



# Battery Energy Storage Systems for Off-Grid & Grid Scale Installations in India 2018

June 2018

With India's ambitious renewable energy capacity plan and world class establishments, battery energy storage represents huge opportunity to generate more of electricity from renewables be less reliant on conventional energy generation from coal & gas.

# BATTERY STORAGE

**COST SAVING & THE POTENTIAL TO USE MORE RENEWABLE ENERGY**

**BATTERY STORAGE**



**ROUND THE CLOCK, RELIABLE, LOW CARBON ENERGY SUPPLY**



## THE BENEFITS



### DOMESTIC CONSUMERS

- ✓ Access to cheap retail electricity prices
- ✓ Usage of more cheap & non-polluting solar power



### INDUSTRIAL CONSUMERS

- ✓ Peak-shaving by procuring less expensive peak electricity
- ✓ Usage of self-generated solar power through roof-top model



### REMOTE LOCATIONS

- ✓ Reduction of reliance on DG Sets for power back up
- ✓ Usage of more local, cheap renewable electricity



### ELECTRICITY NETWORKS

- ✓ Cost-effective alternative to meeting peak demand
- ✓ Avoid need for network upgradation and scale up
- ✓ Enabling higher share of renewable energy especially for distributed solar PV in given area



### ELECTRIC VEHICLES

- ✓ Less polluting & lesser maintenance alternative
- ✓ Recharging cheaper than refueling with petrol with right infrastructure
- ✓ Car battery can also be used for domestic energy storage

Source: eninrac research, IRENA, World Bank, MoP Govt. of India, Climate Council

# Why eninrac's report upon “ Battery Energy Storage Systems for Off-Grid & Grid Scale Installations in India 2018”

UNEARTHING POWERFUL POTENTIAL OF BATTERY STORAGE FOR RENEWABLE ENERGY & ELECTRIC VEHICLES IN INDIA

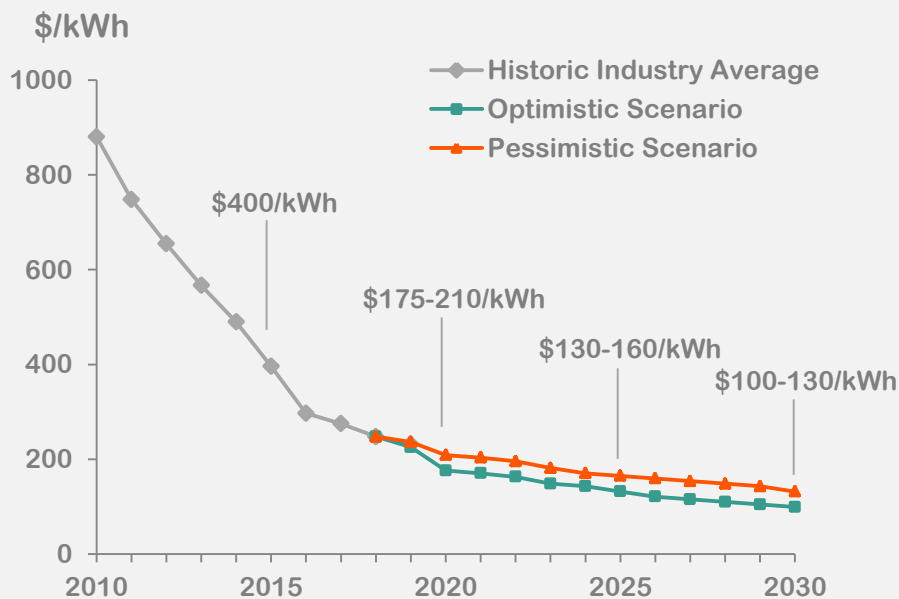
**STORAGE BUSINESS CASE MASSIVE IN NEAR FUTURE WITH CLOSE TO \$160 BILLION CUMULATIVE MARKET SIZE GLOBALLY, WITH INDIA SET TO BE THE LEADING CONTRIBUTOR**

With growing solar PV installations and further gaining up in renewable power capacity additions clubbed with enticing business for electric vehicles in India, the rationale behind the battery energy storage systems (BESS) is certain to embellish and gather momentum in the country. The storage market is already making sustained gains and is expected to flourish with near term market size of close \$160 Billion and grow further to \$ 300 Billion by 2030. Interestingly this entire energy storage market shall see BESS being the largest contributor in terms of share of above 50% globally. This shall be no different in India either and shall be not be a surprise that it might stand scaled up to 70-75% in the country. Having said that with India being still in the nascent phase for the BESS there are certain push elements desired for the market gain momentum and unwind it's entire market potential in the country for there are terrific benefits for its application.

With electric vehicles market bursting up the scene coupled with increasing solar PV installations in the country business case for BESS does call for a deep dive to project opportunities for different value chain players likely to engaged with in the segment. With our consistent effort to create a difference margin and present industry first market research insights we plan to delve deep in to bi-furcate the opportunities and benefits for one & all for battery storage market applications in the country. Our preliminary research findings were so engrossingly positive for the adaptation of BESS in India by offering extremely positive storage business. For instance, considering both off-grid and large scale grid installations the battery energy storage systems present extremely viable option for country like India, given the cost of batteries see a slide as was seen for solar modules globally. We firmly, believe that for grid stabilization, transmission & distribution system upgrade deferral, off-grid installation storage, black-start services, industrial peak shaving and balancing of energy along with residential storage and price arbitration for different consumer category do offer immense potential for BESS in India.

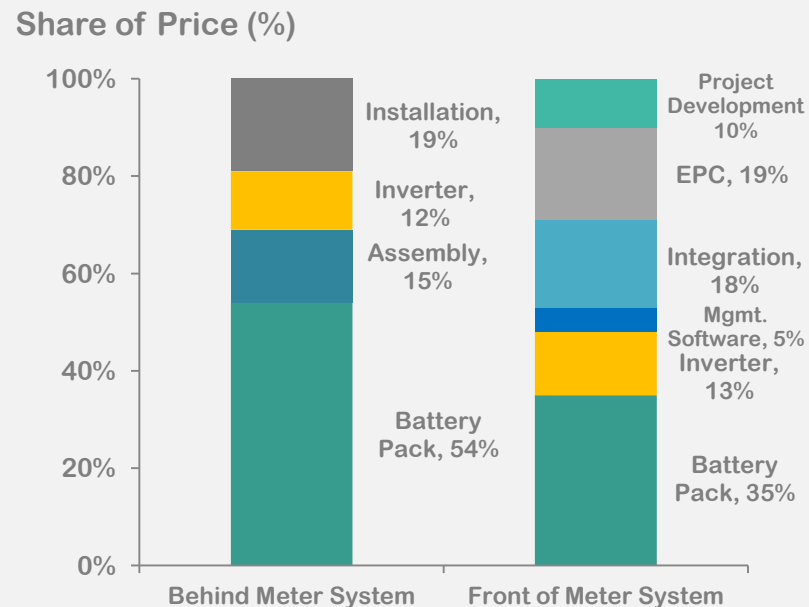
Several key insights emerged from our prelim findings, of which first being that the storage applications, can, under favorable conditions be certainly profitable even in current pretext. Cost degressions, especially in case of static batteries with significantly improve profitability in number of additional applications which we listed above. To estimate the overall business potential currently and be adaptive with respect to the outlook till 2024 we have delved deep into market happenings and shall be projecting exact market size through our exclusive D2I tool designed for BESS market in India. Our experienced sector specialists, domain consultants & analysts shall combine to present and extremely robust dossier to produce a seamless business decision making process with highly flexible service offerings to customize the report as well as per the customer requirements for both small & large scale installations catering off-grid and grid couplings. The report shall be a path finding guide for estimating the market analysis for BESS by product i.e. Lithium-Ion batteries, VRB's, flow batteries etc. & certainly by applications for both domestic and industrial consumers, electrical networks, electric vehicles segment and remote location installations with deep focus on companies benchmarking & intelligent information for them. To learn of contents & coverage you may see the detailed "Table of Content" which shall enable further the business objectives respectively.

### Battery Pack Global Costs – Trends & Outlook

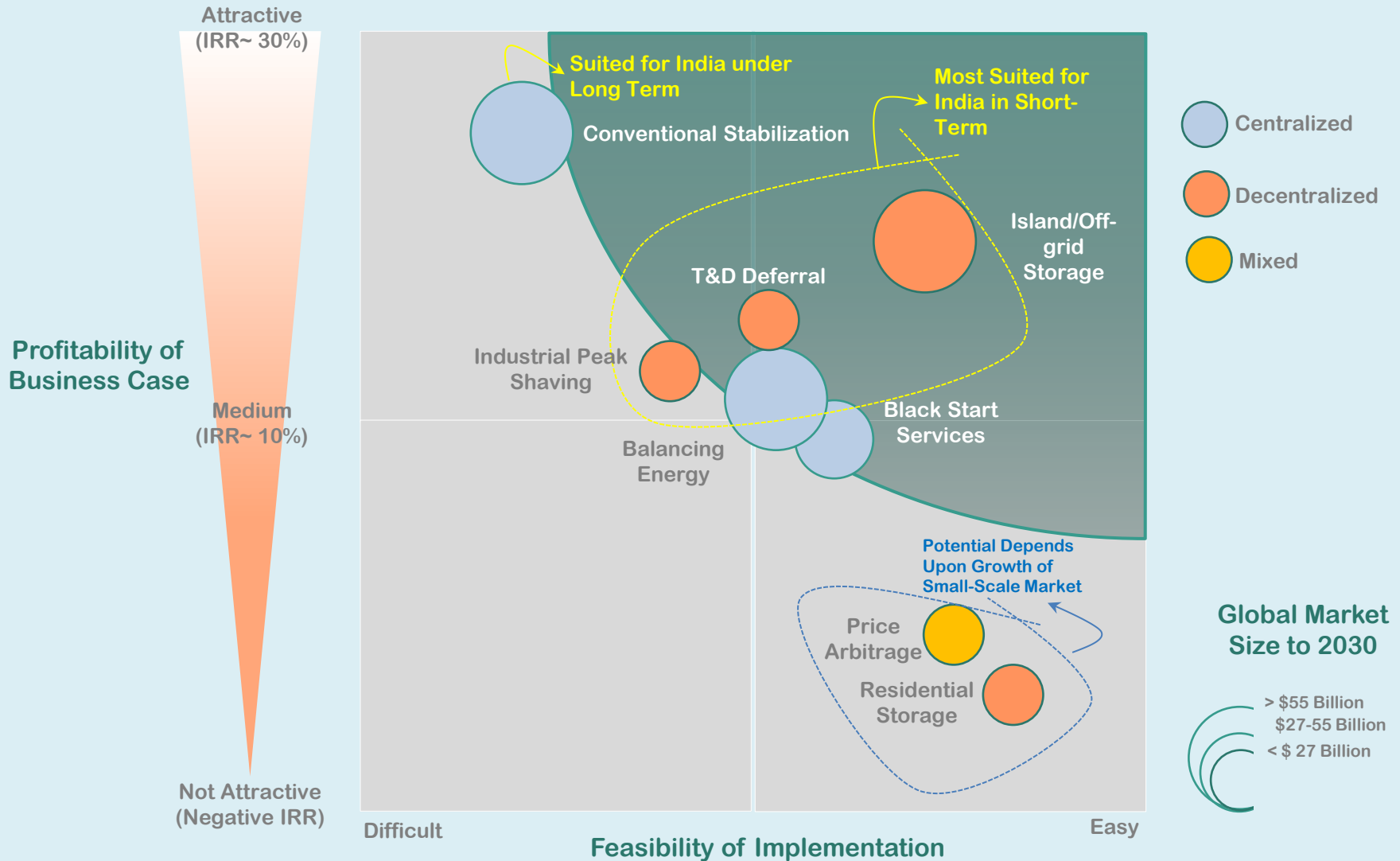


Source: eninrac research & analysis, GTM, BCG, Bloomberg

### Total Battery Prices, 2018



# Storage Business Case Attractive Indices for Near Future – Off-Grid & Grid Scale Installations



Source: eninrac research & analysis, BCG Analysis

## BUSINESS CASE FOR BATTERY ENERGY STORAGE SYSTEMS IN INDIA

- Government of India plans to add 100 GW of solar capacity in the country by 2022 needs storage for making large scale solar power installations completely grid interactive
- Cumulative renewable energy share to go up till 160 GW if India hits the planned capacity & increasing share of renewable in power generation portfolio in the country.
- 40 GW of roof-top installations to be achieved till 2022 demands for small-scale solar PV installations be utilized round the clock
- High adaptability of electric vehicles projected in India and changing dynamics of transportation sector in the country
- Rising electricity demand in India with installed capacity likely to cross 600 GW by 2030 calls for better demand response which BESS can assure
- Falling trajectory of battery prices globally and further fall expected in near term helping cost economics of adaptation of BESS in India

## REPORT INSIGHTS

- Identification of right market strategy among capacity market & storage market in India
- Battery Energy Storage Opportunity Matrix for Small Scale Adaptability in India – Regional Estimates
- Battery Energy Storage Opportunity Matrix for Off-Grid Installations in the country factoring solar roof-top business case for domestic consumers
- Financial Attractive Indexation for both Small & Large Scale BESS adaptability in India
- Region wise BESS opportunity for large scale grid integration via comprehensive D2I track
- Complete BESS Market outlook in India till 2024 with competition landscape, value chain opportunities and regulatory variance
- BESS Market Product Outlook till 2024 in terms of Li-Ion Battery, Flow Battery VRBs etc.
- Complete market sizing and opportunity outlook till 2024 for different applications in India like Electric Vehicles Adaptability, renewable energy integration, uninterrupted power supply to industrial power consumers and diesel generator replacement opportunity for telecom industry in India
- Company Profiles of all leading players in India & their business plan, battery product benchmarking, financial performance & product portfolio track with strategic initiative feed.
- BESS Market Orientation in India with Outlook till 2024 for Utility application (conventional power generation, grid operation and services), Direct Consumer application (UPS for Large Industrial Consumers), Renewable Energy Integration etc.
- Management & Control for BESS in India with Barrier & Growth Drivers in the country till 2024

## KEY HIGHLIGHTS

- Solar PV Pairing Opportunity for both off-grid and utility scale with battery energy storage systems in India & outlook till 2024
- Best suited location identification for integration of BESS in small-scale off-grid installations in India – Best fit regional analysis D2I Model feed
- Opportunity Sizing for BESS in solar roof-top projects in India with outlook till 2024
- Financial Attractiveness Index for both small & large scale grid integration of BESS in India – Regional Track from D2I Model
- Opportunity track for Industrial peak shaving & outlook till 2024 for large consumers
- Opportunity for power distribution utilities in deferring the network embellishments through adapting to BESS with outlook till 2024 – Map for region based utilities through D2I Model feed
- Opportunity for power transmission utilities in deferring the network embellishments through adapting to BESS with outlook till 2024 – Map for region based utilities through D2I Model feed
- Battery Market Product Outlook in India as per Lithium-Ion, Flow Battery & VRBs etc till 2024
- Application based opportunity track for BESS market in India till 2024 with specific sub-segment opportunity bundling for telecom industry and electric vehicles market in India
- Company Benchmarks for products, services, margins, financial performance for top BESS providers in India

## PRESS EXCERPTS

“With continued large scale integration of the intermittent solar power into the grid, the manageable threshold is fast approaching and the time for introducing grid scale energy storage system has arrived. Battery Energy Storage Systems (BESS) turns out to be the most preferred among the storage systems. It would therefore be helpful, to know the various issues arising out of large scale solar injection into grid and the solution BESS provides in managing them.”

Intersolar

“Large-scale adoption of energy storage is expected to attract investment over \$3 billion in the next three years in India. Already, over 1 GWh of annual assembling capacity is being set up for converting imported li-ion cells into battery modules by various Indian companies”

Economic Times

## KEY QUERIES ADDRESSED

- What shall be in-store for India capacity market or energy storage?
- What will be the best storage technology in India?
- What shall be scale of opportunity for small-scale grid integration projects with BESS in India?
- What shall be the opportunity for large scale BESS integration in India & how shall be the outlook?
- What shall be region wise opportunity in India for solar PV pairing with BESS?
- How attractive financial returns shall be if companies engage in both small & large scale BESS integration?
- Which areas in India shall be most potent for BESS integration for domestic consumers under solar roof-top scheme?
- What shall be Battery Market Outlook in India till 2024 under Li-Ion Battery, VRB's & Flow Battery respectively?
- What size and scale of opportunity does BESS shall offer in electric vehicles market in India?
- What size and scale of opportunity does BESS offer for Uninterrupted Power Supply to large industrial consumers in India?
- How BESS can be a replacement opportunity for DG Sets in India for Telecom industry?
- What shall be the key barriers & risk to BESS adaptability in India?
- Which company shall lead the BESS market in India till 2024?



## MUST BUY FOR

- Battery Manufacturers for Energy Storage Systems
- Electric Vehicle Value Chain Players
- Battery Suppliers to Electric Vehicles
- Utility Solar Power Project Developers
- Roof-top Solar Power Project Developers
- EPC Contractors for Solar & Wind Energy Projects
- Smart Grid Service Providers
- Power Distribution Utilities
- Power Transmission Utilities
- Telecom Industry Players
- Diesel Generator Manufacturers
- Government & Regulatory Bodies
- Research Institutions/Bodies
- Funding Bodies/Banks

## COMPANIES MENTIONED

- General Electric
- Exide Technologies
- Amaraja Group
- Hitachi Limited
- Samsung SDI
- AES Storage Systems
- Luminous Power Technology Systems
- HBL Power Systems
- Su-Kam Power Systems
- Base Corporation
- Okaya Power Limited
- True Power International Limited
- Southern Batteries Limited
- Green Vision Tech Private Limited
- Evolute Solution Limited



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# THANK YOU!

Happiness does not come from doing easy  
work but from the afterglow of satisfaction  
that comes after the achievement of a  
difficult task that demanded our best

- Theodore Isaac Rubin