Steps states can take to advance energy storage

Policy | State governments and agencies have a key role to play in fostering the growth of energy storage. Todd Olinsky-Paul of the Clean Energy States Alliance looks at the key policies, programmes and incentives being used by America's pioneering storage states

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With the federal government refocusing on fossil fuels, state clean energy policy is now more important than ever in bringing renewable energy and energy storage technologies to scale. And indeed, some states are beginning to step out as leaders on energy storage policy, as they have done for wind, solar and other clean energy technologies. But there is still a lot of work to be done at the state level if storage is to fulfill its potential as a revolutionary technology for both grid-scale and behind-the-meter applications.

Utility procurement

California, of course, seized the early lead in 2013, with its aggressive 1.325GW utility energy storage procurement mandate (an additional 500MW was added in 2017). The mandate specifies separate procurement targets that must be met by each of the state's major utilities by 2020; in addition, it identifies separate targets for storage sited on the transmission grid, distribution grids and behind customer meters in each utility territory, meaning that utilities must procure storage in a variety of sizes, locations and applications. Additionally, the mandate specifically excludes large pumped hydro, to avoid the situation where a few big hydro projects might crowd out battery storage.

The state followed up with a series of rulings to address interconnection issues, expand markets, enhance the integration of renewables and provide for additional benefits to distribution grids. At the same time, California refocused its Self-Generation Incentive Programme (SGIP) almost entirely on behind-the-meter storage. The current SGIP budget through to 2019 is over US$500 million, with 79% reserved for energy storage projects.

State clean energy policy will be a key driver of future storage activity the US

The result has been a booming market for both grid-scale and behind-the-meter storage in California. The state leads the nation in both commercial- and utility-sited energy storage deployment. Several lessons can be drawn from this:

- The push-pull combination of a utility mandate along with significant customer incentives is critical. It is unlikely that the California markets would have scaled so quickly if both utilities and customer/third-party developers had not been engaged in moving the market forward.
- Incentives and mandates notwithstanding, much of the success of the California market is related to the state's high electricity costs, high solar penetration

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A 2MW battery project in Sterling, Massachusetts, which has emerged as one of the leading states in the US for encouraging energy storage

and, most critically, high demand charges, which can be greatly reduced by installing behind-the-meter energy storage systems. This provided a ready market of commercial customers, and it also fueled utility demand-response programmes.

- California benefited from coordination between state policymakers and regulators, and the single-state California Independent System Operator (CAISO); few other states, with the exceptions of New York and Texas, have such an advantage.

Other states have followed suit with utility procurement, but none so boldly. Oregon instituted a 5MWh procurement mandate, which applies to the state's two large investor-owned utilities. Although not a large requirement, it is noteworthy that Oregon chose to express its mandate in terms of megawatt-hours, rather than megawatts. And a few other states, including New York and Nevada, have authorised utility procurement targets, though it's not clear yet whether these targets will be adopted. Most recently, Massachusetts announced a 200MWh "aspirational" utility target. And Puerto Rico, back in 2013, adopted rules requiring all new grid-scale renewable generators to include a storage component. Though not technically a target or mandate, this does establish a minimum requirement for energy storage development as a percentage of new renewable capacity on the island grid.

Energy storage is also allowed, in various forms, within several state Renewable Portfolio Standards (RPSs). It may seem that an RPS would be the logical vehicle through which states could require utilities to procure storage. However, it is notable that only four states have an RPS that allows battery storage as an eligible resource; there are no existing RPSs with carve-outs or requirements for energy storage; and none of the recently announced state procurement targets are being developed within an existing state RPS. One reason for this may be that opening a state's RPS to revision can be politically hazardous, as opponents of the RPS may take the opportunity to try to weaken or revoke it. Another issue is that storage, though it offers many benefits, is not the same as generation, and groups that support renewable energy may object to diverting a portion of the portfolio to support a non-generation resource (Massachusetts plans to circumvent this issue by adding battery storage within its Alternative Energy Portfolio Standard – APS – rather than its RPS). Whatever the reason, states have thus far found it easier to create standalone storage mandates or targets, rather than to add storage into an RPS.

Grant programmes

Competitive grant programmes are often the first tool used by states to demonstrate a new technology. They offer a number of advantages, including giving the state a large degree of control over which projects get built, and providing opportunities to learn about the technology, its applications, economics and markets.

Numerous states have awarded energy storage grants under various programmes, including some specifically dedicated to energy storage, and others targeted to storage-related services such as microgrids or resiliency. Notable microgrid and resiliency grant programmes were established in several north-eastern states in the aftermath of Superstorm Sandy, which knocked out grid power to some communities for weeks. These include a US$50 million microgrids programme in Connecticut, a US$40 million resiliency initiative and another US$15 million in storage grants in Massachusetts, a US$40 million microgrids programme in New York, and a US$10 million energy storage grant and rebate programme in New Jersey. State energy storage grants have also been awarded in Vermont, Oregon, California, Washington State and Maryland.

Although there are still emerging energy storage technologies, the established battery chemistries – lead acid and lithium ion – would seem to need no further demonstration, having proved themselves in thousands of installations worldwide. Nevertheless, it is likely that as new states begin to experiment with energy storage, they will want to demonstrate the technology for themselves. Thus, competitive grants are likely to remain an important part of the state storage incentive landscape for some time to come.

In addition to demonstrating the technology, grant programmes are useful for demonstrating new applications and economic cases for storage. This can be particularly effective when state resources are leveraged with federal and private resources, as shown by a number of high-profile projects jointly supported by state energy agencies, U.S. DOE Office of Electricity, and Sandia National Laboratories. Clean Energy States Alliance has assisted several of these innovative projects across the country [1].

Incentives

As states become more comfortable with energy storage, they should begin to move beyond one-off grant programmes, and instead devote public resources to more developer-friendly forms of support. These include predictable, longer-term programmes such as rebates and adders, tax incentives and market-based incentives such as renewable energy credits. An example of this progression is provided by New Jersey, which began its energy storage programme in 2014 with competitive grants, but by 2016 had progressed to a combination of grants and rebates. Other early-adopter states such as Massachusetts and California are also considering storage rebate programmes.

Although California's SGIP is the most successful example of a state energy storage incentive programme, Massachusetts leads the way for development, still in progress, of the most comprehensive suite of energy storage incentives, mostly through adding storage as an eligible technology to existing programmes. As recommended by the state's landmark 'State of Charge' report [2], Massachusetts is working on incorporating storage into its APS; making storage eligible for energy efficiency funds; rolling out a new solar rebate programme, with a storage adder, to replace its SREC programme; and creating a new, stand-alone storage rebate modelled after its existing MOR-EV programme. At the same time, Massachusetts continues to provide grant funding to projects that demonstrate novel and non-monetisable applications.

As the Massachusetts example demonstrates, it may be easier for states to incorporate storage as an eligible technology within existing, funded clean energy incentive programmes, rather than creating new, stand-alone programmes dedicated to supporting storage. The former can be as simple as amending the definition of eligible technology, while the latter requires more work, both in creating a new programme, and in identifying dedicated funding to support it. Additionally, finding political support for storage within an existing programme may be easier than finding political support for the creation of a new programme.

However, there are drawbacks to adding storage to existing programmes. One problem is that adding a new technology without expanding the programme's budget may be seen as a threat by advocates for (and beneficiaries of) the original programme – for example, solar advocates may not wish to share hard-won incentives with storage developers. Another problem with this sort of eligibility expansion is that it ties storage to other technologies – for example, the Massachusetts SMART solar programme will provide a storage incentive, but only if that storage is connected to an eligible solar installation. A third potential drawback is that adding storage as one among a number of eligible technologies – for example, in municipal PACE bonding programmes – may or may not result in more storage being deployed.

Among the many existing types of state energy programmes to which storage might be added, the two most promising are state RPSs for utility-scale storage, and state energy efficiency programmes for behind-the-meter storage.

State RPS programmes, for reasons discussed above, have not been opened to storage in most states; however, 29 states plus the District of Columbia and Puerto Rico have an RPS, and these standards have proven themselves very successful at increasing the deployment of renewables. According to Lawrence Berkeley National Laboratory, more than half of all growth in renewable electricity generation (60%) and capacity (57%) between 2000 and 2016 is associated with state RPS requirements [3]. Thus, the potential growth in storage as a result of state mandates is enormous – especially if states were to create a storage carve-out within their RPS.

Energy efficiency (EE) programmes are likewise an enormous untapped resource. Currently, more than US$7 billion is budgeted annually in state electrical energy efficiency programmes. Traditionally, electrical energy is aimed at reducing consumption of electricity; recently, some state EE programmes have added a solar component, which does nothing to reduce consumption but does reduce the amount of electricity purchased from the grid, helping to make the overall mix of electricity consumed less polluting. Adding storage to EE programmes requires a further shift in the definition of "efficiency", since storage does not reduce consumption and, in fact, may slightly increase it due to losses incurred over time. What storage brings to the table, however, is the ability to both increase self-consumption of solar and shift purchases of electricity from the grid to off-peak times, thereby reducing demand charges and enabling consumers to participate in demand response programmes. Storage can also safeguard the value of solar in the face of declining net metering rates. Electrical energy storage is not yet widely considered an energy efficiency measure, but there are indications that early adopter states are considering adding storage (for example, this is under consideration in both California and Massachusetts for those states' respective 2019 EE plans).

Other state initiatives

There are numerous other steps states can take to support energy storage.

Studies are a typical early effort that helps state legislators and policymakers to learn more about a new technology or market. Numerous states have conducted studies on energy storage and microgrids, with the preeminent example being the previously mentioned Massachusetts 'State of Charge' report. This 2016 report included a modelling analysis of the state's electric grid, which identified not only the optimal amount of energy storage to add to the grid, but also where it should be located, down to the substation level. It also recommended a comprehensive suite of storage-supportive policy and programme initiatives.

Studies such as these can be useful even beyond the state that conducted the study. For example, Clean Energy Group is currently working with an informal group of New England state policy makers who, while their agencies cannot afford to duplicate the Massachusetts study, would still like to learn from it, and apply it to their own state policy efforts.

Tax credits can be helpful in supporting larger-scale storage deployment, although it is unlikely that most states could provide tax credits large enough to replace the soon-to-sunset federal investment tax credit, which applies to storage so long as it is charged by qualifying renewable generation. Maryland recently became the first state in the nation to provide a 30% tax credit on the installed cost of energy storage systems. The credit is capped at US$5,000 for residential and US$75,000 for commercial projects, with a US$750,000/year cap on total credits awarded.

A third approach tried by some states has been to support related complex technologies such as microgrids, in the hope that the resulting projects will include renewables and storage. This approach has met with mixed success. The Massachusetts Community Clean Energy Resilience Initiative, a US$40 million grant programme for municipalities, did result in a number of solar-plus-storage projects; by contrast the Connecticut Microgrids Grant and Loan Programme, a US$50 million grant programme, resulted in relatively few projects that incorporated storage, instead funding numerous microgrids employing cogeneration (CHP) and fuel cells. Similarly, the innovative New Jersey Energy Resilience Bank, despite high initial expectations, has not thus far resulted in any resiliency projects based on renewables and energy storage.

What's next?

As more states take up energy storage as an important part of their overall clean energy and efficiency portfolios, it is to be hoped that they learn from, rather than replicate, the first steps of the early adopter states. Additionally, it would be prudent for states to study the arc of solar PV, as it seems that energy storage is following a similar glide path from niche applications to full commercialisation to grid parity. And finally, states should – and some are already starting to think about this – move early to ensure that low- and moderate-income communities are not left behind in the energy storage revolution. Energy storage, and its many benefits, should not be exclusively for utilities and wealthy corporations.

Some recommendations:

- **Study the regulated markets.** Frequency regulation was a breakout market for storage in PJM, through it was quickly saturated; in ISO New England, utilities can use storage to reduce their demand during regional peaks, reducing capacity and transmission costs so significantly that a 4MWh battery can pay itself off in fewer than seven years. As other ISO and RTO markets develop, new applications for storage may be revealed.
- **Study the connections between utility and customer-sited storage**. The big play behind the meter is in demand charge management; the big play for utilities, at least in some areas, is in capacity and transmission charge management. A facility with a non-coincident load can achieve both, as has been demonstrated by Green Mountain Power in Vermont and Southern California Edison. If utilities want to stay ahead of the storage revolution, they will need to embrace distributed resources.
- **Watch for the tipping point.** GTM Research recently reported that the price of lithium-ion battery packs fell 73% between 2000 and 2016. Every price drop means energy storage becomes an affordable technology for more customers and more applications.
- **Look for standardisation and services.** Aside from further declines in manufacturing costs, the best indicator that energy storage has arrived as a fully commercialised commodity will be the commoditisation of support industries – storage leasing, storage financing, storage warrantees, storage controls and integration.
- **Watch how storage is defined and regulated.** Thus far, storage has mostly ended up in the generation bucket, so far as state policy is concerned – but this is starting to change. It may not seem important, but how states define storage can have a big impact on everything from interconnection requirements to utility ownership. Already, some states have amended regulations to allow utilities to own storage – for example, New York in its REV proceedings and Massachusetts in its Act Relative to Energy Diversity. Utility ownership can bring more resources to the table, but it can also tend to crowd out third-party and customer ownership, if regulatory guard rails are not in place. And states are in the very beginning stages of understanding how to regulate utility-owned storage. ■

Reports on energy storage policy and economics are available from the CEG/CESA websites at www.resilient-power.org and at http://www.cesa.org/projects/energy-storage-technology-advancement-partnership/

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