

## FLUE GAS DESULPHURISATION – ENVIRONMENT

NEWS: Recently a **committee of experts**, chaired by **Principal Scientific Advisor (PSA)** Ajay Sood, has recommended that India do away with a decade-long policy of mandating **Flue Gas Desulphurisation (FGD) units** in all **coal-fired thermal power plants (TPPs)**.

### WHAT'S IN THE NEWS?

#### Rationale Behind Rolling Back of the FGD Mandate

- **Low Sulphur Content in Indian Coal:**

According to data from **NIAS and IIT-Delhi**, around **92% of Indian coal** contains **low levels of sulphur (0.3%–0.5%)**, which means the emissions from burning this coal release comparatively lower quantities of sulphur dioxide (SO<sub>2</sub>).

Therefore, mandating the installation of FGDs in all coal-fired plants was found to be **scientifically and economically unnecessary**.

- **Environmental Trade-offs from FGD Installation:**

Installing FGDs across the thermal power sector would increase the consumption of **electricity and freshwater**, both of which are critical resources.

Between 2025 and 2030, FGDs would emit an **additional 69 million tonnes of CO<sub>2</sub>** due to energy consumption, but only **reduce SO<sub>2</sub> emissions by 17 million tonnes**, thus creating a **climate cost** without proportional environmental benefit.

- **Availability of Cost-Effective Alternatives:**

Technologies such as **electrostatic precipitators**, manufactured by BHEL and others, offer a **much lower-cost solution** to tackle emissions.

These alternatives are especially useful in the Indian context, where **particulate matter (PM) pollution** is more significant due to the high ash content in domestic coal.

#### What is Flue Gas Desulphurisation (FGD)?

- **Definition and Purpose:**

FGD is a **pollution control technology** used to remove **sulphur dioxide (SO<sub>2</sub>)** from the exhaust (flue gas) of **coal-fired power plants**.

It uses **alkaline reagents**, typically **limestone (calcium carbonate)** or **sodium compounds**, to chemically bind and neutralize SO<sub>2</sub>.

- **Working Process Overview:**

In an **absorber tower or scrubber**, hot flue gas is **sprayed with a water–limestone slurry**. The SO<sub>2</sub> in the flue gas reacts with limestone to form **calcium sulphite or calcium sulphate (gypsum)**, which is removed as a by-product.

- **Effectiveness of FGD:**

FGDs can eliminate **up to 95% of SO<sub>2</sub> emissions**, significantly improving air quality when used with high-sulphur coal.

#### Flue Gas Composition and Environmental Relevance

- **Origin and Constituents:**

Flue gas, also called **stack gas**, is the result of burning fuels like coal, oil, or biomass in industrial boilers and power plants.

It typically contains:

- **Particulate matter (dust)**
  - **Sulphur oxides (mainly SO<sub>2</sub>)**
  - **Nitrogen oxides (NO<sub>x</sub>)**
  - **Carbon monoxide (CO)**
  - **Traces of mercury and heavy metals**
- **Environmental Risk of Untreated Flue Gas:**  
Without treatment, these emissions can severely degrade **local air quality**, contribute to **acid rain**, and pose **public health risks**.

### **Environmental Impact of Sulphur Dioxide (SO<sub>2</sub>)**

- **Air Pollution Hazard:**  
SO<sub>2</sub> is a **toxic gas** that irritates the respiratory system and harms both **human and animal health**.
- **Acid Rain Formation:**  
In the atmosphere, SO<sub>2</sub> combines with water vapor to form **sulfuric acid**, which falls as **acid rain**.  
This acid rain:
  - Damages **forests, aquatic ecosystems, and agricultural soils**.
  - **Kills insects and aquatic life**, reduces fish stocks, and threatens biodiversity.
  - **Destroys infrastructure** by corroding steel, damaging paints, and weakening buildings and bridges.
- **Cultural Heritage Erosion:**  
Acid rain accelerates the **weathering of stone monuments**, resulting in the **erosion of historical and cultural landmarks**.

### **Comparison: Electrostatic Precipitators (ESPs) vs. Flue Gas Desulphurisation (FGD)**

| Aspect                              | Electrostatic Precipitators (ESPs)                            | Flue Gas Desulphurisation (FGD)                                      |
|-------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------|
| <b>Primary Function</b>             | Remove <b>particulate matter (PM)</b> from flue gas           | Remove <b>sulphur dioxide (SO<sub>2</sub>)</b> from emissions        |
| <b>Cost of Installation</b>         | Approx. <b>₹25 lakh per MW</b>                                | Approx. <b>₹1.2 crore per MW</b> – significantly costlier            |
| <b>Pollution Control Efficiency</b> | Removes up to <b>99% of particulate emissions</b>             | Removes up to <b>95% of SO<sub>2</sub></b> , but little impact on PM |
| <b>Resource Consumption</b>         | Requires <b>less water and electricity</b> , more sustainable | Consumes <b>more water and power</b> , adds to CO <sub>2</sub> load  |

| Aspect                      | Electrostatic Precipitators (ESPs)                            | Flue Gas Desulphurisation (FGD)                                |
|-----------------------------|---------------------------------------------------------------|----------------------------------------------------------------|
| Suitability for Indian Coal | Highly suitable due to <b>high ash content</b> in Indian coal | Less relevant due to <b>low sulphur content</b> in Indian coal |

### Conclusion: Why India Rolled Back Universal FGD Mandate

- The decision is based on a **scientific assessment of coal characteristics, environmental trade-offs, and cost considerations.**
- Instead of a **blanket FGD mandate**, India aims to adopt a **flexible, cost-effective approach** that prioritizes **regional air quality needs, resource conservation, and climate compatibility.**
- **Electrostatic precipitators and targeted FGD adoption** in high-sulphur areas may offer **greater environmental returns at lower cost.**

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/central-pollution-control-board-to-decide-on-future-of-flue-gas-desulphurisation-units-power-minister/article69679608.ece>