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## **SCOPE OF THE REPORT**



Each of these markets have been estimated in terms of MWh, with 2019 as the base year and projections for 2020-2027.





### Street Lights

### Solar Home Lighting Systems

### Micro and Mini Grids



# **ABBREVIATIONS**

AS	Ancillary Services
BESS	Battery Energy Storage System
BTM	Behind-the-Meter
C&I	Commercial & Industrial
CAGR	Compounded Annual Growth Ratio
CAPEX	Capital Expenditure
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
DISCOM	Distribution Company
DT	Distribution Transformer

ESCO	Energy Service Company
ESS	Energy Storage Systems
FRAS	Fast Response Ancillary S
GENCO	Generation Company
ICAP	India Cooling Action Plar
IEGC	Indian Electricity Grid Co
IPP	Independent Power Proc
LCOE	Levelized Cost of Electric
MNRE	Ministry of New & Renew
MSME	Micro Small and Medium

Services

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## **ABBREVIATIONS**

NLC	Neyveli Lignite Corporation		T&D	Tran
NLDC	National Load Despatch Center		TPDDL	Tata Po
NTPC	National Thermal Power Corporation		TES	Ther
РСМ	Phase Change Material	]	TMEIC	Toshiba N
PHES	Pumped Hydro Energy Storage			Systems
PLF	Plant Load Factor	]		
RLDC	Regional Load Despatch Centre	]		
RRAS	Reserves Regulation Ancillary Services	]		
ROI	Return on Investment	]		
SECI	Solar Energy Corporation of India	]		

### smission & Distribution

### ower Delhi Distribution Ltd.

## mal Energy Storage

### Iitsubishi Electric Industrial Corporation



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# **INDIA STATIONARY ENERGY STORAGE MARKET 2019 - 2027**



e Case		Worst Case
cenario, the licy framework, and ongoing are considered more robust n at CAGR 8% for	,	•Modest market growth is projected in the worst case scenario when delayed projects in grid scale segment, impact of COVID- 19 and improving grid reliability are projected to result in slow growth at CAGR of 2% between 2019- 2027.

# **INDIA ENERGY STORAGE MARKET FORECAST**

of XX% during 2019-2027.





# **BATTERY TECHNOLOGY SPLIT**

Lead acid chemistries will continue to dominate the BTM segment, and Li ion in the grid scale segments during the short term. In the long term, as Li ion prices drop to \$150/kWh or below, its penetration in the BTM segment will also increase considerably.



Others include Flow batteries, NaS, metal air batteries, supercapacitors, thermal batteries etc.

\* This is not inclusive of Thermal Energy Storage systems





2027



# **PRICING TREND BY BATTERY CHEMISTRY**

Price of Lead acid battery remains fairly constant during the forecast period. The price is only affected by fluctuations in raw material prices. Major lead acid OEMs have their own recycling plants and are not significantly affected by changing raw material prices.

Prices of all other battery chemistries are expected to drop during the long term. Li ion battery prices have dropped from \$280/kWh in 2018 to \$230/kWh in 2019. As local manufacturing picks up we can expect it dropping further to cross \$XXX/kWh by 2024.



\* In the absence of local manufacturing, global pricing trends will be considered. The impact of COVID-19 on Li ion battery price hikes is not reflected in the chart. Source: CES analysis

2027



# **IMPROVEMENTS NEEDED IN POLICY FRAMEWORK**

To support effective implementation of storage technologies, policy support is required for framing regulations, development of standards, integration of storage with renewables and raising awareness and defining storage as a asset class alongside generation, transmission and distribution

### **Existing Policy Network**

- CERC vide connectivity regulations in 2019 has allowed Standalone Storage system of installed capacity 50MW and above as applicant eligible for grant of Connectivity
- Central Financial Assistance for residential rooftop solar under RTS Phase II for up to 40% for 4GW addition till 2022. Besides performance incentives for DISCOMs announced.
- In March 2019, an inter-ministerial steering committee was set up for the National Mission on Transformative Mobility and Battery Storage.
- CERC has approved a new market mechanism for Real Time Market for electricity trading to be implemented from 1 June 2020.
- Renewable Energy Targets (175GW by 2022 and 450 GW by 2030)
- Universal Energy Access Power for all homes by 2019 (Saubhagya)
- National Solar-Hybrid policy. State level Power policies from few states.

### Lack of Policy Framework

- Absence of a Storage specific policy with more clarity on Storage target by State or application and with an investment plan.
- Absence of tariff guidelines for RE+storage projects .
- Hybrid power policy has to come from every state.
- Framework for reuse, recycle & disposal of batteries including 2<sup>nd</sup> life usage.
- Lack of a strong TOU framework across states and consumers is necessary for ESS adoption to pick up.
- Policy for distributed ESS- RE & micro grids integration.

#### **Awaiting Approval**

- Niti Aayog's 10GWh Gigafactory incentive policy is awaiting approval at Lok Sabha.
- Delay in Ancillary Service procurement in market mechanism
- DSM penalty implementation in several states in delayed.
- Draft Policy for Round the clock supply of energy from Renewable power plants, by MNRE.

Policy and regulatory details are explained in detail in New/Draft Regulations and its Impact





# **LIMITATION: IMPROVEMENT IN GRID RELIABILITY**



India's power need continue to grow due to modernisation and economic growth, and has been witnessing an increasing trend in the share of renewable power.

The latest data from CEA shows that India is peak power deficit by -0.7% and electricity generation deficit by -0.5% for 2019-20 (Updated in April 2020). Northern and northeaster region faced the highest power deficits at -1% and -3.7% respectively. CES considers the power availability may not be adequate when industrial demand starts to pick up, or even to meet exigencies such as unscheduled generator shutdown or extreme weather event.

While calculating power demand, only people who are connected to the grid and have access to electricity at present are taken into consideration, and supply of subsidised / free electricity to farmers is limited to few hours every day. At least 40% of the rural households enjoying partial electrification of up to 8 hours a day are not metered.

300 million people don't have access to electricity, power cuts / load shedding are rampant, generation companies are powering down production, per capita power consumption is significantly lower than the world average and discoms are unable to buy electricity due to poor financial health.

- Source: Central Electricity Authority, April 2020



# **IMPACT OF COVID-19 IN ESS MARKET**

While most industry sectors are expected to recover from COVID-19 by third to fourth quarters during 2020-21, rooftop solar along with inverters will be the worst hit segments due to non-essential nature of investment for the customers.

Rooftop Solar	Telecom	UPS	Grid Scale renewable projects	Inver
23				
Legend Low Mo	derate High Source: CE	S analysis		





# **AUTHORS**



Debmalya Sen Senior Consultant – CES India



Avanthika Satheesh Industry Research Manager CES India



Suchitra Subramanian Analyst – CES India



Shivam Chauhan Research Analyst – CES India



Debi Prasad Dash Executive Director IESA

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#### Design and content copy: ETN Team

Ashok Thakur, Chief Editor

Shraddha Kakade, Assistant Editor

Swati Gantellu, Corporate Communications

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A-501, G-O Square, Aundh-Hinjewadi Link Road Wakad, Pune 411057, India

contact@indiaesa.info







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