Powering The Future

By Kevin B. McLachlan

Batteries are an indispensable part of our mobile world, powering everything from headsets to phones to tablets to laptops. Those everyday lithium-ion items represent a 1991 technology and, as recent fire issues in Samsung's Galaxy Note 7 phone highlight, they are not perfect. What comes next in the world of batteries is expected to play a leading role in shaping the "next big thing." Think even smaller and even bigger batteries, think energy storage systems. Then consider potential ripple effects such as long-running, cost-effective electric vehicles. Consider that, when paired with solar systems, batteries are increasingly seen as an important household power solution in countries like Germany and Australia.[1]

While manufacturers have improved lithium-ion batteries over the years, there is pressure for a new commercial battery technology—one that offers both greater storage capacity and lower manufacturing costs. Commercializing an improved alternative is a tall order and work is underway worldwide. In fact, the U.S. Department of Energy funded an estimated 75 energy-storage research projects in 2016, alongside numerous other privately funded research projects and startups.[2]

Progress is coming as researchers experiment with new chemistry and new physical forms. For example, in the current lithium-ion battery, a highly flammable liquid electrolyte separates positive and negative electrodes. One new approach eliminates this liquid by using a solid electrolyte. A Tufts University researcher has developed a sheet of special plastic that lets ions travel back and forth between electrodes better than the traditional liquid electrolyte. This design can use lithium metal, which has five times more energy density than the compound currently used in lithium-ion batteries.

The result: potentially reduced flammability plus significantly more power from a battery charge.[3]

At the larger-scale end of the battery innovation spectrum are new storage system technologies designed for the electrical grid. The idea is to have a solar- or wind-compatible system that stores and generates electricity. One example is the flywheel battery—a 5,000-lb. steel wheel, spinning at 8,500 rpm, which is suspended by a magnet and in a vacuum cannister, leading to very little friction. The wheel can be "spun up" when excess electricity is being generated. When electricity is needed, the motor reverses and becomes a generator, feeding electricity back into the grid.[4]

Time will tell which new battery technologies will lead the race to commercial success. From our vantage point, the winners will likely spark far-reaching change, ranging from accelerating innovation already underway in the auto sector, to disrupting staid utilities, to creating exciting micro ventures. We will be watching for the "right" opportunities all along the way.

1. Andrew Stock, Petra Stock and Veena Sahajwalla, "Powerful Potential: Battery Storage for Renewable Energy and Electric Cars," Climate Council of Australia Limited, 2015, https://www.climatecouncil.org.au/uploads/ebdfcdf89a6ce85c4c19a5f6a78989d7.pdf.
2. Richard Martin, "Why We Still Don't Have Better Batteries," *MIT Technology Review*, August 29, 2016, https://www.technologyreview.com/s/602245/why-we-still-dont-have-better-batteries/.
3. David Pogue, "Booting Up the Search for Better Batteries," *Science Friday*, February 17, 2017, https://www.sciencefriday.com/segments/booting-up-the-search-for-better-batteries/.
4. Pogue, "Booting Up the Search for Better Batteries."

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