The Future of Storage in Africa

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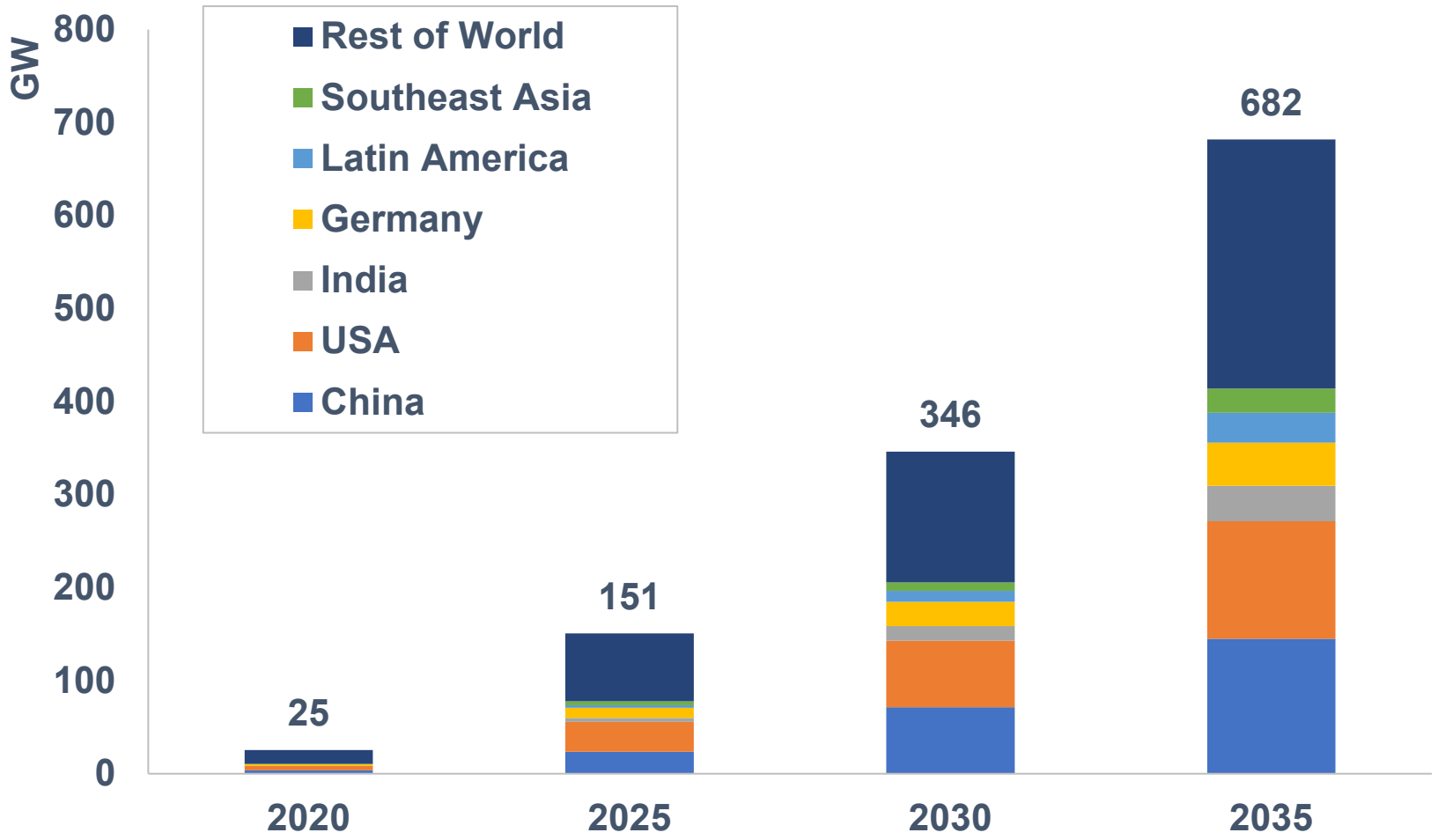
Cumulative Energy Storage Installations (GW), 2020-35



Overview of Energy Storage Use Cases

Energy Storage Use Cases

In-front-of-the-meter (utility side of the grid)	
Ancillary services	Non-energy grid services. Frequency regulation is by far the most relevant but other services (e.g. black start) are also considered for storage.
T&D deferral	Storage to defer transmission & distribution CAPEX investments. Example: Localized evacuation bottleneck for photovoltaic (PV). Battery discharges over existing transmission after dark.
Grid-scale renewables integration	Improving manageability of intermittent renewables on the grid. From ramp support (<30 min. discharge time) to firming (<2h) to peak shifting (>2h).
Price arbitrage	Buying energy cheap and selling high, e.g. on spot markets. An established business model for hydro. Chemical batteries are still too small and expensive.
Behind-the-meter (BTM) (on the customer premises)	
Demand-charge reduction & demand-response	Commercial and industrial (C&I) customers can avoid penalties for exceeding load thresholds, which can amount to 40% of monthly bills for a few hours per month of peak load. Behind-the-meter storage to take advantage of demand-response schemes, incentivizing reduced loads at certain times.
Distributed PV self-consumption	Behind-the-meter energy storage from distributed PV to self-consume at the point of generation, e.g. for rooftop solar in residential homes, and in C&I buildings. This is an attractive solution for unreliable grid supply and displacing heavy fuel oil generators.

Source: Based on Lazard's Levelized Cost of Storage 4.0 (Nov 2019)

Storage is a key component of IFC's power strategy

IFC's power strategy is based on country-level approaches that focus on supporting client countries' energy needs, energy security, and climate transition through universal access to affordable, reliable, and cleanest energy available.

Creating a dynamic power system as the basis for a sustainable energy future requires IFC to take a holistic approach across four key components – renewable energy, T&D, gas-fired generation and energy storage

1

Renewable energy is at the heart of the IFC power strategy

IFC is taking a holistic view on what is needed to enable deployment and scaling up of renewables by focusing on creating a **flexible and resilient power system**. A flexible power system that can absorb a high share of renewables requires a mix of tools from the system flexibility tool box:

2

T&D infrastructure / Intelligent networks ("smart grid")

- Connecting generation with load centers
- Providing much needed grid flexibility and resilience
- Increasing access and electrification coverage

3

Gas Fired Generation

- Important role in energy transition in a decarbonizing world
- Reliable and flexible capacity to meet demand
- Critical role in supporting the integrated transmission network
- Avoids investment in coal- and oil-fired capacity
- Contributes to local pollution abatement

4

Energy Storage

- Has a central role to play in the grid of the future
- Versatile applications: load smoothing, time-shifting, T&D deferral, etc.
- IFC has a pivotal role to play in speeding up deployment in emerging economies on a commercial basis

What does IFC see happening on the continent

BESS common place in mini-grid and off-grid deployments; with governments, utility providers and DFI's accelerating scale up efforts and integration into national grids.

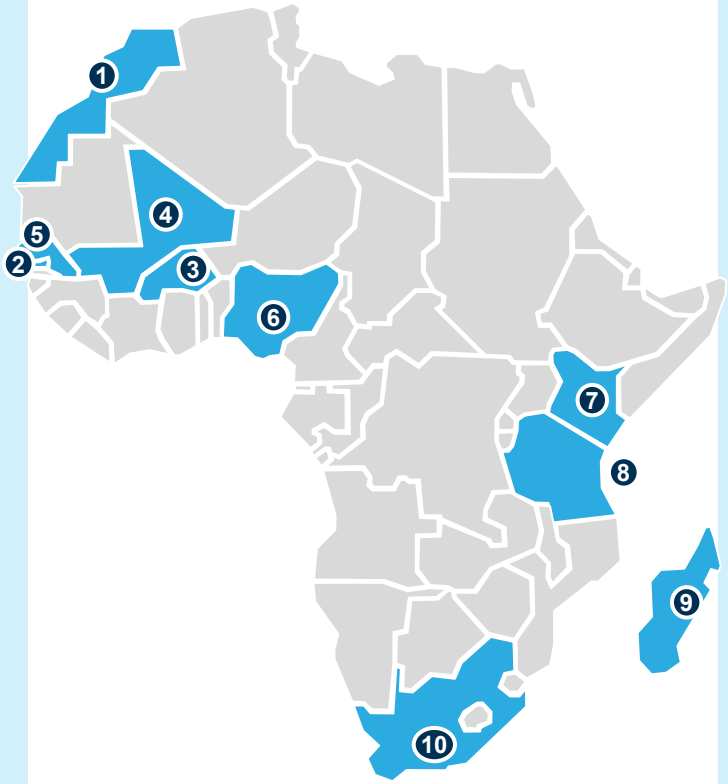
1. Morocco - Midelt hybrid solar project is Africa's first and largest hybridization of PV and CSP technologies utilizing thermal energy storage in 2020.

2. Gambia – (i) Successful tender process for feasibility study into Gambia's 150MW solar park PV plus storage, and (ii) pre-selection of developers for 20MW solar PV and storage completed.

3. Burkina Faso - SONABEL, MoE and IFC sign agreement to develop country storage investment roadmap based on PPP models in 2019.

4. Mali - Fekola gold mine's 30 MW solar plant & 15/17MW storage facility is one of the world's largest off grid solar and storage projects in 2019.

5. Senegal - EOI tendered for preparation and implementation support in procurement of 80MWh capacity of battery storage in grid frequency regulation use case.



6. Nigeria - 30MWh capacity BESS project tendered under Nigeria's solar electrification program for universities (Energizing Education Program, EEP).

7. Kenya - USTDA funded feasibility study into solar power and battery storage applications tendered and awarded in 2019.

8. Zanzibar – Pre-feasibility work ongoing in potential solar with battery storage IPP project where IFC is supporting WB the Zanzibar Energy Sector Transformation (ZEST) Project.

9. Madagascar - Pre-qualification of developers for 25MW Scaling Solar plus Storage tender complete.

10. South Africa – Preparation of tender documentation ongoing for 1.4 GWh capacity storage to provide grid support as part of WB's $1bn concessional climate financing. Target project delivery date of December 2021.

Challenges and Opportunities

Similar to the solar sector experience, battery storage in emerging markets is expected to catch up with OECD countries, though challenges remain.

Market Drivers

- **Declining near term costs against increasing reliability of Li-ion battery storage technology.**

  "Since 2010 the cost of a lithium-ion battery per kWh has fallen ~90%, from $1,183 in 2010 to just $156 in 2019."

- **Increasing RE penetration driving demand for complimentary storage solutions**

  For RE Integration, power firming, ramp rate control.

- **High cost of electricity makes for compelling economic case in the adoption of battery storage solutions.**

  High diesel costs especially in island / off-grid environments make batteries competitive.

- **Multiple use cases in the emerging markets context**

  Grid stability is a key issue in SSA with frequency regulation becoming a driver even in countries with low RE penetration.

  Proliferation of mini-grids and off-grids which require add on storage solutions to provide all-round electricity access.

Market Challenges

- **Robust regulatory framework required for energy storage to reach its full potential.**

  Uncertain policy commitment has hindered adoption of utility/large scale storage investments.

- **Operations and maintenance challenges arising from gaps in local skills & technology**.

  Storage technology requires optimal operation within strict temperature bands.

  Environmentally friendly disposal options remain extremely limited in SSA.

- **Impending limits on significant cost reductions for Li-Ion battery packs are expected.**
- **Additional complexity from the stacking of revenues required to make commercial sense in the African context.**
- **Senior debt financing challenges.**

  Arising from the contractual nature of the projects and the scale of the investments

DFIs are committed to bring storage to scale

THE WORLD BANK IBRD • IDA
Energy Storage Partnership

CIF CLIMATE INVESTMENT FUNDS
$250m Global Program

Sources: BloombergNEF

DFIs can accelerate storage deployment in EMs though upstream engagements focused on policy, technology and financing solutions

Policy

- Addressing the ***regulatory gap in EM's*** remains a top priority in the facilitation of bankable project structures.
- ***Lack of standardized business models*** with no singular trends or models dominating globally
- Initiatives that ***transfer best practices that facilitate scale such as standardization of government procurement processes*** will be vital
- ***IFC acts as a honest broker*** in its dual capacity as investor and transaction advisor – ensuring equitable risk allocation between public and private sectors.

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Technology

- EM's need long-duration, robust, resilient, non-toxic storage systems.
- Number of emerging technologies:
  - Lithium ion batteries
  - Flow batteries
  - Green hydrogen
  - Gravity
  - Heat

Trajectory of opportunities

As policy and technology matures, the emergence of ***new use cases and business models*** *will require* ***innovative financing solutions***

1

- **Storage <4hrs**
- Integration Renewables
- Grid Support Services

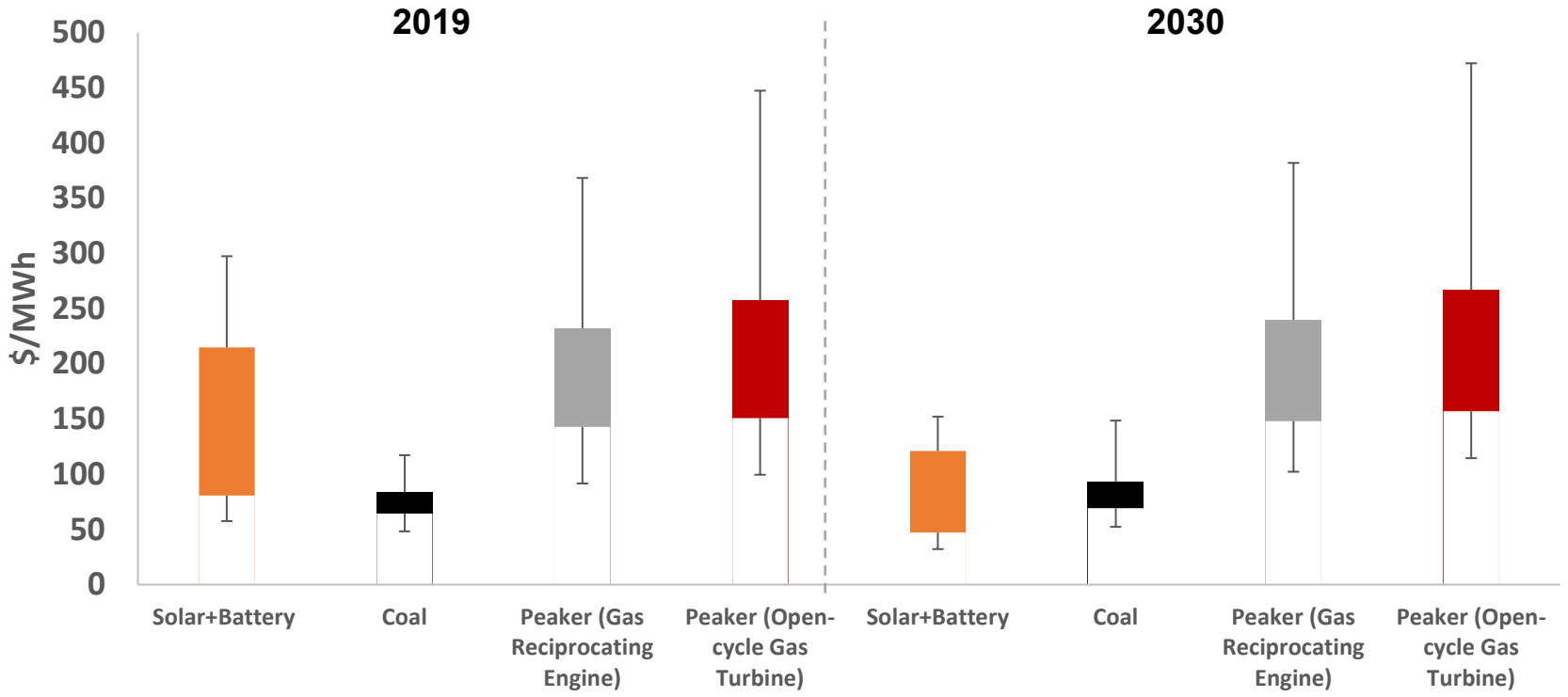
2

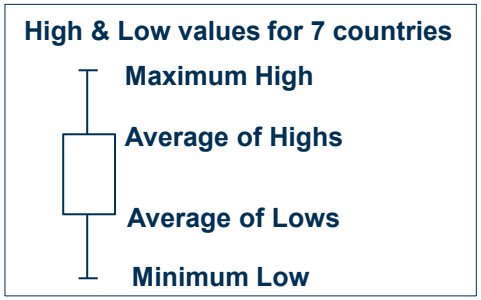
- **Storage >4hrs**
- Additional RE integration viability
- Compete with new gas & diesel

MARKET MISMATCH: EMERGING MARKETS NEED LONGER DURATION STORAGE

	OECD	Emerging markets
Needs	• **Short duration** – there's always a grid for backup • **Priority on power: Ability to quickly ramp** up and down (similar to peakers) • **Benign ambient temp** • **Multiple applications** serving complex market structures (i.e. real time bidding into ancillary services markets) • **End-of-life recycling** no issue	• **Long duration** - Power remote systems through the night and thorugh outages • **More extreme ambient temp** • **Low maintenance** • **End-of-life recycling** not always perfect
Appropriate technologies	Li-ion	Long-duration, robust, un-cooled, non-toxic technology

Solar + Storage Economics: LCOE Outlook, 2019 & 2030





Summary

1. Energy storage is entering a sustained period of significant and rapid growth. Business cases for batteries are more complex than for wind or solar.
2. Bankable projects for the near term (3-5 years) will focus on lithium-ion batteries. Current technology is proven to deliver discharge times up to approximately 4 hours.
3. Energy storage systems will continue to see cost improvements due to technology innovation, manufacturing scale, competition, and other industry dynamics.
4. Solar and batteries are already competitive with newly build gas peakers. Over the next decade, the economics of solar and batteries will become even more compelling, including against new build coal.
5. Batteries will play in integral role in Renewables (solar and/or wind) penetration, though policy and procurement models still need to be defined in various country contexts
6. DFIs have a potentially catalytic role to play in creating markets for energy storage in Africa. The current scale of the largest projects in emerging markets lags about four years behind leading developed markets.

Thank you

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