available for coal-based thermal power plants (TPPs). Most of this information, however, is outdated and the interpretations are irrelevant.

CSE has based its comments on its interaction with experts has summarized the international norms of coal-based TPPs followed in various countries which are more stringent than that is notified in India (see *Box: Emission norms—a comparison*).

Page no. and para	CEA report findings	CSE comments
Page 11 of 74, para 2	Emission norms are location specific in some of the countries (China, Australia) which have substantial coal fired power generation. Key areas in China which includes Beijing City, Tianjin City, Hebei Province, Wuhan City and many more areas have stricter emission standards over the baseline emission levels as shown	Based on its findings, the report asks for location-specific exemptions. Countries have tightened location-specific standards globally, but in no cases have location-specific waivers been granted. Allowing such exemptions could set a dangerous precedent, prompting other companies to demand similar concessions and permits to locate their factories in relatively cleaner cities, with little effort to limit pollution. Region-specific standards are notified by the local governments in an attempt to reduce pollution in their areas. India also has provisions to make norms stringent. States like Maharashtra usually impose stringent norms in the consent in comparison to the national standards.
Page 9 of 74, para 2	Similarly, in Australia, the emission levels for coal fired power plants varies from region to region	

Box 2: Emission norms—a comparison

	PM	SO_2	NOx
INDIA			
Old standards	150–350	None	None
2015 revised standards			
Units installed before 31 December 2003	100	600 (< 500 MW) 200 (≥ 500 MW)	600
Units installed during 2004–16	50	600 (< 500 MW) 200 (≥ 500 MW)	300
Units installed from 1 January 2017	30	100	100
WORLD STANDARDS			
China	30	100	100
China (key regions)	20	50	100
China new plants (eastern)	10	35	50
Japan (general)	50	Permit	200
Japan (permit)	5	27	40
EU BAT	5	20	50
US—NSPS/NESHAP	14.5	100	110
US—BACT	14.5	22	70

* In mg/Nm^3 (milligram per normalized cubic metre)
Note: NSPS = New source performance standards, NESHAP = National emission standards for hazardous air pollutants (NESHAPS), BAT = Best available technology, BACT = Best available control technology

Source: MoEF&CC revised norms 2015 and CSE study *Heat on Power*, 2015

4. RECOMMENDATIONS

The sulphur dioxide norm for which the Central Electricity Authority is seeking relaxation is a criteria pollutant. Typically the background levels of sulphur dioxide in the ambient air of healthy environments are below 2 $\mu g/m^3$. Its presence over 20 $\mu g/m^3$ (24-hour mean) or 500 $\mu g/m^3$ (10-minute mean) can have severely deleterious effects on health.

Recent research has revealed that even slight increase in the sulphur dioxide concentrations in the ambient air affects sensitive groups such as babies, pregnant women and people suffering from asthma or chronic lung disease. In addition, the pollutant gets accumulated in the air and also converts to secondary particulate matter. Pan-India particulate matter is a concern; about 126 non-attainment cities have already been identified in the country.

The analysis to seek such a relaxation is clearly incomplete and ambiguous, and is cherry-picked with the intention of diluting the norms.

CSE appreciates the interest of the Minister of Power to convene meetings to review progress of the implementation of the norms. Studies such as the CEA report, however, can only increase confusion and mislead with regard to the intent, and increase pollution impacts. They also indicate that CEA and the Ministry of Power have not placed adequate trust in the findings and consequent regulations brought in by the Ministry of Environment, Forest and Climate Change. In addition, there is a denial as well as a vacuum in the understanding of the air pollution emergency and the contribution of power stations to it. The CEA study has attempted to use linear relationships and histogram-type analysis to study the impact of pollution from coal-based thermal power plants. Concepts of chemistry have not been touched on even briefly. Chemical reactivity, long-range transport, accumulation, atmospheric fate of the pollutant and related aspects—such as chemical reactivity, long-range transport, accumulation, atmospheric fate of the pollutant—have not been counted. We advise peer-reviewed and scientific reports—after inviting comments from the public research institutions, members from the Central Pollution Control Board and relevant stakeholders—as well as the industry to get the full picture of the issue.

Centre for Science and Environment recommends that the following:

1. Stakeholders must publish transparently at least minute-on-minute raw ambient air quality data for the last one year for air quality monitored by stations in their immediate vicinity for public research and scrutiny. The Central Electricity Authority must publish the collated one-year minute-on-minute raw ambient air quality data submitted by power stations for this analysis.
2. Central Electricity Authority and Ministry of Power should work in tandem and ensure that thermal power plants implement norms that are good for environment as well as the health of people.
3. Stakeholders must work together to aid implementation of the norms. Techno-commercial issues have to be aggregated and better strategies have to be evolved to resolve the same. In addition, the ministry should work to bring in policies to disincentivize plants that are not taking enough measures to meet the deadline and incentivize power plants in the direction to meet the deadline by implementing policies such as first run.

Centre for Science and Environment
41, Tughlakabad Institutional Area,
New Delhi 110 062 Phones: 91-11-40616000
Fax: 91-11-29955879 E-mail: cse@cseindia.org
Website: www.cseindia.org