India’s Looming Power Crisis: Renewable Energy Challenges and Solutions

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What’s in Today’s Article?

India Power Shortage Latest News

- India’s rapid renewable energy expansion without adequate storage systems has led to growing electricity grid instability, with power shortages expected to rise in May and June.

- This issue is worsened by a decade-old policy to scale down thermal power expansion, reducing critical baseload support during peak summer evenings.
- Additionally, financial mismanagement in power distribution, driven by state governments' reluctance to address revenue leaks and reliance on central lending utilities to cover discom losses, further exacerbates the crisis.

Rapid Growth of Renewables and Associated Challenges

- India has been rapidly expanding renewable energy, adding over 21 GW (excluding large hydro) in the current fiscal year, bringing total capacity to 165 GW (212 GW with large hydro).
- In contrast, coal-based thermal capacity stands at 220 GW.

Intermittency Challenges of Renewables

- Unlike thermal power, which can be ramped up as needed, solar and wind energy depend on weather conditions.
- Solar generation peaks in the afternoon but drops by evening, creating a supply gap when electricity demand surges due to air conditioner usage in North India.

Thermal Capacity Constraints in Non-Solar Hours

- To meet evening demand, thermal plants are ramped up, but India's coal-based capacity has grown only 7% since 2019-20, limiting its ability to fill the gap.
- While past thermal additions (92 GW from 2012-2017) allowed grid operators to increase plant load factors (PLFs), most plants are now running at high PLFs, making further scaling difficult.
    - PLF measures a power plant's capacity utilization, expressed as the percentage of actual energy generated to the maximum possible energy it could have generated during a given period.

Rising Power Demand and Grid Stability Concerns

- India's peak power demand has surged from 169 GW in 2018-19 to 250 GW in 2024-25 and is expected to reach 270 GW this summer.
- With growing reliance on renewables (from 72 GW in 2019-20 to over 150 GW in February 2025), grid stability has become a major concern.

Projected Power Shortages in Summer 2025

- India's top grid operator anticipates power shortages from April to October, with May and June identified as high-risk months.
- Unmet demand could reach 15-20 GW, especially during non-solar hours.

Risk of Load Shedding and Supply Deficits

- The Loss of Load Probability (LOLP) for May is estimated at 19% in the best-case scenario and 31% in the median scenario, indicating a one-in-three chance of supply shortages. For June, the LOLP ranges from 4.7% to 20.1%.
    - LOLP in power systems engineering is the probability that the system fails to meet the demand for electrical power within a specified period, essentially indicating the risk of a power outage.

Urgent Need for Energy Storage Systems

- The Central Electricity Authority (CEA) recognizes the grid stability challenges posed by intermittent renewables.
- Hence, it issued an advisory recommending co-located **Battery Energy Storage Systems (BESS)** and **Pumped Storage Plants (PSP)** with solar projects.
- These systems can store surplus solar power during the day and release it when demand peaks in non-solar hours.

Current Storage Capacity vs. Growing Renewable Base

- While India’s total renewable energy capacity has surpassed 200 GW, its installed energy storage capacity remains low at just 4.75 GW (PSP) and 0.11 GW (BESS) as of late 2024.

Importance of Timely Deployment

- The National Load Despatch Centre (NLDC) warns that delays in BESS and PSP commissioning could worsen energy shortages, especially during peak demand periods.
- Ensuring timely deployment will improve grid flexibility, support renewable integration, and mitigate reliability risks.

Reviving Thermal Power to Address Shortages

- To increase active generation capacity, the National Load Despatch Centre (NLDC) has suggested invoking Section 11 of the Electricity Act, 2003 to mandate higher operational levels for imported coal-based plants.
- These plants are typically used less due to their higher costs, but their optimal utilization during peak demand could help mitigate supply shortages.

Hidden Costs of Renewable Energy

- To manage power intermittency, aging thermal units are being kept on standby, but this leads to high costs.
- Experts argue that the assumption of renewables achieving grid parity is misleading, as factoring in standby thermal power nearly doubles the cost of renewable electricity.

Policy Missteps & Their Consequences

- Decisions taken over the past decade are now affecting grid stability.

- The National Electricity Plan (2017-22) had ruled out fresh thermal capacity additions beyond 2022, except for 50 GW of under-construction projects.
- Imported coal-based projects were also discouraged due to global price volatility.

Corrective Measures Underway

- Recognizing past planning failures, corrective actions have been initiated, including:
    - A renewed push for nuclear power in fleet mode
    - Expansion of thermal capacity
    - Importing coal to restart idle plants
    - Mandating energy storage for all new solar projects under the latest Central Electricity Authority (CEA) directive
- These measures aim to stabilize the grid and ensure a reliable power supply during high-demand periods.

India Power Shortage FAQs

Q1. Why is India facing a power shortage in 2025?

Ans. Rapid renewable expansion without storage and limited thermal capacity has led to grid instability.

Q2. How does renewable energy impact India’s power grid?

Ans. Solar and wind power fluctuate, creating supply gaps during peak demand, especially in non-solar hours.

Q3. What measures can prevent India’s power crisis?

Ans. Expanding energy storage (BESS, PSP) and reviving thermal power plants can stabilize the grid.

Q4. Why is India’s thermal power capacity insufficient?

Ans. A policy shift away from thermal expansion since 2017 has led to supply constraints.

Q5. What role does the government play in solving the crisis?

Ans. The government is mandating energy storage, reviving coal-based plants, and investing in nuclear power.

Source: IE | News18