

Flash Analysis

Credit Analysis

Battery Energy Storage - Value chain integration is key

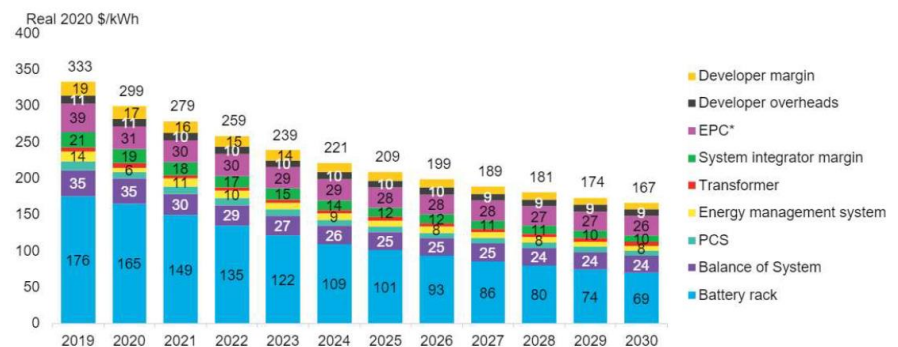
»» The battery energy storage systems (BESS) market is currently dominated by a few large players (top 7 with 60% market share), yet this is expected to change due to the tremendous growth opportunities over the coming years.

06.07.2022, Felix.Meurer@kfw.de

Over the last months we have seen an increase in projects with BESS components as investors are starting to use BESS to take advantage of volatile intraday electricity prices and regulators are focusing on BESS to facilitate a stable and secure power supply. According to Bloomberg NEF this trend will continue with worldwide storage capacity growing to 368GW / 1,065GWh by 2030 (CAGR of 30% / investments of USD 262 bn)¹. These exceptional growth expectations create opportunities for the currently dominating market players such as Tesla or Fluence as well as new market entrants.

Falling BESS prices...

In the past, Battery Energy Storage Systems were not economical due to the high upfront investment costs and the low profit expectations. However, prices of energy storage systems decreased significantly over the past few years falling from close to 600 \$/kWh in 2016 to 279 \$/kWh in 2021. A further decrease to 167 \$/kWh is estimated by 2030, led by technological advances and the expansion of production capacities².



Source: BNEF, Global Energy Storage Outlook 2021, November 15, 2021; USD price per kWh for fully installed four-hour AC energy storage systems

...and volatile electricity markets make BESS viable investments.

Additionally, the accelerating shift to renewable energy generation causes increasingly volatile electricity spot prices, especially high day-night differences that can be exploited by BESS. Furthermore, the decentralized and volatile (weather dependent) electricity generation poses significant challenges to grid stability. As a result, investors are starting to use BESS to take advantage of volatile intraday prices and regulators are focusing on BESS to facilitate a stable and secure power supply.

¹ Bloomberg NEF 1H 2022 Energy Storage Market Outlook, March 24, 2022

² Bloomberg NEF Global Energy Storage Outlook 2021, November 15, 2021 and IRENA Electricity Storage and Renewables: Costs and Markets to 2030

Large players dominate current market...

The utility-scale BESS market is currently dominated by a few large players (Top 7 with 60% market share in 2020)³. Most of these belonged to the first-movers in the market, being supported by large parent companies. Current market leaders by cumulative installed capacity (per 2021) are Tesla (7GWh) and the AES / Siemens Joint-Venture Fluence (6GWh). The other top competitors (Powin, BYD, Sungrow, Wartsila and Flexgen) follow with a significant gap having around 1.5 – 2GWh of installed capacity respectively.



Source: BNEF Energy Storage System Providers 2021: Key Trends, June 28, 2021

...yet market growth offers opportunities for new players.

According to BNEF's latest market reports, however, the dominance of these large players might not last due to the forecasted rapid growth of the market creating opportunities for new providers. The disclosed orders of the top 7 battery storage providers already make this trend visible accounting for only 32% of the forecasted market deployments in 2022 (2021: 66%). As a result, BESS-Providers are adapting to the increased competition by developing nuanced business strategies to specifically address the needs of certain customers and expanding their product offering to include the whole value chain and lower overall costs.

BESS value chain



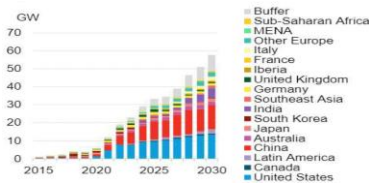
Source: BNEF Energy Storage System Providers 2021: Key Trends, June 28, 2021

The BESS value chain consists of hardware and software components as well as different services. **Hardware:** The core of all battery storage systems is the battery cell. Most BESS-Providers do not build battery cells (with the exception of Tesla, BYD) but partner up with major battery manufacturers (CATL, LG, Samsung) due to the high capital intensity and large advantages of economies of scale. These cells are then combined in a metal frame to make up the battery racks and equipped with inverters etc. (PCS) to connect them to other systems. While battery manufacturers also provide battery racks developing one's own rack production enables companies to streamline costs and be in charge of the storage system's design. The main **software** components are: the battery management system (BMS) and the energy management system (EMS). The BMS regulates the safe charging process, monitoring all battery cell metrics (i.e. cell voltage, temperature etc.). The EMS is the main operating software integrating the BESS with outside systems and controlling its activities. While some BESS-Providers rely on external software most develop their own. In-house BMS and EMS software competencies help to increase the visibility over the battery for warranty and O&M purposes, as well as, providing BESS-Providers with a platform to distinguish themselves from competitors. Integrating in-house software and hardware production also increases the safety and performance of the overall storage systems. **Services:** The standard service offered by all players is

³ Bloomberg NEF Energy Storage System Providers 2021: Company Profiles, June 29, 2021

System integration. This entails setting up all the respective hard- and software components -sourced from one or several producers- and ensuring the functionality of the units. The actual physical deployment at the project site, however, is often outsourced to local partners (EPC's). After the project completion most BESS-Providers offer long-term O&M services including performance guarantees (10 – 20 yrs), warranties and technical maintenance.

Tremendous growth expected over the next decade led by US and China



Source: Bloomberg NEF, Global Energy Storage Outlook 2021; November 15th, 2021

Bloomberg NEF estimates that investments in energy storage systems will cumulate to \$ 262 bn. between 2021 and 2030. The storage capacity is expected to increase from 17GW in 2020 to 368GW / 1,065GWh in 2030, with China and the US leading this growth (approx. 54% of all additional installations)⁴.

In **China** the cumulative storage capacity is forecast to grow from 5.8GW in 2021 to 96 – 120GW in 2030 supported by policy mandates and access to cheap batteries. The second national energy storage guideline (released in July 2021) outlines a deployment target of at least 30 GW by 2025. 19 provinces already encourage or even require energy storage to be paired with renewable projects (typically 10-20% of EE-capacity to be added as storage), even though most of these do not yet make economic sense.

In the **US** the policy shift of the federal government as well as individual state incentives⁵ are expected to lead to a drastic increase of renewable power projects, often paired with energy storage. Storage capacity is therefore forecasted to reach 90GW in 2030 from 7.3GW in 2021. Regional differences, however, lead to different paces across the country with California, Texas and the Southwest dominating in the near term.

In **Europe, Middle East and Africa** energy storage capacity is forecasted to reach 54GW from 4.4GW in 2020, even though Europe's ambitious decarbonization targets would offer a higher growth potential. The failure to realize this potential is mostly attributed to missing clear regulatory mechanisms supporting the installation of BESS. As a result, Bloomberg NEF expects, for example, residential usage of BESS to continue to dominate in Germany, Europe's biggest market (forecast: 13.4GW installed by 2030).

Outlook: strong growth and increasing vertical integration of value chain

According to recent studies this decade will see a drastic increase of installed battery storage capacity due to the decline in costs of battery storage together with the rising volatility of electricity markets. This provides ample opportunities for existing BESS-Providers and new market entrants. However, the increased competition will put profit-margins under pressure as the market matures. BESS-Providers that have so far only focused on parts of the value chain (depending on the respective parent: i.e. hardware: BYD, Sungrow / software: Fluence, Wärtsilä). will look to increase their vertical / upstream integration to cut out other players (battery rack manufacturers, software developers) and reduce overall costs. Examples are Tesla (market leader, fully integrated), Fluence (developed own battery rack and BMS software) and Powin (developing battery rack, BMS and EMS).

The main challenge for BESS-Providers over the coming years is therefore finding the financial and human capital to expand existing production, develop upstream competencies and keep up with technological advances (e.g. energy trading software). Additionally, supply relationships will have to be expanded and diversified to provide supply security. We expect that these forecasted market developments will favor large existing players and new entrants backed by financially strong parents with electricity market expertise.

⁴ Bloomberg NEF 1H 2022 Energy Storage Market Outlook, March 24, 2022

⁵ FitchRatings, U.S. Battery Storage Dashboard: July 2021