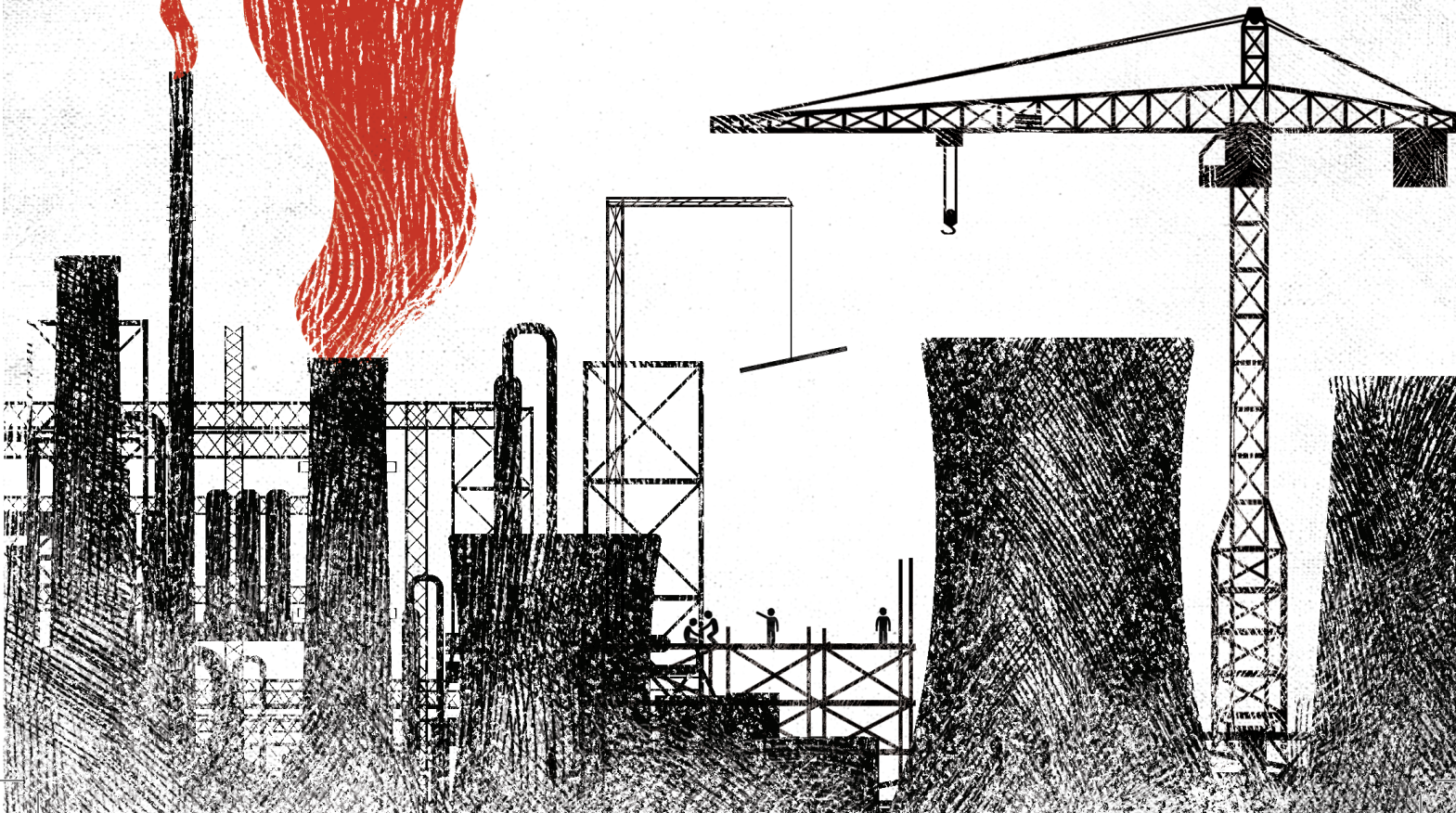




# **COAL POWER STATIONS IN U.P.**

**AN ASSESSMENT OF THEIR COMPLIANCE  
WITH NEW NORMS**





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# BACKGROUND

Uttar Pradesh (UP) has 21.5 GW of coal-based thermal power stations. They are amongst the largest source of industrial pollution which prompted the Ministry of Environment, Forest, and Climate Change to revise the emission norms. By complying with these norms, particulate matter, sulphur dioxide, and oxides of nitrogen emissions will reduce by 32, 62, and 25 per cent, respectively (see Graph 1: Pollution load reduction in Uttar Pradesh 2019) in U.P. Since the state is densely populated - pollution reduction will be immensely beneficial.

The original deadline to comply with the norms was December 2017. Central Pollution Control Board has sent directions to the stations specifying a new deadline, which was also submitted to the Supreme Court (SC). The SC expressed displeasure at the delay and sought clarifications if the deadlines can be brought forward, especially for plants that are located in densely populated or critically polluted areas. Some of the units in UP have to comply with the new norms by 2019, which will be challenging. Any non-compliance/missing the CPCB deadline may have legal consequences. This fact sheet is a documentation of the progress made by power stations and course corrections necessary to ensure timely implementation.

## POWER GENERATORS IN U.P. AND THEIR DEADLINES

The largest power generator in the state is NTPC Ltd. having a generating capacity of 9.5GW. UPRVUNL with 5.5GW is the next largest. In addition, there are four private players - Bajaj, Jaypee, Lanco, and Reliance - generating power.

- 11 per cent of the installed capacity has to follow the norms by the end of 2019 and 23 per cent by 2020. Roughly one-third of the capacity has to comply with the norms in both 2021 and 2022 (see Graph 2: Company versus coal fleet capacity and their deadline).

- Most of the capacity is close to urban clusters or in heavily polluted areas.

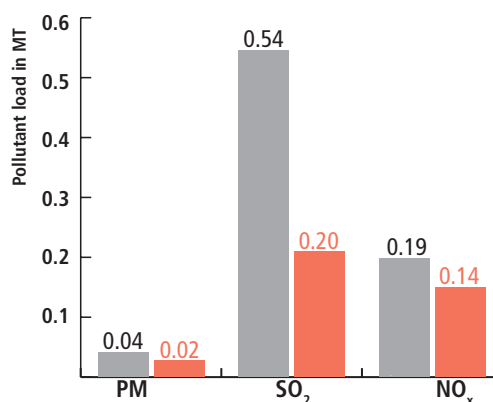
## COMPLIANCE STATUS: CURRENT

None of the stations are meeting with the sulphur dioxide limits. Nearly 70 per cent of the capacity is not meeting with the oxides of nitrogen and 50 per cent with the particulate matter limits (see Graph 3: Compliance Status in U.P.).

## Graph 1: Pollution load reduction in Uttar Pradesh 2019

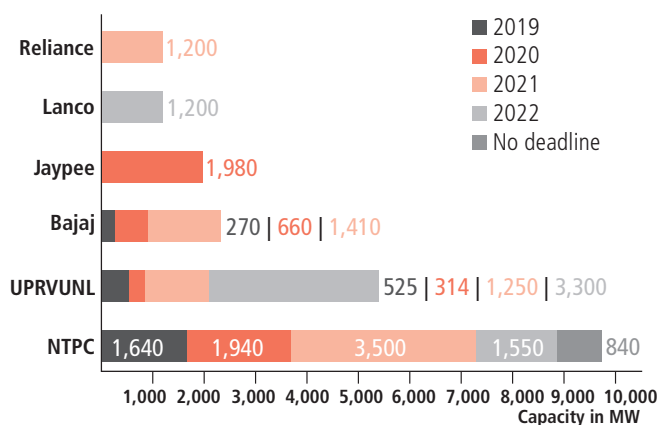
Emissions from power plants will fall sharply on implementation of the norms

■ Business as usual ■ norms compliant



## Graph 2: Company versus coal fleet capacity and their deadline

Three companies has to demonstrate their compliance by end of this year

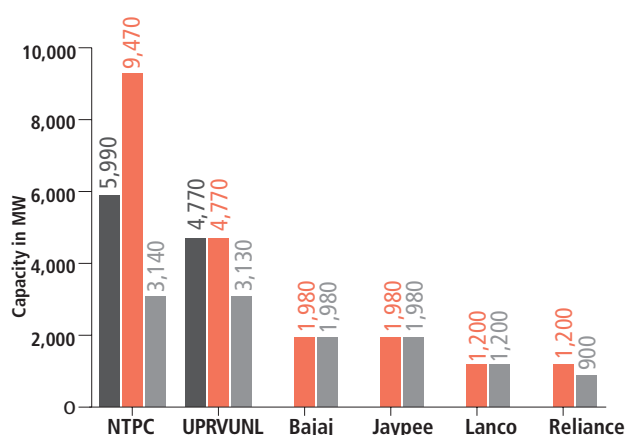


Source: Centre for Science and Environment, 2018

### Graph 3: Compliance Status in U.P.

All stations require SO<sub>x</sub> and NO<sub>x</sub> control measures

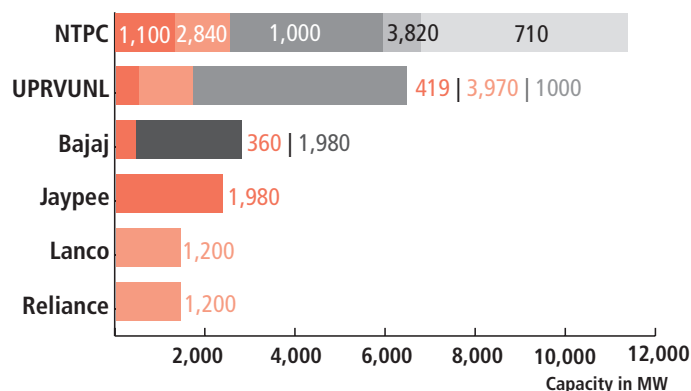
■ PM non compliant ■ SO<sub>x</sub> non compliant ■ NO<sub>x</sub> non compliant



### Graph 5: Company wise progress—FGD installation

Private-run are lagging behind, significant number of state and central stations may miss the deadline

■ Stage 0 No reported plan ■ Stage 1 Cost approval  
 ■ Stage 2 Tenders specification preparation  
 ■ Stage 3 Tender floated ■ Stage 4 Tender awarded  
 ■ Stage 5 Work under progress

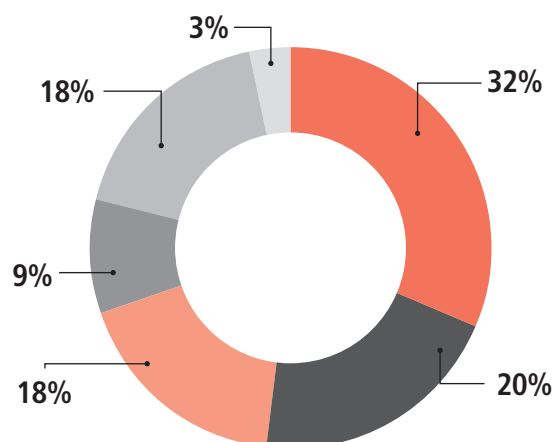


Source: Centre for Science and Environment, 2018

### Graph 4: FGD installation status—U.P.

Only 21 per cent capacity is likely to comply by deadline

■ Tender floated ■ Tenders specification preparation  
 ■ Data not available ■ Cost approval  
 ■ Work under progress ■ Tender awarded



- New equipment/technology to remove sulphur from flue-gas is required to meet the sulphur dioxide limit. Power stations are at various stages in installing these devices (See Graph 4: FGD installation status – U.P. and Graph 5: Company wise progress-FGD installation).
- All the companies except the old units of NTPC and UPRVUNL are not in compliance with the new NO<sub>x</sub> limits. However none of the plants seem to have any plans to meet with the NO<sub>x</sub> norms.
- All of the private sector plants report compliance. A few units of NTPC and UPRVUNL violate the revised PM limits. These units were meeting the older norms but they require up-gradations of their ESP to meet the revised norms.

### CURRENT EMISSIONS

#### Data Quality:

Three sets of data are available to check the emissions from thermal power station - 1.Independent lab, 2. Pollution control board, 3. CEMS. Power stations spend roughly Rs 30-40 lakhs every year for monitoring purposes, which is approximately a quarter of their environment management fund. Yet, the data generated is flawed. There are three major issues -

- Data is under reported. For instance, CSE measured the levels of sulphur dioxide in few units of U.P. and found it to be 2 to 5 times of the reported emissions.
- The CSE estimate and independent lab data differed by a factor of 2 for 1,920MW, 3 for 1,710 MW, and 4 for 420 MW of capacity (See Graph 6: Variation in Sulphur dioxide data - independent lab vs. CSE).
- The CSE estimate and CEMS data differed by a factor 2 for 2,420 MW, 3 for 1,130 MW, and 5 for 250 MW. Only 1 unit reported data in line with the CSE data

(see Graph 7: Variation in Sulphur dioxide data - CEMS vs. CSE).

- New power station's data is not reaching the CPCB servers. For about 3 GW of the generation capacity in U.P. CEMS data was not available. UPPCB must ensure they are receiving data from the CEMS instrument.
- Pollutant reporting unit – major issue: Many CEMS devices are capable of reporting values in three kinds of units- 1. 'ppm', 2. 'mg/cu.m', 3. 'mg/N.cu.m'. Shuffling the conversions and reporting 'ppm' as mg/N.cu.m leading to under reporting was common.

#### Particulate matter:

Only 50 per cent of the capacity is complying with the revised PM norms. Two categories violate most - 1. Old power stations (commissioned before 2003) and 2. Recently commissioned stations (after 2009) (see Graph 8: Particulate matter emission range – U.P.).

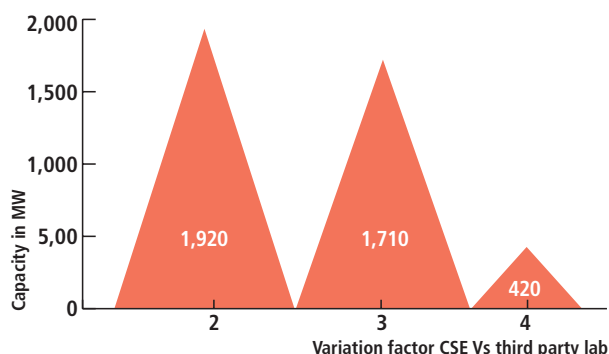
- Nearly 80 per cent of the 7.9 GW capacity commissioned before 2003 is not meeting the revised norm of 100 mg/N.cu.m.
- 1,130 MW of the 1,930 MW capacity commissioned between 2003 and 2009 is not meeting the revised norm of 100 mg/N.cu.m. MoEF&CC has asked stations to meet 100 mg/N.cu.m norms since 2003 and from 2009 the norm was further reduced to 50mg/N.cu.m. Despite this, a significant share is non-compliant.
- 34 per cent of the capacity commissioned after 2009 - nearly 4 GW - is non-compliant. This capacity will need up-gradations to meet the revised norms.

#### Sulphur dioxide:

All units except ten units of UPRVUNL Harduaganj, Paricha, and NTPC Tanda emit over 1000mg/N.cu.m of sulphur

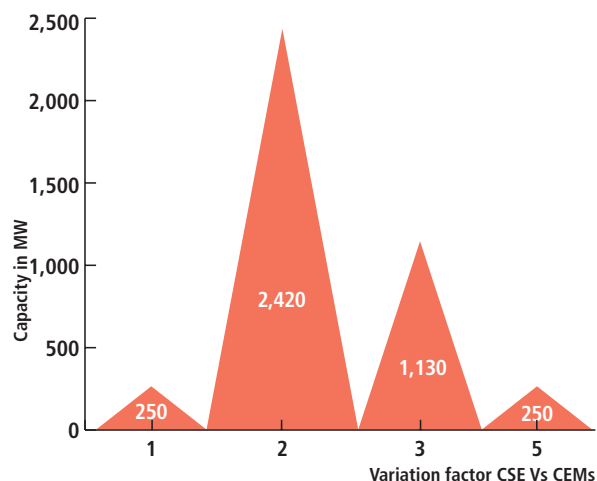
#### Graph 6: Variation in Sulphur dioxide data - independent lab vs. CSE

Independent lab data was one-half to one-fourth of CSE's estimate



#### Graph 7: Variation in Sulphur dioxide data - CEMS vs. CSE

CEMS data was one-half to one-fifth of CSE's estimate

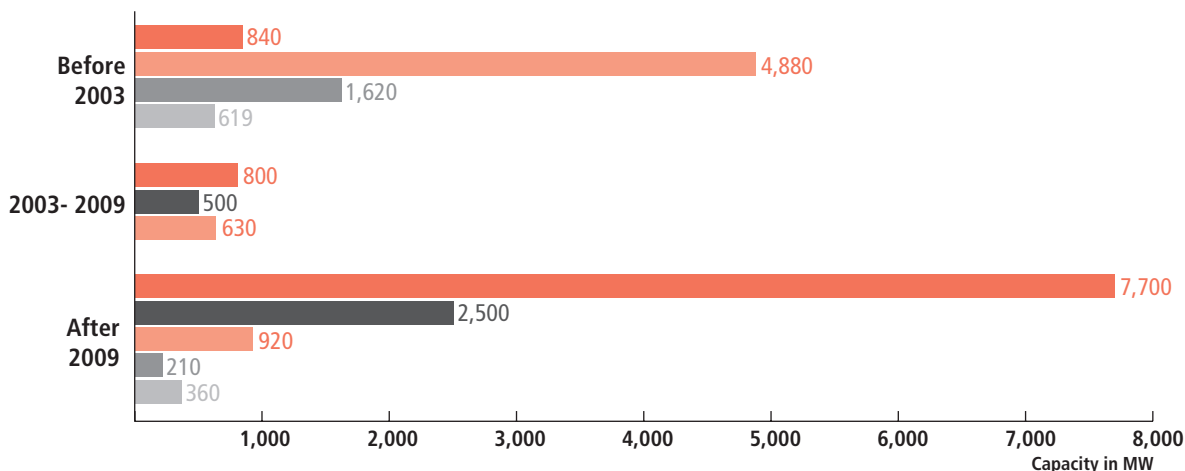


#### Graph 8: Particulate matter emission – U.P. (Capacity in MW)

Bulk of plants commissioned before 2003 non-compliant

Emission range in mg/N.cu.m

■ ≤ 50 ■ 50 – 100 ■ 100 – 150 ■ 150 + ■ No data



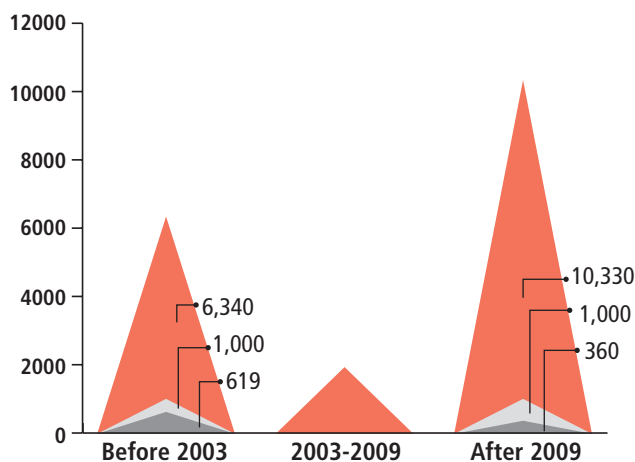
Note: Norm of 100 mg/N.cu.m for plants commissioned before 2003, 50 mg/ N.cu.m, thereafter

Source: Centre for Science and Environment, 2018

**Graph 9: Oxides of nitrogen emission range – U.P. (Capacity in MW)**

None of the stations are meeting the 300mg/N.cu.m norm

■ 300-600 ■ Over 600 ■ No data — Total (MW)



Note: Norm of 600 mg/N.cu.m for plants commissioned before 2003, 300 mg/N.cu.m, thereafter

dioxide. A meagre 1,780 MW (units less than 500 MW) report emissions between 600 and 1000 mg/N.cu.m.

#### Oxides of nitrogen:

Only 38 per cent of the installed coal power station capacity comply with the new oxides of nitrogen limits. Violators predominantly comprise stations commissioned after 2009 (See Graph 9: Oxides of nitrogen emission range – U.P.). Also, 1 GW commissioned before 2003 was not in compliance.

#### ENSURING COMPLIANCE

To meet the particulate matter and oxides of nitrogen limits no significant investment or time-consuming modifications are necessary. However, to meet with the SOx norm sizeable investment and modifications are required.

The pollution control board should require plants to submit time-bound, committed action plan. Based on the deadlines and unit-size, three broad stages of progress emerge.

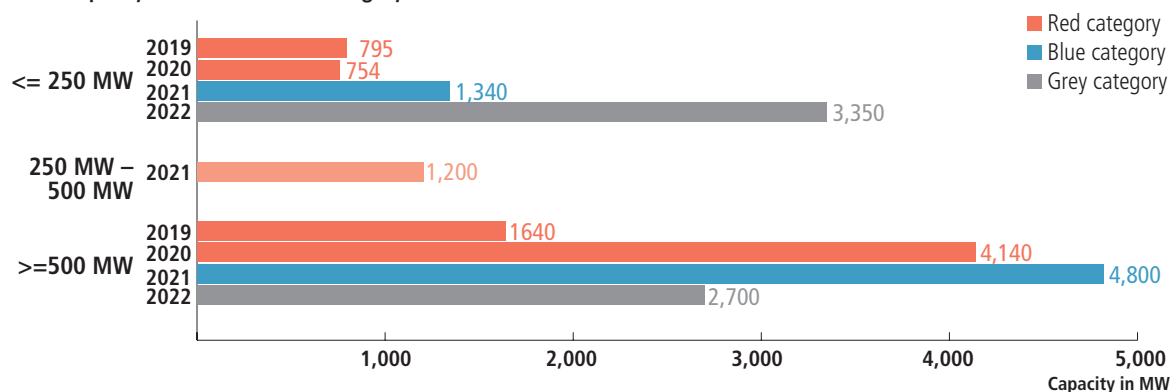
- **Red category:** This category with capacity of about 7.3 GW should be in the advanced stages of implementation. These units should be in the process of finalising engineering detail, material procurement, and civil foundation.

- **Blue category:** Capacity of about 7.34 GW in this category should already be involved in activities like tenders, vendor negotiation at the moment. Tender must be awarded in the next quarter but no later than by end of the year.

- **Grey category:** In about 6 GW, tender must be awarded latest by middle of the next year. However, the PCB should take action plan from these plants also and closely monitor progress to ensure there is no slippage.

**Graph 10: Deadline versus coal fleet capacity -size wise distribution**

Sizeable capacity falls under the red category



\*Deadline data not available for 840 MW

Source: Centre for Science and Environment, 2018

## RECOMMENDATIONS

### Data quality and CEMS device audit

- Pollution control Board must ensure that the data received from the power station is of appropriate quality. If the plants report wrong data, they may issue show cause to them. At-least on a quarterly basis they may review the data submitted and start rectification measures on receiving poor quality data.
- During the survey of thermal power plants in Uttar Pradesh, it was observed that although all the plants have installed CEMS system on each of its unit, data credibility is still an issue. Fixing the issue of data quality on an immediate note, must be done on priority.

### Action Plan

- **Project planning:** Installation or modification of a pollution control system is an elaborate process. A detailed project schedule elaborating Design, Engineering, Civil Work, Supply, Erection, and Commissioning is critical. The plant management has to identify the appropriate and clear milestone in the process of implementation. The identification requires thorough brain storming at various levels in the plant management, vendors, manufacturers, consultants, and other stakeholders. Clear milestones can ensure that the bottlenecks are swiftly identified and the process runs in a timely fashion. Pollution control board should collect this milestone document from the power station at the earliest.
- **Monitoring:** Tracking the progress of the project properly against the original plan, is necessary to ascertain that it stays on track. By this process it is simpler to identify when a project is beginning to deviate from its intended course. The earlier this project deviation gets spotted, the easier it is to course correct. It is advisable that the regulators ensure that projects are monitored every two months in the case of short projects and once in four months in long-duration projects. To integrate this exercise within the existing framework, the pollution control board can modify the existing protocols:
  - Revise consent forms incorporating the new emission norms
  - Change the site Inspection report format to enable the field officer to collect data on progress made by power stations.
  - Review Environment statement formats which the companies submit. The statements should include a 'Proforma' to collect information on efforts to follow the revised norms.
- **Penalty:** The regulators should ask the power stations to pay a bank guarantee (BG). This may serve as a commitment from them that they will assume liability if they fail to meet the committed targets. On a periodic basis the regulator should check the target versus on-ground progress. They should impose penalty (a certain percentage of BG) for violations on a periodic basis. This will serve a deterrent if any there's any failure to comply by the action plan.

### Old plants

- The Ministry of Power is clear in its policy that inefficient and expensive old coal power stations should be phased out. Central Electricity Authority in the National Electricity Plan (published in 2018) has recommended phased retirement of 47GW by 2027. State Electricity Regulatory Commissions are rejecting R&M proposals due to substantial costs. In this scenario, recovering any investment made in up-gradation of pollution control technology in coal-based thermal power stations is a challenge. They will have limited time to recover these investments. CSE advises strongly that these stations avoid any up-gradations even for pollution control and submit early retirement plan to the regulators. If they choose to run as back-up, they will need to ensure that all control technologies are in-place.

### **Ensure appropriate technology selection**

MoEF&CC has designed the norms in such a manner that based on age and size of the unit the pollution control needs differ. Smaller-size and older units need to comply with lenient emissions limits which does not need significant investment. For instance:

- For units of capacity less than 500 MW, the emission limit for sulphur dioxide is 600 mg/N.cu.m. To meet this, cost-effective solutions like partial flue gas desulphurisation (partial FGD) technology, dry sorbent injection (DSI), or use of washed coal/ultra-low sulphur coal is sufficient. Expensive full scale wet-FGD systems are not needed. NTPC is adopting dry sorbent injection (DSI) technology in its old and smaller units. NTPC Dadri station is expected to start its DSI operation by end of this month. Similarly, state generating companies like UPRVUNL Harduaganj, Parichaa, TANGEDCO, are also opting for DSI. Capital required for DSI is approx. 30 per cent the cost of wet-FGD and installation time is less than a year.
- Advanced technologies to control NO<sub>x</sub> like SCR and SNCR is not required to meet the limit of 300 or 600 mg/N.cu.m. Low-NO<sub>x</sub> burners, over-fire air systems and optimised combustion is sufficient to meet the norms. Several stations including Adani Tiroda, NTPC Mauda in Maharashtra are meeting the norm of 300 mg/N.cu.m with low-NO<sub>x</sub> burners.

### **Capacity Building**

● Installation of system alone will not assure compliance. For example: installation of CEMS and its data alone is not credible today to design pollution control system. Plants still rely on manual sampling and analysis by independent labs to know their actual levels of emission. Similarly plants having both LNB and OFA are found to be non-compliant for NO<sub>x</sub>. It suggests that capacity building of the official is an essential and critical aspect to materialize the investment made in pollution control technologies. CSE recommends capacity building in the following areas:

1. Protocols: stack samples for emission testing - manual and CEMS;
2. Awareness on CEMS maintenance, Calibration and Certification.
3. Combustion control and operation of the available NO<sub>x</sub> control systems;
4. Inspection and effective operation of ESP; and
5. FGD installation, commissioning, and operations.
6. Improving water use efficiency and conducting water audit