Stationary battery storage

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The drop in the cost of Li-ion batteries has leveled, leaving room in the battery energy storage market for both established and emerging technologies. Look for the commercialization of many new battery designs over the next decade.

Environmental, social, and economic pressures are motivating efforts to reduce fossil fuel use to generate electric power, heat buildings, produce chemicals, and enable transportation. Many coal-fired and nuclear power plants are coming offline, leaving a gap in the regional electricity supply that is being filled by natural gas, biofuels, and renewables such as wind, solar, and hydropower.

The grid will need to modernize to incorporate alternative energy sources and meet the growing demand for electricity. Battery energy storage systems (BESSs) will be a critical part of this modernization effort, helping to stabilize the grid and increase power quality from variable sources. BESSs are not new. Lithium-ion, lead-acid, nickel-cadmium, nickel-metal-hydride, and sodium-sulfur batteries are already used for grid-level energy storage, but their costs have hindered their broader application.

Lithium-ion (Li-ion) batteries are the most common choice for new BESS installations. They have grown in popularity because they offer high energy and power densities at a cost that has fallen dramatically in the past decade. The low cost of Li-ion batteries has made them popular for transportation and stationary energy storage. However, these two applications have very different technical requirements (Table 1). Li-ion technology is best suited to transportation applications. Batteries for electric vehicles require high energy capacities to provide power to the motor drives for extended periods, as well as to power starting and lighting.

Batteries for transportation applications must be compact and require high volumetric energy and power densities. These factors are less critical for grid storage, because footprint is not often a limiting criterion. If a site requires more storage capability, it can often be met by adding an additional container of batteries. In addition, Li-ion battery performance degrades over time; grid storage facilities that employ Li-ion technology will need new battery packs in less than ten years.

This article provides an overview of the BESS market and presents some chemistries that could better meet the needs of large-scale energy storage applications.