NexantECA

Technology and Costs

TECH 2020S12: Electrochemical Energy Storage

Electrochemical Energy Storage is one in a series of reports published as part of NexantECA's 2020 Technoeconomics – Energy & Chemicals (TECH) program.

Overview

Large-scale electrochemical energy storage (EES) is growing in importance with declining costs and integration with renewable power sources (e.g., solar PV and wind). EES systems plus renewable power are becoming a greater part of overall power generation mix while reducing carbon footprint, achieving decarbonization targets, and enhancing sustainability. The objective of this TECH report is to address some key questions:

- What are the viable pathways and roadmap for determining potential end-use applications for EES systems?
- What are the most likely global market trends, scenarios, and opportunities for EES systems in the next 5 to 10 years – *including post-Covid-19*?
- How to properly determine the costs and techno-economics of various battery chemistries and technologies in large-scale EES systems?
- What are the main issues related to overarching regulatory framework and relevant challenges to address related to EES systems?

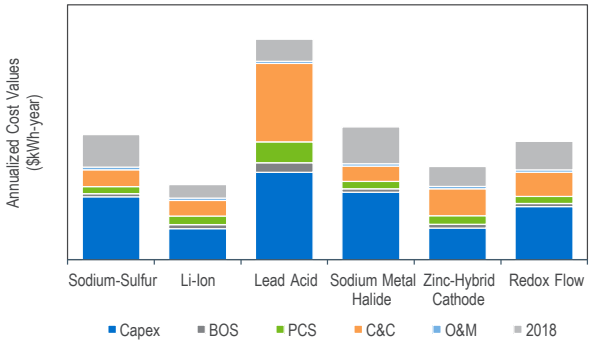
Commercial Technologies

Based on innovation and improvements, EES systems are modular in design and allow process plants, commercial and industrial (C&I) facilities, etc. with a wider range of behind-the-meter (BTM)/non-dispatchable scenarios and potential power export for front-of-the meter (FTM)/dispatchable scenarios. Commercially advanced battery chemistries and technologies (e.g., Lithium-Ion (Li-Ion) and flow batteries) have much to offer both by exploiting utility time of use (TOU) rates and/or with BTM self-generation from renewable power. EES systems provide "re-chargeability" along with much deeper cycling for achieving higher energy-to-power (E2P) ratios.

Process Economics

Cost metrics for EES systems are typically described in two standardized ways, namely, cost per kWh and cost per kW based on two types of electrical power architectures (e.g., DC coupled or AC coupled). The cost per kWh is described in LCOS or total installed cost. For comparative and illustrative purposes, the approximate annualized cost values for key battery chemistries and technologies are shown on a $ per kWh-year basis for 2025 (for a 1 MW/4 MWh EES system) with the main cost elements of Capex, BOS, PCS, C&C, and O&M. Total annualized costs for 2018 are overlaid (in grey) and higher incremental cost for 2018 is numerically listed on top of the forecasted annualized costs. Li-Ion continues to have the lowest total annualized cost followed by zinc-hybrid cathode and redox flow battery.

Annualized Cost Values on $/kWh-year for Battery Chemistries and Technologies



Commercial Overview

Large-scale EES systems are a key element in the power generation supply/value by providing important ancillary services while enhancing reliability, availability, and maintainability (RAM). Growth in EES systems will likely not occur uniformly throughout various countries globally since growth will vary based on regulatory policy, local system characteristics, and end-customer demand. Important challenges remain in developing viable business models, project financing, EPC guarantees and OEM warranties. Based on the findings, results, and case studies presented in this TECH Report, ***the outlook is very good and there is a very high degree of probability for rapid market penetration of large-scale EES systems integrated with solar PV and wind*** in peaking duty and service as well as possible base load duty and service.

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- Regional supply and demand balances for product, including capacity tables of plants in each region
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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program, the Biorenewable Insights program (BI), and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

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