

Coal Push Solar Curtailment: How Coal Push Solar Curtailment Impacts India's Power Sector

April 5, 2026 • vajiramandravi.com



Coal Push Solar Curtailment Latest News

- As India prepares for a hotter-than-normal summer with more heatwave days, concerns have emerged over the government's plan to rely more on coal-based power amid gas shortages caused by the West Asia conflict.
- This raises issues like solar curtailment and grid management.

Power Demand and Preparedness

- The government has stated that India's power system is adequately prepared to meet peak summer demand.
- However, gas supply disruptions have created challenges, especially during periods of high electricity consumption.

Role of Gas-Based Power

- Although gas-based power contributes a small share to India's energy mix, it plays a critical balancing role, especially:
 - During non-solar hours (evenings and nights)
 - When demand is high in summer
- Around 10 GW of gas-based capacity is typically used during peak demand periods.

Shift Towards Coal and Alternatives

- To compensate for reduced gas availability, the government plans to rely on:
 - Coal-based power generation
 - Renewable energy sources
 - Energy storage systems
- This shift ensures immediate supply but comes with long-term trade-offs.
- Gas-based power plants are more flexible and responsive:
 - They can ramp up or down quickly
 - Help balance fluctuations in renewable energy
 - Ensure grid stability during evening peaks, when solar power is unavailable
- Thus, reduced gas usage affects efficient integration of renewables.

Concern: Solar Curtailment

- A key concern is the curtailment of solar energy (i.e., reducing or stopping solar power generation despite availability).
 - Coal plants are inflexible: They cannot quickly adjust output.
 - This leads to situations where solar power is reduced to accommodate coal-based generation.
- This undermines renewable energy utilisation.

Greater Reliance on Coal-Based Power

- India's electricity generation is heavily dependent on **coal**, contributing over 70%, while gas-based power accounts for only 1-2%.
- Despite being costlier than coal and renewables, gas-based plants are crucial during peak demand periods, especially in summer evenings, due to their flexibility.
- The **West Asia conflict** has disrupted gas supplies, forcing the government to **prioritise limited gas availability** for essential sectors.
- This has reduced the availability of gas for power generation, increasing dependence on coal-based plants.

Government Measures to Bridge the Gap

- To meet rising summer demand, the government has initiated several steps:
 - Directed Tata Power's 4 GW imported coal plant in Gujarat to resume full operations from April 1 after being idle for six months.
 - Asked thermal power plants to defer maintenance to maximise electricity generation.

- Ensured that all generating companies maintain full capacity utilisation, except during unavoidable outages.
- These steps are expected to make around 10,000 MW of additional capacity available between April and June 2026.
- The government is also **closely tracking thermal and hydro projects** scheduled for commissioning by June 2026 to ensure timely addition of capacity during peak demand.

Role of Hydro and Renewable Energy

- Hydropower is being carefully scheduled to conserve water for peak demand periods.
- Renewable energy expansion is being accelerated, with faster clearances for:
 - Wind power projects
 - Battery Energy Storage Systems (BESS)
- India is prioritising energy security through coal-based generation amid gas shortages, while simultaneously pushing renewables and storage solutions.
- The challenge lies in balancing short-term demand with long-term clean energy goals.

Renewable Energy Curtailment: Emerging Concern

- A higher dependence on coal-based power plants may lead to increased renewable energy (RE) curtailment, especially solar.
- This is mainly due to the operational inflexibility of coal plants, which cannot easily reduce output when renewable generation rises.

What is Curtailment and Why It Happens

- Curtailment refers to the reduction or shutdown of renewable power generation despite availability.
- It occurs to maintain grid stability and safety, particularly when:
 - Power supply exceeds demand
 - The grid faces frequency issues or congestion
- Between May and November last year, India curtailed about 23 GW of renewable energy, highlighting the scale of the issue.
- A major reason behind curtailment is the **Minimum Technical Load (MTL)** of coal plants.
 - MTL is the lowest level at which a thermal plant can operate safely (currently around 55% capacity).
 - Coal plants often cannot reduce output below this level, even when solar generation is high during the day.
- Experts suggest lowering MTL (possibly to 40%) to better accommodate renewable energy.

Changing Power Generation Pattern

- Earlier:
 - Solar met daytime demand.
 - Gas-based plants handled evening peaks.

- Now:
 - Greater reliance on coal means coal plants remain operational even during daytime.
 - This forces cheaper solar power to be curtailed, despite availability.

Grid Constraints and Regional Challenges

- Curtailment is also driven by:
 - Transmission congestion, especially in high-renewable states like Rajasthan and Gujarat
 - Low power demand in certain states (underdrawal)
 - Limited ability to transfer surplus renewable power across regions
- These constraints make it difficult to fully utilise renewable energy.

Operational and Economic Factors

- Coal plants are preferred for reliability, especially for evening peak demand.
- Increasing flexibility in coal plants requires technical adjustments and higher costs, though compensation mechanisms exist.
- For utilities, it is often easier to keep coal plants running at minimum load and curtail renewables rather than frequently ramping generation.

Structural Challenge: Lack of System Flexibility

- Curtailment is not just about renewable availability but about system-wide flexibility, including:
 - Energy storage (BESS)
 - Flexible demand management
 - Balancing resources
- Without these, integrating large-scale renewables becomes difficult.

Source: IE

Source: <https://vajiramandravi.com/current-affairs/coal-push-solar-curtailment/>

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