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DAILY EDITORIAL ANALYSIS

TOPIC

SUSTAINING SOLAR ENERGY GROWTH WITHOUT CURTAILMENTS

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Context

- India achieved its **NDC target of 50% installed electricity capacity from non-fossil sources ahead of 2030**, yet solar curtailment of 2.3 TWh and 44 GW of unsigned PPAs in 2025 reveal that the transition has moved from a capacity challenge to a systems challenge.

India's Solar Status: Where It Stands

- India ranks **3rd globally in solar energy and 4th in total installed renewable capacity (IRENA 2025)**.
- A record 38 GW of solar capacity was added in 2025, taking total installed solar capacity to around 136 GW.
- **India is already ahead of its 2030 NDC commitment** and is on track to reach 500 GW non-fossil capacity.
- NITI Aayog projects solar capacity **could reach 1,500 GW by 2050** under current policy and 2,400 GW under a Net Zero scenario. The production story is strong. The governance story is lagging.

The Core Problem: A Grid Not Built for Solar

- India had to curtail 2.3 TWh of solar generation between May and December 2025, for which compensation of Rs 5,750 million to Rs 6,900 million had to be **paid to generators.** The curtailed solar could have **avoided around 2.1 million tonnes of CO2 emissions had it displaced coal generation.**
- States like Rajasthan, Gujarat, and Tamil Nadu reported curtailment levels ranging from 10% to 30% during peak solar hours due to transmission unavailability.

Challenges

- **Unsigned PPAs — investment freeze:** As of September 2025, approximately 44 GW of awarded capacity remained stranded with unsigned Power Sale Agreements, driven by DISCOM reluctance, evolving offtaker preferences, and grid infrastructure delays. Without a signed PPA, no financial closure, no construction.
- **Transmission infrastructure lagging capacity:** The solar-rich states of Rajasthan and Gujarat are not where demand is, the demand centres of Delhi, Maharashtra, and West Bengal are thousands of kilometres away. Transmission expansion has not kept pace with generation growth.
- **DISCOM financial stress:** AT&C losses hover around 16% & tariff under-recovery persists. Financially weak DISCOMs delay PPA signing, avoid procurement commitments, and skip timely payments, creating a cycle of uncertainty that suppresses both solar investment and grid modernisation.
- **Coal fleet rigidity:** India's coal plants supply approximately 75% of power generation. Their technical floor of 55% MTL means solar headroom at midday is structurally limited unless the coal fleet is made more flexible or displaced by storage.
- **Supply chain constraints:** Lead times for critical high-voltage equipment including 220 kV and 400 kV transformers stretched to around 20 months in 2025, directly delaying transmission infrastructure that evacuation-constrained solar projects depend on.
- **Rooftop solar underperformance:** PM Surya Ghar faced DCR module shortages, duplicate serial number errors on the portal, and net metering restrictions at state level.

Government Initiatives

- **Green Energy Corridor Phase I and II:** Builds inter-state transmission for integrating renewable power; targets 20 GW evacuation capacity.
- **National Smart Grid Mission:** Modernises distribution infrastructure through smart meters, automation, and demand response.
- **RDSS (Revamped Distribution Sector Scheme):** Reduces AT&C losses and upgrades DISCOM infrastructure with outcome-linked funding.

- **PM KUSUM:** Decentralised solar in agriculture, reducing DISCOM dependence and grid pressure
- **PLI for Solar PV**: Builds domestic module and cell manufacturing to reduce import dependence and ALCM compliance risk
- **Battery Energy Storage PLI:** Decentralised solar in agriculture, reducing DISCOM dependence and grid pressure

Way Forward

- Lower coal MTL below 55% through technical upgrades and operational protocols, creating the midday headroom that solar needs without curtailment becoming routine as capacity scales.
- Mandate signed PPAs within 90 days of project award through a central regulatory mechanism with CERC oversight, ending the 44 GW backlog that is freezing solar investment and project execution.
- Deploy Battery Energy Storage Systems (BESS) at transmission nodes in Rajasthan and Gujarat, targeting 10 GW of storage capacity by 2027 to absorb peak solar generation and supply the evening ramp.
- Overhaul DISCOM finances through time-bound privatisation or professional management models in states with persistent AT&C losses above 20%, replacing the current structural weakness with financially viable offtakers.
- Shift from PPA-based dispatch to SCED nationally, enabling least-cost renewable dispatch across state boundaries and reducing curtailment caused by contractual inflexibility rather than physical congestion.
- Scale smart metering to 250 million households by 2028 and introduce time-of-day tariffs, shifting demand to solar peak hours and turning consumers into demand-side flexibility resources.

Conclusion

- India's solar energy journey has become a key part of its clean energy transition and climate goals, and issues like **unsigned PPAs and solar power curtailment** need urgent action while the target of **500 GW of non-fossil capacity by 2030** seems possible.
- Strengthening transmission networks, expanding storage infrastructure, improving DISCOM finances, and ensuring clear policies are essential for supporting solar growth and reaching India's long-term **Net Zero 2070 vision.**

Daily Mains Practice Question

[Q] **Discuss the major factors responsible for solar power curtailment in India. Suggest a comprehensive strategy to ensure sustained growth of solar energy without curtailments.**

Source: BL

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