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Integrated Energy Storage in the United States

By Ben Bovarnick December 2015

Introduction and summary

Whether powering cellphones or keeping laptops charged, energy storage has become a daily function in our lives. Now, these storage systems are poised to help supply power to homes, cars, and power plants. The rapidly falling cost of energy storage technologies in recent years is encouraging wider adoption by utilities, commercial business, and homeowners, and it is important that policymakers proactively drive greater integration of energy storage within the broader electricity grid.

The term "energy storage" describes a broad slate of technologies that primarily store electrical energy for later use, allowing utilities and electricity consumers to access it when most needed. Although cellphone and laptop batteries store and discharge energy in the same way as many commercial and utility-scale energy systems, these large systems can hold thousands to millions of times more energy in reserve. These storage systems are used to improve the efficiency of electric utility operations, support electric grid stability, and save extra electricity to meet peak demand.

Energy storage is a relatively small but emerging market in the electric industry.[1] In recent months, new energy sector announcements have focused additional attention on battery storage and the range of benefits energy storage technologies can provide the electric grid.[2] Tesla, the electric vehicle and energy storage company, recently announced that it will sell its Powerwall system for residential storage and its Powerpack utility-scale lithium-ion batteries at significantly lower prices than market analysts predicted.[3] In fact, recent projections for large-scale battery storage through 2020 suggest costs will fall 40 percent to 60 percent from the 2015 price point, driving significant growth in energy storage markets.[4]

Likewise, there has been movement on the policy side at both the state and federal level. California adopted an energy storage mandate in 2014 to require utilities to provide the state with 1.3 gigawatts, or GW, of energy storage capacity by 2022—a mandate that state utilities are already beginning to meet.[5] New York is reforming its regulatory environment and incentives to finance energy storage projects through the state's Reforming the Energy Vision initiative, which will

support a new market for energy storage.[6] Momentum can be seen at the federal level too, with Reps. Chris Collins (R-NY) and Mark Takano (D-CA) launching the congressional Battery Energy Storage Caucus last October.[7]

Historically, energy storage has primarily served as temporary backup power for large commercial buildings, such as hospitals, or cellphone towers—often using lead-acid batteries—or has been used to increase electric grid capacity in the form of large pumped hydroelectric storage, or PHS.[8] Yet with the exception of new PHS projects, U.S. energy storage capacity remained mostly flat throughout the 20th century. However, spurred by cost declines and technical advances, energy storage—excluding PHS—has grown more than 1,200 percent in the past 15 years.[9] Much of this growth has been spurred by utilities, which have installed 85 percent of new energy storage capacity in U.S. markets since 2013. By comparison, 1.2 percent of new energy storage capacity came from residential installations.[10]

The concentration of energy storage within utility projects is partly due to the high capital costs, but also because energy storage offers clear benefits for electric generators and grid operators. Energy storage can help electric utilities meet peak-capacity demand by holding energy in reserve and releasing it when it is most needed, balance electricity levels flowing through the grid to preserve grid reliability, and defer costly investments in new transmission or distribution systems. Additionally, energy storage can reduce emissions associated with electric generation by helping renewable energy generators extend the length of time they can provide energy and reducing the amount of electricity that utilities must purchase from inefficient natural gas peaking plants.

As the costs of energy storage technologies generally—and battery storage in particular—continue to fall, these projects are likely to become increasingly important resources in U.S. electricity markets. Yet many states do not have established policies for incorporating energy storage into electric markets or to encourage its usage. This nascent market offers policymakers and industry leaders the chance to consider how states and utility regulators can reduce barriers to deployment and increase opportunities for energy storage in order to provide low-cost, high-value services to support utility operations, reduce consumer electricity demands, and bolster state electric grid efficiency. As energy storage costs fall, policymakers should take steps to ensure these technologies play an integral role in offering flexible utility solutions that maximize reliability while limiting long-term electricity costs.

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