



New In-depth Analysis Energy Storage Systems - Grid to Behind the Meter

February 2020 – 3rd Edition

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(170+ ppt slides on pdf)

Grid to Behind the Meter Storage Applications / segmentation

- Transmission and Distribution
- Generation and Storage
- Uninterrupted Power Supplies
- End User Cost Benefits
- Regulation services
- Arbitrage Services
- Back Up and Reserve Services
- Black start storage
- Investment deferral
- Grid independent power services

ESS market 2019-2025 and forecasts

- ESS total market 2010-2015
- End user installed base 2010-2025
- Generation and T&D Segments 2010 - 2025
- ESS Forecasts – Excluding Pumped Hydro 2010 - 2025
- New Storage Capacities 2010 - 2025

Establishing Value/Demand for Applications

- Bulk Storage Applications:
 - Wind Generation to Distributed Storage
 - Community Energy Storage
 - Flexible Peaking Resource
 - Merchant Electricity Storage
 - Reduction of Peak A/C Demand
- Grid and Transmission Applications:
 - Connected PV Integration
 - Distributed Energy Resources – Plug-In Vehicles
 - Frequency Regulation
 - Spinning Reserve
 - Transmission and Distribution Deferral
 - Transmission Support and Charge Avoidance
- End User Benefit Applications:
 - Bill Management
 - Uninterrupted Power Supply

Types of Energy Storage Utilized - Major Technologies

- ESS requirement
- Energy storage solutions
- ESS Segment specifications
- ESS market unmet needs
- Technology matches for segments
- Technology Timelines
- 5 technology competing for most of the applications
 - Lithium Ion
 - Lead acid battery
 - NaS
 - FLOW battery
 - Fuel cells
- Future technology (LiS, Li-Air...)
- Each battery technology have specific range of operation
- Cost of energy storage for each technology
- Li-ion technology:
 - Principle
 - Value Chain
 - Technology roadmap
- Lead acid technology:
 - Principle
 - Value Chain
 - Technology roadmap
- Flow battery:
 - Principle
 - Value Chain
 - Technology roadmap
 - Flow batteries comparison (V/V, Zn/Br, H/Br, Fe/Cr, Zn/Fe, ...)
 - Flow battery Vs. Li-ion cost structure 2017-2026
- Other technologies:
 - Li Sulfur
 - NaNiCl₂
 - Flywheel
 - Fuel cells

Regional Energy Storage

- Europe:
 - Major Generation and Storage Drivers
 - Regulatory and Incentives
 - Major Growth Applications
 - Energy Storage Summary
 - Largest Grid Storage Applications
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 - Leading Technologies
 - Materials Roadmaps and Needs
- Germany:
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- UK:
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- South America – Brazil
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- INDIA:
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Major Segments Drivers, Forecasts, Value Chain, Unmet Needs and Promising Technologies

- PV integration:
 - Principle
 - Market
 - Value Chain
 - Unmet needs
 - Storage technology
- Off-Grid power generation:
 - Principle
 - Market
 - Value Chain
 - Unmet needs
 - Storage technology
- Transmission and distribution reserves and investment deferral:
 - Principle
 - Market
 - Value Chain

- Unmet needs
- Storage technology
- Residential storage:
 - Principle
 - Market
 - Value Chain
 - Unmet needs
 - Storage technology
- Commercial & Industrial:
 - Principle
 - Market
 - Value Chain
 - Unmet needs
 - Storage technology

Forecasts & Conclusions

- Total potential market for “other” applications
- ESS market & forecasts
- Stationary Telecom market
- STATIONARY: UPS MARKET
- Total Li-ion battery market forecasts 2019-2030