MSL COCKPIT
SPECIAL EDITION

India's Solar, Storage & Critical Minerals Media Intelligence Report

Navigating India's Clean Energy Revolution - Part I

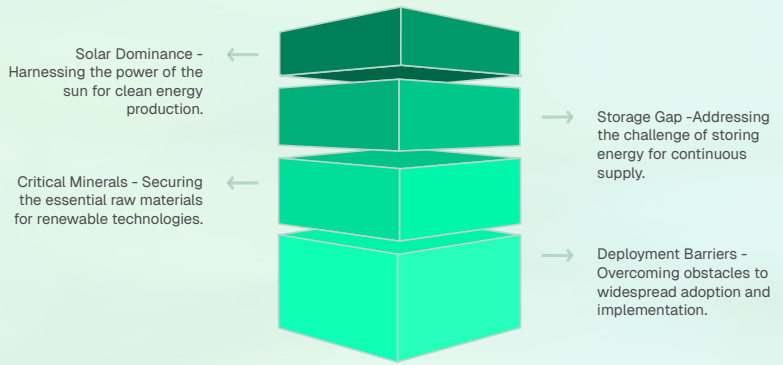
Published: Dec 2025: News & X Mentions in India: Jan 2025 - Nov 2025

Executive Summary

India's **solar**, storage and **minerals ecosystem** remains the backbone of its renewable energy strategy and energy transition strategy. Solar power continues to dominate the country's renewable energy portfolio, driven by falling tariffs, strong utility-scale additions, and ambitious national schemes like PM Surya Ghar. However, India remains deeply exposed to imported modules, cells and minerals—with domestic manufacturing still costlier despite Production-Linked Incentive (PLI) support. This dependency has become a central credibility issue for India's "energy independence" narrative on the global stage.

Grid instability, curtailment, land conflicts and governance frictions remain major structural barriers to scaling deployment. On the storage front, India has installed less than 1 GWh against a staggering requirement of approximately 230 GWh by 2032 (from BESS), reflecting the largest infrastructural gap in the nation's energy transition. Revenue stacking mechanisms, classification of battery energy storage system (BESS) assets, and development of ancillary markets are still unresolved, significantly constraining investment appetite among both domestic and foreign investors.

Meanwhile, critical minerals such as lithium, rare earth elements (REEs), cobalt and graphite have emerged as strategic priorities for long-term energy security. India's reserves are substantial but processing capabilities remain limited; early-stage coal-overburden extraction programmes and exploration initiatives offer long-term potential but require significant capital and technology partnerships.



Solar Sector Conversations

Jan 1 – Dec 1, 2025; the chart shows the Mention Volumes across categories .

- Infrastructure & Supply Chain and Technology saw a joint peak on Sep 15–22. The Infrastructure & Supply Chain theme reached 1.34k mentions, a 376% increase above its median. This surge was primarily driven by X posts reposting about India's "Solar energy leadership (Asia's biggest solar park in Gujarat)" and the need for "Policy incentives, subsidies...for Solar Modules, Battery Storage (BESS), Green Hydrogen & Grid Transmission."
- Technology also peaked on Sep 15–22, reaching 1.55k mentions, an 259% increase over its median, driven by discussions around #partnership and #bhutan, seeing increases of 116% and 79% respectively.
- Infrastructure & Supply Chain also peaked earlier on Aug 18–25, reaching 899 mentions, a 219% increase above its median.This was driven by #indianrailways and #energy, which saw 231% and 27.6% increases, respectively.
- Policy and Regulation experienced a significant peak on Jul 14–21, reaching 800 mentions, a 211% increase above its median. Hashtags like #rcm2025 and #solarcooperation saw increases of 17.5% and 14.3% respectively, indicating discussions around policy development and international collaboration.

India's Solar Landscape

India has installed 130+ GW of solar capacity, forming a critical component of its renewable energy portfolio. This positions the country as the third largest producer of Solar Energy in the world.

Rooftop solar is growing but still represents less than 20% of established targets, indicating substantial untapped potential in distributed generation. The PM Surya Ghar scheme demonstrates high intent from the central government but has experienced mixed uptake at the state level due to implementation complexities and varying local priorities.

Despite domestic manufacturing initiatives under the Approved List of Models and Manufacturers (ALMM) framework and PLI schemes, imports remain high—particularly for high-efficiency cells and wafers. Large-scale utility projects continue to dominate capacity addition, driven by competitive auctions and improving project economics.

Improved bankability, hybrid projects combining wind and solar, streamlined discoms and battery storage can vastly improve the net outcomes of solar projects across India.

The rooftop solar sector is not only contributing to clean energy but also creating job opportunities across India. Initiatives like the PM Surya Ghar scheme have led to the training of thousands in solar panel installation and maintenance, fostering local entrepreneurship.

130+

GW Solar Installed

Current operational capacity

250

GW RE Portfolio

Exceeds 50% of Total Installed generation capacity of which almost 129 GW is solar.

<20%

Rooftop Target

Achievement rate so far

Market Momentum & Investment Trends

Major players including Adani Green Energy, ReNew Power, NTPC Renewable Energy, and Tata Power are driving gigawatt-scale project pipelines that will define India's renewable trajectory over the next decade. These companies are leveraging economies of scale, improved financing terms, and technological advancements to deliver increasingly competitive projects. A report by the **National Institute of Solar Energy** reveals India's potential for 3,343 GWp of ground-mounted solar PV from wasteland. Rajasthan leads with 828.78 GWp, followed by Maharashtra, Madhya Pradesh, Andhra Pradesh, and Gujarat.

Domestic manufacturing capacity is expanding with new facilities coming online, but production remains cost-disadvantaged. Despite efforts to boost domestic manufacturing, approximately 50-60% of solar modules are still imported from China. The Indian government is implementing measures such as anti-dumping duties and local content requirements to reduce this dependency

Foreign Institutional Investment

FII and sovereign fund interest remained strong for utility-scale solar projects. Companies like **Waree Energies**, for example, grew with FII investors increasing their share from 1.4% in Dec 2024 to 6.5% in Sept 2025

Corporate Decarbonisation

Industrial and commercial demand is rising sharply as corporations pursue Science-Based Targets and **RE100** commitments to meet sustainability goals.

MSME Adoption

Distributed solar is gaining significant traction among micro, small and medium enterprises seeking to reduce energy costs and improve competitiveness.

Key Barriers: Land, Grid & Governance

Land Conflicts

Rajasthan oran (sacred grove) disputes are slowing multiple gigawatt-scale projects, with local communities asserting traditional rights over land earmarked for solar development. These conflicts highlight the need for better community engagement and benefit-sharing mechanisms.

Grid Congestion

Significant curtailment events have been reported in Tamil Nadu, **Rajasthan**, and Karnataka due to inadequate transmission infrastructure and grid management capabilities. This results in renewable energy spillage and undermines project economics.

Microgrid Challenges

Recent **microgrid shutdowns** highlight critical policy mismatches between central schemes and state-level implementation. However, researchers at the **National Institute of Technology, Rourkela**, have developed a hybrid microgrid system that integrates solar, wind, and battery sources to provide reliable electricity.

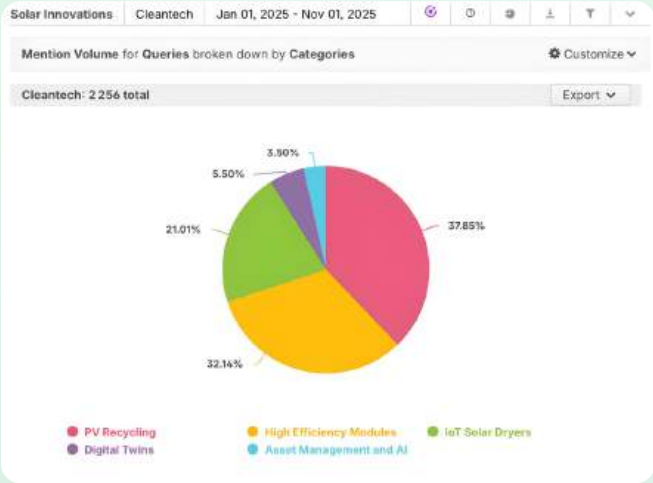
Political Pushback

Local political considerations are increasingly affecting project siting decisions, with elected representatives responding to constituent concerns about **land use** and environmental impacts.

Governance Concerns

Governance noise surrounding large tenders, including **SECI inquiries** and allegations of procedural irregularities, has created reputational risks and uncertainty in the procurement process.

Technology Shifts in Solar



Share of mentions of Innovative technologies in the Solar space

AI-Enabled Asset Management

Advanced analytics and machine learning algorithms are gaining rapid adoption for **optimizing solar asset performance** and predictive maintenance.

IoT Integration

Internet of Things-based applications including solar dryers and cold-chain integration are expanding solar's impact beyond electricity generation.

Higher-Efficiency Modules

Next-generation technologies including TOPCon (Tunnel Oxide Passivated Contact) and HJT (Heterojunction) are emerging in the Indian market.

Digital Twins

Virtual replicas of physical assets enable sophisticated predictive fault management and optimization of operational parameters.

PV Recycling

Photovoltaic recycling infrastructure is gaining regulatory traction as India prepares for end-of-life management of early solar installations.

Domestic Manufacturing: Status & Challenges

India's push toward solar manufacturing self-reliance has shown measurable progress, with **module imports dropping 57%** during the first eight months of FY25 compared to the previous year. This decline reflects both the impact of import restrictions under ALMM and the gradual scaling of domestic production capacity under PLI-supported facilities.

The introduction of anti-dumping duties on solar cell imports from China aims to protect domestic manufacturers and encourage the growth of local industries. India's commerce ministry has recommended anti-dumping duties of 23-30% on solar cell imports from China for three years. Several companies are establishing **vertically integrated solar manufacturing facilities** in India, focusing on the entire value chain from polysilicon to modules. This includes significant investments in ingot and wafer production, with targets set for 2027. The Indian Solar Manufacturers Association is advocating for protective duties on imports to bolster local production.

PLI Uncertainties

Delays and ambiguities in PLI disbursement timelines are impacting the pace of capacity scale-up and deterring some potential investors.

Integration Gap

Integration of solar manufacturing with battery energy storage system production remains slow, limiting opportunities for domestic value addition.

Financial & Policy Signals

Market Dynamics

Solar tariffs remain highly competitive, typically ranging between ₹2.5-2.7 per kWh in recent auctions, making solar one of the most affordable sources of new electricity generation in India. This tariff band reflects improving technology costs, better financing terms, and economies of scale in project development.

India's solar journey is at a crossroads, with **manufacturing capacity growing far faster than demand.** This has created what analysts describe as an emerging solar glut, as new factories are producing more modules than the market can absorb. The curtailment rate, the share of solar power that is generated but cannot be used or fed into the grid, rose to about 12 per cent in October.

The market is witnessing a strategic shift toward hybrid power purchase agreements combining solar, wind and storage to provide more reliable supply profiles. Viability Gap Funding (VGF) support is strengthening hybrid dispatch reliability and making round-the-clock (RTC) renewable power increasingly viable.

Emerging Drivers

Carbon markets are expected to significantly influence solar demand from industrial consumers as the domestic carbon trading scheme evolves. Companies with high emissions intensity are likely to accelerate renewable procurement to manage compliance costs and meet voluntary commitments.

India's Storage Landscape

India needs approximately 230 GWh of battery energy storage capacity by 2032 to effectively balance renewable energy integration and ensure grid stability. **However,** only about 0.5 GWh of storage capacity (Operational BESS) exists today—representing one of the most severe infrastructure gaps in the country's energy transition roadmap.

Critical for RE Balancing

BESS is essential for managing renewable energy intermittency and enabling higher penetration of variable generation sources.

RTC Supply Enabler

Storage enables round-the-clock renewable power supply, replacing the baseload characteristics of conventional generation.

High Barriers

Significant financing and capital expenditure barriers are slowing adoption despite recognized benefits.

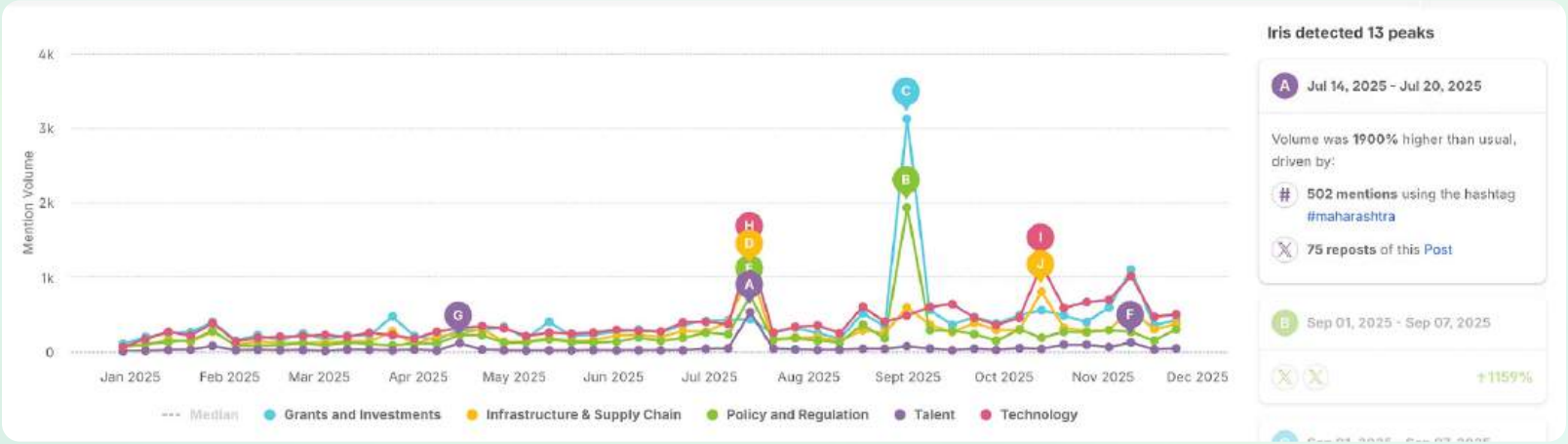
Regulatory ambiguity on energy storage classification creates uncertainty about applicable tariff structures, taxation, and operational frameworks. The poor clarity on revenue stacking opportunities—where storage assets could earn from multiple value streams including energy arbitrage, capacity payments, and ancillary services—prevents investment decisions from being finalized.

*Note: The storage landscape section mostly discusses BESS initiatives and excludes Pumped Storage in this report.

Storage Sector Conversations

Jan 1 – Dec 1, 2025; the chart shows Mention Volume for Cleantech categories, revealing several significant peaks driven by policy announcements, investment initiatives, and infrastructure developments.

- Talent mentions soared in mid-July. The category saw a notable peak of 530 mentions during Jul 14–21, 2025, an increase of 1900% above its median. This surge was primarily driven by discussions around Maharashtra's collaboration with UC Berkeley to advance its energy sector, with mentions highlighting efforts to improve "clean, reliable, and affordable energy".
- Policy and Regulation peaked in early September. The category observed a peak of 1.93k mentions during Sep 1–8, 2025, surging 1159% above its median. This spike was driven by the Union Cabinet's approval of an incentive scheme for critical mineral recycling, which aims to boost "capacities to recycle battery waste and e-waste, promote investment and encourage job creation".
- Grants and Investments saw a significant rise in early September. This category reached 3.12k mentions on Sep 1–8, 2025, representing a 906% increase above its median. This activity was largely driven by discussions related to investments and job creation spurred by the Union Cabinet's incentive scheme for critical mineral recycling.
- Infrastructure & Supply Chain peaked in mid-July. This category experienced a peak of 1.08k mentions during Jul 14–21, 2025, showing a 390% increase above its median. Mentions focused on directives to develop a logistics hub, including a dry port and storage terminal, and plans to implement DI pipeline systems and solar energy solutions to meet population demands.



Storage Technology Pathways

Lithium-Ion Dominant

Li-ion batteries remain the dominant technology for grid-scale and distributed storage applications, but they are expensive and create significant import dependencies, particularly for cells and critical materials.

Sodium-Ion Emerging

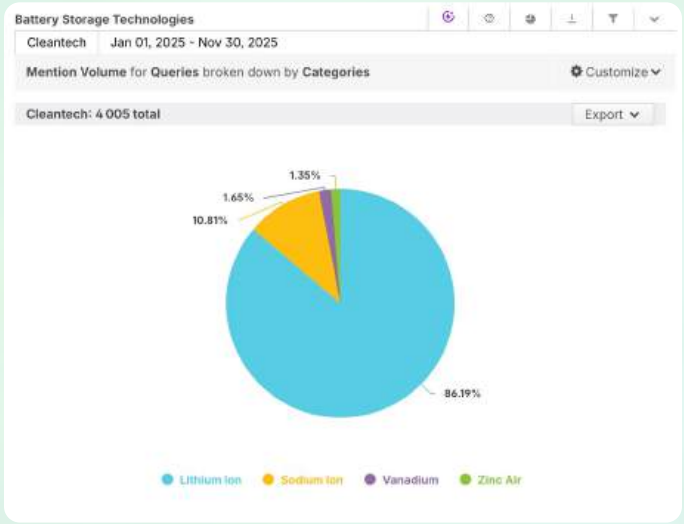
Sodium-ion technology is emerging as a safer, more temperature-resilient option particularly suited to India's climate conditions. It also reduces dependency on lithium supply chains.

Zinc-Air Interest

Zinc-air batteries are gaining interest for long-duration storage applications where discharge times of 8+ hours are required for daily cycling or seasonal storage.

The recent inauguration of a MWh scale **VRFB system by NTPC** marks a pivotal moment in the country's clean energy transition, enhancing grid resilience and renewable energy integration. This initiative is part of a broader effort to diversify energy storage solutions beyond lithium-ion batteries, addressing the growing demand for sustainable energy storage options.

Hydrogen-based storage is being explored for large industrial clusters where co-location with green hydrogen production can improve overall system economics. Additionally, a circular economy is emerging through battery recycling investments, with several companies announcing plans to establish facilities for recovering valuable materials from end-of-life batteries.



Financing & Viability of Storage

The Indian government on June 10 announced a viability **gap funding (VGF) worth Rs 5,400 crore** for developing 30 gigawatt hour (GWh) of new battery energy storage systems (BESS) to ensure round-the-clock renewable energy capacities in the country, representing an important first step in de-risking early projects. Various states, including **Maharashtra** and **Rajasthan**, are set to benefit from the central government's VGF scheme for BESS projects.

Revenue Challenges

- No established market for ancillary services revenue streams
- BESS assets not recognized as "infrastructure" limiting access to favorable financing
- Absence of time-of-use (TOU) pricing dampens commercial viability for arbitrage
- High off-taker risk from distribution companies **(DISCOMs)** with weak financial health

The lack of infrastructure status for BESS assets has significant financing implications, preventing access to lower-cost capital and longer tenor debt that is crucial for capital-intensive energy infrastructure. Until storage can stack multiple revenue streams and benefit from improved regulatory classification, achieving financial viability without subsidies will remain challenging.

Critical Minerals: India's Strategic Imperative

India possesses approximately **6.9 million tonnes of rare earth element (REE) reserves**, ranking among the world's largest holders. However, the country's **processing capability remains severely limited,** creating a strategic vulnerability in its energy transition supply chain. Most REE minerals are exported for processing and then re-imported as refined products or components.

Coal Overburden Extraction

The Coal Ministry is exploring extraction of REEs from mine overburden, potentially unlocking significant resources from existing mining operations.

NCMM Priorities

National Critical Mineral Mission (**NCMM)**, is armed with an outlay of Rs 34,000 crore aimed at accelerating exploration, refining, recycling, and technological innovation.

Technology Enablers

These minerals are essential inputs for solar panels, wind turbines, BESS, electric vehicles, and green hydrogen electrolyzers.

Vertical Integration

Companies like Reliance Industries and **Vedanta** are exploring vertical integration strategies to secure mineral supply chains.

Supply Chain Vulnerabilities

India's renewable energy ambitions are constrained by critical supply chain vulnerabilities that expose the country to geopolitical risks and price volatility. Addressing these dependencies is essential for achieving genuine energy independence and climate leadership.

China Dependence

India still depends heavily on China for solar wafers, high-efficiency cells, and permanent magnets used in wind turbines and EV motors. This creates strategic vulnerabilities.

Lithium Imports

India is fully import-dependent for lithium, with geopolitical concentration risk in Australia, **Chile,** and China for processing. No domestic lithium production exists currently.

Price Volatility

Solar module prices fluctuate significantly with Chinese manufacturing overcapacity cycles, creating uncertainty in project planning and tariff bids.

Battery Materials

Battery materials supply chains are exposed to global shocks from producing countries like Chile (lithium), Democratic Republic of Congo (cobalt), and China (processing).

Strategic Partnerships

There is an urgent need for long-term mineral supply agreements with friendly countries including Australia, Canada, and nations in Africa and Latin America.

Outlook: What to Watch

The next 12-18 months will be decisive for India's solar, storage and critical minerals trajectory. Conversations that have been gathering steam along particular themes

1

Sodium-Ion Deployments

India's first commercial sodium-ion battery installations at utility scale, signaling technology diversification and reduced lithium dependence.

2

Hybrid PPA Announcements

Major power purchase agreement announcements for solar-plus-storage hybrid projects offering round-the-clock renewable supply.

3

Mineral Block Auctions

Critical mineral exploration block auction outcomes and processing capacity investments by both public sector and private players.

4

Grid Modernization

Regulatory approvals and investment commitments for renewable energy corridor expansion to address transmission bottlenecks.

5

COP30 Discussions

India and other nations are calling for equitable and predictable climate finance to facilitate their transition to renewable energy. The need for innovative financing mechanisms and collaborative efforts to mobilize resources is emphasized, as countries strive to meet their Nationally Determined Contributions (NDCs).

Success in these areas will determine India's credibility as both a climate leader and an emerging renewable energy superpower capable of meeting its 2030 targets while building genuine energy independence.

Methodology

The Magnify team uses Brandwatch to power insights across media on topics of interest. Analysts segment the data into thematics to understand the governing ideas and key voices across media narratives. The analysis covers mentions across news sites, 'X', blogs, forums, and other open platforms. It has been done on English mentions only.

For questions, comments and recommendations: please reach out to **suryasen.kundu@mslgroup.com** or **tushar.bajaj@mslgroup.com**