NATIONAL GOVERNORS ASSOCIATION

Issue Brief

Powering Up: State Trends for Advancing the Use of Energy Storage

Introduction

The adoption of advanced energy storage technology is poised to transform the U.S. electric power market to one that is more resilient, cleaner and more diverse. This technology facilitates greater use of renewable resources and microgrid systems and decreases the need for "peaking" power plants (i.e., power plants that are typically only run during periods of high electricity demand).[1] As the cost of advanced energy storage technologies drops and market demand increases, the potential benefits are motivating states to act. During the 10-month period between October 2016 and July 2017, 18 states implemented policies to promote advanced energy storage through executive orders, legislation or utility commission actions for a total of 33 states that have implemented or are taking actions to adopt energy storage policies. This issue brief updates an October 2016 National Governors Association's report on energy storage, *State Strategies for Advancing the Use of Energy Storage*, and highlights new state policies implemented or under consideration from October 2016 through July 2017.[2,3,4]

"Advanced energy storage" refers to several technologies: batteries, compressed air, thermal, flywheels, hydrogen and supercapacitors. Lithium ion batteries dominate the current market, while new technologies are entering the marketplace that can improve the flexibility of energy storage applications.[5] For example, supercapacitors can discharge stored power nearly instantaneously, providing rapid response for energy fluctuations, and without degrading as quickly as batteries.[6] Compressed air energy storage allows for longer periods of supplied power than most batteries on the market.[7] Combining of technologies can extend the benefits of storage for more specific grid applications.

Advanced energy storage includes both large, "in-front-of-the-meter," utility-scale storage systems that are connected to the electric grid, and smaller, "behind-the-meter," distributed systems, meaning that the energy storage system is installed on the customer's property and on the customer's side of the utility meter. Currently, about 20 percent of the energy storage capacity in the United States is behind the meter, but researchers forecast that in the next five years, that capacity will increase to roughly 50 percent as increased competition and marketability between manufacturers drive down price and utility regulators restructure prices to better monetize the value of distributed energy resources.[8,9]

Costs are still relatively high for many energy storage applications, but recent deployment of advanced energy storage systems has increased rapidly, reaching a total of 1.4 gigawatts (GW) in the United States in May 2017.[10] This total complements 22.8 GW in installed traditional energy storage applications (primarily pumped hydro) that continues to support the power system.[11] Some researchers predict that advanced energy storage deployments will increase significantly in the next five to ten years because of technology cost reductions, market and regulatory changes, and increased transportation electrification so that annual deployments will pass 2.5 GW of installed electric generation capacity in the United States by 2022.[12] For comparison, the total amount of installed electric generation capacity in the United States is approximately 1,100 GW, and annual generation capacity additions were more than 27 GW in 2016—more than half of which involved renewable energy technologies.[13,14] The Energy Storage Association, which represents the storage industry, set a goal in April 2017 calling for 35 GW of advanced energy storage to be deployed in the United States by 2025.[15]

State Policy Updates: October 2016 to July 2017

States have taken a leadership role in advancing energy storage. This update looks at three areas of recent state policy activity:

- Procurement targets;
- Financial incentives; and
- Research and development (R&D) efforts.

Those and the following four policy strategies are covered in the 2016 National Governors Association (NGA) report, *State Strategies for Advancing the Use of Energy Storage*:

- Incorporating energy storage in state energy planning;
- Recognizing the multiple benefits of storage in state regulations;
- Developing streamlined siting, approval and interconnection processes; and
- Encouraging the assessment of storage in energy assurance efforts.[16]

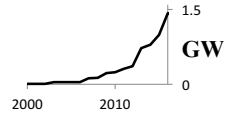
Together, these seven types of policies are helping improve technology performance, encourage use, and monetize value not currently being captured in electricity markets.[17]

The State of Energy Storage: A Brief Look at Energy Storage Development

From October 2016 to July 2017, 18 states implemented or initiated an energy storage policy for a total of 33 states taking action.[18]

Nearly 90,800 workers were employed in the energy storage industry (including pumped hydro) in 2016.[19]

Advanced energy storage capacity grew three-fold in five years, from 442 megawatts (MW) in May 2012 to 1,554 MW in May 2017.[20]



Lithium ion batteries accounted for more than 95 percent of advanced energy storage deployment in the first half of 2017.[21]

Prices for lithium ion batteries used to replace peaker plants have fallen about 12 percent, from $453 per megawatt-hours (MWh) in 2015 to an industry average $399 per MWh in 2016.[22] In comparison, natural gas peaker plants cost $165 to $218 per MWh. Analysts predict energy storage will be cost-competitive with natural gas peakers in the next five years.[23]

Distributed energy storage systems accounted for 20 percent of the energy storage market in 2016. This is projected to reach 53 percent by 2022.[24]

California accounts for 41 percent of the energy storage projects in the United States and 21 percent of installed capacity. **Arizona**, **Nevada** and **Texas** each have more than 10 percent of the country's energy storage capacity.[25]

Energy Storage Procurement Targets

Four states established or updated their energy storage procurement targets from October 2016 to July 2017. Another two states are considering adopting procurement targets.

- **California**'s Public Utilities Commission (PUC) adopted a new requirement that investor owned utilities (IOUs) propose investments for up to 500 MW of distributed energy storage, in addition to a previously adopted 2013 procurement target of 1.3 GW by 2020.[26] California has the largest state mandate and has deployed approximately 130 MW of energy storage under AB 2514 since the program was adopted in 2013.[27]

- **Massachusetts**' set a 200 MWh energy storage procurement target to be achieved by January 1, 2020. Massachusetts also launched a $10 million grant program for energy storage investments through the Advancing Commonwealth En-ergy Storage program, announced up to an additional $10 million for further energy storage demonstrations, included an incentive for energy storage paired with solar PV in the new solar program (SMART) designed to double the state's solar PV capacity, and explicitly allowed energy storage to be paired with bids into the current 9,450,000 MWh clean energy and 1,600 MW offshore wind procurements.[28]

- **Oregon**'s PUC released guidelines requiring the state's two IOUs have a minimum of 5 MWh of storage capacity by 2020.[29]

- The **New York** PUC ordered each IOU in the state to have at least two energy storage pilot projects operational by the end of 2018.[30] In June 2017, the state legislature also approved an energy storage target for 2030. The governor has not signed the bill yet.[31]

- **Connecticut** and **Nevada** passed legislation requiring their state PUCs consider adopting storage procurement targets. The commissions have not yet formalized specific mandates.[32]

Advanced Energy Storage Financial Incentive Programs

From October 2016 to July 2017, nine states created new financial incentives or rate reforms to capture the value of energy storage, including the following examples:

- **Maryland** created the first tax credit for energy storage in the country, a 30 percent tax credit for energy storage—up to $75,000 for corporations and $5,000 for individuals.[33] The credit is valid for installations made between January 2018 and December 2022, and the total amount of credit awarded to all tax payers cannot exceed $750,000. This strategy creates incentives for new industry without appropriating large amounts of funds or committing to a mandate.

- New York adopted a "Value Stack" pricing system to provide more accurate compensation and replace net metering–based compensation.[34] The Value Stack pricing mechanism compensates distributed energy resources, including storage based on their location, capacity, environmental impact and demand reduction ability. Credits are generated based on the expected value of the system and the hourly pricing for energy that the New York independent system operator provides.[35]

- In Nevada, Governor Brian Sandoval signed a bill in June 2017 that creates incentives under the state's existing Solar Energy Systems Incentive Program for energy storage systems.[36]

- **Vermont** Governor Phil Scott signed Act 53 into law in May 2017. The Act requires the Department of Public Service to submit a report

to the legislature by November 15, 2017, on the issue of deploying energy storage on the Vermont electric transmission and distribution system. The Act also authorizes the State's Clean Energy Development Fund, to fund energy storage projects that support renewable resources.[37]

Promote Advanced Energy Storage Research and Development

Most of the 33 states that have set energy storage policies have promoted energy storage R&D efforts. From October 2016 to July 2017, the following four states began new research and development initiatives:

- New York made $15.5 million available for research and deployment to help facilitate the development of the state's utility procurement target set earlier in 2016.[38] The state made an additional $6.3 million available for emerging energy storage products and technologies that would enable the grid to better support renewable resources.[39]

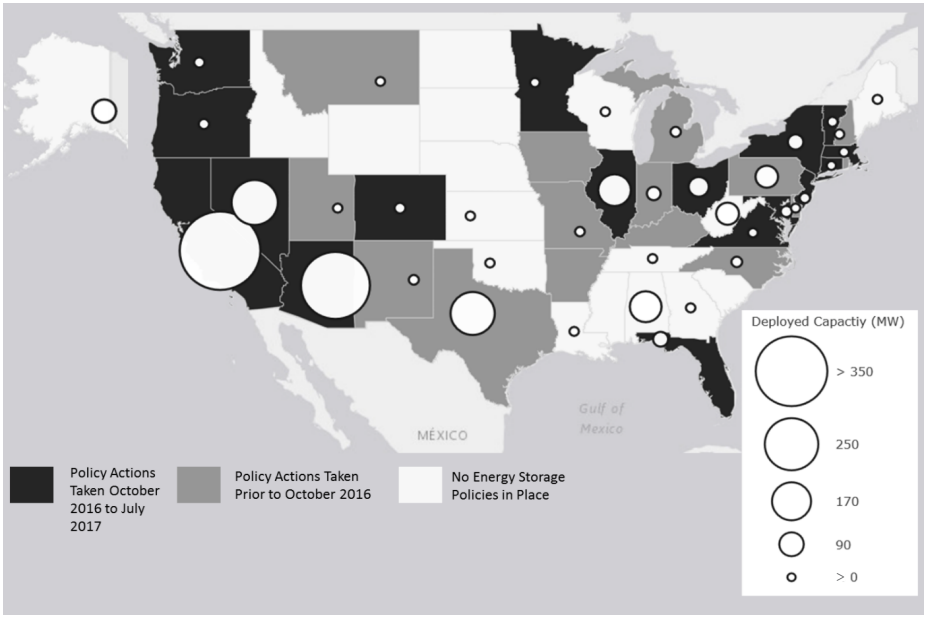
- **Minnesota**'s Department of Commerce and the Legislative Energy Commission called for an investigation into how energy storage can participate in wholesale markets and to consider how partnerships and grants can fund R&D efforts as part of the final report for its 2025 Energy Action Plan, highlighting next steps for Minnesota's energy future.[40] In addition, the Energy Transition Laboratory at the University of Minnesota released a report that addressed economic opportunities for energy storage in the state that found significant benefits from energy storage and recommended that the state develop proposals to fund commercially significant storage projects.[41]

- Other states are incorporating storage into broader policy research and education outreach for grid modernization and new energy technologies. **Illinois**'s NextGrid and **Ohio**'s PowerForward initiatives aim to educate the public and inform policymakers on best practices to facilitate energy storage deployment as part of broader power-sector modernization efforts.[42,43]

Conclusion

Energy storage is expected to play a growing role in state power-sector modernization efforts. States that have not yet begun to implement energy storage policies can look at the successes and policy paths other states have chosen to assess their next steps.

State Policy Action and Deployment of Advanced Battery Storage[44]



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Endnotes

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[3] The following 18 states have made policy advances in the past 10 months: Arizona, California, Colorado, Connecticut, Florida, Hawaii, Illinois, Maryland, Massachusetts, Minnesota, Nevada, New Jersey, New York, Ohio, Oregon, Vermont, Virginia and Washington. Some states, like Florida, are not highlighted below because their recent policy action does not fall into one of the three main policy categories highlighted in this brief.

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