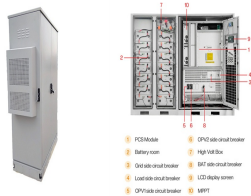


# 2020 ENERGY STORAGE PRICES



What is the 2020 grid energy storage technologies cost and performance assessment? Pacific Northwest National Laboratory's 2020 Grid Energy Storage Technologies Cost and Performance Assessment provides a range of cost estimates for technologies in 2020 and 2030 as well as a framework to help break down different cost categories of energy storage systems.



How has the energy storage industry changed over time? The energy storage industry has expanded globally and evolved rapidly as costs continue to fall. Opportunities in consumer, transportation, and grid applications have been defined, making it increasingly important to understand how varying technologies compare in terms of cost and performance.



Where will stationary energy storage be available in 2030? The largest markets for stationary energy storage in 2030 are projected to be in North America (41.1 GWh), China (32.6 GWh), and Europe (31.2 GWh). Excluding China, Japan (2.3 GWh) and South Korea (1.2 GWh) comprise a large part of the rest of the Asian market.



How much does a solar energy system cost? In addition to costs for each technology for the power and energy levels listed, cost ranges were also estimated for 2020 and 2030. The dominant grid storage technology, PSH, has a projected cost estimate of \$262/kWh for a 100 MW, 10-hour installed system. The most significant cost elements are the reservoir (\$76/kWh) and powerhouse (\$742/kW).



How much does a battery cost in 2020? BloombergNEF's annual battery price survey finds prices fell 13% from 2019. Hong Kong and London, December 16, 2020. Lithium-ion battery pack prices, which were above \$1,100 per kilowatt-hour in 2010, have fallen 89% in real terms to \$137/kWh in 2020.

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What are energy storage technologies? Energy storage technologies, store energy either as electricity or heat/cold, so it can be used at a later time. With the growth in electric vehicle sales, battery storage costs have fallen rapidly due to economies of scale and technology improvements.



Current Year (2021): The 2021 cost breakdown for the 2022 ATB is based on (Ramasamy et al., 2021) and is in 2020\$. Within the ATB Data spreadsheet, costs are separated into energy and power cost estimates, which allows ???



This paper defines and evaluates cost and performance parameters of six battery energy storage technologies (BESS)???lithium-ion batteries, lead-acid batteries, redox flow batteries, sodium-sulfur



The energy storage industry has expanded globally as costs continue to fall and opportunities in consumer, transportation, and grid applications are defined. As the rapid evolution of the industry continues, it ???



Hong Kong and London, December 16, 2020 ??? Lithium-ion battery pack prices, which were above \$1,100 per kilowatt-hour in 2010, have fallen 89% in real terms to \$137/kWh in 2020. By 2023, average prices will be close to ???



Prices for a fully installed, four-hour, utility-scale storage system this year range from \$235 to \$446/kWh, based on responses to BloombergNEF's industry survey. The wide range highlights the number of variables that affect prices, such as ???

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Base Year: The Base Year cost estimate is taken from (Feldman et al., 2021) and is currently in 2019\$.. Within the ATB Data spreadsheet, costs are separated into energy and power cost estimates, which allows capital costs to be constructed ???



With respect to these observations, the chemical storage is one of the promising options for long term storage of energy. From all these previous studies, this paper presents a complete evaluation of the energy (section 2) ???



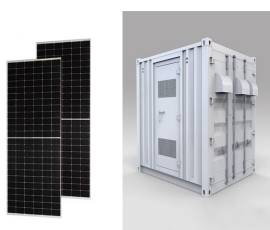
Projects delayed due to higher-than-expected storage costs are finally coming online in California and the Southwest. Market reforms in Chile's capacity market could pave the way for larger energy storage additions in ???



The authors also wish to acknowledge the significant contributions and insight provided by the industry partners referenced in the assessment. ii Energy Storage Grand Challenge Cost and ???



ATB represents cost and performance for battery storage with a representative system: a 5-kW/12.5-kWh (2.5-hour) system. It represents only lithium-ion batteries (LIBs)???with nickel manganese cobalt (NMC) and lithium ???



Based on cost and energy density considerations, lithium iron phosphate batteries, a subset of lithium-ion batteries, are still the preferred choice for grid-scale storage. More energy-dense chemistries for lithium-ion batteries, ???

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Other metals, such as copper, have fallen from pandemic-era highs but have not returned to pre-2020 prices. Interestingly, both batteries and solar panels have seen their prices drop by about 90% since 2010, with both ???



Base Year: The Base Year cost estimate is taken from (Feldman et al., 2021) and is currently in 2019\$.. Within the ATB Data spreadsheet, costs are separated into energy and power cost estimates, which allows capital costs to be constructed ???



The National Renewable Energy Laboratory's (NREL's) U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2020 is now available, documenting a decade of cost reductions in solar and battery ???