Initial Findings

Energy Storage Technology Study (HB 773)

Introduction

1. Energy storage adoption is universally expected to have profound impacts on the electric power industry.

2. Energy storage can provide services traditionally provided by a generator, a transmission asset, or a distribution asset, making it difficult to characterize energy storage from a regulatory standpoint.

3. Storage systems can range in size from small on-site units to utility-scale systems that interconnect to the bulk power grid. Depending on the technology used—e.g., pumped hydro, thermal storage, batteries, flywheels—and project size, energy storage systems can discharge at their full capacity for a maximum of 15 minutes to days.

4. Storage projects can be developed in months rather than years, and can be sized precisely to meet demand. Additional capacity can be added as needed.

5. Historically, pumped hydro has provided the most energy storage capacity in the United States, with 38 facilities located in areas where the geography is suitable. There is no pumped hydro in Maryland, nor any significant prospect for it.

Costs

6. Cost declines are opening market applications for a variety of non-hydro resources—such as flywheels, solid rechargeable batteries, flow batteries, and water- or salt-based thermal storage—collectively known as "advanced energy storage technologies."

7. In particular, battery storage is generating interest due to its modularity and fast-response times, which allow for multiple applications, and to its especially dramatic price declines (which are being driven by the electric vehicle market). According to IHS, an analytical consulting firm, lithium-ion battery prices declined by 50 percent between 2012 and 2015, and are expected to decrease by another 50 percent by 2019.

8. Thermal storage technologies are more efficient than electrical storage technologies. Though rarely in the spotlight, technologies such as grid-connected water heaters have low capital costs and fast response times that make them well-suited for a wide range of services.

9. Along with projected cost declines and technology improvements, increasing renewable energy generation and the electrification of heating and transportation will be drivers for energy storage.

10. Pairing storage with renewable energy generation has some cost advantages relative to stand-alone systems. Currently, energy storage paired with solar generation qualifies for the

federal investment tax credit for renewable generation, as long as at least 75 percent of the energy used to charge the energy storage system comes from a renewable energy system.[1] Also, the cost of some system control equipment can be shared between the renewable energy and energy storage systems, as can siting and interconnection expenses.

Benefits

11. Energy storage offers several benefits, the value of which depends on the perspective taken—that of the State considering financial and social benefits; that of the electric distribution utility considering the cost of alternative approaches to addressing system needs; that of the project developer considering potential revenue streams; or that of the customer considering retail energy costs and electricity reliability concerns.

12. In Baltimore Gas and Electric's service territory, the 10 percent of the hours during which demand was at its highest accounted for 25 percent of annual electricity costs in 2016 and 2017. Instead of relying on natural gas peaking plants during times of high electricity demand, energy storage can release energy stored during off-peak periods when electricity prices are lower.

13. Energy storage can provide backup power when outages occur due to severe weather or other causes. Storage systems tied into microgrids can help support critical facilities in communities, such as large hospitals. Maryland also has state and federal government entities and high-technology businesses that need high levels of reliability.

14. More "flexible generation" resources with fast response times and the ability to ramp down to low operating levels will help to maintain reliable grid operations as more variable generation such as wind and solar become more prevalent. Energy storage is one such option for these grid-stabilizing services.

15. Energy storage can help electric distribution utilities manage reverse power flows at distribution substations with high levels of solar generation. It can also shave localized peak demand on specific, small areas of the distribution grid.

16. Together, the services described above can: reduce peak demand; allow for the deferral of investments in new generation capacity; increase the grid's flexibility, reliability, and resiliency; reduce greenhouse gas emissions and associated compliance costs; and possibly defer transmission and distribution investments.

Obstacles

17. Many of the benefits described above result in system-wide cost savings but have no market value. From a developer's perspective, storage projects may not be justified economically unless more of these benefits are monetized by policymakers, regulators, and/or PJM.

[1] Also, the amount of the ITC for an energy storage system is limited to the percentage of the charging energy provided by renewable energy. For example, if 90 percent of the energy used to charge the energy storage system is sourced from a solar energy system, then the energy storage system is eligible for only 90 percent of the ITC.

18. Receiving compensation from multiple value streams is key to energy storage economics. Regulatory and operational hurdles exist towards providing multiple services using a single system, including services at both the wholesale and retail level.

19. Maryland's retail electricity rates tend to mask the real-time cost of energy and/or fold demand-related expenses into volumetric (i.e., per-kWh) charges. This gives customers little incentive to minimize their usage at times of peak demand, eliminating one of the key potential benefits to customer-sited storage.

20. It is unclear whether electric utilities can own and operate energy storage projects in Maryland because of provisions in Maryland's electric restructuring law prohibiting electric utilities from owning generation assets. It is anticipated that the Maryland Public Service Commission will address this issue.[2]

21. Traditional evaluation tools may use outdated cost information for energy storage and may only quantify a portion of the benefits that storage can provide. This makes it difficult to compare energy storage with more traditional distribution grid investments.

22. Because advanced energy storage devices are relatively new, real-world performance data is limited.

23. The interconnection process for behind-the-meter energy storage is not fully defined. For example, questions remain about how to treat energy storage systems that are not designed to export power to the grid or are programmed not to exceed certain export levels.

Policies

24. In over 20 states, regulatory and legislative bodies are considering ways to spur energy storage growth. These efforts range from investigating energy storage, clarifying how energy storage fits into existing rules, planning for energy storage as part of grid modernization initiatives, providing market incentives for energy storage, or supporting in-state storage manufacturing.

25. A combination of factors influences the suitability of approaches used elsewhere. Like other states interested in energy storage, Maryland has statutory requirements to increase the use of renewable energy generation and to decrease the level of greenhouse gas emissions. Unlike states where utilities remain vertically integrated, Maryland no longer oversees planning for investments in generation or transmission. Also, Maryland no longer requires electric distribution utilities to submit integrated resource plans, with detailed explanations of their long-term distribution system needs and investment strategies.

26. In 2017, Maryland became the first state to enact tax credits for energy storage systems, which are in effect through 2022. The tax credit is for up to $5,000 for residential applications and is limited to the lesser of $75,000 or 30 percent of the installed system costs for commercial customers. A statewide annual tax credit cap of $750,000 is also

[2] The PSC has convened an Energy Storage Working Group. The Group has developed a memo on utility ownership of storage. This will serve as the basis for the corresponding sections of the Energy Storage Study.

imposed. Concern has been expressed that this tax credit is not large enough to serve as a significant catalyst for energy storage deployment in the State.

27. Four states (California, Massachusetts, New York, and Oregon) have adopted procurement mandates/targets for energy storage. Based on conversations with stakeholders, there is support from energy storage companies for procurement targets or mandates, although electric distribution utility and utility trade association representatives have expressed concerns that mandates can be arbitrary and inefficient.

28. In the context of creating an energy storage procurement target or mandate, important policy considerations to address include bulk power and distribution system needs, technology neutrality, and project diversity, in terms of size, ownership, and grid location.

29. There is widespread interest in pilot projects to demonstrate energy storage value/benefits, controlling a cohort of small-scale distributed systems, testing different ownership models, or exploring different technologies. Stakeholders have stressed the importance of creating a framework for broader deployment after results of the pilot projects are made available.

30. Important policy considerations to address in the context of electric distribution utility ownership include permissible locations and uses for storage assets—in particular, whether utilities may earn revenues as an energy or ancillary services provider, as well as using storage as a distribution asset. There are also hybrid ownership models to consider.

31. It would be difficult to include an energy storage requirement in the Maryland RPS, since it is a MWh-based target, and the charging and discharging of energy storage devices may result in little, no, or negative net energy. The RPS also does not address location of resources, which is important for energy storage.

32. Besides procurement targets or mandates and pilot projects, support has also been expressed for rate changes (e.g., more TOU, higher demand charges, location-based charges); incentive programs to address first costs; rebates; building code credits; and coordination with EmPOWER Maryland.

33. With regard to electric distribution utilities, support has been expressed for allowing a return on storage investments and/or contracts for storage services provided by third parties; reforming the interconnection process; requiring the consideration of storage during system planning; and shifting from return on investments to performance-based incentives.

34. The rate impacts of promoting energy storage are a source of concern for consumers. Using energy storage on the system may not result in lower bills, but rather minimize bill increases that would otherwise occur over time.

PJM

35. It is possible energy storage could participate in PJM's regional transmission planning processes, although that has not occurred yet. PJM representatives have indicated that this is being considered.

36. About 350 MW of battery installations participate in PJM's frequency regulation market, but that market is relatively small—PJM buys about 700 MW per hour. PJM representatives have indicated that the market is saturated, and prices are coming down.

37. In some portions of the country, energy storage can serve as a capacity resource, meaning that it is compensated for committing to serve loads during the few times each year when the grid is most taxed—usually due to severe weather. Current rules make it difficult for energy storage to participate in PJM's capacity market due to requirements that a resource be available for any emergency, regardless of its duration.