CONCESSIONAL FINANCING TO ACCELERATE ENERGY STORAGE

October 21, 2020

WORLD BANK GROUP
Energy & Extractives

ESMAP

KEY PRINCIPLES OF CLIMATE FINANCE

- Demonstration of GHG reduction
- Additionality/Incrementality
- Transformative Impact/Paradigm Shifting technologies and approaches
- Large scale
- Implementation readiness

FOUR LARGE CLIMATE FINANCE PROGRAMS UNDER OPERATION

Under Climate Investment Funds (CIFs)

Clean Technology Fund (CTF)
Supports transformational large-scale RE, EE and transport projects in middle income countries.

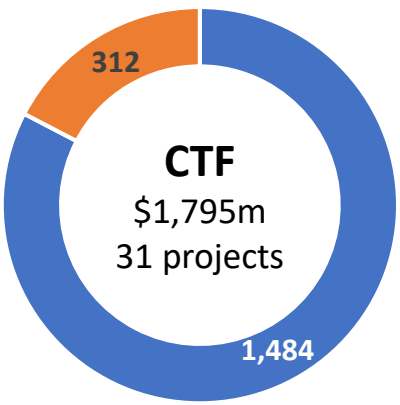
Scaling-up Renewable Energy Program (SREP)
Supports scaling-up RE solutions for energy access and clean energy supply in low income countries.

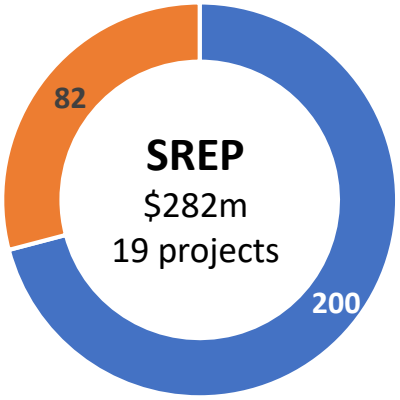
Financing mechanisms under UNFCCC

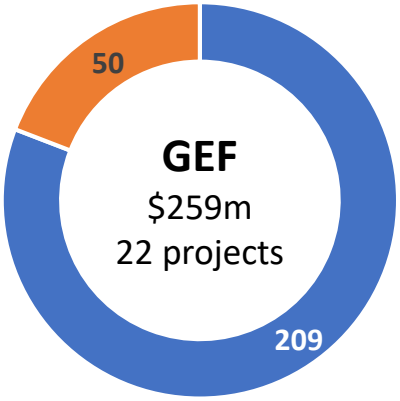
Global Environment Facility (GEF)
Hosts multiple environmental funds. RE/EE projects with GHG emission reductions are supported under climate change mitigation window.

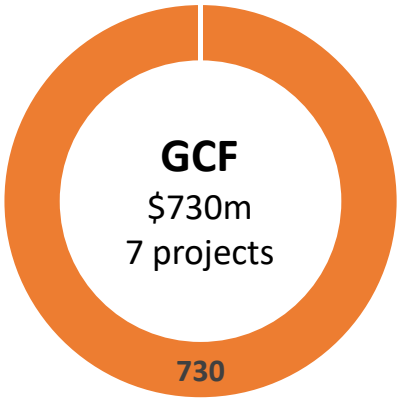
Green Climate Fund (GCF)
An official financing mechanism under the Paris Agreement to support climate change mitigation and adaptation projects in developing countries.

US$ 3.0 BILLION OF CLIMATE FINANCE IN PORTFOLIO AND PIPELINE





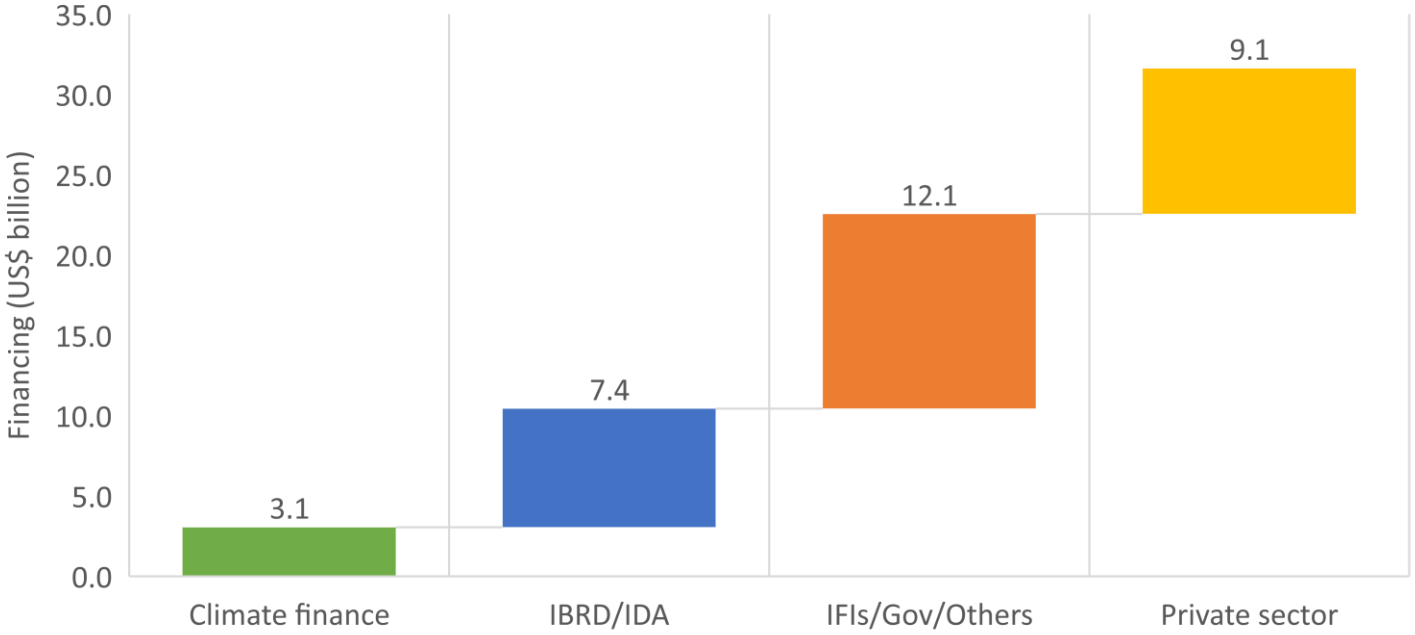




Portfolio

Pipeline

MOBILIZE OVER US$ 28 BILLION OF INVESTMENT IN CLEAN ENERGY

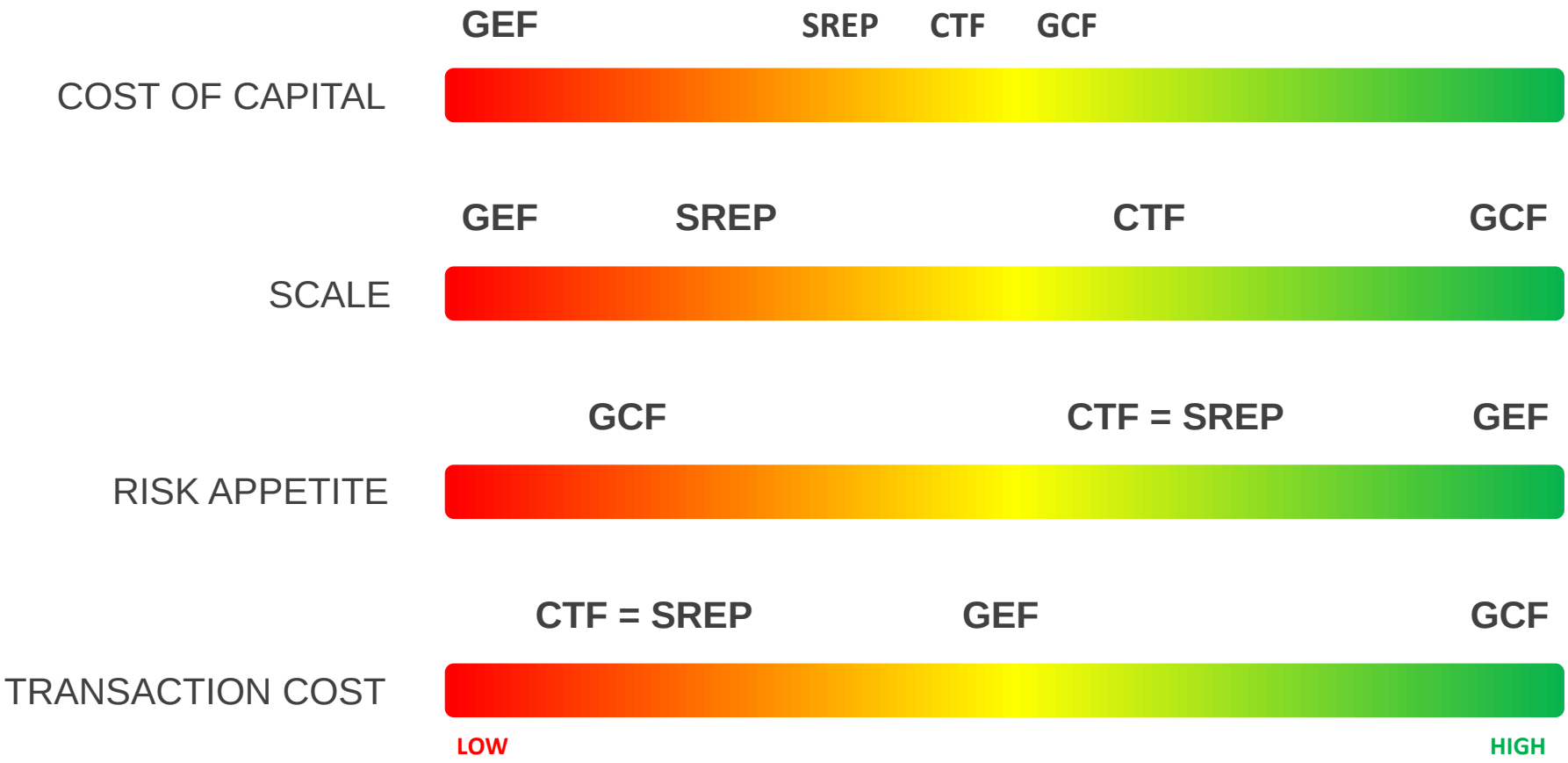


* Only from projects in portfolio or pipeline. Closed projects are not included.

Highlighted achievements include:

- Morocco Noor Concentrated Solar Power (CSP): 500 MW installed capacity; $2.5b mobilized
- Global Geothermal Development Plan (GGDP): support 11 countries; over $4.0b mobilized
- Energy Efficiency in China: 3 → 5,000+ ESCOs established; over $3.7b mobilized

CLIMATE FINANCE PROGRAMS HAVE DIFFERENT CHARACTERISTICS



WHY BATTERIES ARE GETTING ATTENTION?

Multifunctionality	• Fuel saving (maximize utilization of capex-intensive renewable assets) • Generation and network deferral • Demand balancing (mitigate variability & uncertainty) • Grid support (voltage control, black start...)
Modularity	• Comes as a compact, self-contained system, ready to deploy immediately • Can stack-up to create larger systems • Versatility to grow in power or in energy
Cost decrease potential	• Economies of scale with increased deployment • New chemistries can disrupt cost reduction path • Cost decreases expected to follow the path we have seen for solar PV
Ubiquitous asset	• Deployable nearly anywhere • Cost decreases expected to follow the path we have seen for solar PV

BATTERY STORAGE OFFERS A MULTITUDE OF VALUABLE USES

Minigrids

Minigrids: Increasing access in remote locations and islands.

In-front-of-the-meter (On the utility side)

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.

Transmission Deferral: Front-of-the-meter storage to defer transmission investments. Example: Localized evacuation bottleneck for 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)

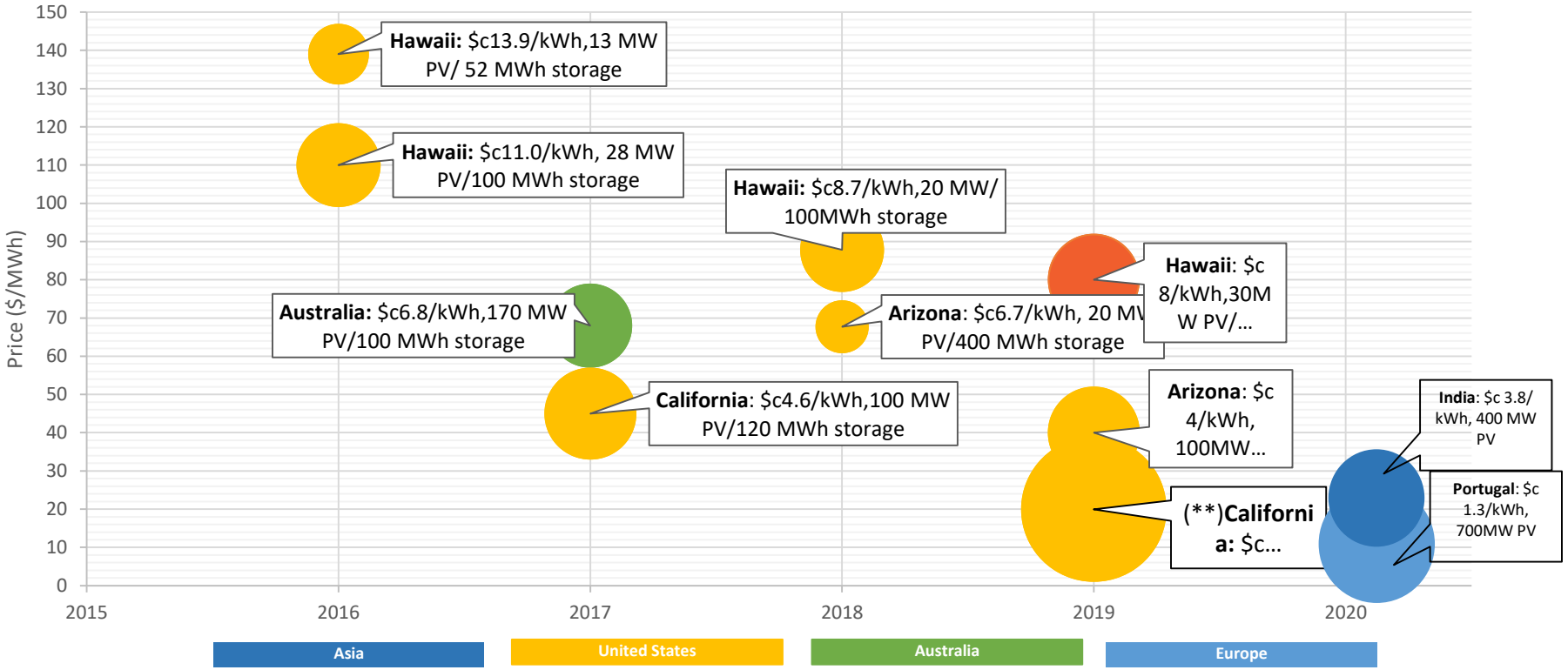
Price Arbitrage: Buying energy cheap, e.g. on spot markets, and selling high (established business model for hydro).

Behind-the-meter (on customer's premises)

Demand-charge reduction & demand-response:
Commercial and industrial customers avoid penalties for exceeding load thresholds, which can amount to 40% of monthly bills for a few hours per month of peak load, or benefit from demand-response bonuses when they power commercial buildings from batteries at peak time

Distributed PV Self-Consumption: Behind-the-meter storing of energy from distributed PV to self-consume at the point of generation, e.g. for rooftop solar in residential homes, and in commercial and industrial buildings (including hybridization with generators)

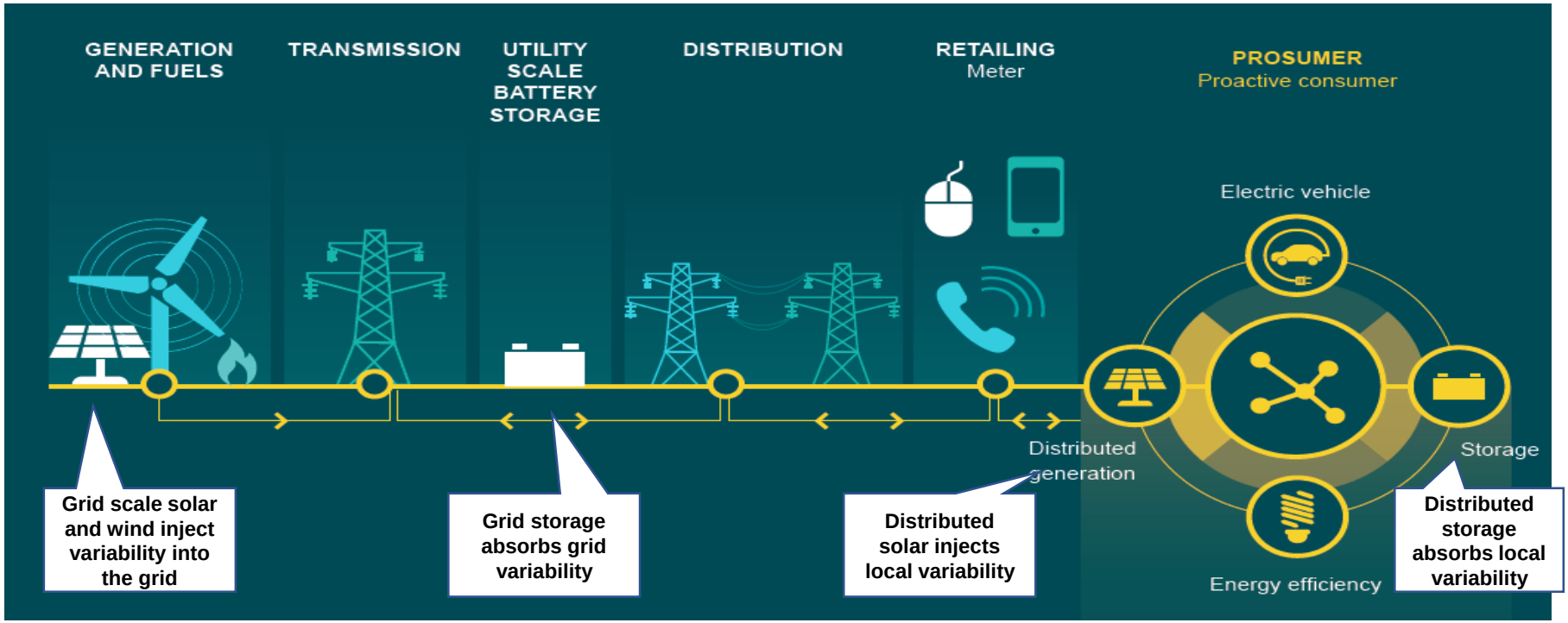
PV + battery storage PPA prices from 2016 –2020 (*) between 1.3-8 $c/kWh



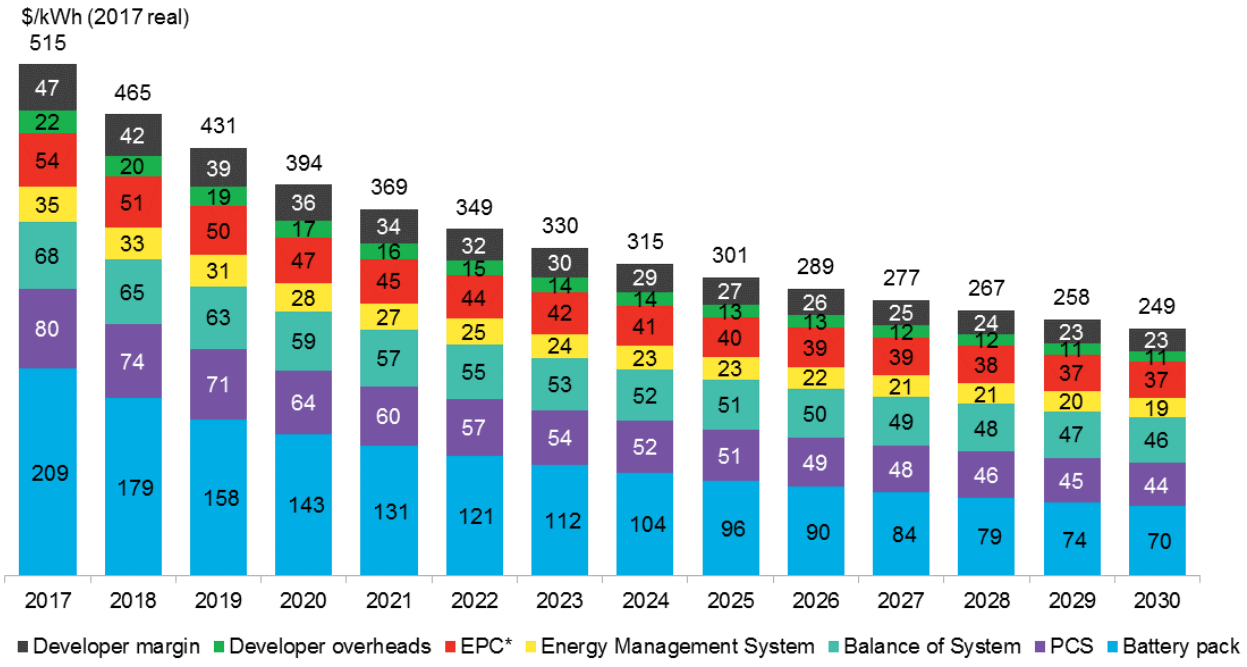
(*) The size of the bubble indicates storage capacity of the plant (MWh). However, it is difficult to infer relation to price trend in terms of inverter capacity to battery storage vs total PV capacity. (**) Nevada has lowest of PPA of 2.3$c/kWh, storage capacity still needs to be confirmed to be commissioned in 2021

Sources: PV magazine, IEA, WB own data, computed data from internet by the WB team

BATTERIES ENABLE EASIER GRID INTEGRATION OF VRES



COST EVOLUTION OF LI-ION BATTERY STORAGE



(Source: Bloomberg New Energy Finance)

Final cost however is dependent on location and operating conditions (i.e., temperature, cycling regime, power/energy ratio)

MARKET BARRIERS TO ACCELERATE STORAGE

- Lack of familiarity with Battery Storage Systems technology among utilities, regulators and financiers;

- High upfront costs, particularly in time-shifting applications that require larger batteries;

- Lack of adequate cost recovery mechanisms, with regulations not clearly stating the incentives for energy storage to be received from the energy, ancillary services or capacity markets, as well as for third-party or customer ownership of certain DERs;

- Elevated risk of emerging battery technologies with performance superior to Li-ion but limited track record in utility-scale applications; and

- Operation and maintenance challenges specific to emerging markets (e.g., high temperatures, lack of capacity to operate and maintain the BESS).

NEW/UPCOMING CONCESSIONAL CLIMATE FINANCE

- Climate Investment Funds –New Programs , Battery storage
- GEF 7 (7th replenishment cycle) is available for climate change mitigation
- GCF has US$ 10 billion available for approval
- Canadian Climate Change fund: US$ 275 million for energy transition countries and Small Island Developing States (SIDs);
- ESMAP upstream support is available

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