Thermal energy storage united states

Thermal energy storage united states

Energy storage resources are becoming an increasingly important component of the energy mix as traditional fossil fuel baseload energy resources transition to renewable energy sources. There are currently 23 states, plus the District of Columbia and Puerto Rico, that have 100% clean energy goals in place. Storage can play a significant role in achieving these goals by serving as a “non-wires alternative” that can provide added reliability and grid services as renewable resources such as wind and solar replace fossil fuel baseload resources.

The US storage market had a record-setting third quarter of 2023, adding 2,354 megawatts (MW) (or 7,322 megawatt-hours (MWh)) of installed capacity to the grid.[1] It is expected that the US storage market will install an estimated 63 gigawatts (GW) between 2023 and 2027.[2] As of 2023, there is approximately 8.8 GW of operational utility-scale battery storage in the United States.[3]

The installation of utility-scale storage in the United States has primarily been concentrated in California and Texas due to supportive state policies and significant solar and wind capacity that the storage resources will support. At the end of 2023, Texas had 7.3 GW of installed storage capacity, while California had 3.2 GW of installed capacity.[4] In 2022, CAISO, ERCOT, NYISO, PJM, and ISO-NE collectively had approximately 4.3 GW of standalone storage capacity, with another collective 24 GW expected to come online between 2024 and 2025.[5]

For the most part, battery energy storage resources have been developing in states that have adopted some form of incentive for development, including through utility procurements, the adoption of favorable regulations, or the engagement of demonstration projects.[6]

Approximately 16 states have adopted some form of energy storage policy, which broadly fall into the following categories: procurement targets, regulatory adaption, demonstration programs, financial incentives, and consumer protections.[7] Below we give an overview of each of these energy storage policy categories.

Procurement targets require utilities to acquire a specified quantity of energy storage typically by a specified deadline. To date, 11 states, California, Oregon, Nevada, Illinois, Virginia, New Jersey, New York, Connecticut, Massachusetts, Maine, and Maryland, have adopted procurement targets.[8]

California was the first state to adopt a procurement target and initially mandated that the state’s investor-owned utilities procure 1,325 MW of energy storage by 2020,[9] before adding 500 MW distributed storage[10] to the goal for a total of 1,825 MW by 2020. In 2015, Oregon directed their two largest Investor Owned Utilities to each install 5 MWh by 2020 (minimum), up to a maximum of 1% of 2014 peak load.[11] In 2017, the Nevada legislature directed the PUC to establish targets to procure 1,000 MW by 2030, with interim targets starting at 100 MW by December 31, 2020.[12]

Connecticut set its goal in 2021 to achieve 300 MW by 2024, 650 MW by 2027, and 1,000 MW by 2030.[17] Maine also set its goal in 2021 to achieve 400 MW of installed storage capacity by 2030, with an interim target of 300 MW by 2025.[18] New York originally set a goal to procure 3 GW of energy storage by 2030,[19] but New York Governor Kathy Hochul most recently announced plans to double that goal to reach 6 GW by 2030.[20]

In May 2023, Maryland became the 11th and latest state to enact an energy storage target, with a goal to deploy 3 GW of storage capacity by 2033.[21] The new law requires the Maryland Public Service Commission to establish the Maryland Energy Storage Program by July 1, 2025 and provides for incentives for the development of energy storage.[22]

Procurement targets are beneficial in that they provide supportive signals for investors and reduce regulatory uncertainty.[23] Procurement targets can also vary from broad MW requirements to more specific mandates that focus on the adoption of certain storage technologies. For example, California limited pumped storage to 50 MW of the total procurement goal. Procurement targets have been set at both the state utility commission level (e.g., California, Colorado, Massachusetts, Nevada, New York) and by state legislatures (e.g., Oregon, New Jersey).

Regulatory adaption refers to changes made in state energy regulations designed to create opportunities for storage.[24] All of the states with a storage policy in place have a renewable portfolio standard or a nonbinding renewable energy goal. Regulatory changes can broaden competitive access to storage such as by updating resource planning requirements or permitting storage through rate proceedings.

Even still, incorporating storage into IRPs can be a challenge since storage is different from conventional electricity generators and demand-side resources. For example, storage has unique operational constraints, can be interconnected at various points, can serve a variety of applications, and has policy and regulatory uncertainty that may affect system profitability.