NRDC India

FACTSHEET

INDIA COUNTRY PROFILE: ENERGY STORAGE



November 2026

1. ENERGY LANDSCAPE AND ENERGY RESOURCE MIX

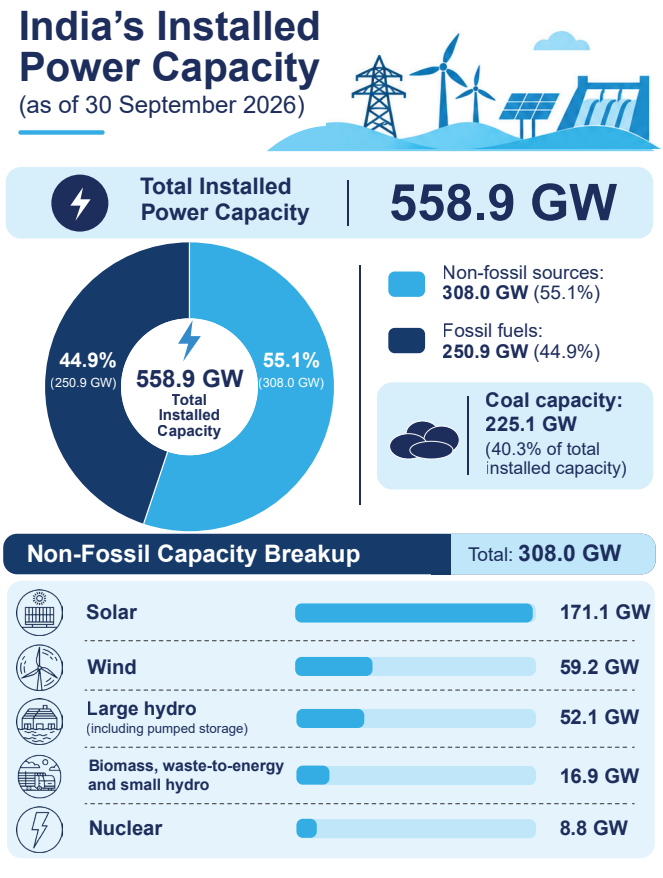
India's rapid economic growth is reshaping its electricity system. According to the Government of India's First Advance Estimates released in January 2026, India's economy continued to demonstrate strong growth with the real Gross Domestic Product (GDP) estimated to expand by 7.4 percent in FY2025–26. The growth figures have been supported primarily by the services sector, alongside continued expansion in the manufacturing and construction sectors.[1] The economic growth, combined with rapid urbanization, cooling demand, industrialization, digitalization, electrification of transport, and rising household appliance use, is pushing India's electricity system into a new phase of demand growth and power system complexity.

India's climate change mitigation commitments reinforce this shift. Under its 2022 Nationally Determined Contribution (NDC), India had committed to reduce the greenhouse gas emissions intensity of its GDP by 45 percent (compared to the 2005 levels) by 2030, and to achieve 50 percent cumulative installed electric power capacity from non-fossil sources by 2030.[2] In March 2026, India updated its NDC for 2031-35, building on the earlier commitments by targeting a 47 percent reduction in GDP emissions intensity by 2035, a 60 percent cumulative installed electric power capacity from non-fossil sources by 2035, and continued alignment with its long-term goal of achieving net-zero emissions by 2070.[3]

India met its NDC target of achieving 50 percent cumulative electric power installed capacity from non-fossil sources in June 2025, five years ahead of schedule.[4] The most recent government update shows that, as of 30 September 2026, total installed power capacity stood at about 558.9 GW, of which 308 GW (55.1%) was from non-fossil sources.Fossil fuel capacity was about 250.9 GW, with coal alone accounting for 225.1 GW (40.3% of total installed capacity). Among non-fossil sources, solar had reached 171.1 GW, wind 59.2 GW, and large hydro (including pumped storage) 52.1 GW. Nuclear capacity stood at 8.8 GW, while biomass, waste-to-energy and small hydro together accounted for a further 16.9 GW.[5]

However, this increase in installed capacity of renewable energy sources does not directly translate into an improvement in power generation. Due to solar and wind power's lower capacity utilization and dependence on factors such as weather and time, coal continues to be the dominant source of electricity generation, accounting for 70.8 percent of total generation.[6] On the afternoon of May 21, 2026, when India's power demand touched a record peak of 270.7 GW, the peak was met primarily by thermal generation (which represented approx. 63 percent of the total power generation at that moment). Meanwhile, solar was the second-largest contributor, supplying 59.9 GW (around 22 percent) of the generated power.[7] This gap between power capacity addition and actual power generation highlights how India's power transition is no longer just about adding renewable capacity, but about building the flexibility, energy storage capability, and grid readiness needed to use clean power reliably.

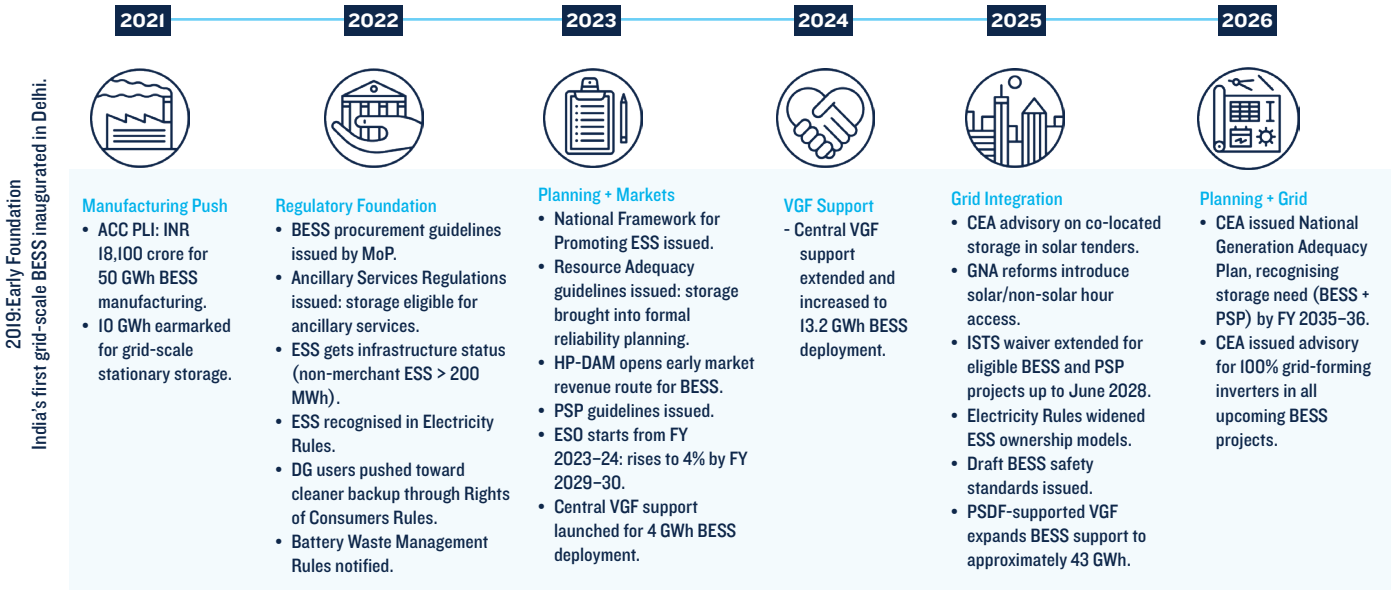
Thus, India will need both battery energy storage systems (BESS) and pumped storage projects (PSP) as they help fulfill different flexibility needs. BESS can respond quickly and is well suited for intra-day balancing, evening peak management, renewable energy shifting, ancillary services, and distribution level support. PSP, on the other hand, can provide longer duration storage, making it useful for managing extended low renewable periods, seasonal balancing, and system level reliability. Together, BESS and PSP can help India move from renewable capacity addition to reliable renewable integration. As of July 30, 2026, the installed capacity of BESS (Primarily Li-ion Technology) in India with capacity greater than 1 MWh is 2.9 GW/8.6 GWh.[8] In the case of PSP, India currently has 7.4 GW of pumped storage capacity in operation.[9]



2. STORAGE-RELEVANT POLICY AND REGULATORY LANDSCAPE

While India has used pumped storage for grid flexibility for decades, the policy push around BESS began taking shape around 2019, when India's first grid-scale BESS was inaugurated in New Delhi. Figure 1 shows the recent phase of storage reforms, outlining how energy storage policy measures have evolved into a more comprehensive policy and regulatory framework since 2019.[10]

FIGURE 1: INDIA'S ENERGY STORAGE POLICY AND REGULATORY FRAMEWORK TIMELINE, 2019-2026



The policy framework now spans the entire storage value chain: national planning, legal recognition, demand creation, procurement, market participation, public finance, domestic manufacturing, grid-access incentives, safety standards and lifecycle management.

Abbreviations: ACC – Advanced Chemistry Cell; PLI – Production Linked Incentive; INR – Indian Rupees; GW – Gigawatt; GWh – Gigawatt-hour; BESS – Battery Energy Storage System; ESS – Energy Storage System; MoP – Ministry of Power; CEA – Central Electricity Authority; DG – Diesel Generator; HP-DAM – High Price Day Ahead Market; ESO – Energy Storage Obligation; FY – Financial Year; VGF – Viability Gap Funding; GNA – General Network Access; ISTS – Inter-State Transmission System; PSDF – Power System Development Fund; PSP – Pumped Storage Project.

A key milestone in the development of a robust energy storage policy strategy was the **National Framework for Promoting Energy Storage Systems,** issued by the Government of India's Ministry of Power in 2023, which provides the overarching policy direction for scaling up storage in the power sector in India.

At the **planning level**, the Ministry of Power's Central Electricity Authority (CEA) has estimated that India will need about 888 GWh of energy storage capacity by 2035-36 to support reliable renewable integration, including 80 GW/321 GWh of BESS (Lithium-ion technology) and 94 GW/567 GWh of PSP.[11] Thus underlining the importance of long-duration energy storage (LDES) in the case of India. While short duration BESS can help manage intra-day balancing and evening peaks, long-duration energy storage such as pumped storage and other emerging LDES technologies will be required for extended low-solar or low-wind periods, seasonal balancing, and round-the-clock clean power. Further, energy storage has also been incorporated into India's Resource Adequacy framework, which estimates the optimal capacity mix required to meet the projected demand at minimum cost.[i] In June 2023, the Ministry of Power issued the Resource Adequacy Plan guidelines, which treat energy storage, generation, and demand-responsive resources as planning elements for reliably meeting future peak demand and maintaining grid stability. This marks an important shift, as storage is no longer viewed only as a renewable energy (RE) add-on, but as part of India's reliability and adequacy planning.

Transmission-related incentives are another major enabler. The waiver of inter-state transmission system charges has been extended for eligible storage projects, including co-located BESS projects commissioned and pumped-storage projects awarded up to June 2028. This will help improve the economics of storage-backed renewable energy and support inter-state procurement of clean power, especially from renewable-rich states to demand centers.

India has also created a **demand-side pull** for storage, through regulatory obligations that create demand for energy storage alongside the expansion of renewable

i Resource adequacy refers to planning for sufficient generation, storage, demand response, and transmission capacity to reliably meet electricity demand during peak and stressed periods.

energy. The earlier trajectory of the Ministry of Power's Energy Storage Obligation specified a gradual increase in the share of electricity consumption to be met through renewable energy stored in energy storage systems, rising from 1 percent in FY2023–24 to 4 percent by FY2029–30. The revised Renewable Consumption Obligation notification, issued in September 2025, incorporated energy storage as a pathway for meeting renewable consumption targets under the central framework. Additionally, state-level regulatory provisions may also support storage deployment, subject to the applicable state regulations and subsequent amendments.

Meanwhile, the Electricity (Rights of Consumers) Amendment Rules, 2022, have created a **consumer-side push** for storage. The rules require consumers using diesel generator sets as essential backup power to shift to cleaner technologies, such as renewable energy with battery storage, within five years from commencement of the rules (i.e., by April 2027) or as per timelines specified by the State Electricity Regulatory Commission.

The **legal recognition** of energy storage systems (ESS) as part of the power system has proved to be a foundational reform. The Electricity Rules were amended in December 2022 to explicitly recognize ESS as an integral part of the power system, enabling storage to be used across generation, transmission, and distribution. Another important step was the inclusion of ESS in the Harmonized Master List of Infrastructure Sub-sectors in October 2022, thereby improving access to long-tenure and lower-cost financing. In September 2025, the Electricity Rules were further amended to allow ESS to be developed, owned, leased, or operated by power generation companies, transmission licensees, distribution licensees, consumers, system operators, and independent energy storage service providers. Thus widening the scope for utility-scale, merchant, consumer-owned, and third-party storage business models.

On the **procurement** side, the guidelines for the procurement and utilization of BESS as part of generation, transmission, and distribution assets, along with ancillary services, were notified by the Ministry of Power in March 2022. Simultaneous establishment of standard bidding guidelines for firm and dispatchable power from grid connected renewable energy projects with energy storage systems have helped shift procurement from plain RE toward firm, peak-hour, and dispatchable clean power products.

India has also created new **market opportunities** for energy storage. Under the Central Electricity Regulatory Commission's (CERC) Ancillary Services Regulations, 2022, energy storage resources are eligible to provide secondary and tertiary reserve ancillary services, subject to specified conditions. Electricity supplied from BESS has also been allowed to participate in the High-Price Day-Ahead Market, launched in March 2023, enabling storage to respond to peak price signals. These measures have created early revenue channels for storage beyond fixed-capacity procurement.

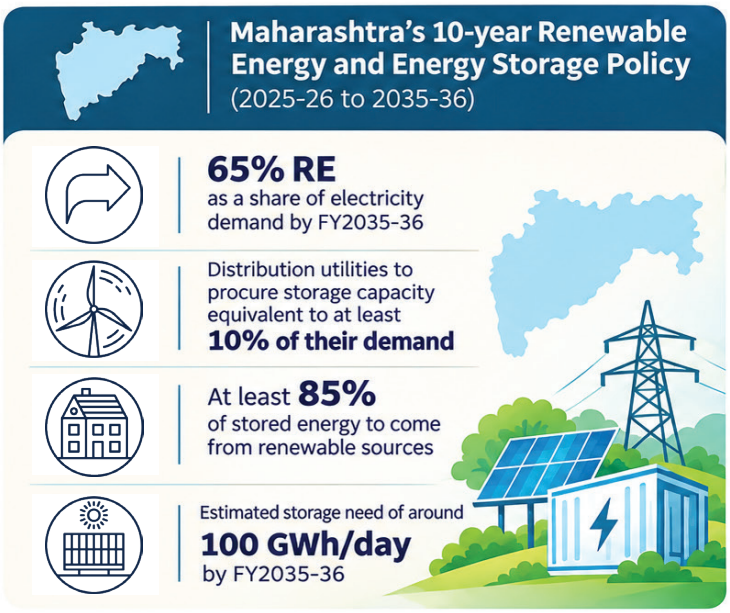
Further, **public finance** is being used to accelerate early storage deployment. India's central Viability Gap Funding (VGF) support now covers about 43 GWh of BESS, comprising 13.2 GWh under the central VGF scheme. The public finance support also covers a separate 30 GWh Power System Development Fund-supported VGF scheme approved in June 2025.[12] Domestic battery manufacturing is also being supported through the Production Linked Incentive (PLI) scheme for Advanced Chemistry Cells, with INR 18,100 crore allocated for 50 GWh of manufacturing capacity, including 10 GWh for grid-scale stationary storage.

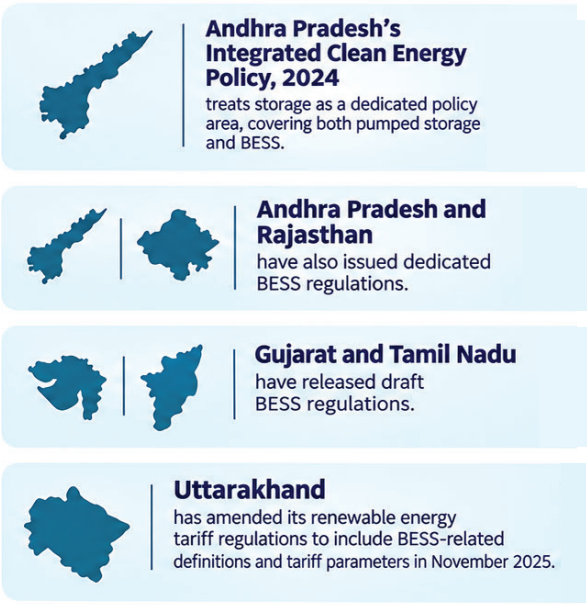
Pumped storage is being promoted as a long-duration and grid-scale flexibility resource. The Ministry of Power's April 2023 guidelines for pumped-storage projects cover transparent site allotment, self-identification of off-river PSP sites, concessional use of government land where available, and use of exhausted mines for development of PSP.

Several newer measures are shaping the next phase of storage deployment. The CEA has issued an advisory recommending co-location of storage with future solar tenders, with storage capacity of at least 10 percent of installed solar capacity for a minimum duration of two hours. Additionally, CERC's Connectivity and General Network Access amendments have introduced solar-hour and non-solar-hour access concepts, which can help storage systems shift renewable power to evening and night hours. The CERC has also amended tariff regulations to provide a framework for energy storage systems installed with regulated thermal generation or transmission assets. The CEA has also issued draft safety and technical standards for BESS to promote the importance of safety, design, and operational standards as deployment scales up. Moreover, the CEA has issued an advisory in July 2026 for equipping all upcoming BESS projects with 100 percent grid-forming inverters, to improve system strength, voltage and frequency support, and black-start capability as inverter-based renewable energy and storage scale up. In addition, the Government of India's Ministry of Environment, Forest and Climate Change has notified the Battery Waste Management Rules, 2022, which lays down a lifecycle management framework for batteries.

State-level policy and regulatory initiatives are also beginning to translate national energy storage frameworks into meaningful implementation.

- Maharashtra's 10-year Renewable Energy and Energy Storage Policy (2025-26 to 2035-36) is a notable example: it targets 65 percent RE as a share of electricity demand by FY2035-36, requiring distribution utilities to procure storage capacity equivalent to at least 10 percent of their demand, while also requiring that at least 85 percent of stored energy comes from renewable sources. The policy estimates that the state would need around 100 GWh/day of storage by FY2035-36.





- Andhra Pradesh's Integrated Clean Energy Policy, 2024, also treats storage as a dedicated policy area, covering both pumped storage and BESS.
- Andhra Pradesh and Rajasthan have also issued dedicated BESS regulations, while Gujarat and Tamil Nadu have released draft BESS regulations. Elsewhere, Uttarakhand has amended its renewable energy tariff regulations to include BESS-related definitions and tariff parameters in November 2025.

Overall, India now has a relatively advanced storage policy framework. The next challenge is implementation, i.e., converting national policy signals into bankable procurement, market revenue streams, and grid-planning processes.

3. TRENDS DRIVING THE NEED FOR ENERGY STORAGE AND KEY USE CASES

India is adding renewable energy capacity at an unprecedented scale. During FY2025-26, India added 55.3 GW of non-fossil capacity, the highest ever in a single year.[4] Solar power accounted for 44.6 GW of this capacity addition.[13] India's current power mix is being shaped by four interconnected trends — rising renewable capacity, higher daytime clean energy contribution, sustained post-sunset demand, and limited flexible supply options — that are driving the need for more flexible resources such as energy storage. Together, these trends show that energy storage is not needed for a single use case alone. In fact, it is becoming a portfolio resource across generation, transmission, distribution, and behind-the-meter applications.

i. **RE Growth and Curtailment are Making Storage Critical**: The rapid renewable growth in India is a major transition opportunity, but it also creates a balancing challenge as the grid needs flexible resources that can absorb variable renewable generation and reduce curtailment. India curtailed around 2.1 TWh of RE in FY2025-26, equivalent to about 1.3 percent of total renewable generation and roughly INR 629 crore of foregone electricity.[14] Storage is, therefore, essential to convert renewable capacity addition into reliable clean electricity supply and to reduce RE curtailment.

ii. **Solar-rich Days are Creating a New Flexibility Challenge**: Solar power generation is increasingly helping India meet its daytime demand. On 6 July 2026, clean energy sources, including renewables, hydropower and nuclear, met 50% of national demand of 221.5 GW at 11:46 a.m. IST.[15] This marked the second time, following the previous occurrence on 29 July 2025, that clean energy sources met over half of India's electricity demand at a given point in time. Clean energy also met over 45% of India's electricity demand for 50 days since May 2026. However, this success also creates a new operational challenge, which is to build enough flexibility in the grid to enable the shifting of RE to post-sunset demand hours.

iii. **High Post-sunset Demand is Stressing Distribution Utilities**: Power demand in India is increasing. A snapshot of this rising demand was witnessed on May 21, 2026, when India recorded a new all-time peak electricity demand of 270.7 GW. The nighttime demand on the same day (between 10:15 p.m. and 11:15 p.m. IST) remained around 250 GW, which was only slightly below the daytime record peak. [7] Similarly, on July 16, 2026, the nationwide electricity demand touched 270 GW at 3:30 p.m. (IST), just short of the all-time high demand peak of May 2026. Even at 12:00 a.m. (IST), the grid was still serving 245 GW. These trends highlight how demand remains high even after solar generation drops. For distribution utilities, such high demand creates stress on feeders, substations, and local networks during evening and late-night hours. Storage systems can help shift daytime clean power to post-sunset demand periods and support distribution-grid reliability.

iv. **Limited Flexible Generation Makes Storage More Important**: As of June 2026, coal capacity stood at 224.1 GW, which is significantly larger than gas (about 20 GW).[16] According to the National Generation Adequacy Plan (for 2035-36) projections, gas capacity will remain around 20 GW by 2035-36, even as solar and wind capacity are expected to rise substantially.[11] This suggests that India is unlikely to rely on gas as a major flexibility resource. Thus, making batteries, pumped storage, and other flexible resources critical for balancing renewable variability.

Beyond these power-system trends, new demand centers such as electric vehicle (EV) **charging stations** are also creating additional storage use cases. 2.55 million EVs were sold in India in FY2025-26, a 25 percent increase over the previous year.[17] However, the EV charging infrastructure has not expanded at the same pace as EV sales. As of March 2026, nearly one in five of India's 27,737 public charging stations were not operational.[18] The 2030 target of 1.3 million charging stations would require a nearly 47-fold increase in the next four years.[19] Grid expansion will be unable to catch up with the target in time as DISCOM connection approvals and energization timelines act as bottlenecks on new sites. BESS, especially when paired with on-site solar, can reduce peak grid draw, defer costly transformer and feeder upgrade costs, improve charger reliability, and help charging sites scale up where grid augmentation is delayed.

There is also a second-life battery opportunity. Under the Government of India's PM-eBus Sewa scheme, Government of India initiative to promote electric buses in urban public transport, more than 38,000 electric buses are expected to be part of the public transport fleet by FY2028-29, with each bus carrying 250 to 350 kWh of batteries. When these batteries retire from vehicle use in mid-2030s, they will still hold 80 percent of the

original storage capacity (even after running 200,000 kilometers) and can be repurposed into bus depot charging infrastructure at lower cost than new cells, thus extending their useful life by up to 10 years.[20]

Together, these trends are driving the growing need for storage solutions that can shift clean electricity across hours, reduce curtailment, manage peak demand, support grid reliability, and serve new electrified demand centers. The main storage use cases emerging from these trends can be summarized as:

i. RE integration and curtailment reduction
ii. Evening peak management
iii. Resource adequacy and capacity value
iv. Distribution-grid support
v. Ancillary services and grid stability
vi. EV charging infrastructure support
vii. Behind-the-meter reliability and second-life battery applications

4. INCORPORATING ENERGY STORAGE SYSTEMS: KEY ENABLERS AND BARRIERS

While India has a strong policy and market case for energy storage, however, deployment will depend on whether regulatory, financial, and operational barriers can be overcome efficiently. Table 1 summarizes the key enablers and barriers for advancing expansion of battery storage.

TABLE 1: KEY ENABLERS AND BARRIERS FOR INCORPORATING ENERGY STORAGE SYSTEMS

Enablers	Barriers
Growing System Need: Rising peak demand, rapid RE growth, and limited gas-based flexibility are creating an imminent need for storage in India's power system.	**Deployment Gap:** As of July 2026, India's cumulative operational BESS capacity has reached 8.6 GWh. This shows that deployment is still at an early stage compared to the projected system needs.
Clear National Policy Direction: Energy Storage is now included in national electricity planning, resource adequacy, procurement guidelines, ancillary services, and the Energy Storage Obligation.	**Revenue Uncertainty:** Storage provides multiple benefits, including peak shifting, ancillary services, congestion relief, and backup power. However, most projects are still compensated for only one or two value streams.
Improving BESS Tariff: Competitive procurement has driven down tariffs for standalone BESS in India. However, the sustainability of the lowest bids remains a concern, given the financial and execution risks facing several projects. Tariff comparisons should therefore consider project status, storage duration, cycle requirements, and viability of implementation. For example, Gujarat Urja Vikas Nigam Limited's Phase VI procurement in 2025 discovered tariffs of approximately INR 2.80 lakh/MW/month for standalone BESS. The project received tariff approval in December 2025, providing a useful reference point for tracking the transition from tariff discovery to implementation.[21]	**Utilities' Financial Stress:** Distribution utilities are likely to be major storage buyers. However, it must be noted that their financial health can affect payment security and long-term procurement confidence.
Public Finance Support: Viable gap funding and competitive bidding are reducing early-stage cost barriers.	**State-level Regulatory Variation:** As open access charges, banking rules, green tariffs, scheduling rules, and storage treatment differ across states, this creates uncertainty for developers and consumers.
Domestic Manufacturing Push: The PLI scheme supports domestic battery manufacturing.	**High Upfront Cost:** Battery storage remains capital-intensive: financing cost, contract design, and risk allocation strongly affect project tariffs.
State-level Action: States such as Maharashtra are beginning to introduce storage-specific policies, which is creating models that other states can learn from.	**Supply-chain Dependence:** India is building manufacturing capacity, but near-term dependence on imported cells, materials and critical minerals remains a risk.

5. REGIONAL CASE STUDIES

Battery Energy Storage Systems (BESS) deployment in India is beginning to reveal two complementary pathways. The first is **grid-scale storage**, where BESS supports renewable integration, peak shifting, and distribution-grid reliability. The second is **demand side storage**, where BESS is located close to new electricity demand centers such as EV charging hubs, bus depots, airports, and highways. Together, these pathways highlight how storage can support both the power system and emerging electrified sectors.

The two case studies in the Table 2 capture the first pathway i.e., grid-scale BESS deployment. The Rajnandgaon solar and BESS plant demonstrates how a RE-plus-storage system is used for shifting solar generation to non-solar peak hours, while the BRPL Kilokari facility demonstrates how a standalone BESS is used as an urban distribution-grid asset.

TABLE 2: BESS CASE STUDIES

Parameter	Rajnandgaon Solar + BESS, Chhattisgarh	BRPL Kilokari Standalone BESS, New Delhi
Significance	Demonstrates how solar-plus-storage can move India from solar capacity addition toward dispatchable renewable power	Demonstrates how BESS can work as a distribution grid asset close to load centres, especially in dense urban areas where network expansion is difficult
Project Type	RE + Co-located storage project	Standalone distribution-level BESS installed at utility's substation
Location	Rajnandgaon, Chhattisgarh	33/11 kV Kilokari Substation, New Delhi
Commissioning Date	February 2024	March 2025
Solar Capacity	100 MW AC solar PV plant, 155.02 MWp DC	Not applicable, as this is a standalone BESS project
BESS Capacity	40 MW/120 MWh, 3-hour storage duration	20 MW/40 MWh, 2-hour storage duration
Implementing Agency/Owner	Solar Energy Corporation of India Limited (SECI)	Project SPV: Kilokari BESS Pvt. Ltd., awarded to IndiGrid; project developed on BOOT basis
Utility/Beneficiary	Chhattisgarh State Power Distribution Company Limited	BSES Rajdhani Power Limited
EPC/Project Developer	Tata Power Solar Systems Limited	IndiGrid and AmpereHour Energy
Battery Technology	Lithium-ion BESS; SECI also notes use of bifacial mono-crystalline PV modules for the solar plant	Lithium Iron Phosphate battery technology
Project Cost/Tariff Signal	Approved tariff of INR 4.02/kWh	Levelized annual tariff approved at INR 57.6 lakh/MW/year, or INR 4.8 lakh/MW/month
Financing/Support	Supported by World Bank financing, SECI's internal resources, and domestic loans	Concessional/catalytic capital support provided by the Global Energy Alliance for People and Planet
Primary Use Case	Stores solar generated power and supplies power during non-solar peak hours; supports renewable integration and grid stability	Peak shaving, local reliability improvement, network-overload reduction, and power-quality support
Effectiveness and Replication Potential	Useful for RE-rich states and central or utility tenders that want firm and dispatchable renewable energy (FDRE), or RE during non-solar peak hours; The project demonstrates that storage can help shift solar power to evening or other non-solar hours	Useful for urban distribution utilities where local network augmentation is costly or space constrained; The project demonstrates that substation-level BESS can support reliability, reduce peak load, and strengthen the distribution grid

These two projects illustrate the role battery energy storage systems play in supporting the grid at different points in the power system. At the generation end, BESS make solar power more dispatchable, whereas at the distribution end, BESS support the grid by helping utilities manage local peak demand and network constraints. A related and increasingly important use case of BESS is now emerging around EV fast charging, where storage can reduce the grid impact of high-power charging demand and help accelerate charger deployment in locations where grid connections or upgrades are delayed.

The following three projects in India highlight how the EV charging use case is already moving from the concept stage to on-ground implementation:

1. **Bengaluru Airport, RE2EV:** The country's first solar-powered EV charging station using second life batteries, developed by BESCOM, GIZ India and DULT, has been set up near the Kempegowda International Airport in Bengaluru, Karnataka. A 45 kWp rooftop solar array along with a 100 kWh second life battery system powers 23 charging points around the clock at lower price rates compared to private charging stations.[22]
2. **Surat Althan Bus Depot:** India's first solar-powered smart bus depot has been built with support from GIZ India for INR 1.60 crore in Surat, Gujarat. A 100kW solar and 224 kWh second life BESS system charges electric buses around the clock without drawing from the grid.[23] The project is expected to generate 100,000 units of electricity annually while saving INR 6.65 lakh each year in energy costs.
3. **ChargeZone Project E-DHARA, Dahej, Gujarat:** India's largest EV charging network, ChargeZone, is rolling out its highway charging expansion using solar-plus-BESS off-grid hubs. The first site at Dahej, Gujarat, runs on 1 MW solar and 5 MWh of storage. There are plans for setting up 100 such hubs across national highways in India.[24] The hub is designed to operate primarily off grid, connecting to the conventional power grid only when necessary for energy security. The Dahej site will serve as a prototype for a larger national rollout.

6. WAY FORWARD

India has built a strong national policy base for energy storage. Storage is now recognized in planning, procurement, market design, public finance, manufacturing policy, and grid-access incentives. The next big step is to convert this policy base into bankable projects that can support the grid.

Currently, India has around 8.6 GWh of operational BESS capacity, with merchant projects accounting for nearly 80 percent of this capacity.[8] [25] This capacity buildup represents how developers are seeing value in market-based storage, especially through price arbitrage, peak-hour discharge, and emerging market revenues. However, merchant BESS alone cannot meet all system needs.[ii] As a result, India will need different storage models for different use cases, including RE-plus-storage projects, transmission and distribution level storage, and behind-the-meter systems for consumers.

The next major priority is sub-national implementation. States and utilities need to move from broad storage targets to practical planning goals such as where storage is needed, how much storage is required, what duration is suitable, which use cases should be prioritized, and how costs and benefits should be allocated. These assessments should be integrated into state resource adequacy plans, transmission and distribution planning, and renewable procurement strategies. Storage planning should also distinguish between short-duration and long-duration needs. While two- to four-hour batteries can support evening peaks and market arbitrage, however, India will also need longer-duration storage for extended low-solar or low-wind periods, seasonal balancing, and round-the-clock clean power for large consumers. Such focused planning will help states identify the right storage duration and technology mix based on their demand profile, RE mix, and grid constraints.

Further, to effectively use storage systems and not just procure energy storage capacity, state electricity regulators also need to issue clearer rules on ownership, cost recovery, tariffs, charging and discharging, metering, dispatch, safety, and multiple revenue streams.

Currently, India's energy storage opportunity lies in scaling up deployment while building a competitive domestic manufacturing ecosystem. As identified earlier, storage can help shift clean power to evening hours, reduce renewable energy curtailment, support distribution networks, replace diesel backup, and improve reliability during peak demand and extreme weather events. Aligning growing demand for grid-scale storage with investments in battery manufacturing, supply chains, and indigenous technology development will be important for reducing import dependence and capturing the industrial and economic benefits of India's energy storage transition.

ii A merchant battery operates without a long-term contract, charging when exchange prices are low and discharging when prices are high. This is both commercially relevant and system-relevant in India's power market, where surplus mid-day solar generation increasingly coincides with lower prices, while demand and prices rise toward the evening peak.

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