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# DAILY EDITORIAL ANALYSIS

TOPIC

## INDIA'S POWER SECTOR: NAVIGATING ENERGY NEEDS AND ENVIRONMENTAL RESPONSIBILITY

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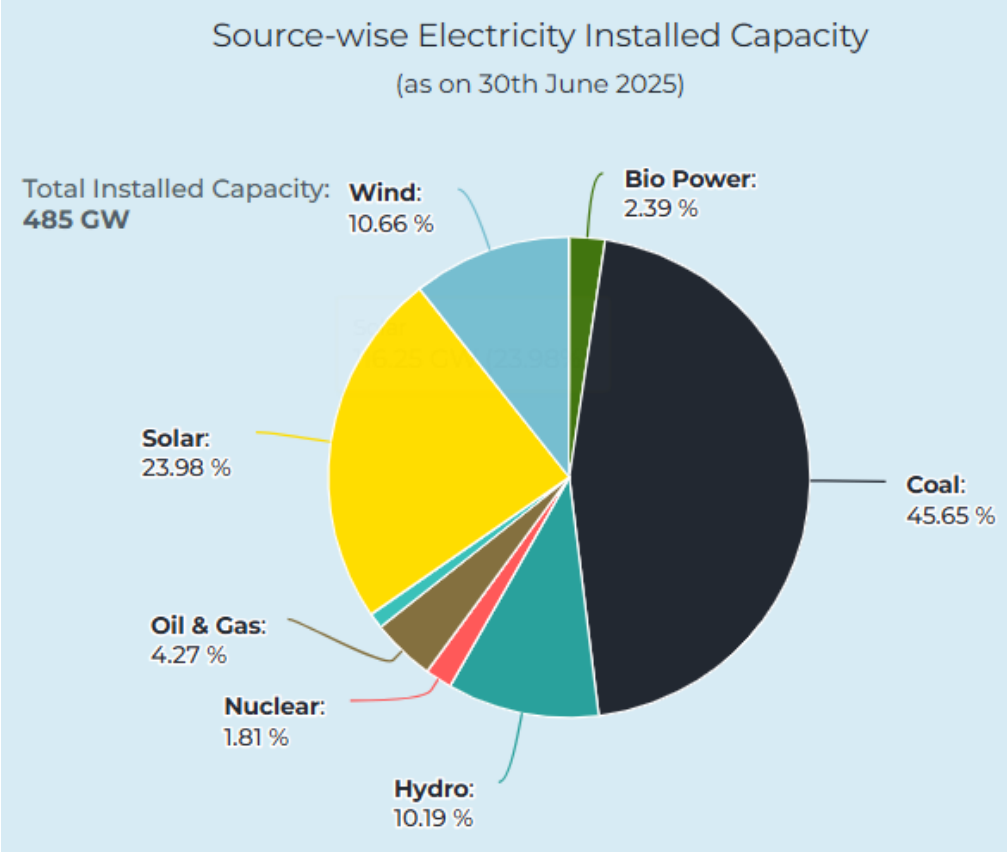
# INDIA'S POWER SECTOR: NAVIGATING ENERGY NEEDS AND ENVIRONMENTAL RESPONSIBILITY

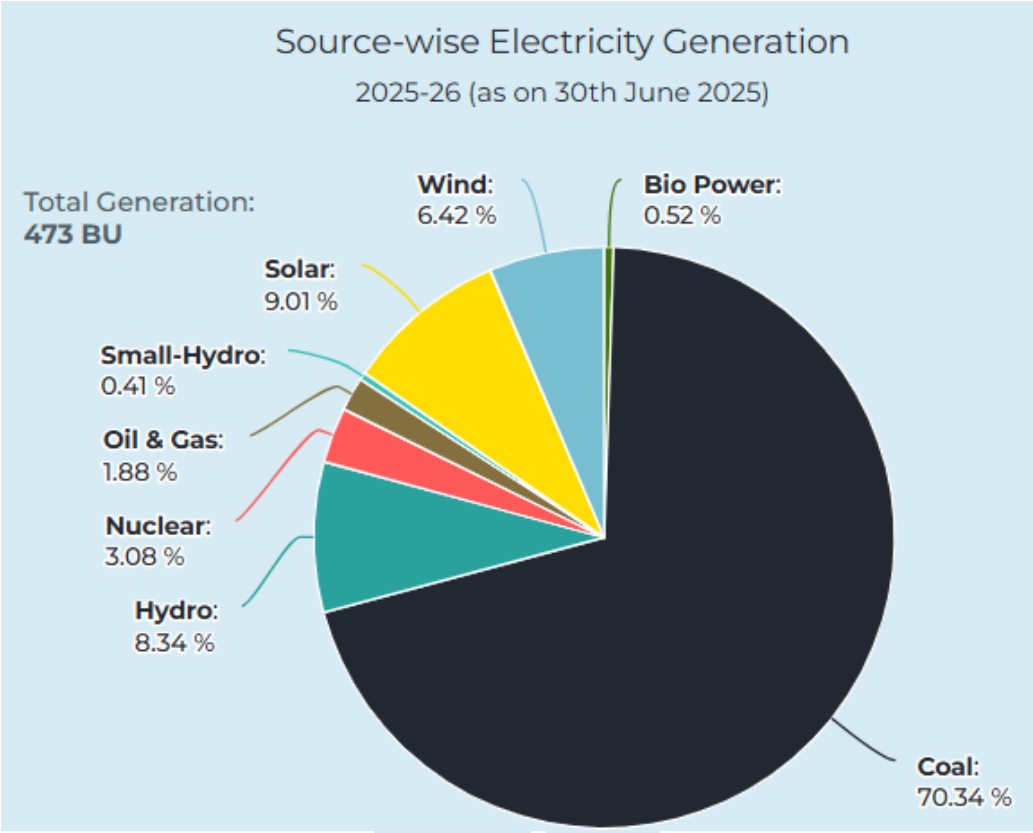
## Context

- India's power sector, long characterized by fragmented regulation, mounting debts, and inefficient distribution, is undergoing vital reforms to meet modern energy needs and ensure sustainable, reliable access for all.

## India's Power Sector

- **Installed Generation Capacity:** India is the **third-largest producer and consumer** of electricity worldwide, with an installed power capacity of 466.24 GW as of January 31, 2025.
- **India's Coal Based Energy:** It contributes **nearly 55% to the national energy mix** and fuels **over 70% of total power generation.**
  - It has the **fifth-largest coal reserves** and is the **second-largest consumer.**
  - **Sulphur Dioxide ($SO_2$),** a harmful pollutant associated with respiratory and ecosystem damage, remains a major concern.
- **Renewable Energy Growth:** India is **among the top nations** globally for **solar and wind capacity**, aiming for **500 GW of non-fossil fuel capacity by 2030.**
  - **Total Installed Capacity** (renewable energy sources, including large hydropower): 209.45 GW (As of December 2024).
    - Wind Power (48.16 GW); Solar Power (97.87 GW); Biomass/Co-generation (10.73 GW); Small Hydro (5.10 GW); Waste To Energy (0.62 GW), and Large Hydro (46.97 GW).
- **Transmission Infrastructure:** The country boasts **one of the world's largest** synchronized power grids, enabling electricity transfer across regions.
  - India has achieved near-universal electricity access, with over 99% of villages electrified.






**Flue Gas Desulphurisation (FGD)**

- MoEFCC mandated the **installation of Flue Gas Desulphurisation (FGD) systems** to curb $SO_2$ emissions.
  - In 2015, India introduced **revised emission norms,** requiring **mandatory FGD installation across thermal plants** by 2017.
- It is a **set of technologies** used **to remove $SO_2$** from exhaust flue gases of fossil fuel plants.
- The **most common method** in India is **wet limestone scrubbing**, where $SO_2$ reacts with limestone slurry to form gypsum.

## Key Concerns & Challenges:

- **Coal Dependency:** Thermal power remains dominant in India, raising concerns about environmental sustainability and supply fluctuations.
- **Economic Burden on Consumers:** Installing FGD systems entails high capital expenditure, especially for older plants.
  - Estimates suggested a cost increase of ₹0.25 – ₹0.30 per kilowatt-hour (kWh), which would ultimately affect power tariffs.
- **Technology Gaps:** Many aging plants were not designed for retrofits.
- **Lack of Indigenous Supply Chains:** Dependence on imports slowed progress.
- **Mixed Compliance:** Less than 15% of coal-based capacity had installed FGD by early 2024.
- **Low Sulphur Content in Indian Coal:** Indian coal naturally has low sulphur content.

## Scientific Re-Evaluation of the SO2 Norms

- **IIT Delhi and Ministry of Power Study:** It stressed the need for a more comprehensive analysis of $SO_2$ emissions across the country.
  - It recommended reevaluating the need for FGDs based on empirical data rather than blanket policy mandates.

- **NEERI-NITI Aayog Report**:
  - Ambient $SO_2$ levels at all monitoring stations were **well below** the prescribed limit of **80 $\mu g/m^3$**, despite limited FGD implementation.
  - India's **geographical and climatic conditions** — including higher solar radiation, stronger vertical convection, and greater ventilation — naturally reduce ground-level $SO_2$ concentrations.
  - The **carbon footprint of FGD systems** due to limestone mining, transport, and water usage posed additional environmental concerns.
  - $CO_2$, a long-lived greenhouse gas, has a greater atmospheric impact than $SO_2$, calling into question the net environmental benefit of mass FGD deployment.

## Policy Revision: A Targeted and Balanced Approach

- Based on scientific analysis, the government revised its notification. Key changes include:
  - **Power plants are now categorized** into three groups:
    - Located near large cities;
    - Situated in heavily polluted zones;
    - All other plants
  - Only plants in the first two categories are required to install FGDs.
  - Around **78% of thermal power plants are exempt**, significantly reducing unnecessary capital expenditure.

## Implications for Power Sector and Energy Policy

- **Financial Relief:** The revised guidelines help avoid avoidable investments in FGD systems, freeing up resources for other critical infrastructure, particularly renewable energy.
- **Tariff Stability:** Consumers and power distribution companies benefit from stable tariffs, shielding them from unnecessary cost escalations.
- **Balanced Energy Transition:** India's energy transition roadmap emphasizes renewables. However, **domestic coal** will remain essential for ensuring **energy security** in the near to medium term. The new notification supports this balanced transition strategy.

## Way Forward: Rethinking Implementation

- **Phased Implementation:** Prioritize high-polluting regions for early adoption.
- **Hybrid Solutions:** Combine FGD with other NOx and particulate control mechanisms.
- **Updated Deadlines With Accountability:** Tie non-compliance to financial penalties.
- **Funding Innovations:** Use green bonds or international aid to support retrofits.
- **Dynamic Norms:** Encourage transition to low-sulphur coal or renewables where feasible.

## Conclusion

- The revised $SO_2$ emission norms mark a **science-led and economically pragmatic shift** in India's environmental regulation. By aligning policy with empirical research and ground realities, the government has optimized public spending, reduced environmental trade-offs, and created a more sustainable pathway for the energy sector.

**Source: IE**

## Mains Practice Question

**[Q]** Critically examine how the adoption of Flue Gas Desulphurisation (FGD) technology in India's thermal power sector reflects the country's approach to balancing energy security with environmental responsibility.

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