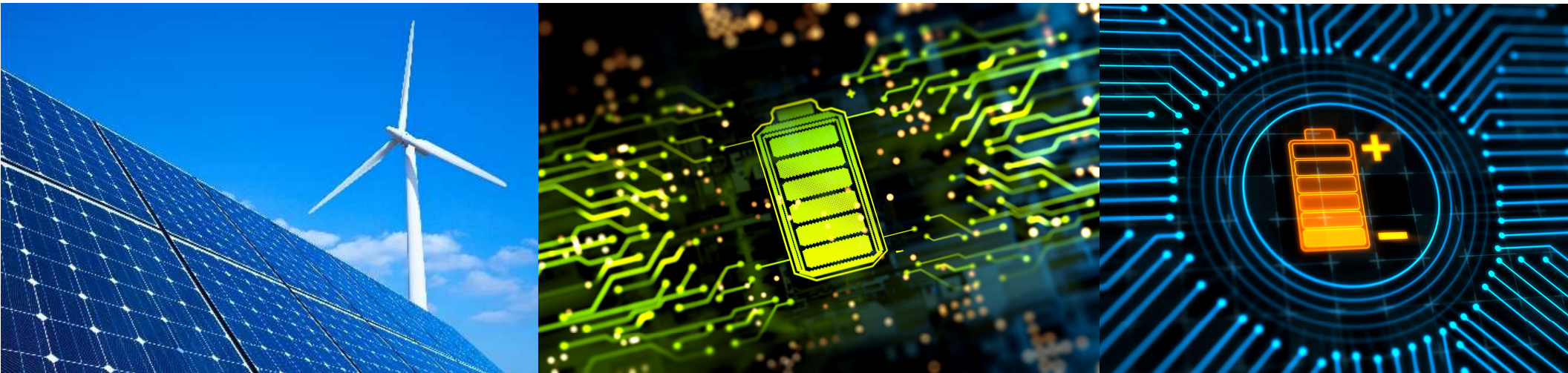


# Energy Storage in Emerging Markets

June 2023



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

*Li-ion dominates until 2030. LDES, Sodium-ion and solid-state 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

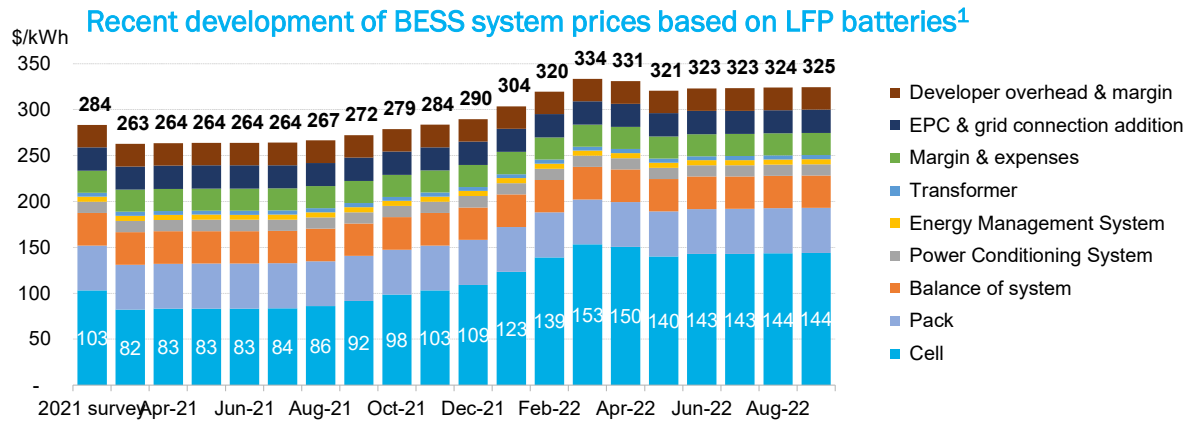
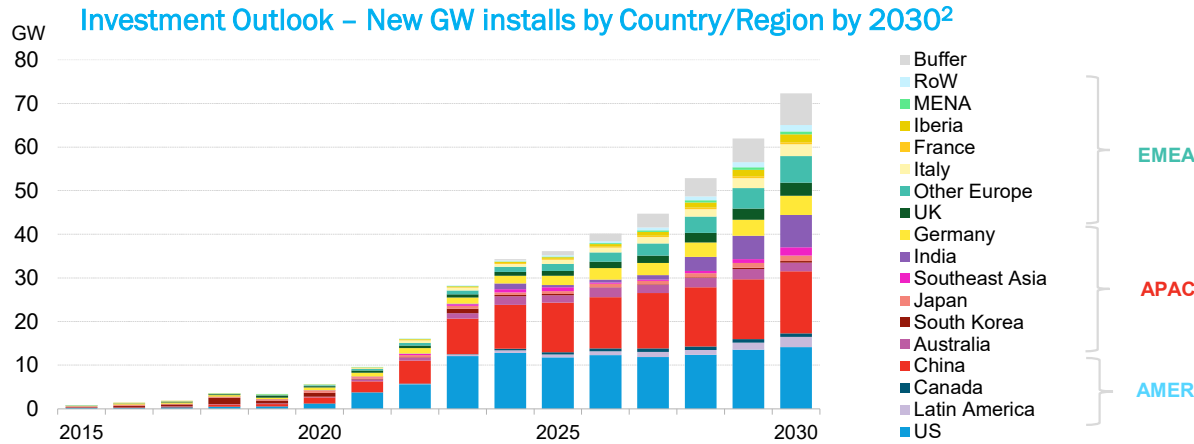
## Key use cases:

### ✓ 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

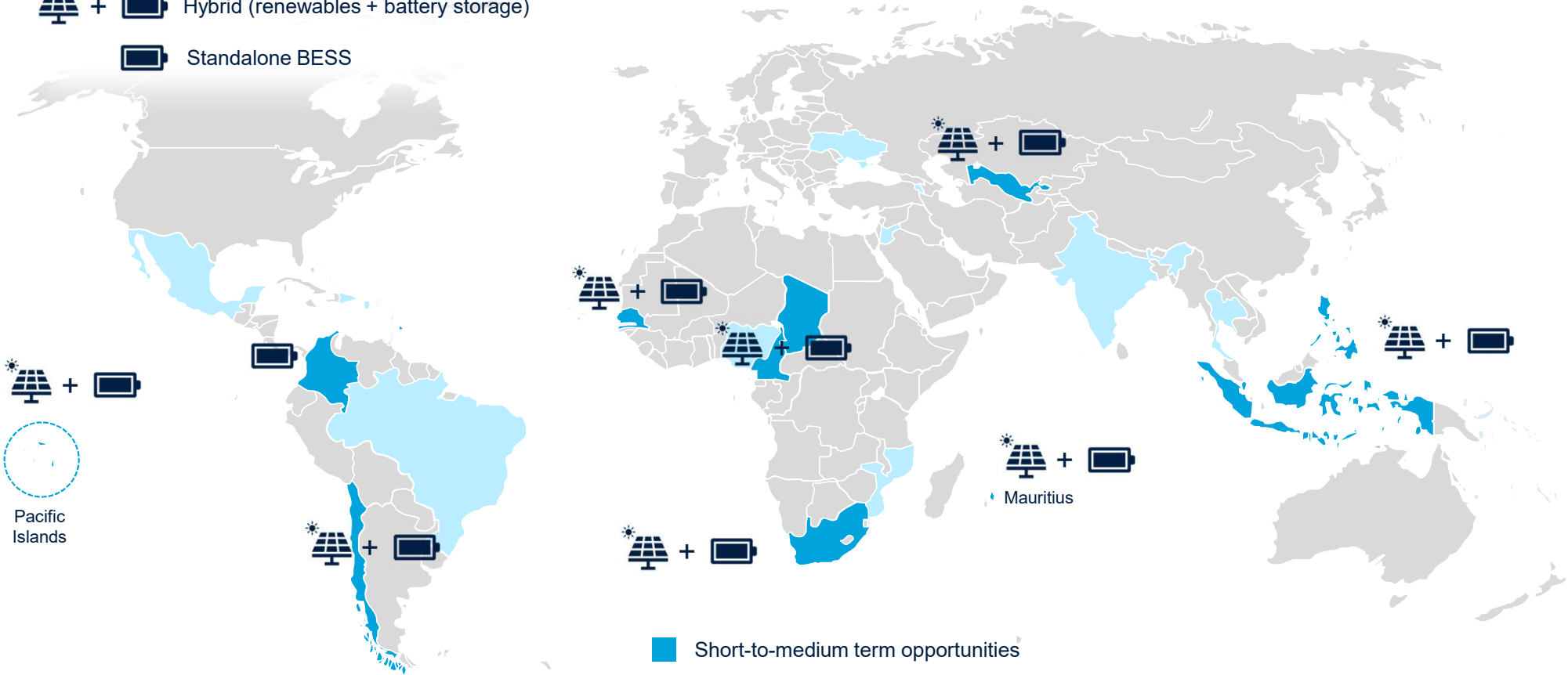
(1) Source: BNEF; Cost of a 4hr duration turnkey energy storage system, with Chinese LFP battery cell adjusted for raw material prices

(2) Source: BNEF



# Select Emerging Markets with on-going and potential BESS activity

 +  Hybrid (renewables + battery storage)

 Standalone BESS



  
Pacific Islands

 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.

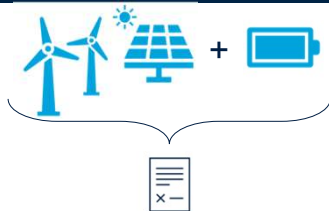


### Heterogeneity in Use Cases and Offtake Structures

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

## Standalone BESS Contract

### Capacity /Availability payments



- **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**

## 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**

## 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?


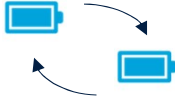

## What is the use case (installation option + use of BESS)?



## 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 

## What is the strategy to maintain BESS performance?

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

## 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

## Geography

## Drivers / Opportunity

 Island nations (e.g. Samoa, Tonga, Barbados, Dominican Rep., Timor-Leste, Mauritius)

Small **islands** with high-cost **thermal** generation (typically diesel)

- **Firmness**

 Chile

Liberalized markets with sophisticated utilities & favorable regulatory environments. **Recent regulation** for standalone BESS. Major coal phase out drive (5GW). T&D bottlenecks.

- **Grid Services**
- **Arbitrage + T&D infrastructure deferral**

 Philippines

**Energy deficit** with 58% **coal** generation; Liberalized, sophisticated market including C&I offtakers seeking decarbonization paths

- **Firmness + Peak shaving**

 South Africa

With 80%+ energy based on coal, aggressive RE penetration (13+ GW by year end 2023)

- **Firmness + Peak shaving**

 Brazil  
Colombia

**Liberalized markets** with sophisticated utilities & **favorable regulatory environments**. Major transmission bottlenecks. Massive RE penetration, including DG (Brazil).

- **T&D infrastructure deferral**

 India

Over 70% **coal** generation; Significant RE penetration. Recent large stand-alone storage **tenders** for 2 x 250MW/500MWh. More tenders expected.

- **Grid Services**
- **Peak Shaving**



## 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!



**Maham Iftikhar Warraich**  
Storage Sector Lead  
**IFC Global Energy**

**Email:** [mwarraich@ifc.org](mailto:mwarraich@ifc.org)