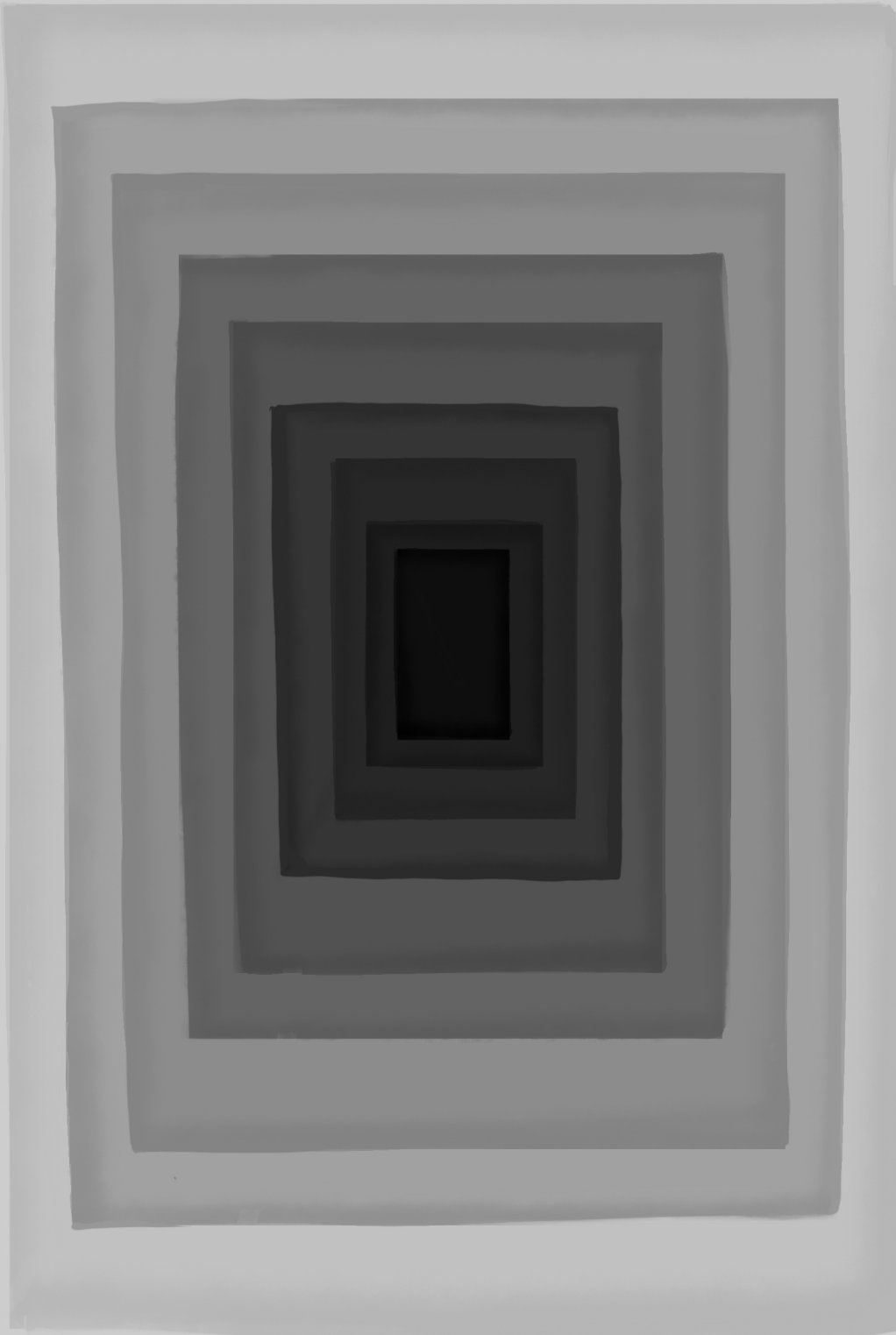


# Waiting for Godot?

A review report on environmental norms for thermal power plants in India





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Prayas (Energy Group)

September, 2022



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*\*A well-known play by Samuel Beckett*

## About Prayas

Prayas (Initiatives in Health, Energy, Learning and Parenthood) is a non-Governmental, non-profit organization based in Pune, India. Members of Prayas are professionals working to protect and promote public interest in general, and interests of the disadvantaged sections of the society, in particular. Prayas (Energy Group) works on theoretical, conceptual, regulatory and policy issues in the energy and electricity sectors. Our activities cover research and engagement in policy and regulatory matters, as well as training, awareness, and support to civil society groups. Prayas (Energy Group) has contributed to policy development in the energy sector as part of several official committees constituted by Ministries, Regulatory Commissions and the Planning Commission/NITI Aayog. Prayas is registered as SIRO (Scientific and Industrial Research Organization) with Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India.

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## 1. Why this study now?

India's power sector is heavily dependent on coal-based thermal generation, which accounts for over 75% of the country's electricity generation. With greater recognition of the socio-environmental fallouts of coal-based generation, the availability of viable alternatives like renewable generation, and policy support for such alternatives, the future role of coal in the power sector is being debated. For instance, India committed to increasing its capacity of and generation from non-fossil sources as part of its Panchamrit declaration at COP26 (Press Information Bureau, 2021). This is not to say that coal will stop being a key player, especially in the short and medium term. While the share of coal is likely to decline slowly over a multidecadal timeframe, the absolute quantity of coal used for electricity generation may even increase in the near future (Central Electricity Authority, 2020).

With the continued dependence on coal, the associated environmental impact and health risks will also continue. The pollution level in areas with a higher concentration of thermal generators, like Korba and Singrauli, has consistently been found to be high (Dahiya, et al., 2020). This poses a health risk to resident communities. In fact, communities living in areas near coal-based assets, such as thermal power plants (TPPs), are known to suffer from chronic health complaints such as respiratory diseases, musculoskeletal conditions, and cardiovascular issues, due to increased exposure to toxic pollutants (Dahiya, Myllyvirta, & Costantino, 2022; Rinchin, Chatterjee, Ganguli, & Jana, 2017). TPP emissions are known to affect pollution levels at locations that are distant from the TPP as well (Guttikunda & Jawahar, 2014). Further, the National Clean Air Programme (NCAP) has targeted concentration reduction of particulate matter in 122 cities, many of which are in the proximity of TPPs, by 2024 (MoEFCC, 2019). Given all this, controlling pollution from coal-based electricity generation in a timely manner becomes crucial.

Imposing emissions standards for TPPs are an avenue to control emissions, and address some of the associated concerns with thermal generation. In India these standards were introduced through the Environment Protection Rules, which were first notified in 1986, and stipulated standards for the emissions of particulate matter from TPPs. In December 2015, the Ministry of Environment, Forest, and Climate Change (MoEFCC) amended these rules through the notification of the Environment Protection (Amendment) Rules, 2015 (Ministry of Environment, Forest and Climate Change, 2015). This amendment introduced standards for water consumption,

waste water discharge and for the emission of sulphur dioxide, oxides of nitrogen, and mercury in addition to making the standards for the emissions of particulate matter more stringent.

However, the efficacy of these standards would only be as good as their implementation, which has been fraught with delays and dilutions. Since the notification of the 2015 amendment to the Environment Protection Rules, the deadline for compliance has been deferred thrice, and there have been several instances of regulatory ambiguity and delays from key actors. Additionally, planning and coordination towards implementation of these standards has been inadequate though it is critical, given the far-reaching impact of compliance to the standards. This impact also extends to electricity consumers, both in terms of cost and reliability of supply.

This report aims to highlight the interplay of the environmental standards with the power sector, and the role of various stakeholders in relation to the environmental standards. It also takes stock of the progress on this front in the almost seven years since the standards were first amended, and suggests some ways forward.

## **2. Why are the environmental norms the power sector's business?**

In order to adhere to the environmental standards (or norms), most TPPs would need to undertake additional expenditures. These expenses could be towards using coal that has lower sulphur content or installing pollution control equipment (PCE) or other such measures towards adherence. Based on factors such as the size, location, type of technology, age of the TPP and the quality of coal used for generation, most TPPs are likely to require some type of PCE installation to comply with the standards introduced in the 2015 Amendment. This could vary from Flue Gas Desulphurisation (FGD) systems and Dry Sorbent Injection to control SO<sub>2</sub> emissions, to Electrostatic Precipitators for PM emissions, or Selective Catalytic Reactors to address NO<sub>x</sub> emissions, amongst others.

The extent of capital expenditure towards PCE will vary significantly based on TPP conditions and the PCE required. The operation of PCE will also likely result in increased auxiliary consumption<sup>1</sup>, use of reagents and other raw materials, or coal washing, and will thus, contribute to additional

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<sup>1</sup> Auxiliary consumption is the energy consumed by the equipment needed to operate the power plant. It is usually expressed as a percentage of the energy generated by the power plant, and for coal based TPPs, it is around 8% without PCE.



operating costs for the TPPs. Such additional capital and operational expenses affect the cost of generation of the TPPs and the price consumers pay for the power generated. For instance, FGDs, one of the more expensive PCEs, can increase the cost of generation by Rs. 0.25 to Rs. 0.75, per unit of electricity generated (Srinivasan, et al., 2018).

In addition to the financial impact, the installation of PCE also requires significant planning and time for installation and connection with the operating TPP. This varies across types of PCE, and even then, there are differing accounts on the time required for such installation, as elaborated in Box 2. During the commissioning of some types of PCE, the TPP may even need to be shut down for a period, and in the absence of careful planning and scheduling, multiple TPPs may shut down simultaneously resulting in insufficient power being available to meet consumer demand.

Thus, adherence to the norms requires additional technical and operational planning for TPPs, and additional expenditures and risks of disruption in power supply to the consumer. Adherence, therefore, needs coordination, planning, and concerted action at the plant and sector level. Power sector institutions, such as the Ministry of Power (MoP), Central Electricity Authority (CEA) and the Electricity Regulatory Commissions (ERCs), are tasked with ensuring coordination and clarity of operations within the power sector, and safeguarding consumer interests. This would include minimising costs while ensuring the norms are adhered to. Given this, some aspects pertaining to TPP compliance with the environmental norms fall in the ambit of power sector institutions, making compliance to environmental norms the power sector's business also.

The additional expenditure due to adherence, for instance, will impact the price of electricity paid by the consumers, which is regulated by the respective ERCs. To elaborate, the price paid for electricity, or the electricity tariffs, are typically two-part, consisting of a fixed cost and a variable cost. The fixed cost is related to the capital investment for the TPP and is received by the generator as long as it is available to generate, even if it does not actually generate electricity. The variable cost on the other hand is predominantly related to the fuel costs and are incurred only when electricity is generated and is paid in proportion to the units of electricity actually generated. It is expected that a significant portion of the costs incurred for installation and operation of the PCE will fall under fixed costs. TPPs that supply power in accordance to contracts

with distribution companies<sup>2</sup> (DISCOM) have their tariffs determined according to Section 62 or discovered under Section 63 of the Electricity Act, 2003 (Prayas (Energy Group), 2019).

Tariffs of TPPs with a contract to sell power to a DISCOM under Section 62 are determined by the appropriate ERC. This tariff is calculated to include the recovery of all prudent costs plus a profit (which is linked to the return on equity component deployed by the TPP). Respective (Central, State, or Joint) ERCs stipulate and regulate these tariffs as per the provisions of Tariff Regulations. In accordance to these regulations, ERCs are tasked with ensuring prudence in expenditure, and approving any changes to the tariffs of Section 62 TPPs, such as the additional expenditure and tariff impact on account of adherence to the environmental norms.

Section 63 TPPs, on the other hand, have their tariffs discovered through the process of competitive bidding, where the DISCOM signs a contract with the TPP that will supply electricity at the lowest rate (also known as the discovered tariff). The contract that incorporates and makes the discovered tariff binding is called the Power Purchase Agreement (PPA), which also specifies the extent and conditions under which the discovered tariff can be modified. This includes instances of *change in law*, where changes in tariff can be attributed to government action and the modification of an existing Indian law, such as the 2015 amendment. As per the provisions in the PPA, the cost impact on account of adherence to such change in law should not adversely affect the economic position of the TPPs, and can be passed on to the consumer.

Given these regulatory linkages, the roll out of the environmental norms, as per its first amendment in 2015 to its latest iteration in 2022, impacted the power sector and was impacted by the role of power sector stakeholders, in addition to their environmental sector counterparts, as elaborated in the next section.

### **3. 2015-2022: What happened with the environmental norms?**

#### **3.1. 2015 to 2017: The first amendment and the first deadline**

The 2015 amendment to the Environmental Protection Rules was a step in the right direction and it introduced norms comparable to prevailing international standards (Bhati, 2016). Table 1 reproduces the norms introduced in the 2015 amendment.

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<sup>2</sup> TPPs may also supply power directly to consumers through bilateral contracts or exchanges. The consumer may also own a TPP and consume its generation (also known as captive TPPs).

Table 1. TPP environmental standards according to the 2015 amendment

Parameter	Applicability	Standards
Particulate Matter (PM)	TPPs installed before 31 <sup>st</sup> December 2003	100 mg/Nm <sup>3</sup>
	TPPs installed from 1 <sup>st</sup> January 2004 up to 31 <sup>st</sup> December 2016	50 mg/Nm <sup>3</sup>
	TPPs installed from 1 <sup>st</sup> January 2017 (including those that have been accorded environmental clearance and are under construction)	30 mg/Nm <sup>3</sup>
Sulphur Dioxide (SO <sub>2</sub> )	TPPs installed before 31 <sup>st</sup> December 2003	Units smaller than 500 MW: 600 mg/Nm <sup>3</sup> Units greater than 500 MW: 200 mg/Nm <sup>3</sup>
	TPPs installed from 1 <sup>st</sup> January 2004 up to 31 <sup>st</sup> December 2016	Units smaller than 500 MW: 600 mg/Nm <sup>3</sup> Units greater than 500 MW: 200 mg/Nm <sup>3</sup>
	TPPs installed from 1 <sup>st</sup> January 2017 (including those that have been accorded environmental clearance and are under construction)	100 mg/Nm <sup>3</sup>
Oxides of Nitrogen (NO <sub>x</sub> )	TPPs installed before 31 <sup>st</sup> December 2003	600 mg/Nm <sup>3</sup>
	TPPs installed from 1 <sup>st</sup> January 2004 up to 31 <sup>st</sup> December 2016	300 mg/Nm <sup>3</sup>

	TPPs installed from 1 <sup>st</sup> January 2017 (including those that have been accorded environmental clearance and are under construction)	100 mg/Nm <sup>3</sup>
Mercury (Hg)	TPPs installed before 31 <sup>st</sup> December 2003	Units greater than 500 MW: 0.03 mg/Nm <sup>3</sup>
	TPPs installed from 1 <sup>st</sup> January 2004 up to 31 <sup>st</sup> December 2016	0.03 mg/Nm <sup>3</sup>
	TPPs installed from 1 <sup>st</sup> January 2017 (including those that have been accorded environmental clearance and are under construction)	0.03 mg/Nm <sup>3</sup>

Source: Environment (Protection) Amendment Rules, 2015, MoEFCC Notification dated 7th December 2015

In addition to the emission standards listed in Table 1, the amendment also introduced norms pertaining to water consumption<sup>3</sup>. As per the 2015 amendment, all TPPs were required to be in compliance with the standards within two years of the notification, i.e., by 7<sup>th</sup> December 2017. A draft of this amendment based on consultations with some stakeholders was made available for public comments before the finalisation of the amendment. However, neither the comments received nor any reasoned responses to these comments were made public. Such lapses in due process while finalising the first notification of the norms has made it possible for stakeholders like the TPPs to claim that these norms and timelines were not realistic.

As discussed earlier, it is essential to carefully plan the installation of PCE in order to ensure uninterrupted power supply. Towards this end, a phased implementation plan for the installation

<sup>3</sup> TPPs with Once Through Cooling must install Cooling Towers and achieve specific water consumption of 3.5 m<sup>3</sup>/MWh. All existing Cooling Tower based TPPs must reduce specific water consumption to 3.5 m<sup>3</sup>/MWh. New plants installed after 1<sup>st</sup> January 2017 must meet specific water consumption up to 2.5 m<sup>3</sup>/MWh, and achieve zero waste water discharge.

of PCE was prepared by the CEA (on behalf of the MoP), and submitted to the MoEFCC. However, despite the December 2017 deadline, this implementation plan was prepared only as late as June 2017, though many types of PCE have long gestation periods.

In addition, there was also limited regulatory clarity regarding financial and procedural aspects of adherence, and the TPPs themselves were not proactive in this regard. Only a few generators even initiated the requisite approval proceedings with their respective ERCs, and that too after significant delays. To list some examples, the Lalitpur Power Generation Company approached the Uttar Pradesh ERC only in November 2017, and Nabha Power petitioned the Punjab ERC in January 2018, which meant they were far from compliance by the December 2017 deadline. And these were among the plants that even approached the ERCs – most plants did not even do that. This practice of little or late action from the generators has continued and contributed to subsequent missed deadlines.

Even TPPs commissioned after 1<sup>st</sup> January 2017, which were supposed to adhere to the environmental norms from the start of operations, continue to operate without PCE. As per CEA's Broad Status Report for March 2022 (Central Electricity Authority, 2022), generators such as Bhadradi TPP and Singareni TPP in Telangana and units 7 and 8 of Suratgarh TPP in Rajasthan—units which have been commissioned after January 2017—still do not have operational PCE. It is important to note that these power plants received their environmental clearance after the amendment of 7<sup>th</sup> December 2015. In its affidavit to the Supreme Court, the MoP held that plants that had obtained their environmental clearance post 7<sup>th</sup> December 2015 would be allowed to be commissioned only contingent on their compliance with the new environmental norms (CEA affidavit on behalf of Ministry of Power, 2018). Yet, these TPP units have been commissioned and are generating power, despite not having operational PCE at the time of their commissioning. In fact, it is surprising that they were furnished with the consent to operate from their corresponding PCBs in the first place<sup>4</sup>.

Given the lack of sufficient due process in the initial roll out of the norms and the reluctance in compliance from several key actors, as seen above, a revised deadline was discussed even before the first deadline came to pass. In October 2017, the MoP, based on discussion with the MoEFCC

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<sup>4</sup> Since emissions data for the plants is not publicly accessible, it is not clear if these units are adhering to the norms, though the chances that they adhere to them are slim without any PCE.

and some stakeholder consultations, proffered a revised phased implementation plan which outlined staggered implementation of PCE for TPPs by 2022, a new deadline which provided a five-year extension to ensure compliance. This new deadline was validated by the Central Pollution Control Board (PCB), which issued directions to TPPs in December 2017, to ensure compliance in accordance to the MoP's revised implementation plan.

### 3.2. 2018: Introducing the second deadline

In February 2018, the MoEFCC submitted an affidavit to the Supreme Court as part of an ongoing case, and accepted the 2022 deadline for all plants except those located in the National Capital Region (NCR). Given the high levels of air pollution in the region, an earlier deadline of 2019 was accepted for TPPs located in NCR. The still ongoing case at the Supreme Court brings to the fore several key issues regarding the treatment of the environmental norms, as discussed in Box 1.

#### **Box 1. MC Mehta versus the Union of India: an ongoing environmental saga**

The MC Mehta versus Union of India case in the Supreme Court has been ongoing since 1985 (Writ Petition Civil No. 13029 of 1985) and has now become an omnibus case dealing with myriad strands of the environment affecting the NCR. The matters pertaining to the environmental norms were subsumed into this case in November 2017, and are yet to see resolution.

From November 2017 to February 2018, the discussions in court were mainly focused on the immediate implementation of the 2015 norms, with no extensions or exemptions. In February 2018, the MoEFCC submitted an affidavit in response. It stated that the MoP submitted a seven-year compliance timeline, i.e., compliance by 2024, which was found to be too long by the MoEFCC. Instead, a five-year implementation timeline to be completed by 2022, was considered. It was also stated that the phased implementation plan accordingly prepared by the MoP accounted for *"techno-economic feasibility while ensuring the availability of power to all at affordable cost without any disruption"*.

Another affidavit on behalf of the MoEFCC was submitted in March 2018, in which the timeline ranging from 2018 to 2022 was stated to be *"a very compact and compressed schedule"*, but it also stated that this *"very tight"* timeline for implementation may be allowed. Additionally,

matters such as the date of adherence for new units (commissioned post 2017), fly ash utilisation, water consumption standards, hesitancy from certain TPP units towards compliance, the CEA's monitoring role, and the NOx standards were also flagged. Incidentally, the NOx norms were diluted five months later.

In August 2018, the MoP submitted an affidavit in the matter, wherein it stated that the onus of ensuring implementation lay with the generators, and hence, it would only take responsibility for monitoring of the implementation plan for Central TPPs, under NTPC and DVC. The MoP also insisted on milestone-based tracking of central TPPs, to ensure progress towards compliance by December 2021, ahead of the 2022 deadline, subject to dilution of the NOx norms. On the matter of new or under construction TPPs being required to comply from start of operations, the MoP took a stand that this should not be a condition for TPPs which have obtained their environmental clearance before 7<sup>th</sup> December 2015. As seen earlier, even this condition has been violated. It was also deemed that no penalties need be considered. The MoP did not engage with the impact of compliance costs on the Merit Order Dispatch (MoD) stack<sup>5</sup> and any incentives for early/timely compliance were also not explored.

Multiple hearings on several of these issues were held between September 2018 and August 2019, during which there were new stakeholders (such as the Association of Power Producers), and multiple requests for extensions and dilutions, and there was hard-fought consensus on a few matters. However, the case has been languishing since, with hardly any hearings taking place.

As seen above, in many instances, delays and dilutions were argued for, legitimised, and allowed at the apex court. But despite the commitments made to the Supreme Court, some actors have failed to live up to them. The MoEFCC, for instance, solemnly vouched for the 2019 (for NCR TPPs) and 2022 (for non-NCR TPPs) deadlines in its 2018 affidavit to the Supreme

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<sup>5</sup> The Merit Order ranks the various generation sources and stations in the ascending order of their variable costs and is determined for each distribution utility separately. Generators at the top of the list, with the lowest variable costs, are run (or dispatched) first, to address the utility's demand, followed by those with progressively higher variable costs, in accordance with Merit Order Dispatch. This mostly pertains to gas and coal based TPPs, as sources such as renewables and nuclear are categorised as must run, which means that they have to be dispatched if they are available.

Court. This notwithstanding, the MoEFCC notified new deadlines extending beyond 2022 (elaborated in Section 3.3 and 3.4) without seeking explicit permission of the Supreme Court.

With the new timeline in place, the MoP issued a directive to the Central ERC in May 2018, recognising the need for a regulatory framework to address the implementation of the environmental norms, and acknowledging the 2015 Amendment as a change in law event. While this aided in streamlining timely implementation, it came only after the first deadline of December 2017 had already lapsed.

This continuing pattern of delayed action from key institutions towards implementation was also mirrored by institutions tasked with monitoring progress towards compliance to the norms. The CEA, for instance, started monitoring the status of PCE implementation only after the first deadline had lapsed. While the CEA continues to monitor the progress of PCE implementation<sup>6</sup>, its checks of progress have been conflated with and limited to FGD installation. Another example are the PCBs, which are responsible for monitoring whether TPPs are in adherence with the stipulated emission standards, and holding the non-compliant accountable. However, the PCBs have done little to penalise or deter non-compliance<sup>7</sup>, as evidenced by the inaction towards TPPs that continue to operate without the requisite PCE (and hence most likely did not adhere to stipulated norms), especially those commissioned after 1<sup>st</sup> January 2017<sup>8</sup>. Further, while the PCB is expected to continuously monitor emissions from TPPs, the data thus collected is not accessible in the public domain. This impedes the transparency of process and makes it difficult to identify which TPPs, if any, are compliant with the norms. Such checks and balances to compliance

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<sup>6</sup> The CEA carries out TPP wise tracking of FGD installation progress across stages such as such as planning, feasibility study completion, tender specification, award of bids, and project completion (Central Electricity Authority, 2022).

<sup>7</sup> There are a few media reports of some TPPs being issued notices for non-compliance by corresponding SPCB, but it is not clear whether such action has resulted in any penalties or adherence by the TPP.

<sup>8</sup> Even though MoEFCC issued a fresh amendment to the norms in 2021, in the absence of any official notification otherwise, all TPP units commissioned from January 2017 were legally obliged to comply with the 2015 notification until the 2021 notification. However, available evidence suggests that the PCBs failed to enforce this.



become particularly relevant in light of the multiple dilution and changes to the norms introduced in the 2015 amendment such as the June 2018 amendment<sup>9</sup>.

### 3.3. 2019 and 2020: Addressing cost recovery and more amendments

Even after two amendments to the emission standards, acknowledgement of the first amendment being a change in law, and a lapsed deadline, there was little regulatory clarity regarding the rollout of the environmental norms, especially with regard to the cost impact associated with adherence. They continued to be dealt with on a case-by-case basis. The Central ERC's Tariff Regulations, notified in March 2019 (Central Electricity Regulatory Commission, 2019), and its subsequent amendment in August 2020, attempted to address this lacuna for Section 62 TPPs regulated by it. These tariff regulations clarified the process to deal with the increased tariff on account of the additional expenditure incurred by complying to the environmental norms. They clarified the tariff structure with respect to PCE and provided financial and operational details regarding the cost recovery mechanism for additional expenditure on account of PCE for Section 62 TPPs. Similarly, a cost recovery mechanism for Section 63 TPPs was introduced by the Central ERC through a discussion paper, later in September 2020, and finalised through a suo-motu order in August 2021, after public consultations (Central Electricity Regulatory Commission, 2021). To date, no state ERC has issued similar regulations to the best of our knowledge.

While these regulatory actions provided pivotal inputs on procedure and assuaged some of the associated ambiguities with regard to the environmental norms, they failed to pre-empt crucial challenges associated with adherence. They were notified only after the December 2019 deadline for NCR TPPs had already lapsed, with the Section 63 order being notified just 16 months before the revised deadline of December 2022. Along with this, TPPs also continued their apathetic approach to environmental norm adherence. Not surprisingly, the December 2019 deadline was

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<sup>9</sup> The 2018 amendment relaxed the norms pertaining to water consumption. New plants installed after 1<sup>st</sup> January 2017 were now required to meet specific water consumption up to 3 m<sup>3</sup>/MWh (2.5 m<sup>3</sup>/MWh earlier), and achieve zero waste water discharge. It also revoked the applicability of these norms on TPPs using sea water.

missed by most of the NCR TPPs as far as installing PCE went<sup>10</sup>. Moreover, CERC's actions only address these issues at the central level. At the state level, matters pertaining to the environmental norms are still dealt with on a case-to-case basis. Further, while CERC's regulations allow for recovery of PCE related costs based on prudence checks, they are based on installation of PCE and not conditional on adherence to the norms. This is a matter of concern because the bulk of PCE related expenditure is reflected as a fixed cost which is liable to be paid whether or not the PCE is operational and thus controlling pollution.

Even as the aforementioned regulatory and monitoring measures were introduced, amendments and dilutions were introduced to the norms themselves. After the 2015 and 2018 amendments, the Environment Protection (Amendment) Rules, 2020 was notified in October 2020, which diluted the NOx emission standards to 450 mg/Nm<sup>3</sup> from 300 mg/Nm<sup>3</sup> for TPPs installed between 1<sup>st</sup> January 2004 and 31<sup>st</sup> December 2016.

Demands for such dilutions and delays have come from several quarters since the notification of the 2015 amendment. Given its role in the prevention of pollution and the protection of the environment, the MoEFCC has the jurisdiction to define suitable norms, and to deter non-compliance. However, in most instances, it seems to have accepted such demands with little pushback, and introduced amendments to address them.

Such action from the MoEFCC, though, is not unique to this instance. MoEFCC mandated that TPPs located beyond a stipulated distance from a coal mine must use coal with at most 34% ash, which would typically require 'washing' of the coal. This would aid not only in reducing fly-ash emissions but potentially also reduce cost<sup>11</sup>. However, there were challenges with the treatment of washery pollutants and reject disposal, and several issues with its implementation which led to limited compliance. Then, in May 2020, the MoEFCC surprisingly issued another notification which did away with the hitherto requisite usage of coal with 34% ash by TPPs (Ministry of Environment,

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<sup>10</sup> Of the ~16 GW which was supposed to have FGDs installed by December 2019 according to the revised timelines, only 1 GW had actually done so. However, in theory, lack of PCE installation does not translate to non-adherence. TPPs may be able to adhere to the norms through other alternative methods (use washed, low sulphur coal, etc.). Adherence in such cases can only be confirmed based on publicly released emissions monitoring data, though chances are that the plants did not adhere to the norms.

<sup>11</sup> It was expected that the increased cost of washed coal would be more than offset by savings in transportation and ash-handling costs.

Forest and Climate Change, 2020). Interestingly, the 2020 notification by the MoEFCC attempted to assuage some concerns with the environmental fallout of this action, by stating that the TPPs— which are required to adhere to the 2015 norms (suitably amended) in a timely manner were better equipped to deal with the pollution impact of generation from unwashed coal. This underscores the importance of TPPs adherence to the emission norms since addressing the environmental effects of using high-ash coal is also contingent on their timely compliance. Since low-ash coal is no longer mandated for use by TPPs, the effects of non-compliance to the norms will likely be more pronounced than if TPPs were non-compliant whilst using low-ash coal.

Another amendment to the Environment Protection Rules was notified by the MoEFCC in March 2021 (Ministry of Environment, Forest and Climate Change, 2021). Not only did the 2021 amendment introduce yet another extension to the deadline, but it also rendered the plans and implementation schedules hitherto discussed irrelevant.

### **3.4. 2021-2022: The third and fourth deadlines and a penalty for polluting**

Prior to the notification of the 2021 amendment, the CEA was directed by the MoP<sup>12</sup> to submit a paper regarding plant location specific emission standards. It is surprising to note that a report on emissions and the environment was requisitioned from the CEA, which is a technical institution with expertise on matters pertaining to electricity and not the environment or pollution. The resultant CEA paper (Central Electricity Authority, 2020) recommended a graded FGD installation plan, based on geographic location and ambient SO<sub>2</sub> levels, to be rolled out in a *ten-to-fifteen-year* timeframe. The paper's basis for proposing the delayed timeframe is that ambient SO<sub>2</sub> concentrations around TPPs are low and hence very few locations need PCE such as FGDs (the costliest PCE). However, studies suggest that ambient SO<sub>2</sub> levels are not the only measure of pollution from SO<sub>2</sub> emissions (Cropper, et al., 2020; Guttikunda & Jawahar, 2014). SO<sub>2</sub> and other sulphur oxides can react in the atmosphere and lead to the formation of secondary particulate matter, and are a major contributor to PM pollution, which is a major health concern. This perspective of secondary particulate formation is not discussed in the CEA paper, calling into question the recommendations offered. A more recent study commissioned by the CEA from the Indian Institute of Technology, Delhi discusses the formulation of SO<sub>4</sub> aerosols (particulates) from SO<sub>2</sub> (Centre for Atmospheric Sciences IIT Delhi, 2022). This study also mentions that emissions

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<sup>12</sup> As part of discussions in a meeting chaired by Minister of State (IC) Power and NRE on 21<sup>st</sup> January 2020.

from TPPs and the secondary sulphate aerosols can travel long distances and affect atmospheric concentrations. Therefore, controlling SO<sub>2</sub> emissions is likely to be critical to limiting particulate matter concentrations rather than for controlling ambient SO<sub>2</sub> concentrations alone.

The 2021 amendment, taking some cues from CEA's report on geography-specific timelines, introduced deadlines for TPPs that were categorised into category A, B, and C based on proximity to cities having million plus population and critically polluted areas or non-attainment cities, as defined by the Central PCB<sup>13</sup>. It also introduced an 'environmental compensation', which is a category-wise penalty for non-compliance. Interestingly, the CEA published a review of the 2021 amendment (Central Electricity Authority, 2021), in which it cited manufacturing constraints and supply bottlenecks and again recommended action based on the questionable basis of ambient SO<sub>2</sub> levels. On this basis, it reiterated its case for a timeline that extended another ten years, i.e., till 2035.

The 2021 amendment required the Central PCB to constitute a taskforce to categorise TPPs. The taskforce published the finalised list in December 2021, with just a year remaining for category A TPPs to be in compliance (Central Pollution Control Board, 2021)<sup>14</sup>. Thus, these plants can technically claim that they were officially informed about the deadline applicable to them quite late for them to be able to comply with it, though the onus of compliance has laid with generators since the 2015 notification.

Perhaps in response to this, and in response to a MoP office memorandum to the MoEFCC dated 3<sup>rd</sup> May 2022 suggesting a further postponement of the deadline by two years, the MoEFCC published yet another amendment in September 2022 (Ministry of Environment, Forest and Climate Change, 2022). The change in the timeline for compliance between the 2021 and 2022 amendment is illustrated in Table 2. As per the 2022 amendment, the deadline for compliance with SO<sub>2</sub> emission norms is further pushed by another two years for each category, while the deadline for compliance for the other norms remain unchanged. The environmental compensation was also made uniform across the categories in the latest amendment.

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<sup>13</sup> To its credit, it did not introduce a ten to fifteen year time frame for adherence to norms.

<sup>14</sup> This list also underwent revision, and the categorisation of plants was revised in June 2022 (Central Pollution Control Board, 2022).

Table 2. Change in timelines for compliance as per the 2021 and 2022 amendment

Type of Unit	Amendment	Compliance for?	Deadline for Compliance		
			Category A (within 10 km radius of NCR or cities with million plus population)	Category B (within 10 km radius of critically polluted areas or non-attainment cities)	Category C (TPPs not included in category A or B)
Non-retiring units	2021 amendment	For all parameters	31 <sup>st</sup> December 2022	31 <sup>st</sup> December 2023	31 <sup>st</sup> December 2024
	2022 amendment	For parameters other than SO <sub>2</sub> emissions	31 <sup>st</sup> December 2022	31 <sup>st</sup> December 2023	31 <sup>st</sup> December 2024
		For SO <sub>2</sub> emissions	31 <sup>st</sup> December 2024	31 <sup>st</sup> December 2025	31 <sup>st</sup> December 2026
Retiring units*	2021 amendment	For all parameters	31 <sup>st</sup> December 2022	31 <sup>st</sup> December 2025	31 <sup>st</sup> December 2025
	2022 amendment	For parameters other than SO <sub>2</sub> emissions	31 <sup>st</sup> December 2022	31 <sup>st</sup> December 2025	31 <sup>st</sup> December 2025
		For SO <sub>2</sub> emissions	31 <sup>st</sup> December 2027	31 <sup>st</sup> December 2027	31 <sup>st</sup> December 2027

Source: Prayas (Energy Group) compilation based on MoEFCC notifications dated 31<sup>st</sup> March 2021 and 5<sup>th</sup> September 2022

\*Retiring units are those that submit an undertaking to the Central PCB and CEA, declaring their date of retirement and requiring exemption from compliance to the norms on grounds of such retirement.

A majority of the TPPs fall into category C, with the most relaxed deadlines for compliance. Thus, with the 2022 amendment, most of the TPPs now have to fully meet SO<sub>2</sub> emission norms only nine years—and non-SO<sub>2</sub> emission norms seven years—after the initial December 2017 deadline for compliance. Moreover, the CPCB classification does not include about 51 GW of captive coal

capacity<sup>15</sup> in the country that also should be in compliance with the emission norms – so, about 20% of the coal based capacity in the country can claim to not even know its official compliance deadline.

This back to back push back of deadlines without due process, along with the papers from the CEA asking for even more lax timelines for compliance, raises questions about the seriousness of the power sector to comply with even the latest deadlines.

In addition to the papers, the CEA has also evaded proactive action that could have aided adherence. In keeping with its expected function, the CEA did come out with cost benchmarking for FGDs (Central Electricity Authority, 2019) and information regarding FGD technology selection (Central Electricity Authority, 2020). However, the cost benchmarking exercise only included indicative figures for the base cost of FGD installation, and flagged other components of cost without even offering similar indicative figures. The document on technology selection included only broad criteria for selection and limited briefs about some FGD technologies. Both of these were broad, brief and belated, with them being published in February 2019 and February 2020, respectively. Moreover, they only included cost estimates of installing FGDs rather than possibly the best way to adhere to the norms. CEA appears to collect emissions data from all generators, in accordance to Format 60 under CEA's Furnishing of Statistics, Returns & Information Regulations, 2007. It also has data on the technologies used by different plants. Potentially, these could have been used to come up with plant-specific guidelines on the most effective way of meeting the norms, which would have simplified the process for all concerned.

These indicate a larger pattern of ad hoc and ambiguous action when it comes to taking steps towards the implementation of the environmental norms, in contrast to the persistent efforts to push for dilution of the norms and extension of the deadlines. In the almost seven years since the notification of the 2015 amendment, key stakeholders across the environment and power sectors have avoided proactive and timely action towards ensuring TPPs' compliance with the environmental norms. With demands for delays, lack of clarity and seriousness, and absence of accountability measures like proper monitoring, transparency and penal actions for non-compliance, it does not bode well for the success of the latest iteration of the environmental

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<sup>15</sup> A captive generation TPP is one which is set up by a person or an association of people, for the primary purpose of self-consumption. It requires that 51% of the electricity generated by such TPP is consumed by the owners.

norms' timeline. The next section discusses and analyses the broad implications of the 2022 amendment.

#### 4. What are the implications of the 2022 amendment?

The taskforce constituted by the Central PCB, as required by the 2021 amendment, included members from the MoEFCC, MoP, Central PCB, and CEA, and was responsible for categorising TPPs based on population and pollution parameters. New timelines were introduced for TPPs in the 2022 amendment based on this categorisation.

##### 4.1. Capacity and ownership spread of TPPs across category A, B, and C

A total of 600 TPP units were considered, amounting to ~211 GW. 66 units (~21 GW) fall into category A, 72 units (~23 GW) are category B, and the remaining 462 units, amounting to ~167 GW, are category C TPPs. Note that this classification does not include about 51 GW of captive TPPs, and therefore, ambiguity continues to prevail over their status and preparedness to meet the norms. The categorisation determines the applicable compliance deadlines for the TPP units. The emission standards they must adhere to, however, are dependent on the age-based categorisation introduced in the 2015 amendment. Table 3 captures the split of category A, B, and C across the age-based categorisation.

*Table 3. Capacity split of TPPs across age-based and location-based categorisation*

Age-based category	Location-based category	No. of units	Capacity (GW)
TPPs installed before 31 <sup>st</sup> December 2003 (Laxest norms)	A	41	8
	B	33	9
	C	140	32
	Total	214	49
TPPs installed after 1 <sup>st</sup> January 2004 up to 31 <sup>st</sup> December 2016 (Medium norms)	A	25	12
	B	33	13
	C	263	104
	Total	321	129
TPPs installed from 1 <sup>st</sup> January 2017 (Tightest norms)	A	0	0
	B	6	2
	C	59	31
	Total	65	33
Total		600	211

*Source: Prayas (Energy Group) compilation based on MoEFCC and CEA documents*

According to this grouping, category A TPPs installed after 1<sup>st</sup> January 2017, would be required to meet the (relatively) most stringent compliance standards, within the tightest timelines. However, as seen in Table 3, this is not applicable to any unit in the country. 61% of the coal-based capacity in the country was installed between 2004 and 2016, and are subject to relatively modest compliance standards. Of this 80% of TPPs are in category C. Further, 9% of the TPPs installed after 2016, subject to the strictest compliance standards, are category C plants with the laxest deadlines. The capacity across these categories is also at varying stages of progress towards compliance, some aspects of which are tracked by the CEA and elaborated in Box 2.

### **Box 2. Tracking compliance: a necessary but narrow exercise**

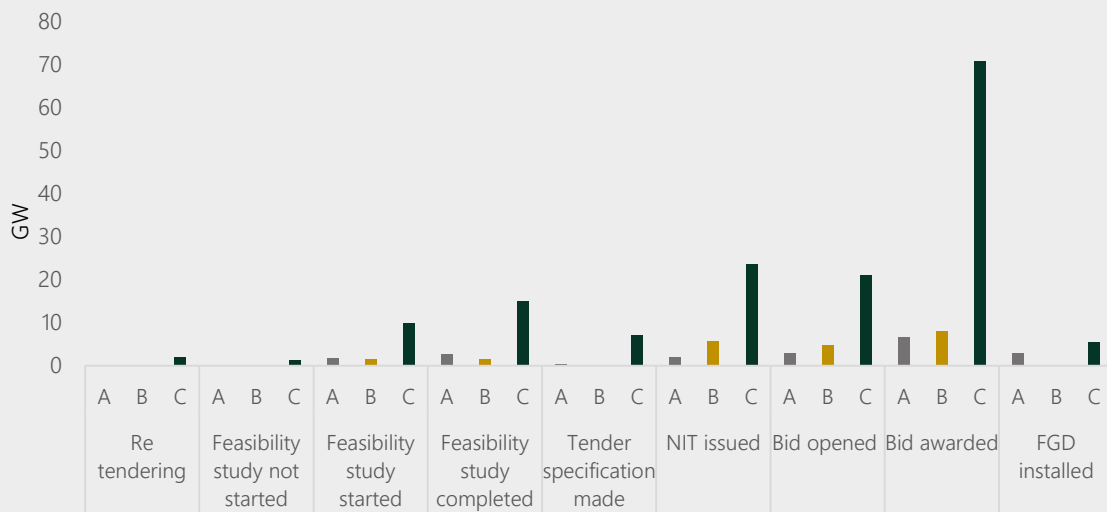
The CEA's monitoring of progress towards compliance is limited to tracking the status of FGD implementation across TPPs in the country. A broader alternative of tracking compliance could have been considered, wherein TPPs could have been mandated to submit a plan of compliance with the norms by a stipulated date. Effective follow up on this could have been ensured by requiring regular (say, quarterly) progress updates to be submitted to the CEA, which could then publish a report tracking overall progress towards compliance with the norms. Currently, however, the scope of tracking compliance is narrower, focusing almost entirely on FGDs alone.

While FGD is only one type of PCE, and even though PCE installation need not be the only way to be in compliance with the stipulated environmental standards, (further discussed in Section 4.3) such tracking is useful. Given that 197 GW, of the total 211 GW of thermal capacity has FGD plans underway, it can prove to be an effective indicator of at least PCE installation to meet the SO<sub>2</sub> and particulate emission standards, if not norm compliance.

CEA's report tracks FGD implementation across progressive procedural stages such as feasibility study started, feasibility study completed, tender specification made, notice inviting tenders (NIT) issued, bid opened, bid awarded, and FGD commissioned. As per the report's August 2022 iteration (Central Electricity Authority, 2022), around 40% of the monitored 197 GW is in the bid awarded stage but only 4% of this capacity has FGD commissioned and some capacity even has to be retendered, as seen in Figure 1.



Figure 1. FGD status across category A, B, and C



Source: Prayas (Energy Group) compilation based on CEA's August 2022 FGD status report and CPCB TPP categorisation for environmental norms

While such tracking of FGD implementation is useful, it would have been more useful to also track the status of key milestones after awarding of the bid and before commissioning of the FGD, such as commencement of work and stagewise progress.

Further, there is ambiguity in the time required to install and utilise the FGD. For instance, as per the CEA, it takes around six months for bidding and finalising the tender, followed by around three years to commission a FGD after placement of the order, followed by an additional two to six months of downtime to operationalise the installed FGD and resynchronise it to the grid (CEA affidavit on behalf of Ministry of Power, 2018). This is vastly different from the time period recognised by the Maharashtra ERC, which states that *“there is no adverse impact of availability of the generating units as . . . FGD installation shall be carried out during the annual overhaul of the Unit”*. It estimates a three-week commissioning period for the FGD (MERC, 2018). Yet another source (response to an RTI filed with NTPC, received in May 2018) identifies an 18-to-36-month window, varying across units, starting from the award of contract to the commissioning of FGD.

Given this ambiguity in time frames, it is interesting to note that there is still 33% of category A capacity which is yet to open a bid. Thus, it is highly unlikely that the category A plants would

have been able to meet the deadline of 31st December 2022 as per the 2021 amendment, though they may just about be able to meet the revised deadline of 31<sup>st</sup> December 2024 as per the 2022 amendment.

With a deadline of 2026 for compliance to SO<sub>2</sub> emission norms, non-retiring category C TPPs may be able to meet their norms if they proceed with acquiring, installing and commissioning the requisite PCE soon. However, as touched upon in Section 4.3, the precedents for this happening are not very encouraging even for category C TPPs.

When considering state-wise, 25% of the total category A capacity lies in Maharashtra. Most category B plants though, are located in Chhattisgarh and Tamil Nadu, with the states accounting for 46% of the capacity in the category. And in the case of the most populous category, 13% of the capacity in category C lies in Madhya Pradesh.

With regard to sectors (ownership), the total thermal capacity of ~211 GW is split between the private (~76 GW), state (~68 GW), and central (~67 GW) sectors. The spread of category A, B, and C TPPs between these sectors is captured in Table 4. This indicates that state-owned plants will have the most to do for compliance with non-SO<sub>2</sub> norms in the initial years.

*Table 4. Sector-wise split of category A, B, and C (in GW)*

	Central	State	Private	Total
Category A	7	10	4	21
Category B	7	10	6	23
Category C	53	47	66	167
Total	67	68	76	211

*Source: Prayas (Energy Group) compilation based on MoEFCC and CEA documents*

As anticipated, the norms and the new deadlines impact TPPs differently, varying across geography, ownership, and commissioning date. On this basis, the specific cost impact will also vary, but remains significant on average. The MoP has stipulated that the additional capital and operational cost incurred on account of compliance can be passed on to the consumers. Further, according to MoP's letter dated 30<sup>th</sup> July 2021, in order to protect TPPs that comply in time, the

impact on variable costs, and by extension their impact on the MoD stack, is also not to be considered till the date mentioned in the 2021 amendment<sup>16</sup>.

#### **4.2. Challenges regarding environmental compensation**

The penalty, or 'environmental compensation', introduced varies from Rs. 0.20 to Rs. 0.40 per unit of electricity generated, as per the 2022 amendments. This penalty will impact the variable cost of non-adherent TPPs, after the deadlines have lapsed. However, the introduction of this penalty mechanism without the requisite procedural and regulatory clarity has raised more questions than it has answered. Given that the penalty is applicable per unit of generation whose emissions violate the norms, it is not clear how TPPs will be penalized. Will they be penalized only for the generation during the period in which the emissions were above the norms, i.e., instantaneously? Will the penalty be applied pro-rata for the period of violation based on the generation on the day or week or month of the violation? Or, would some other mechanism be used?

It is known that the penalty cannot be passed on to consumers and will have to borne by the TPP. It remains to be seen whether this penalty will be deterrent enough for the TPPs to be pushed towards timely compliance. A separate but related aspect is the implication of this penalty for the MoD. However, it is not clear whether the penalty will be considered when building up the MoD stack. If it is not, then non-adherent TPPs may generate more than if it were considered, and by extension, pollute more.

On the other hand, if the penalty impact is to be considered for the MoD, penalties would have to computed on an 'instantaneous' basis if it has to affect the MoD in the next 15-minute block – and it is not clear if mechanisms have been designed to do so. Even if this happens, in actuality generation from a non-adherent TPP would depend on the block of time the MoD stack has been prepared for and the existing variable cost (i.e., MoD position) of the TPP relative to the other TPPs available for generation at that time. With the penalties introduced in 2021 amendment and scaled up in the 2022 amendment, a TPP's position on the MoD stack will likely

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<sup>16</sup> There is lack of clarity on whether the "date mentioned in the 2021 amendment" refers to category-wise deadlines or the final, national deadline mentioned in the 2021 amendment (31<sup>st</sup> December 2025). It is also not clear how the 2022 amendment will impact this, though presumably, the MoD stack would now be unaffected until the revised deadlines.

be affected, but the extent of this impact and the deterrence from non-compliance it will provide needs to be seen.

Further, the penalty impacts a TPP's MoD position and generation only if non-compliance is an exception, and not the rule. If most or all TPPs are non-compliant, penalties would be applicable across the board, which would more or less result in the same stack, resulting in no reduction in pollution.

Additionally, there is also a curious quandary built into the structure of the penalties. Since the penalties are to be borne by the TPP, and based on the understanding that the penalty will be levied per unit of generation, non-conforming TPPs have an incentive to generate less rather than more. This is particularly since their fixed costs (in most cases – the exceptions being plants without long-term PPAs) are covered, contingent to their availability. In other words, non-conforming TPPs may *prefer* being moved lower on the MoD stack, where they are less likely to get scheduled and generate, and by extension pollute and be penalised. On the other hand, if a non-conforming TPP gets scheduled, it will generate electricity and pay a penalty for it, but such generation will also result in increased pollution.

Another complication with the penalties is the impact it has on TPPs that will declare retirement. As per the 2022 amendment, retiring category A TPPs are exempt from compliance to the non-SO<sub>2</sub> emission norms till the deadline of 31<sup>st</sup> December 2022. Retiring category B and C TPPs have up to 31<sup>st</sup> December 2025 for exemption from compliance to the non-SO<sub>2</sub> emission norms, two years and one year more than the deadline afforded to their non-retiring counterparts, respectively. Retiring TPPs of all categories are exempt from compliance to the SO<sub>2</sub> emission norms up to 31<sup>st</sup> December 2027 under the latest amendment. This condition holds for TPPs that submit an undertaking to the Central PCB and CEA, declaring their date of retirement and requiring exemption on grounds of such retirement. If such declared date of retirement submitted by the TPP is before 31<sup>st</sup> December 2022 for Category A TPPs and 31<sup>st</sup> December 2025 for category B and C TPPs, they are exempt from meeting the non-SO<sub>2</sub> emission norms and paying any penalty for non-compliance with non-SO<sub>2</sub> emission norms till their declared date of retirement. For SO<sub>2</sub> emission norms, the retirement dates have to correspondingly be before 31<sup>st</sup> December 2027. Generation beyond such declared date of retirement will incur the penalty. This penalty of Rs. 0.40 per unit of electricity generated will be retrospectively applied on such generation from the compliance dates applicable to the non-retiring units of the defaulting TPP's

category, though its procedural rollout and regulatory applicability is unclear. Per this provision, TPPs planning to retire can generate till their deadline, at cheaper rates, without the burden of the non-compliance penalty or compliance costs that the non-retiring TPPs will be subject to. This effectively incentivises the push back of retirement dates of category B and C TPPs to December 2025 or December 2027 since other TPPs would either have to pay a penalty or bear additional fixed costs and variable charge for every unit of generation, giving such retiring plants a competitive advantage.

#### **4.3. Data challenges and other continuing concerns with the environmental norms**

Some problems with the previous iterations of the environmental norms continue to persist with the 2022 amendment as well.

The lack of sufficient data in the public domain, for instance. As discussed in earlier sections, tracking of environmental norm compliance in the public domain is mostly limited to monitoring installation of PCE (particularly FGD), with little information on their utilisation. Adherence to the environmental norms would depend on whether or not the emissions have been controlled during generation, which in turn is hinged on the utilisation of the PCE, and not just its installation. In theory, TPPs need not depend on PCE installations for complying to all the emission norms, and may be able to meet some of the standards through alternate avenues. This makes the monitoring of emissions crucial to understand compliance, making the absence of reliable emissions data in the public domain a cause of concern.

Data on environmental emissions for June 2022 was put out by the CEA in its 'Report of Monthly Environmental Emission by Thermal Power Plants', the first iteration of which was published in September 2022, though this was self-reported and incomplete for some TPPs (Central Electricity Authority, 2022). TPPs are also mandated to install Continuous Emissions Monitoring Systems (CEMS) (Central Pollution Control Board, 2018), and it is good practise that such data is made available on the corresponding PCB website. However, there is ambiguity with regard to the reliability of such data, given process and monitoring challenges and different state PCBs having

different outlooks towards dealing with the CEMS data they make available. In any case, this information is not publicly available for most TPPs<sup>17</sup>.

The lack of publicly available information also leads to lack of clarity. As mentioned in Section 4.1, the MoP directed the Central ERC, through a letter dated 30<sup>th</sup> July 2021, to not consider the variable cost impact of adherence to the environmental norms for determining the MoD stack, till the date mentioned in the 2021 amendment. However, this letter is not publicly accessible, with it not being hosted on the MoP or Central ERC website. Hence, there is still lack of clarity on whether the date mentioned in the 2021 amendment refers to category-wise deadlines or the final, national deadline (31<sup>st</sup> December 2025). This lack of clarity persists even with regard to tracking of implementation. While the CEA does publish a unit wise list to track the progress of PCE implementation, it is however limited to tracking FGD installations alone, and does not track some major milestones between the awarding of a bid and the commissioning of the FGD, and also does not include progress on other PCE or measures related to adherence to the water norms.

There is significant generation capacity in the form of captive generators which also need to meet the norms. Such capacity, however, is not monitored like the capacity under public and private electricity utilities and are often overlooked in most discussions around environmental norm compliance monitoring. As of 2020, India has around 51 GW of coal-based captive capacity, which is around 24% of the total coal-based installed capacity of utilities. Tracking and monitoring of the compliance status of this significant capacity is not accessible in the public domain – possibly because it's not being adequately tracked.

As seen with the past iterations of the environmental norms, the lack of clarity and sufficient monitoring, worsened by limited data availability, leaves regulatory directions open to interpretation, which invites ad hoc action, litigations, and delays.

In addition to this concern, there are also some other issues to consider. In the regime prior to the 2021 amendment, TPPs installed after 2017 were required to be in compliance with the norms from the start of their operations. But as mentioned in Section 3.1. there were several TPPs, who

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<sup>17</sup> Some rare exceptions are TPPs, such as those belonging to Rajasthan's state generation company (Rajasthan Rajya Vidyut Utpadan Nigam Limited), which publish their emissions data regularly, but this good practice has very few takers.

not only got the consent to operate but also continued to generate without any requisite PCE or repercussion, despite also having received their ECs after 7<sup>th</sup> December 2015. Now, with the introduction of the 2021 and 2022 amendment timelines, these TPPs continue to generate without PCE and escape accountability, as they are now not in violation of the norms till the new deadlines. Moreover, since these penalties for non-conformance were only notified in the 2021 amendment, it is unclear if non-conformance until the 2021 notification was/will be penalised at all and how.

Another challenge is the continuing attempt to push back the deadline for compliance, as seen in the repeated postponement of deadlines since the 2015 notification, and papers by CEA asking for further postponements.

These worrying precedents, slow progress on installing PCE and continuing legacy issues strengthen the probability of missing yet another deadline, and the possibility of regulatory uncertainty after the deadline. Hence, they need corrective, and pre-emptive actions to address the situation.

## **5. Where do we stand now?**

As established in the sections hitherto, there has been limited action under the 2015 amendment, a reset of compliance timelines with the 2021 and 2022 amendments, several iterations of dilution and delay, and a continuing attempt to push the deadline further back.

Given this, there is a likelihood of TPPs missing the latest deadlines as well. Since there was little accountability for non-compliance to previous deadlines, it is likely that TPPs will face no repercussions if this deadline also is missed. Further, over the past six plus years, matters pertaining to the norms have been passed around between the various ministries, ERCs, and other central institutions, leaving little clarity on where the buck stops and who should ultimately be held accountable for the lapses in adherence. Such patterns call into question the sincerity in implementing the norms towards addressing the socio-environmental fallouts of thermal generation, and raises questions about India ever having a tighter emission control regime. The overarching observations that emerge from this analysis are as follows.

- The process of initial definition and notification of the norms could have been better, if the MoEFCC and MoP had acted in cohesion and if the MoEFCC would have come out with detailed reasoning behind the norms and the prescribed deadlines, thus pre-

emptively addressing some of the anticipated reactions. It would have left little room for confusion and ambiguity and addressed most concerns, and enabled faster and smoother implementation.

- Implementation of the notified norms was not enabled effectively by the set of concerned institutions such as ERCs, CEA, and PCBs, and stakeholders such as thermal generators.
- Monitoring of the progress of implementation of PCE at plants, and the compliance of plants that have PCEs is also weak and not sufficiently transparent.

## 6. Where do we go from here?

We provide some suggestions below on how the prevailing status quo of low adherence and weak oversight can be improved.

1. *Compliance-based cost recovery*: Cost recovery of PCEs at plants that have installed them can be made conditional to adherence to the norms. Certification from the corresponding SPCB can be made the basis to permit such cost recovery. This will ensure that it is not just installation of PCE but norm adherence that allows recovery of costs.
2. *Reducing availability*: Plants that do not adhere to the norms may be deemed unavailable for the period (or some portion of the period) that they were not compliant – even if they were operating in that period. This will affect their fixed cost recovery and could act as a strong incentive to comply – otherwise plants may remain satisfied with recovery of fixed costs.
3. *Escalating penalties*: Since the current penalty regime may not be deterrent enough, particularly if plants can continue to recover their fixed costs, an escalating penalty regime, where penalties progressively increase for every year of non-compliance, can potentially encourage greater compliance. Such penalty amounts collected could be used to help ameliorate some of the pollution impacts in affected regions.
4. *Market-based mechanism*: To further strengthen and incentivise compliance, a market-based framework could be considered. This may provide the right incentives for plants to comply and reduce the governance overheads. While such a mechanism may seem attractive and



self-regulating, it requires careful market design, credit allocation, and market oversight if it is to function effectively<sup>18</sup>.

5. *Pro-active regulatory action:* While the CERC has taken some steps to bring in regulatory clarity regarding cost recovery of adherence related expenses, state regulators are yet to act. Even at CERC, the current approach is to treat each plant or unit on a case-by-case basis. The CERC, and through the Forum of Regulators, all state ERCs could consider developing a benchmarking-based approach to enable faster regulatory approvals and clearances without compromising on checking prudence of expenditure. Such an approach could include suitable incentives for early adherence to the norms.
6. *Discussion paper on penalty application:* As discussed in this report, there are ambiguities around how a penalty levied on per-unit of generation would be applied. The CPCB, together with CEA, should come up with a discussion paper on this topic and seek comments, before finalising the details of how the penalty for non-compliance would be applied. The discussion paper should also include details of how the generation and emissions from TPPs would be monitored, so that penalties can be levied where necessary<sup>19</sup>.
7. *Greater transparency and data availability:* Greater transparency is desirable and possible for various elements, and the respective regulatory agencies should either publish such information on their websites and/or mandate TPPs to do so on their websites. This includes data on PCE installations and their costs, granular data on emissions of each type, water consumption and discharge, electricity generation, penalties levied, penalties under dispute and penalties paid.

Even as India takes the first steps towards moving away from coal as its primary source of electricity, it needs to ensure that the impacts of coal-fired power plants on air and water are adequately addressed. The proposed environmental norms were to be a step in this direction. Unfortunately, thus far, they have existed only on paper and have not translated into effective action. The above suggestions are provided in the spirit of kick-starting some action towards effective implementation. Moreover, as this report shows, whatever approach is taken, by its very

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<sup>18</sup> Some other attempts to design market-based approaches have not succeeded very well – for example, the Perform, Achieve and Trade scheme and the Renewable Energy Certificate program (Yadav, Kannappan, Ramanathan, & Arora, 2021; Sawhney, 2021).

<sup>19</sup> Such monitoring and availability of data would be required even if it is to be a market-based approach.

nature, effective action on this front requires close and meaningful coordination between the power and environment ministries and their related institutions, which has been missing so far. Without such concerted planning and implementation of environmental safeguards, citizens cannot breathe easy.

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The socio-environmental fallouts of generation from coal-based thermal power plants are well recognised. The revision of the environmental norms in 2015, which tightened some existing standards and introduced new parameters to check emissions, were a step to address them. But even in 2022, almost seven years since the norms were first notified, the norms have not been adequately implemented or adhered to.

There are significant interlinkages between adherence to the environmental norms and thermal power plant operations, which play a significant role in the power sector. The challenges affecting compliance to the environmental norms, thus, also affect - and are affected by - the power sector. Actors across the environment and power sector, ranging from thermal generators, electricity regulators, ministries and related institutions, share the responsibility for the current state of affairs where the norms are still not sufficiently adhered to. The process of deciding the norms and deadlines, facilitating their implementation and monitoring compliance could all have been better. The actions from the relevant agencies and the resultant patterns of delays and dilution which have hitherto been observed toward environmental norm compliance seem poised to continue, with the deadline for compliance being postponed for the third time as recently as September 2022. These continuing patterns raise questions about whether a tighter emissions regime will ever be a reality in India.

Learning crucial lessons from the roll out of the norms up until now, coordinated planning between the power and environment ministries, and corresponding action from related institutions, is critical to achieve a more effective and prudent regime of emission control. Such measures should include avenues to hold key actors accountable to timely action, while enabling a more conducive environment for compliance. In the absence of this, the country's currently insufficient emission regime is likely to continue toward a deadline that never seems to arrive.