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Interventions to Promote Battery Storage in India

April 2025

Presentation Overview

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Current State

Overview of the present BESS landscape.

Importance & Targets

Significance of BESS for energy transition goals.

Policy Interventions

Government policies impacting BESS deployment and growth.

Regulatory Interventions

Regulations and standards governing BESS operations.

Modelling Interventions

Different modelling approaches for BESS analysis.

Standalone BESS Model

Model for standalone BESS projects

FDRE Model

Model for BESS based firm and dispatchable RE projects

Hybrid/RTC Projects

Generation profile for hybrid projects with BESS.

Overview of BESS in India

- BESS is growing fast : BESS tenders with total installed capacity of 53.8 GWh floated in 2024 in Standalone (3.8 GWh) and FDRE (50 GWh, 92%) mode.
- BESS tenders are undergoing competitive bidding : 42 companies bid for these tenders. 36 companies (85%) have won atleast 1 bid. Minimum allocation won is 50 MWh.
- Execution is sluggish : A total of 2.3 GWh of BESS capacity is expected to get commissioned by the end of 2025. Another 4 GWh+ of BESS capacity is waiting for a PSA associated. 10 GWh+ BESS capacity has been cancelled till date after being awarded.
- Bid prices declined by 70% in 2022/2024 : Multiple standalone storage tenders awarded, tariff dropping from SECI first tender in 2022 of Rs. 10.83 lac/MW/month to NVVN tender awarded in Oct'24 at Rs. 2.37 lac/MW/month
- Battery prices declined by 55% in 2022/2024 : India has witnessed a remarkable plunge in battery storage prices since 2021. BESS capital cost has reached $150/kWh (Rs 2.5 Cr/MW) in India, down from about $350/kWh (Rs 5.8 Cr/MW) in 2022, i.e. a reduction of 55%
- Slow but steady decline expected in battery prices in future : With declining material costs and global manufacturing overcapacity, battery pack prices are anticipated to drop further, potentially reaching $50-60/kWh by 2030, implying a BESS capital cost of $100-120/kWh by 2030.

BESS- Importance & Targets for energy transition

Why BESS is critical for energy transition?

- To achieve its 2030 targets, India will require **292 GW** of solar and **100 GW** of wind capacity, up from the present capacities of about **105 GW** and **50 GW** respectively.
- In order to make this happen, renewables need to be made dispatchable. BESS has a very important role in making the variable RE sources firm and dispatchable.
- National electricity plan estimates requirement of **260 GWh of Grid-scale BESS capacity by 2032** and **1080 GWh of Grid-scale BESS capacity by 2047** to support renewable energy transition.

Targets for BESS in India

- As per CEA's 2nd version of the Report on Optimal Generation Capacity Mix for **2029-30**, released in Apr 2023, target for **BESS is 41.6 GW/208 GWh.**
- Of the 41.6 GW BESS, **30.5 GW** is expected to be installed in **northern region** due to the fact that evening peak is prominent in NR and solar in NR can be used to charge during the day, rest **11.1 GW** is expected to come in **southern region.**

Policy Interventions

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- National Framework for Promoting Energy Storage
- Viability Gap Funding (VGF) to support 13.5 GWh of Standalone BESS (30% support) projects approved for 8 states, apart from CPSU
- Guidelines shared for competitive bidding for standalone BESS, Pumped Hydro and RE+ ESS projects
- Energy Storage identified as Champion Sector and included in Harmonized Group of Infrastructures
- INR 18,100 crores approved for PLI scheme for building 50 GWh of ACC Battery Giga-factories in India
- PLI scheme for critical raw mineral mining being planned
- Exemption of customs duty for critical minerals and Critical Minerals Mission announced
- State Governments giving incentives and subsidies to battery manufacturers to set up facilities in States

Regulatory Interventions

- Energy Storage Obligations (ESO) Target set to 4% of energy requirement by 2030, 10 states have included the same in state RE policies
- All solar installations advised to have 10% ESS (2 hours) participation
- BESS allowed to participate in Secondary and Tertiary Ancillary Markets along with participation in HP-DAM segment
- Extension of ISTS waivers for ESS
- Provisions non-solar hour connectivity – to promote co-location of BESS & wind with solar projects

Modelling Interventions

Policies or actions to support BESS / Hybrid generation model could help accelerate battery storage adoption. Need discussion between Regulators and Industry on how can we simulate their impact

Category	Example Interventions	Modeled Outcomes
Economic Incentives	Subsidies, loans, tax relief	Uptake rate, cost-effectiveness, ROI
Regulatory & Policy	Mandates, time-of-use pricing, grid codes,	Grid impact, policy compliance, storage deployment
Market-Based	Peer trading, VPPs, ancillary services	User income, system efficiency, trading volume
Infrastructure Planning	Utility-scale storage, PPPs	Peak shaving, emissions, costs
Tech & Manufacturing	R&D support, domestic production, recycling policies	Battery price trends, tech diversity, jobs
Awareness & Behavior	Public campaigns, pilot projects	User behavior, adoption rate, public perception

Hybrid Station with BESS Components

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Control Flow

Power Flow

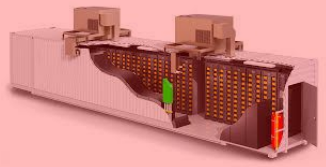
Energy Management System

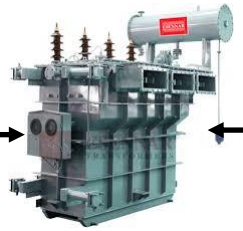
EMS

Master PPC

Grid Substation

WIND FARM





Battery Container + Battery Management System

DC Block with BMS

Power Conditioning System

PCS

Transformer

HT Panel

Balance of Supplies (BOS)

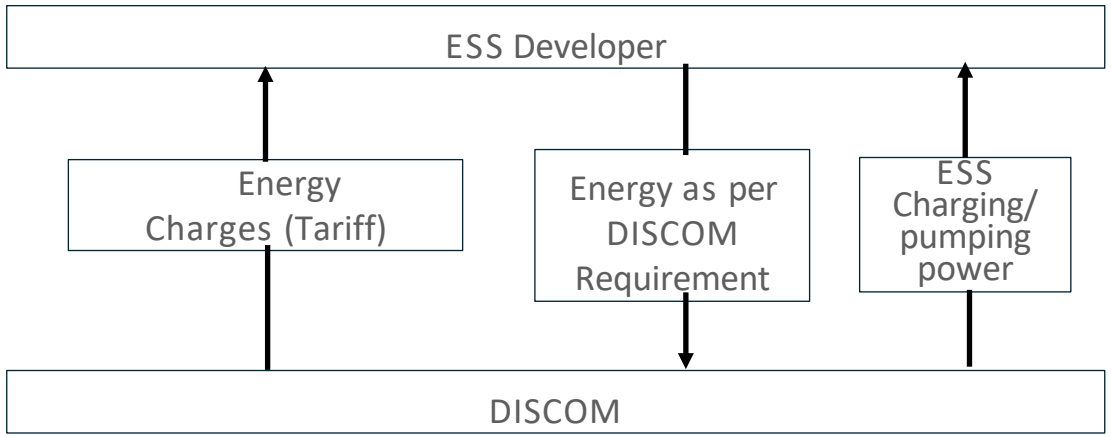
Pooling Substation With SCADA

SOLAR FARM

Bulk of the cost for a BESS system is in the DC Block, for which currently we are dependent of Chinese supply chain

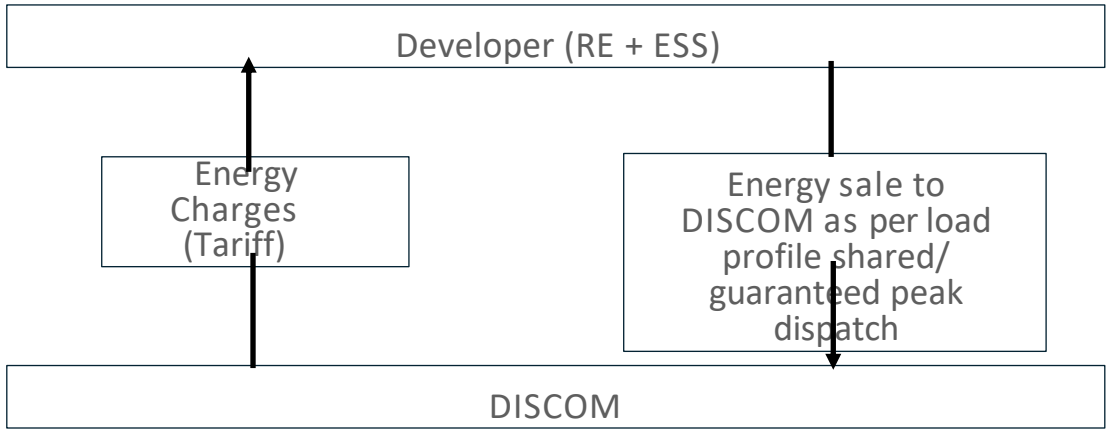
Standalone BESS Model

- Project Tenor: 12 years
- Typical Business Models: BOO/ BOOT
- Availability: 90-95% (annual, in some cases monthly)
- Efficiency: 85-95% (annual)
- Annual Degradation: 2.5%
- Duration: 2-4 Hours/ 2 cycle operations
- Land: Identified and provided by procurer
- BESS Charging Power: Provided by procurer



Firm & Dispatchable RE (FRDE) Model

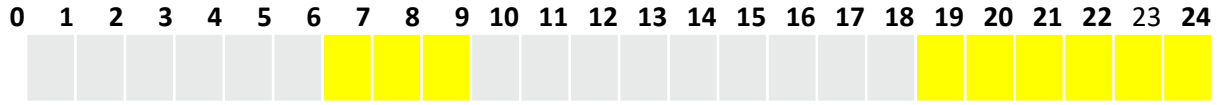
- Project Tenor: 25 years
- Typical Business Models: BOO
- Peak Availability: 90-95% (monthly), if load following then 70-90% adherence block wise accounted monthly
- Peak Hours: 4 Hours (continuous or 2 hrs. each in morning and evening)
- Availability: 100% (max 5% purchase from market)
- Procurer: Identified in most cases
- Location: PAN India



Generation profile for RTC Projects with BESS

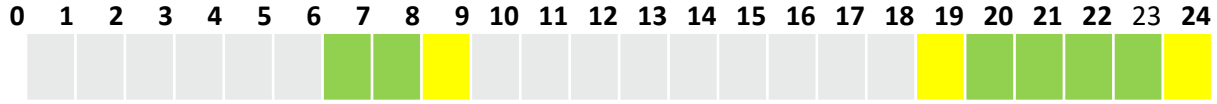
Renew's 300MW project

Defined peak hours as per the tender

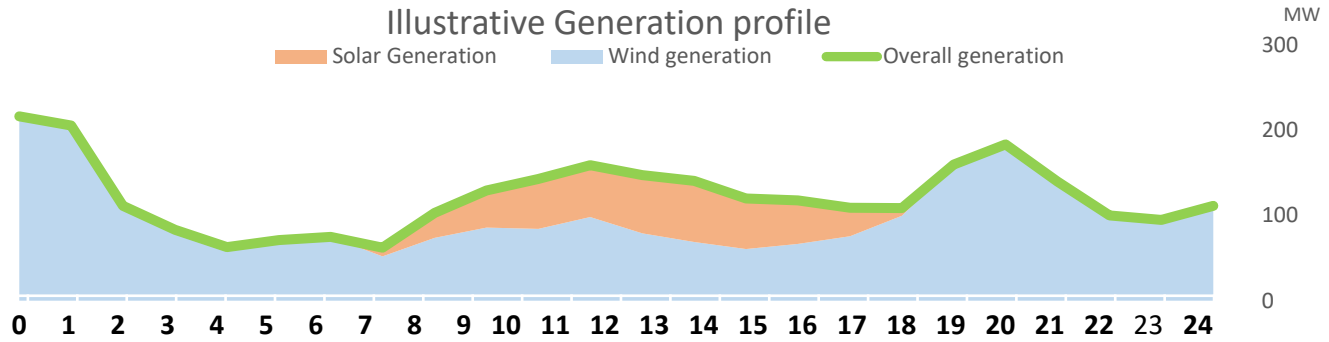


Discom decides one day prior which hours will be peak:
2 peak hours in morning
4peak hours in evening

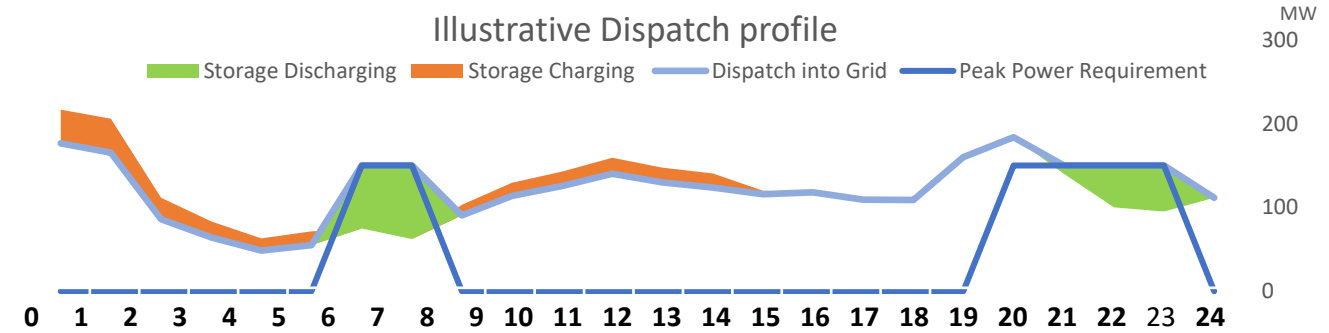
Illustration.



Hybrid Wind – Solar project optimally designed to generate in the peak hour(s) and enough in off- peak hours to charge Battery



Battery supports during peak hours by discharging and charges before next peak hour

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