How States Are Tackling Peak Summer Power Demand in India

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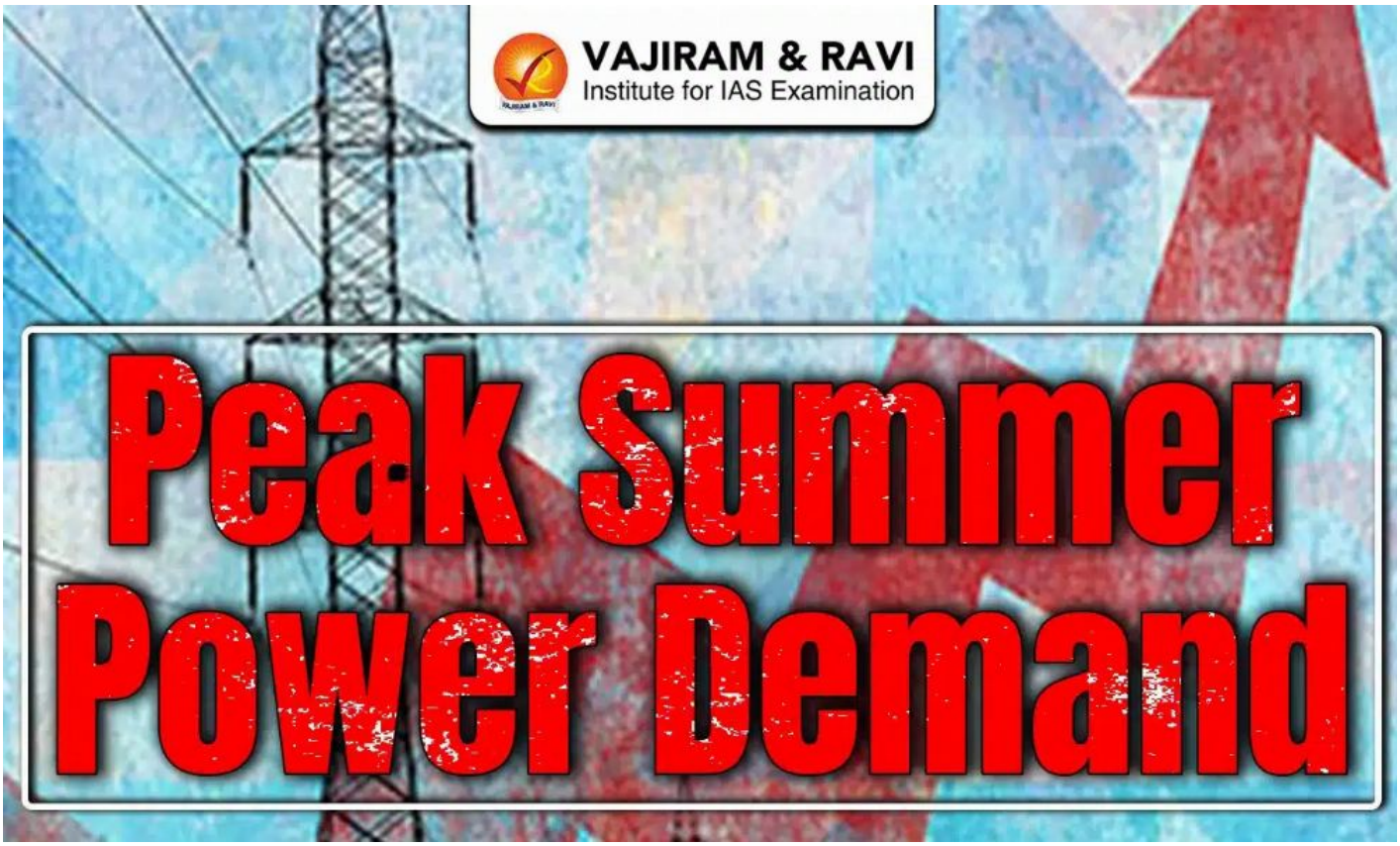

Peak Summer Power Demand Latest News

- India’s summer electricity demand has surged earlier than expected, with peak power demand reaching a record 256.1 GW on April 25, followed by even higher peaks on May 19 and 20.
- Nearly **one-third** of this peak demand was met through **renewable energy sources**, helping the national grid remain stable during daylight hours.
- However, during non-solar hours, when renewable generation declined, the grid faced a 2% power deficit (4,243 MW), highlighting the growing challenge of meeting rising evening and night-time electricity demand.

Understanding Peak Power Demand

- Peak demand refers to the highest level of electricity consumption on a power grid during a specific period, usually measured over a 15-minute interval.

- Although it represents a single point in time, peak demand generally occurs during a 2–4 hour period of unusually high electricity use.

Why Peak Demand Matters

- The power grid must be able to instantly meet peak electricity demand, even if it lasts only for a short duration.
- This means the entire electricity infrastructure—generation, transmission, and distribution systems—must be designed with peak demand in mind.
- Managing peak demand is difficult because:
    - Building enough infrastructure to meet the highest demand at all times can be: **Expensive; Inefficient**. Much of the capacity would remain **underutilise**d during normal or off-peak hours.
    - If adequate capacity is unavailable during peak periods, it can lead to: Load shedding; Power shortages.
- Thus, balancing reliability and economic efficiency remains a key challenge for the power sector.

How States Manage Power Demand

- States manage electricity demand through contractual supply and power exchange purchases.
- The primary mechanism is long-term Power Purchase Agreements (PPAs) signed by State distribution companies (DISCOMs) with power generators, ensuring a stable electricity supply over several years.
- When contractual supply falls short due to sudden spikes in demand, power plant outages, or transmission failures, DISCOMs turn to the second mechanism—**purchasing electricity from power exchanges**.
- These short-term market purchases help address real-time supply-demand mismatches.
    - Currently, about 10–15% of electricity in India is traded through power exchanges.

Demand-Side Management During Peak Hours

- Some states are using more advanced tools. Delhi, for example, has increasingly adopted **time-of-day tariffs**, where electricity prices vary according to the time of use, encouraging consumers to shift usage away from peak periods.
- The use of smart meters is also helping flatten evening demand peaks, particularly those caused by heavy cooling loads during summer.

Challenges Faced by States Amid Rising Power Demand

- India’s electricity demand has risen sharply. Over the last five years, the country’s peak demand has increased by 37%, rising from 183 GW in December 2020 to over 250 GW in April 2026, making it increasingly difficult for states to meet demand reliably.
- State DISCOMs largely depend on long-term power purchase agreements (PPAs) with fixed capacity and pricing.
- However, when demand exceeds contracted supply, they must purchase electricity from short-term power exchanges, where prices rise sharply during peak period, increasing the financial burden on states.

Weak Distribution Infrastructure

- While India has significantly expanded generation and transmission capacity, distribution infrastructure has not kept pace.
- Over the last decade:
    - Generation capacity increased by 76% (303 GW to 532 GW)
    - Transmission network expanded by 47%
    - Transformation capacity increased by 115%
- However, distribution systems remain under severe stress, affecting last-mile electricity delivery.

Frequent Equipment Failures

- The distribution network faces major operational challenges:
    - Nearly 13 lakh distribution transformers fail annually
    - Several northern states experience failure rates as high as 20%
- Key reasons include:
    - Overloaded transformers and feeders
    - Ageing equipment
    - Poor maintenance
    - Infrastructure operating near capacity limits
- This often leads to local outages during peak demand periods.

Financial Constraints of States

- The problem is particularly severe for financially weak states, which struggle to:
    - Buy expensive short-term electricity
    - Upgrade ageing distribution infrastructure
- States such as Uttar Pradesh and Bihar continue to face high distribution losses, overloaded transformers, and outdated infrastructure, making them especially vulnerable during demand surges.

Role of Renewable Energy in Managing Power Demand

- Renewable energy (RE) has become crucial in meeting rising summer electricity demand, especially because solar and wind power have low operating costs, reducing DISCOMs' power purchase burden.
- States like Gujarat and Karnataka effectively meet daytime peak demand through solar power, while Tamil Nadu benefits from strong wind generation during monsoon months.
- RE's variable nature limits round-the-clock reliability:
    - Solar generation drops after sunset, just when evening demand rises
    - Wind power is seasonal and weather-dependent
- States with low RE capacity, such as Punjab, rely more on hydro imports and costly market purchases.

The Way Forward

- To manage rising peak demand efficiently, states need:
    - Energy storage systems such as Battery Energy Storage Systems (BESS) and Pumped Hydro Storage (PHS)
    - Smarter transmission and distribution networks
    - Energy efficiency measures
    - Demand-side tools like time-of-day tariffs and agricultural load scheduling
- India’s power challenge is shifting from merely generating more electricity to managing supply efficiently across time and regions, requiring major investments in storage and grid flexibility.

Source: TH | ToI
