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7TH EDITION

INDIA STATIONARY ENERGY STORAGE MARKET OVERVIEW PART I : FRONT-OF-THE-METER | FTM 2021 - 2030

RENEWABLE ENERGY
INTEGRATION

ANCILLARY SERVICES

DISTRIBUTION UTILITY-SIDE ESS



SCOPE OF THE REPORT

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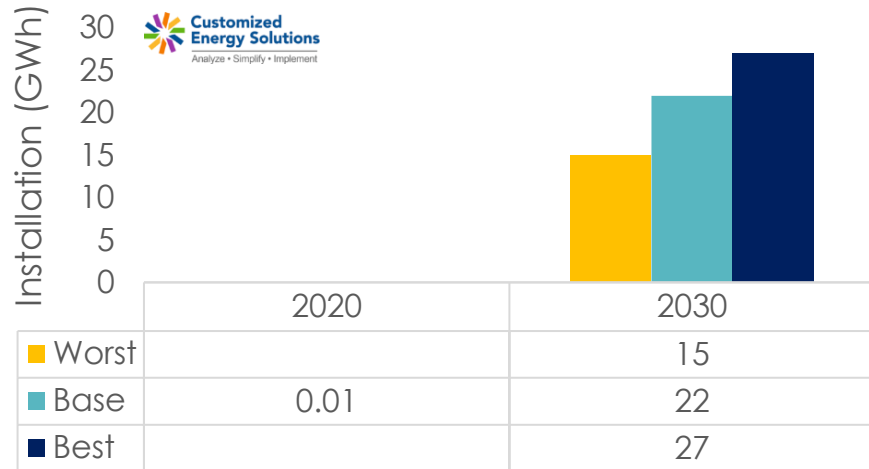
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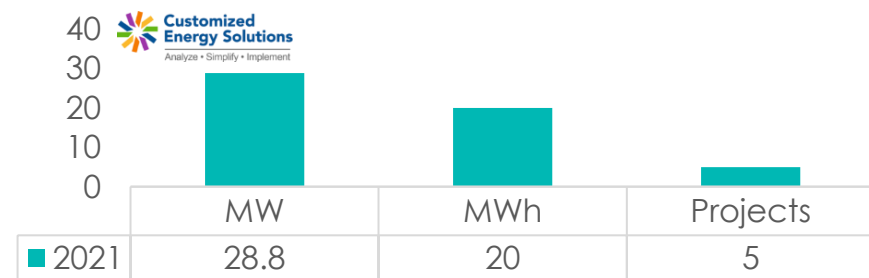


FTM STATIONARY ENERGY STORAGE MARKET OVERVIEW

Annual FTM Energy Storage Potential in India, 2020 and 2030



FTM Energy Storage Installed Capacity, India, March 2021



Installed capacity: The FTM energy storage market in the country is in its nascent stage. Total installed capacity stood at 28MW/20MWh as in March 2021 across 7 projects across the country at generation and distribution grid side. There is a stronger pipeline of projects which are closed and under various stages of construction accounting for 360MW/312MWh

Grid-scale RE Integration: Among the various applications, grid-scale renewable integration takes up majority renewable integration takes up nearly 82% of the market by 2030. The intermittent nature of renewable power need to be amply supported with storage technology to ensure firm and reliable power supply to the grid.

Policy Support: While there is an apparent need for storage on the generation, transmission and distribution side, a strong policy support is essential for the market to pick up. There are some policies at the Central and State level that exist that support storage, however, there is still scope for improvement.

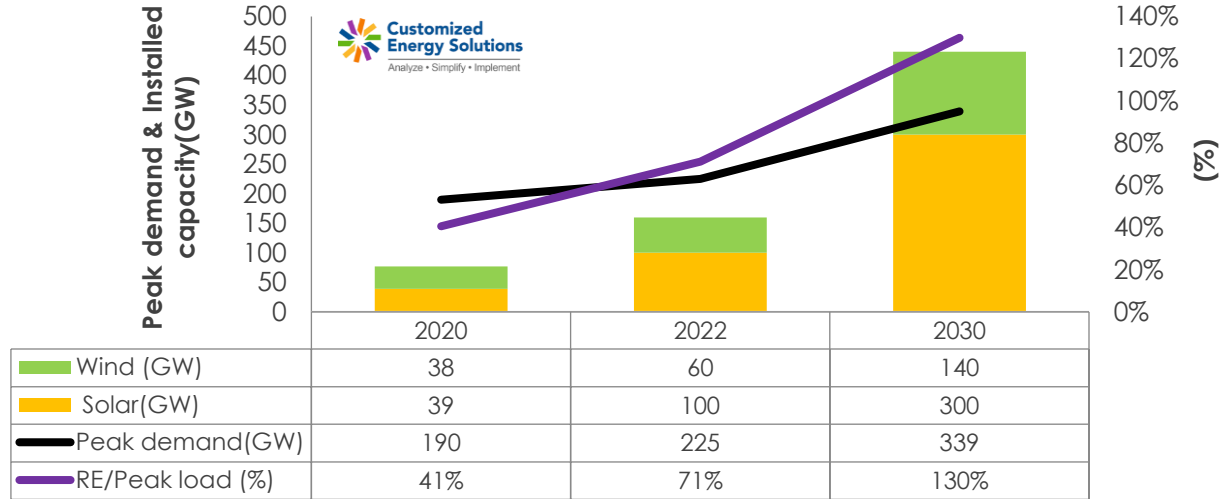
ACC Manufacturing Programme: To address the challenge associated with the local manufacturing of advanced lithium-ion battery cells, NITI Aayog has announced tender to setup Giga factories in India under which cash subsidy will be given to manufacturers through a performance link incentive scheme. This will enable local supply chain with 60%-80% value addition in the country.

Source: CES Analysis

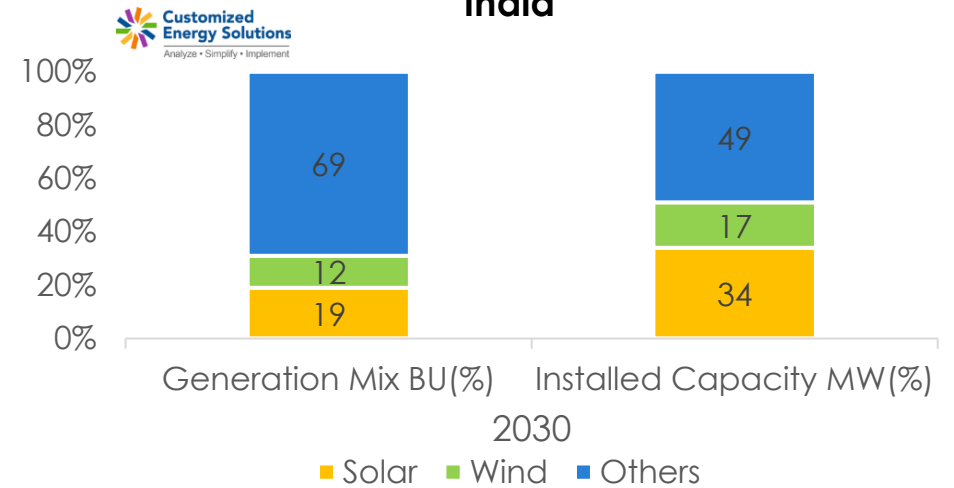
NEED FOR FLEXIBLE RESOURCES IN THE INDIAN GRID

Ministry of New & Renewable Energy (MNRE) has released its RE target as 175 GW for 2022 and 450GW by 2030

RE Installation and Peak Demand Projections, 2020-2030



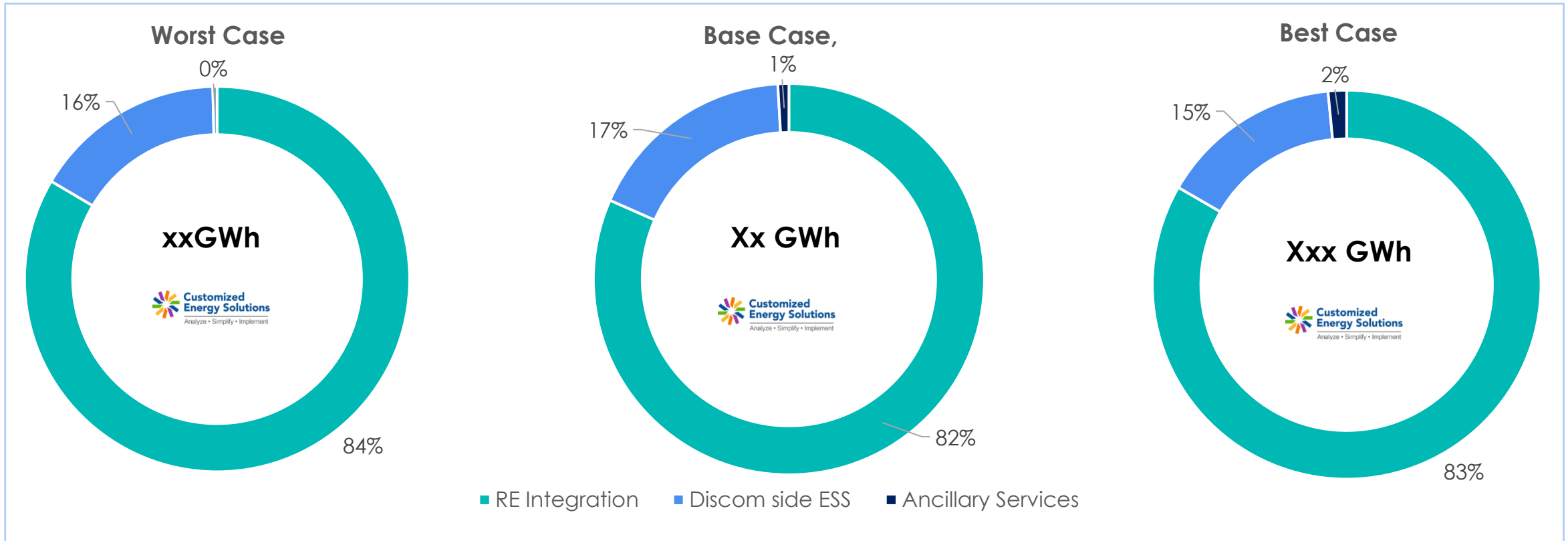
Capacity mix and Generation Mix by 2030, India



- The MNRE has set a target to add 175GW of renewable power by 2022 and 450GW by 2030. Solar and wind power accounts for 280GW and 140GW respectively. Rooftop solar takes up 100GW and grid-scale solar target is 100GW by 2030. With the variable nature of solar and wind power, when this RE comes online by 2030, flexible resources needed to support smooth functioning of the grid.
- The flexible assets to balance the grid as well as to meet the peak demand are hydro plants, pumped storage, battery storage, open cycle gas plants, gas engines, gas power plants and coal-based plants.
- Coal power plants generally designed to support base load are not considered for flexible operation. However, with retrofit, coal plants can be modified as a flexible asset, however this goes against the governments low carbon growth strategy.
- Gas power plants are expensive due to non-availability of gas and low PLF of plants. Several pumped hydro plants are non-operational due to seasonality issues and irrigation commitments.
- Optimal generation capacity mix 2029-30 report by Central Electricity Authority (CES) advocates the addition of 107GWh of BESS to support the 2030 RE target.

Source: MNRE, Optimal Power Generation Report, 2020- CEA, CES

CUMULATIVE FTM ENERGY STORAGE MARKET POTENTIAL 2021-2030

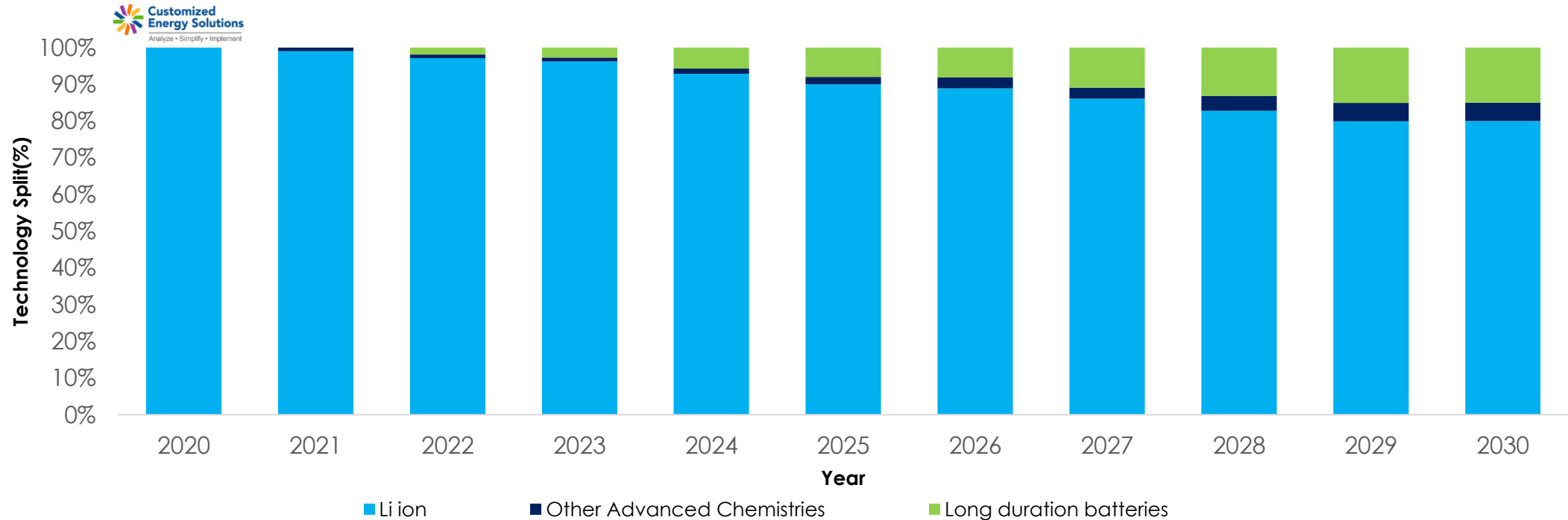


- Renewable integration is expected to constitute 80-85% of the cumulative FTM potential between 2021-2030 in the three cases. ESS size per projects is highest in the RE integration; it ranges between few MWh to 100s of MWh.
- The DISCOM-side ESS segment is expected to contribute 15-17% share across the three scenarios.
- AS segment contributed nearly 1-2% towards the total cumulative potential by 2030.

FTM ENERGY STORAGE MARKET TECHNOLOGY SPLIT

- In 2020, 8MWh was installed, which was a lithium battery of NMC chemistry.
- The total FTM potential is split into PHEs and advanced ESS technologies. In worst case around 8GWh of PHS and in best case around 12 GWh of PHEs is expected to get integrated onto the grid.
- Till 2025, lithium-ion battery chemistry is expected to be dominant in the FTM market, long duration storage systems such as flow batteries are expected to penetrate to achieve upto 20% of the market share by 2030.

Advanced Energy Storage Market Split by Technology, India, 2020-2030



Source: CES Analysis

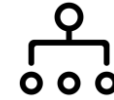
Long duration batteries include flow batteries, metal air, liquid metal, etc., that operates for >4 hours. Other advanced chemistries include short duration batteries upto 4 hours.

REQUIREMENT FOR STRONG POLICY FRAMEWORK

Awaiting Approval



- Delay in Ancillary Service procurement in market mechanism
- DSM penalty implementation in several states in delayed
- National Hydrogen Energy Mission to be finalized
- Incentives for Rooftop-plus-storage
- Framework for reuse, recycle & disposal of batteries including 2nd life usage
- State RE + storage policies
- Unified guidelines for storage projects
- Giga scale battery manufacturing policies



Lack of Framework

- Defining energy storage appropriately under Electricity Act
- Absence of a storage specific policy
- Setting up of energy storage targets application wise/ state specific
- Separate tariff for renewable energy with storage assets
- Many of the states yet to include storage as part of the RE policies
- 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
- Evaluating the use of energy storage for deferring upgrade of transmission asset
- Including storage as part of Green Term Ahead Market (GTAM)

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.

Source: CES Analysis

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