Bess cost

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The 2021 ATB represents cost and performance for battery storage across a range of durations (2-10 hours). It represents lithium-ion batteries only at this time. There are a variety of other commercial and emerging energy storage technologies; as costs are well characterized, they will be added to the ATB.

Battery cost and performance projections in the 2021 ATB are based on a literature review of 13 sources published in 2018 or 2019, as described by Cole et al.(Cole et al., 2021). Three projections from 2019 to 2050 are developed for scenario modeling based on this literature.

Figure3. Utility-scale BESS Moderate Scenario cost projections, on a $/kWh basis (left) and a $/kW basis (right) Projections assume a 60-MWDC project. Note that 2019 costs correspond to Figure -1 and Figure 2.

Definition:The bottom-up cost model documented by(Feldman et al., 2021)contains detailed cost components for battery only systems costs (as well as combined with PV). Though the battery pack is a significant cost portion, it is a minority of the cost of the battery system. These costs for a 4-hour utility-scale stand-alone battery are detailed in Table 1.

Within theATB Dataspreadsheet, costs are separated into energy and power cost estimates, which allows capital costs to be constructed for durations other than 4 hours according to the following equation:

Base Year:(Cole et al., 2021)assume no variable O& M (VOM) cost. All operating costs are instead represented using fixed O& M (FOM) costs. They include augmentation costs needed to keep the battery system operating at rated capacity for its lifetime. In the 2020 ATB, FOM is defined as the value needed to compensate for degradation to enable the battery system to have a constant capacity throughout its life. According to the literature review(Cole et al., 2021),FOM costs are estimated at 2.5% of the capital costs in dollars per kilowatt.

The cost and performance of the battery systems are based on an assumption of approximately one cycle per day. Therefore, a 4-hour device has an expected capacity factor of 16.7% (4/24 = 0.167), and a 2-hour device has an expected capacity factor of 8.3% (2/24 = 0.083). Degradation is a function of this usage rate of the model and systems might need to be replaced at some point during the analysis period. We use the capacity factor for a 4-hour device as the default value for ATB.

Round-trip efficiency is the ratio of useful energy output to useful energy input.(Mongird et al., 2020)identified 86% as a representative round-trip efficiency, and the 2021 ATB adopts this value.

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