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GS Paper II: Current Affairs

1. India's Power Grid Resilience Amid Record Electricity Demand

a. Introduction

India recorded a new peak electricity demand of nearly 271 gigawatts on 21 May 2026, the highest ever. While the Government has highlighted its ability to meet record demand as evidence of a resilient electricity system, Grid-India reported a peak power deficit of about 1.7 gigawatts the following day. Several States also continued to report power cuts, raising concerns about the resilience, reliability and preparedness of India's electricity grid.

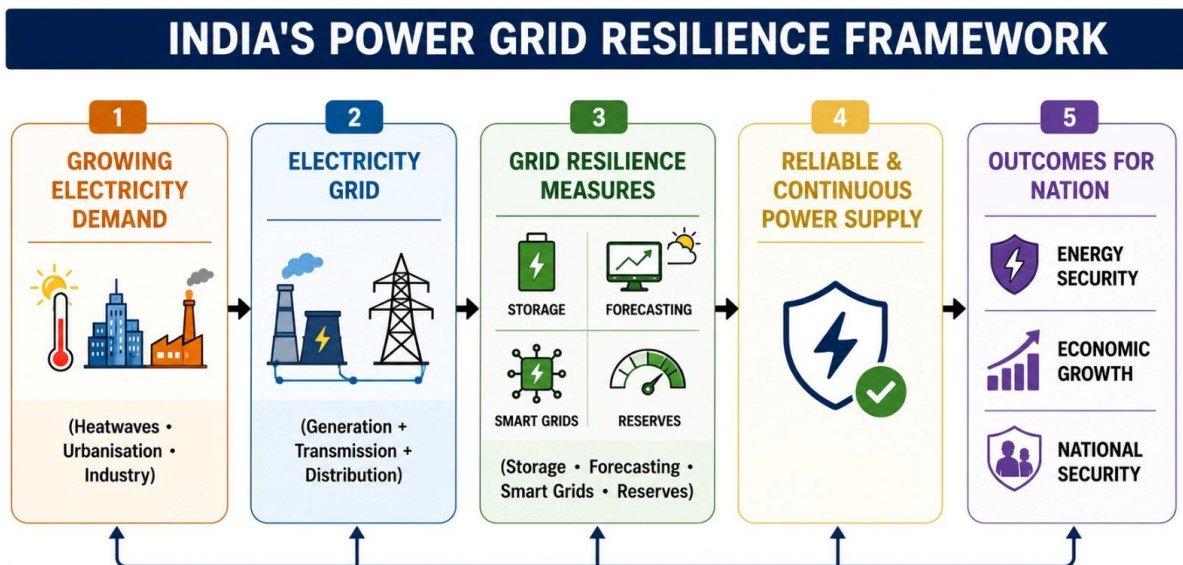
The recent demand record reflects India's rapidly expanding energy requirements. Understanding the broader context helps explain why power shortages can still occur despite significant growth in electricity generation capacity.

b. Background Context

India's electricity demand has grown rapidly because of rising temperatures, economic expansion, urbanisation, increasing household electrification and greater industrial activity. Although installed generation capacity has expanded substantially over the past decade, ensuring uninterrupted electricity supply depends not only on generating sufficient power but also on the ability of the transmission and distribution network to deliver electricity reliably across the country.

The recent power deficit illustrates that achieving a national demand record does not automatically eliminate local shortages. Constraints in generation availability, interstate transmission capacity, distribution infrastructure and real-time grid management can still result in regional outages and load shedding.

The recurring mismatch between electricity availability and uninterrupted supply highlights the importance of understanding the concept of grid resilience.



c. Understanding Grid Resilience

Grid resilience refers to the ability of an electricity system to anticipate, withstand, adapt to and recover rapidly from disruptions while continuing to supply reliable power to consumers.

A resilient power grid is built upon multiple pillars, including adequate generation capacity, robust transmission networks, efficient distribution systems, diversified energy sources, reliable demand

forecasting, sufficient reserve capacity, energy storage facilities and effective real-time grid management. Together, these components enable the electricity system to maintain stability even during periods of exceptionally high demand or unforeseen disruptions.

Despite having one of the world's largest installed power capacities, India continues to experience periodic power shortages because grid resilience depends on far more than generation alone.

d. Why Power Cuts Persist Despite Record Generation

- **Transmission and Distribution Constraints:** Electricity generated in one region cannot always be transmitted efficiently to deficit regions because of congestion in interstate transmission corridors or weaknesses in the distribution network. Consequently, localised power shortages may continue even when adequate electricity is available at the national level.
- **Rising Peak Demand:** Heatwaves have significantly increased the use of air conditioners, coolers, irrigation pumps and commercial cooling systems. Electricity demand therefore rises sharply during certain hours of the day, placing considerable stress on the grid and increasing the likelihood of supply disruptions.
- **Intermittency of Renewable Energy:** Solar and wind energy have become major contributors to India's electricity mix. However, their output depends on weather conditions and varies throughout the day. This necessitates flexible thermal generation, hydroelectric power, battery storage and advanced forecasting systems to maintain grid stability.
- **Dependence on Coal-Based Power:** Coal continues to supply the majority of India's electricity. Any disruption in coal availability, transportation or thermal power plant operations can reduce generation precisely when electricity demand is at its highest.
- **Financial Weakness of Distribution Companies:** Many State distribution companies (DISCOMs) continue to face financial stress because of accumulated losses, delayed subsidy payments and operational inefficiencies. Limited financial resources affect maintenance, infrastructure modernisation and the timely procurement of power, ultimately impacting service reliability.
- **Climate-Induced Stress:** Heatwaves not only increase electricity demand but also reduce the operational efficiency of transmission lines, transformers and thermal power plants. Climate change is therefore simultaneously increasing demand while reducing the efficiency of critical electricity infrastructure.

Recognising these structural challenges, the Government has introduced several initiatives aimed at strengthening the resilience of India's electricity system.

e. Government Initiatives

- Expansion of the National Grid through high-capacity interstate transmission corridors.
- Development of the Green Energy Corridor to facilitate large-scale renewable energy integration.
- Establishment of Renewable Energy Management Centres (REMCs) for improved forecasting, scheduling and grid balancing.
- Promotion of Battery Energy Storage Systems (BESS) and Pumped Storage Projects (PSPs) to enhance grid flexibility.
- Smart metering and distribution reforms under the Revamped Distribution Sector Scheme (RDSS).
- Expansion of renewable energy capacity towards the national target of 500 GW of non-fossil fuel-based capacity by 2030.

These initiatives represent important reforms, but their effectiveness must ultimately be assessed in terms of their contribution to long-term grid resilience and energy security.

f. Significance

- **Foundation of Economic Growth:** A resilient electricity grid is indispensable for economic growth, industrial competitiveness, digital infrastructure and sustainable development. Reliable electricity enables uninterrupted manufacturing, investment and productivity across sectors.
- **Support for Essential Services:** Critical public services such as healthcare, transportation, communications, water supply and emergency response depend upon continuous and reliable electricity.
- **Facilitating the Energy Transition:** As India increases the share of renewable energy and promotes electric mobility, a resilient power grid will become essential for integrating variable energy sources without compromising system stability.
- **National Security and Critical Infrastructure:** Electricity forms the backbone of strategic installations, defence infrastructure, financial systems and digital networks. Grid resilience is therefore a key component of national security and critical infrastructure protection.

g. Challenges

- **Generation Alone is Insufficient:** The recent power deficit demonstrates that installed generation capacity alone cannot guarantee uninterrupted electricity supply. Grid resilience depends equally on transmission infrastructure, distribution efficiency, reserve capacity, storage technologies and effective demand management.
- **Renewable Energy Integration:** Increasing dependence on renewable energy requires substantial investments in storage systems, flexible generation, forecasting technologies and modern grid management to maintain system stability.
- **Financial Constraints of DISCOMs:** Persistent financial weaknesses of distribution companies continue to undermine infrastructure investment, operational efficiency and the long-term reliability of electricity supply.
- **Growing Climate Risks:** More frequent and intense heatwaves are likely to increase peak electricity demand while simultaneously affecting the performance of generation, transmission and distribution infrastructure.

Addressing these challenges requires a comprehensive approach that strengthens every component of the electricity value chain rather than focusing solely on expanding generation capacity.

h. Way Forward

- **Strengthen Transmission and Distribution Networks:** India should continue upgrading transmission corridors and modernising distribution infrastructure to eliminate regional bottlenecks and ensure efficient movement of electricity across the country.
- **Accelerate Energy Storage Deployment:** Investment in Battery Energy Storage Systems (BESS), pumped hydro storage and smart grids should be accelerated to improve system flexibility and support large-scale renewable energy integration.
- **Reform the Distribution Sector:** Distribution sector reforms should prioritise improving the financial sustainability and operational efficiency of State DISCOMs, enabling better maintenance, timely procurement of power and infrastructure modernisation.
- **Promote Demand-Side Management:** Greater emphasis should be placed on energy-efficient appliances, dynamic pricing mechanisms, smart metering, demand response programmes and consumer awareness to moderate peak electricity demand during periods of extreme stress.
- **Build Climate-Resilient Infrastructure:** Future investments should focus on designing electricity infrastructure capable of withstanding extreme weather events and the increasing impacts of climate change.

Conclusion

India's experience of record electricity demand demonstrates that energy security depends not merely on expanding generation capacity but on building a resilient, flexible and climate-ready power system. Strengthening transmission and distribution networks, integrating renewable energy with adequate

storage, improving DISCOM performance and modernising grid management will be essential to ensure reliable, affordable and sustainable electricity supply in the years ahead.

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While every effort has been made to balance depth with brevity, please keep the following in mind:

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However, the PrepAlpine team is simultaneously developing a dedicated Prelims-focused Current Affairs Series, designed for:

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- data recall
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- objective pattern analysis

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