

FLUE GAS DESULPHURISATION: ENVIRONMENT

NEWS: Environment Ministry exempts 78% of coal plants from installing key anti-polluting systems

WHAT'S IN THE NEWS?

The President of India has nominated four eminent persons, including Harsh Vardhan Shringla and Meenakshi Jain, to the Rajya Sabha under Article 80(3) for their distinguished contributions. This provision ensures inclusion of domain experts in parliamentary debates, though its use often invites political scrutiny.

1. Recent Policy Update

- The Ministry of Environment, Forest and Climate Change (MoEFCC) has **exempted 78% of India's coal-based thermal power plants** from mandatory Flue Gas Desulphurisation (FGD) installation.
- The exemption impacts around **180 power plants** and over **600 generating units** across the country.
- FGDs were originally mandated in 2015 to reduce **sulphur dioxide (SO₂)** emissions but deadlines have repeatedly been extended due to high cost and logistical barriers.

2. Background: SO₂ Emissions and FGDs

- **Sulphur Dioxide (SO₂)** is a harmful air pollutant produced mainly by **coal combustion** in power plants.
- Inhalation causes **respiratory and cardiovascular diseases**; SO₂ also forms **secondary particulate matter (PM_{2.5})**, contributing to India's air pollution crisis.
- **India is the world's largest emitter of SO₂**, primarily due to extensive coal usage.

3. 2015 FGD Mandate & Categorization of Thermal Power Plants

- All coal-fired power plants were mandated to install FGDs by 2018.
- Categorization of plants for staggered deadlines:
 1. **Category A (11%):** Within 10 km of NCR or cities with 1 million+ population — Deadline: **Dec 30, 2027**.
 2. **Category B (11%):** Near Critically Polluted Areas (CPA) or Non-Attainment Cities (NAC) — Deadline: **Dec 30, 2028**, subject to **Expert Appraisal Committee (EAC)** review.
 3. **Category C (78%):** Located away from polluted/populated areas — **Fully exempted** from FGD installation.

4. Rationale Behind Exemption

- **Low Sulphur Content in Indian Coal:** Indian coal typically has 0.3–0.5% sulphur, reducing SO₂ output naturally.
- **Minimal Public Health Risk in Remote Areas:** SO₂ levels are within safe limits in many non-urban areas.
- **High Cost:**
 - FGD installation costs around **₹1.2 crore per MW**.
 - Estimated national burden: **₹1.16 lakh crore** for 97,000 MW capacity.
- **Tariff Burden:**
 - FGDs would raise electricity costs by ₹0.72/kWh.
 - 80% of this increase is due to **fixed capital costs**.
- **Vendor Limitations:** Shortage of skilled FGD installation firms has led to implementation delays.
- **Increased CO₂ Emissions:** FGDs consume energy, potentially adding **69 million tons of CO₂ by 2030**, countering climate goals.

5. Flue Gas Desulphurisation (FGD) – Overview

- **Purpose:** Removes SO₂ from flue gas before it exits the power plant.
- **Efficiency:** Can eliminate up to **95% of SO₂**.
- **How It Works:**
 - Uses chemical absorption (commonly limestone) to neutralize SO₂ into harmless compounds like gypsum.

Types of FGDs:

- **Dry Sorbent Injection:** Limestone/sodium compounds react with SO₂; collected using filters.
- **Wet Limestone Scrubbing:** Uses slurry to absorb SO₂; forms gypsum.
- **Seawater FGD:** For coastal plants; SO₂ absorbed by seawater and discharged after neutralization.

6. Status of FGD Implementation in India

- Despite the 2015 mandate:
 - As of **April 2025**, only **~8%** of units have FGDs installed.
 - Most installations have been done by **NTPC**.

- Deadlines now extended to **2027–2029** depending on category.

7. Environmental and Health Impacts of SO₂

Environmental Impacts:

- **Acid Rain:**
 - Forms sulphuric acid in the atmosphere → acidifies lakes, damages crops, erodes buildings.
- **Particulate Matter (PM_{2.5}) Formation:**
 - SO₂ contributes to **15% of India's PM_{2.5}** levels.
- **Haze and Visibility Loss:**
 - Sulphates from SO₂ reduce visibility in urban areas.

Health Impacts:

- **Respiratory Ailments:**
 - Causes coughing, wheezing, worsens asthma and bronchitis.
- **Cardiovascular Diseases:**
 - Long-term exposure increases risk of heart disease and early mortality.
- **Vulnerable Populations:**
 - Children, elderly, and those with pre-existing conditions are most affected.

8. SO₂'s Effect on Global Warming

- **Short-Term Cooling:**
 - Forms aerosols that reflect sunlight and reduce surface temperatures temporarily.
- **Short-Lived:**
 - Aerosols last days to weeks, unlike CO₂, which persists for centuries.
- **Net Warming Risk:**
 - Cutting SO₂ without cutting CO₂ can increase net global warming.

9. Alternatives to FGDs

Alternative Technology	Key Benefits/Uses
Electrostatic Precipitators (ESPs)	Removes PM _{2.5} ; low cost; efficient for Indian coal.
Low-Sulfur Fuel/Natural Gas	Reduces SO ₂ at source.

Alternative Technology	Key Benefits/Uses
Fluidized Bed Combustion	Mixes limestone in furnace to pre-capture SO ₂ .
Ammonia Scrubbing	Effective for small/old plants.
Advanced Sorbent Injection	Cheaper, targeted SO ₂ control.
Wet Scrubbing with Other Absorbents	Uses NaOH, NH ₄ OH; more chemical flexibility.
Oxy-Fuel Combustion	High-efficiency combustion; easier SO ₂ capture.
Renewables (Solar, Wind, Hydro)	Long-term zero SO ₂ solution.
Carbon Capture & Storage (CCS)	Can combine SO ₂ and CO ₂ removal.

10. ESP vs. FGD – Comparison

Aspect	ESP (Electrostatic Precipitator)	FGD (Flue Gas Desulphurisation)
Target Pollutant	Particulate Matter (PM)	Sulphur Dioxide (SO ₂)
Installation Cost	~₹25 lakh per MW	~₹1.2 crore per MW
Efficiency	Up to 99% PM removal	Up to 95% SO ₂ removal
Water/Energy Use	Low	High
Suitability	High for Indian coal	Limited due to low sulphur

11. Global Best Practices

- **China:** Installed FGDs in 90%+ coal plants after strict SO₂ limits in 2000s.
- **EU:** Industrial Emissions Directive mandates SO₂, NO_x, PM controls via advanced tech.
- **USA:** Clean Air Act & Acid Rain Program – used cap-and-trade and strict SO₂ controls.
- **Japan:** Integrated wet limestone scrubbers in coal plants for high efficiency.

12. Government Measures to Control SO₂ in India

- **Air (Prevention and Control of Pollution) Act, 1981**
- **Environment (Protection) Act, 1986**
- **National Ambient Air Quality Standards (NAAQS)**
- **BS-VI Fuel Norms** – Reduce sulfur in fuels for vehicles.
- **National Clean Air Programme (NCAP), 2019**
- **SAMEER App** – Real-time pollution monitoring.
- **FGD Mandate (2015)** – Original policy for SO₂ control via flue gas treatment.

13. Expert Committee Recommendations

- **Formed under Principal Scientific Adviser Ajay Sood** to assess FGD necessity.
- **Key Recommendations:**

- Exempt 80% of plants away from population hubs.
- Focus on **Category A & B** units in polluted/populous zones.
- Encourage hybrid systems: ESP + Advanced Injection.
- Strengthen vendor support and incentivize FGD compliance.
- Promote learning from **global best practices**.

14. Way Forward

- **Prioritize ESPs** for PM_{2.5} control due to cost-effectiveness and relevance to Indian coal.
- **Transition to cleaner fuels** like low-sulfur coal or gas.
- **Accelerate renewable energy adoption** (solar, wind, hydro).
- **Support hybrid technologies** combining PM and SO₂ control.
- **Enforce stricter regulations** in polluted and densely populated areas.
- **Enhance vendor ecosystem** and public-private partnerships for FGD installation.
- **Incorporate climate-smart policies** that balance SO₂ and CO₂ management.

15. Conclusion

The exemption of most Indian coal plants from FGD installation reflects a policy shift prioritizing economic viability over uniform environmental regulation. While SO₂ reductions remain essential for public health, especially in urban areas, India must align pollution control with climate goals by promoting cleaner fuels, renewable energy, and cost-effective technologies.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/environment-ministry-exempts-78-of-coal-plants-from-installing-key-anti-polluting-systems/article69804518.ece>