



## **State Commission Staff Surge Call: Equitable Access to Battery Energy Storage**

On April 14, 2021, NARUC facilitated a state commission staff “surge” call with the Subcommittee on Energy Resources and the Environment to discuss how commissions are facilitating the deployment of battery energy storage for underserved communities such as low- to moderate-income (LMI) customers and residents of affordable housing communities. The topic was inspired by a [pair of reports](#) from the Clean Energy Group on Massachusetts’ ConnectedSolutions storage incentive program, which applies energy efficiency budgets to facilitate storage deployment. On this call, Todd Olinsky-Paul from the Clean Energy Group presented information about the ConnectedSolutions and Bring Your Own Device (BYOD) battery programs in Massachusetts. His presentation was followed by experience sharing from commission staff in Vermont, Massachusetts, and Hawaii on the various approaches to deploy battery energy storage for underserved communities.

### **Todd Olinsky-Paul, Clean Energy Group**

Virtual power plants (VPPs), which are essential to the ConnectedSolutions and BYOD programs, are an aggregation of distributed energy resources (i.e., energy storage) in homes and business that are dispatched in concert with a utility or third-party aggregator to supply grid needs. In the ConnectedSolutions model, homes and businesses with storage capacity retain the use of the batteries for emergency purposes and can also provide services to the grid. In return for these services, battery owners are compensated for their investment and utilities are able to use these aggregated resources to reduce load at peak hours. As these are directed at regional grid needs, rather than individual customer needs, ratepayers save money with this approach. The ConnectedSolutions model is operational in Connecticut, Massachusetts, New Hampshire, and Rhode Island. Additionally, similar demand response programs are being run in California, New Hampshire, New York, Oregon, and Vermont. The BYOD program in Vermont is run by Green Mountain Power, and is discussed later in the call.

The ConnectedSolutions program is run through state energy efficiency programs and requires adoption of an expanded definition of the term “efficiency.” Traditional electrical efficiency is broadly defined as “using fewer electrons,” but this definition does not typically facilitate effective shifts in peak energy demand. The Massachusetts [State of Charge](#) report demonstrated that these peaks are costly, with the top 10 percent of demand hours each year accounting for 40 percent of total costs. Alternatively, peak demand reduction, which can be accomplished through energy storage, may not reduce net consumption but effectively shifts peaks, which can result in benefits across the grid.

Under ConnectedSolutions, customers purchase or lease batteries and sign a multi-year pay-for-performance contract with their utility, either directly or through a third-party aggregator. Behind-the-meter batteries are used to reduce system-wide electric demand peaks, not customer peaks, providing benefits to all ratepayers. This model also allows all customers to participate, regardless of customer class, location, or load. Lastly, an additional benefit of this model is that the multi-year pay-for-performance contracts de-risk storage investments, making it easier to develop projects in overburdened communities.

In the two years since the program was implemented in Massachusetts, the Clean Energy Group found that ConnectedSolutions has resulted in three times the amount of clean peaking capacity than is required by the state Clean Peak Standard. The program has also come close to meeting the state’s three-year energy efficiency goal. [Early results](#) published by Navigant Consulting of residential customers in the National Grid territory further demonstrate this success on the customer side. For a majority of customers, having a



back-up battery was the primary motivation for program participation, a majority of customers never opted out of an event, and the majority would recommend and are likely to continue with the program.

The Clean Energy Group conducted an independent economic analysis of the program for six multifamily affordable housing facilities in Massachusetts to better understand the program's equity potential. Multifamily housing is a difficult sector in which to develop battery storage due to its typically flat load profile and limited demand charge management opportunities. The analyses found that across the six sites, ConnectedSolutions produces a stronger economic result than an alternative strategy of demand charge management. ConnectedSolutions reduces the simple payback period, increases internal rates of return, and supports larger batteries (in both power and energy capacity) to provide a larger resilience benefit for customers. While challenges to multifamily storage deployment remain, the analysis of the ConnectedSolutions model indicates there is untapped potential.

### **Massachusetts**

The Massachusetts Department of Public Utilities (DPU) started looking into energy storage starting in 2015 – 2016 with the [State of Charge](#) report. This foundational report analyzed the costs and benefits, use cases, and barriers to development of battery storage technologies. The report also developed policy and program recommendations. The report found that the structure of various policy components (i.e. markets, retail rates) do not align with the benefits provided by storage, meaning that policy and regulatory action is required to unlock fair compensation for storage. The report initiated a number of different DPU proceedings, and was completed in conjunction with [legislation](#) that was passed in 2016. The legislation included a statutory definition of energy storage, permitted utility ownership of energy storage in certain situations, permitted the co-location of storage with large-scale renewables, and directed the Department of Energy Resources to establish a statewide energy storage target, which was ultimately set at 1,000 MWh of storage by 2025. To date, the state has 179 MWh installed and operating, and an additional 874 MWh upcoming. This was accomplished through a variety of programs, many of which were implemented through DPU.

In 2017, Eversource submitted four demonstration project proposals, two of which were approved. The first project is on Martha's Vineyard for a 15 MW/60MWh battery designed to reduce reliance on and possibly replace diesel generators used for peaking purposes. The battery also promotes the construction of additional distributed solar resources on the island. The other approved project is on the outer cape and is a 25MW/30MWh battery designed to defer investments in transmission and distribution infrastructure, improve reliability, and reduce greenhouse gas emissions. Both projects are currently under construction, and the DPU has developed detailed performance metrics which will be used to assess the projects once operational. The commission also expects more proposals for demonstration projects in the near future.

One the key programs to date is the Social Massachusetts Renewable Target (SMART) program. Launched in 2018, this is the primary solar incentive program in the state which offers tariff-based incentives. The program includes an adder to the incentive rate for a solar facility if it is co-located with storage. The size of the adder is variable and is based on the ratio of the battery capacity to the solar capacity. A facility within this program must also meet certain operational requirements, and in particular they must discharge 52 complete cycle equivalents in a calendar year, which is aimed at meeting summer and winter peak demand. While the SMART program has been successful in deploying storage, it has also raised a number of policy issues needing to be addressed by the commission.



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The first issue relates to net metering rules. The commission examined different configurations of net metering and storage facilities and determined under which scenarios facilities would be eligible for net metering. The commission decided that facilities are generally permitted when storage only charges from the net metering facility or when it is not exported to the grid. The only configuration that is not permitted is when storage can bulk charge and export; however, the commission left the door open to potentially address this issue in the future.

Another question that the commission considered was the monetization of capacity and energy wholesale market revenues with respect to net metering facilities. Traditionally, distribution companies have owned the rights to capacity and energy and have been directed to monetize them to reduce the cost of net metering to ratepayers. However, with storage and solar acting as a single resource, it was necessary to unpack the rights of the distribution company for the energy and capacity values of storage and solar systems separately. The commission created a set of rules for facility owners to buy energy and capacity rights from the distribution company, and use the proceeds to offset net metering.

DPU has also been involved in issues around interconnection. In 2019, the commission opened an investigation into the Commonwealth's interconnection policies, particularly integrating energy storage into the distributed generation interconnection tariff. An order is expected to be issued soon on this topic.

Equity and environmental justice are increasingly important for the commission. Recent climate legislation added a new definition for "environmental justice communities" and modified DPU's mission statement so that equity and greenhouse gas emission must now be considered in commission decisions.

## **Vermont**

In 2020, the Vermont Public Utility Commission approved two tariff programs for energy storage. The programs straddle the boundary between the ConnectedSolutions and demand response models discussed earlier in the call. The first tariff is a BYOD-type tariff, where customers can receive an upfront payment when they install their systems and, in exchange, those systems are aggregated into a VPP. These systems can export to the grid and target revenue streams in the wholesale markets, specifically the ISO-New England forward capacity market and the regional network service market. The second tariff is for utility-owned batteries that are sited behind the customer meter. These batteries are similarly aggregated to reduce peak demand, and also play in the energy market where the utility can use the resource towards meeting renewable portfolio standard obligations. This is a unique lease model, where the utility owns the asset and passes costs through the rate base, and customers make monthly lease payments. Neither of these programs are explicitly aimed at low-income customers, with early adopters generally being wealthy enough to make the high upfront payments.

With the BYOD program, incentives are set at \$850 – 950/kw capacity, which is made in an upfront payment to customers. The customer, however, is required to pay \$20,000 – 25,000 out of pocket, which is generally unable to be financed. BYOD systems are revenue positive in year 4, net positive in year 8, and receive a return on investment (ROI) of 1.33 in year 13. The total installed cost under the utility-owned lease-to-customer model is around \$18,000. The system is revenue positive in year 8, net positive in year 11, and receives a ROI of 1.14 in year 18. While there is interest in increasing participation from LMI customers, increasing the incentives would cause upward rate pressure (as indicated by the lengthy payback periods).



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PUC staff mentioned two potential areas of improvement for the programs: increasing low-income access and reducing carbon intensity. As battery prices fall, access to battery technology for low-income customers is expected to improve. Additionally, the charging pattern for most of the battery systems enables the batteries to charge when power is the cheapest. In New England, this often occurs when the marginal unit on the grid is a natural gas unit, which essentially shifts the use of carbon-intensive power. These considerations, as well as the rate pressure over time, suggest that battery storage is not the most cost-effective power supply choice.

The commission decided not to spend energy efficiency dollars on batteries for two reasons: First, the energy efficiency utility in Vermont is a separate entity from the distribution utility. The most effective way for batteries to be deployed is in areas where the grid is constrained, which should be coordinated by the distribution utility. And second, battery investments do not pass the cost-effectiveness screening tool applied to efficiency investments.

## **Hawaii**

Hawaii is experiencing similar challenges as Massachusetts and Vermont, as well as those that are unique to the state. Hawaii has a number of programs that either explicitly incentivize or could incentivize battery storage deployment. There is no BYOD program, but there are distributed energy resource (DER) programs and Grid Service Purchase Agreements (GSPAs) to encourage development and acquisition of grid services from DERs. The state has several tariff options open to new customers, in addition to net energy metering and net energy metering plus for customers who want to add a non-exporting resource to their system, both of which are closed to new customers. Options currently open to new customers include the interim programs of customer grid supply and customer grid supply plus; as well as the Smart Export tariff. The latter programs are targeted towards solar, but can be applied to storage. A docket is currently open to develop successor programs for the customer supply and customer supply plus programs, and the commission has identified an urgent need to develop a BYOD program to address the expected tightening of capacity reserves with the retirement of a coal plant on Oahu in 2022. Given the tight timeline, there is not a focus on reaching LMI customers right now, but it is a consideration in the development of more permanent DER programs going forward. The Smart Export tariff is specifically designed for storage and encourages charging the battery during the day, when there is high renewable energy generation, and self-consumption or export during the evening peak. GSPAs allow the utility to contract with third-party aggregators who acquire grid services from DERs. These programs are device-agnostic, but the contractors are currently largely targeting water heating, and, to a lesser extent, solar and storage.

Similar to Vermont, Hawaii has an energy efficiency administrator called Hawaii Energy. Hawaii Energy has just started to pilot programs for residential and commercial storage. They initially proposed a program design that was targeted to retrofit existing solar installation; however, due to the COVID-19 pandemic, Hawaii Energy took the opportunity to address the economic downturn and incentivize market development in underserved populations and constrained circuits, plus focusing on resilience for critical infrastructure. In November 2020, Hawaii Energy launched a \$2,500 incentive for the condo and townhouse market, which was identified as a difficult-to-reach sector for the DER industry. Results from the program are still pending, and Hawaii Energy's next step is to explore the integration of this incentive with a whole-home energy efficiency audit for single family participants.



While not a storage program, Hawaiian Electric (HECO) recently launched a small-scale demonstration project called the Solar Roofs Demonstration. Through this program, HECO is renting roof space from state-owned low-income housing developments and sharing the benefits with the state and the residents of the developments. The commission is looking forward to seeing how this program could be integrated with other devices going in the future.

Several challenges have emerged from Hawaii's experiences with DER and storage programs. For BYOD program development, the commission is trying to identify specific grid needs. These potential grid needs include services to address low renewable energy days, morning ramps, evening peaks, and unforeseen outages. Another challenge is knowing how to value grid services. Because Hawaii is a vertically integrated state, it can be challenging to unbundle the value of various services. Additionally, there are concerns about how to quickly set up the BYOD program while ensuring sustainability and minimizing customer confusion. The commission also faces challenges in identifying LMI customers. Lastly, the commission is concerned with how to provide meaningful incentives to customers who rent housing.

### **Discussion**

Staff on the call asked whether the ConnectedSolutions program requires a power market, or if vertically integrated utilities can offer a similar structure. Vertically integrated states have found that environment a hindrance to development of storage programs. Todd commented that having a vertically integrated utility does not preclude a program like ConnectedSolutions, but a market is important in order to understand the value of the grid services. Massachusetts staff added that there does not seem to be a reason why a similar program could not be designed in the absence of a wholesale market. Vermont staff suggested that if utilities are coming up against capacity or power supply limitations, that would be an opportune time to look pair energy storage with other resources to defer transmission and distribution investment. This would require a one-off analyses, as opposed to using market values. Staff in Hawaii acknowledged similar challenges and emphasized consideration of what is being offset and what alternative options may be available.

Another question asked how commissions are addressing equity. Equity provisions included in Connecticut's straw proposal included on-bill payment and a rebate in conjunction with a performance payment. In Massachusetts, a zero-interest heat loan is available for people investing in efficiency measures. Massachusetts staff further added that there are a number of different types of equity concerns in addition to types of customers. Multifamily affordable housing may be easier to address because they are commercial customers. When talking about the residential level, low-income customers do not always have the disposable income to invest in DERs. Loans and rebates can help, but performance-based incentives with payback over a longer period of time are not always as effective. Additionally, a lot of low-income customers do not own property, and it has been difficult to get landlords to adopt measures.

### **Conclusion**

The discussion demonstrated that commissions are employing a variety of models to deploy battery energy storage, with significant variation in how well these programs target and serve underserved populations. In Massachusetts and Hawaii, certain programs explicitly serve underserved populations. While Vermont programs have not had an explicit LMI focus, staff recognized the need to address low-income access as well as carbon intensity. Several challenges came up in this discussion, including how to value capacity and energy services, how to assess the value of storage, and how to develop meaningful incentives.





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