Energy Storage in Emerging Markets

June 2023
Energy Storage Big Picture: Where are we and what to expect?

Li-ion dominates until 2030. LDES, Sodium-ion and solid-sate will begin to make gains around the edges to circumvent Lithium shortage issues

- Today, **Lithium-ion batteries** make up close to 100% of EV batteries and >90% of **stationary battery energy storage systems (BESS)**

- No disruptive change expected between now and 2030. Entirely new battery types take a decade from invention to mass manufacturing, so everything is on the radar now.

- Therefore, **risk of obsolescence and first mover ‘disadvantage’ is limited**

**BUT:**

- EV industry is soaking up supply of li-ion batteries with order sizes magnitudes larger than stationary storage
- By 2030, **stationary storage is expected to receive only 10-20% of li-ion supply**
- ~70% of mined lithium supply globally already goes to batteries
- Therefore, **new technologies expected to begin to making inroads for edge cases: e.g. non-lithium Long Duration Energy Storage (LDES) technologies, sodium-ion batteries, etc.**
Li-ion BESS Industry Snapshot

Key use cases:

- **Frequency Response / Grid Services**
  - Relatively limited in Emerging Markets due to absence of regulation

- **Load shifting** (Firmness, peak shaving, T&D infra deferral)
  - Seen more frequently

Cost related Highlights:

- +25% price increase over 2021 but **prices have stalled**, despite recent fluctuation in mineral prices
- **Cells are the bottleneck**, not minerals
- Relief in 2025 (new factories) but uncertainty about cost trends post 2023/24
- Potential delays (6+ months)
- Consensus 3x volume growth by 2030
Select Emerging Markets with on-going and potential BESS activity

* + Hybrid (renewables + battery storage)

- Standalone BESS

Pacific Islands

Mauritius

- Short-to-medium term opportunities
- Early-stage engagements/potential opportunity
Key Challenges in Emerging Markets

**Cost Competitiveness**
While competitive in islands/isolated grids and markets with value stacking opportunities, cost competitiveness remains a challenge in most markets.

**Lack of Regulation**
Blocks value stacking of different applications & increases the viability gap.

**Operational Complexity**
Lack of expertise and experience in operating and maintaining batteries for many emerging markets utilities, which are currently at non-existent or low-levels of deployment.

**Heterogeneity in Use Cases and Offtake Structures**
Variability in use cases and off-take arrangements means there is no “one-size-fits-all” approach which complicates structuring and easy replication.
Variability in off-take structures for utility scale BESS projects

**RE + BESS Blended LCOE Contract**

- Blended tariff for two different technologies with different characteristics can create interface complexities that need to be carefully assessed

**RE + BESS Two-part Contract**

- Allows for separate structuring of RE + BESS components depending on characteristics – both from technical & financial perspective
- Not possible to be implemented in every EM due to regulatory constraints

**Standalone BESS Contract**

- Stable revenue stream, provided project meets availability & other technical requirements
- Regulatory constraints – needs well developed regulatory regime with possibility to have stand-alone capacity/availability payments

**Uncontracted or partially contracted BESS**

- Can make economic sense in very mature and deregulated markets from an economic perspective (e.g. Chile)
- Uncertainty around revenues requires careful considerations when structuring the transactions similar to merchant RE generation projects
Financing & Structuring: What are some BESS specific high level parameters?

What is the use case (installation option + use of BESS)?

- Standalone
  - Frequency Response & Grid Services
    - Ancillary services
  - Ramp up / smoothing
- OR
  - Load Shifting / Firming
    - T&D deferral
    - Peak shaving
  - OR
  - Ramp up / smoothing

Co-located / hybrid

What is the strategy to maintain BESS performance?

- Overbuild
- Augmentation plans / Replacement
- Any there warranties and/or capacity management agreements?

Are there any PPA / Offtake related downside risks?

A. Term of contract vs. useful life
B. Guaranteed capacity vs. degradation
C. Availability requirements
D. Cycles per day / rules for dispatch
E. Round trip efficiency

Any interface risks for hybrid projects?

- Modelling BESS performance more complex than standard RE
- Ability to charge from the grid vs. RE only
- Sizing of BESS vs. RE (in the context of PPA requirements, overbuild/augmentation plans, etc.)

Risks grows with duration of firm capacity undertakings
## Select Market Drivers and Opportunities

<table>
<thead>
<tr>
<th>Geography</th>
<th>Drivers / Opportunity</th>
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<tr>
<td>Island nations (e.g. Samoa, Tonga, Barbados, Dominican Rep., Timor-Leste, Mauritius)</td>
<td>Small islands with high-cost thermal generation (typically diesel)</td>
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<td></td>
<td>• Firmness</td>
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<td>Chile</td>
<td>Liberalized markets with sophisticated utilities &amp; favorable regulatory environments.</td>
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<td>Recent regulation for standalone BESS. Major coal phase out drive (5GW). T&amp;D bottlenecks.</td>
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<td>• Grid Services</td>
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<td>• Arbitrage + T&amp;D infrastructure deferral</td>
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<tr>
<td>Philippines</td>
<td>Energy deficit with 58% coal generation; Liberalized, sophisticated market including C&amp;I offtakers seeking decarbonization paths</td>
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<td>• Firmness + Peak shaving</td>
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<td>South Africa</td>
<td>With 80%+ energy based on coal, aggressive RE penetration (13+ GW by year end 2023)</td>
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<td>• Firmness + Peak shaving</td>
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<td>Brazil</td>
<td>Liberalized markets with sophisticated utilities &amp; favorable regulatory environments.</td>
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<td>Colombia</td>
<td>Major transmission bottlenecks. Massive RE penetration, including DG (Brazil).</td>
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<td>• T&amp;D infrastructure deferral</td>
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<td>India</td>
<td>Over 70% coal generation; Significant RE penetration. Recent large stand-alone storage tenders for 2 x 250MW/500MWh. More tenders expected.</td>
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<td>• Grid Services</td>
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Key Messages

- Energy storage is expected to **play an increasingly relevant role** in the ongoing energy transition in both developed and emerging markets.

- While battery storage is an **established technology**, it is **new in emergent markets** (little more than 4% of global activity).

- IFC currently has **about a dozen BESS projects in our financing pipeline** across Asia and Pacific, Latin America, and Africa, with several other early-stage engagements in various markets.

- Main challenges include **cost competitiveness**, lack of requisite **regulation** to monetize ancillary grid services, lack of operational **expertise**, and **heterogeneity** (no “one size fits all” solution).

- In line with IFC’s role, storage is a **key component of IFC’s power strategy**. IFC is committed to accelerating deployment of storage in emerging markets.
Thank you!

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