

Bring-Your-Own Battery Programs

The New England Perspective

Utility Energy Forum

August 20, 2021

BYOB BTM Battery Storage Programs

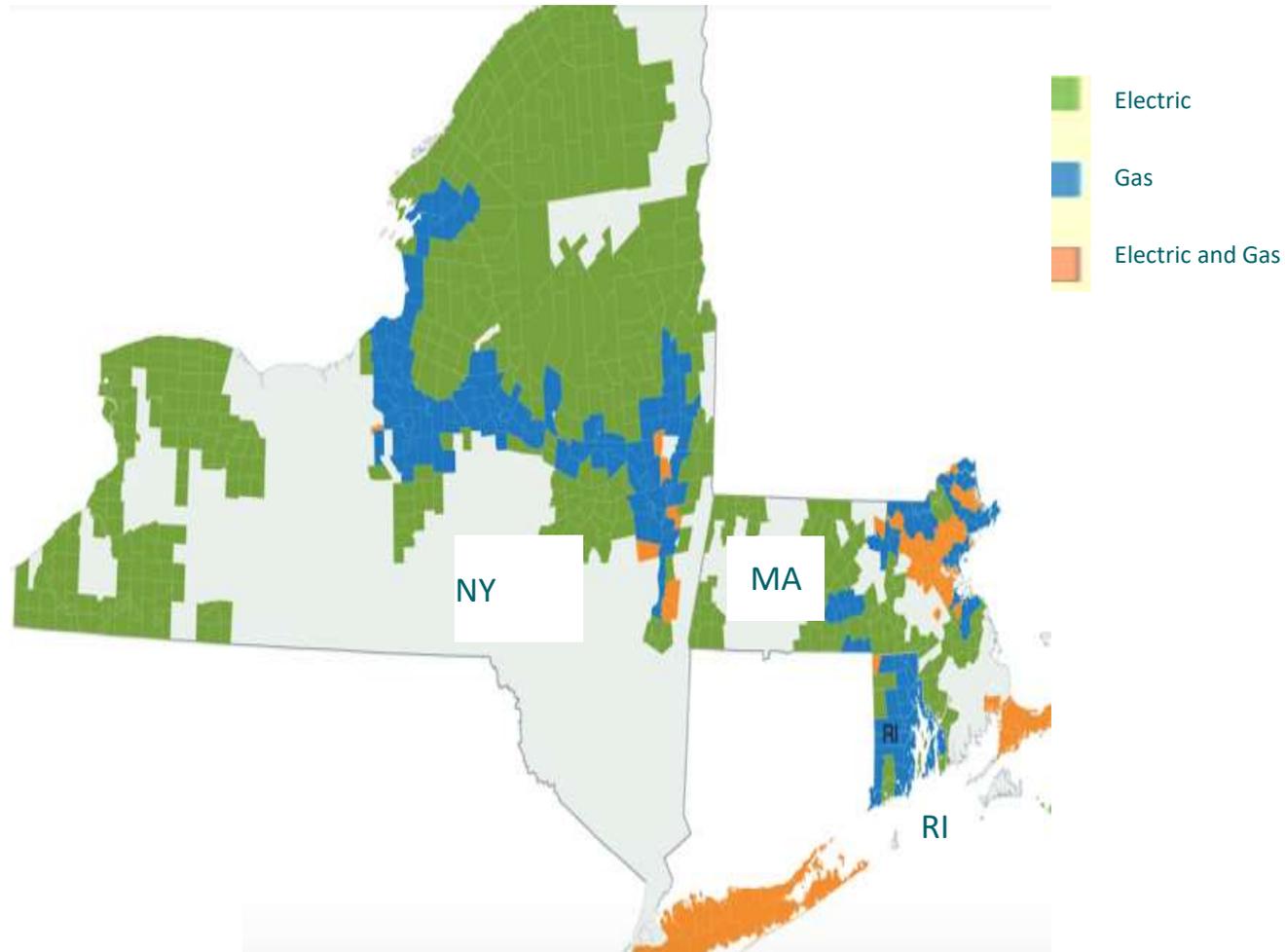
The two dominant IOUs in New England have implemented BTM storage programs that put customer battery resources at the forefront of demand response. These are:

EVERSOURCE >>> **Massachusetts + Connecticut + New Hampshire**

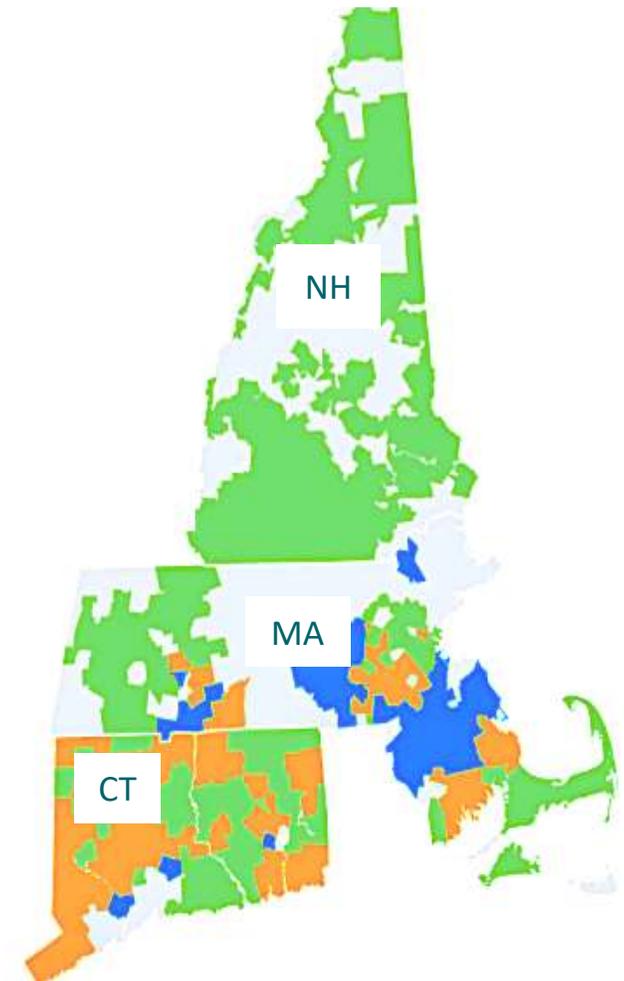
nationalgrid >>> **Massachusetts + New York + Rhode Island**

- >>> Together the two utilities administer six dispatchable battery programs in five states, all under the **ConnectedSolutions** brand.
- >>> These programs are similar except for differences in the size of performance incentives (\$/kW) which vary by state.

National Grid Service Territory



Eversource Service Territory



Drivers - Ambitious State GHG Goals

- Ambitious state goals for GHG reductions and state mandates to acquire more energy storage are key motivators driving these programs.
- Massachusetts was the first state in the country to incorporate BTM battery storage into its Energy Efficiency plan.
- The table at right shows that all five of the states in this study have established goals of 80% or more in GHG emission reductions by the year 2050. Many cities set their own even more aggressive goals.

State	GHG Reduction Goals	Year
Connecticut 	45%	2030
	80%	2050
Massachusetts 	25%	2020
	80%	2050
New Hampshire 	20%	2025
	80%	2050
New York 	40%	2030
	100%	2050
Rhode Island 	45%	2035
	80%	2050

Policy to Pilots to Programs

Massachusetts Example



The MA Green Communities Act directed the utilities to develop new forms of active demand management (e.g., ramping).

The EEAC guides Energy Efficiency for the state and has been pushing to have BTM programs significantly expanded



Jun 2017

Department of Energy Resources (DOER) sets energy storage target of 200 MWh

Dec 2017

DOE awards Eversource \$20M in grants for energy storage pilots. Eversource procures 5 MWh of battery load reduction

Nov 2018

SMART energy program is expanded to incentivize solar projects that are co-located with storage. This is a complementary program that provides leads for ConnectedSolutions.

Jun 2019

ConnectedSolutions launches, opening up BTM storage market

Policy

Pilots

Programs

Demonstrations to Establish Proof of Concept

Two demonstration projects, one by National Grid and the other by Eversource, established a foundation for today's Daily Dispatch and Targeted Dispatch programs.

Battery Storage Demonstration Projects: Summer 2019 Results (Massachusetts)

	National Grid Residential Demonstration	Eversource C&I Demonstration
Number of Participants	49-50*	2-5*
Technologies Tested	BTM Residential batteries 5-7 kW	BTM C& Batteries 520 kW and 1500 kW
Incentive for Capacity	\$225/kW	\$200/kW
MWs Enrolled	0.19 MW	1.07 MW
MWs Evaluated	0.135 MW	0.972 MW
Retail Company States	MA – RI – NY	MA – CT – NH (No impact evaluation)
Evaluation Notes	<p>An evaluation by Navigant found that batteries participating in 2-hour events saved 5.5 kW on average.</p> <p>65% of customers participated in every event.</p> <p>94% of customers had no opt-outs.</p> <p>Savings were roughly 64% of enrolled capacity.</p> <p>65% of customers said access to backup power was a primary motivation for participation.</p>	<p>Eversource paid for C&I battery equipment (demo only).</p> <p>Batteries had consistently good performance.</p> <p>Installations were very large and complex.</p> <p>Energy storage system optimization logic was challenging.</p> <p>Customers valued the performance payments but were unsure of the overall benefit.</p> <p>Challenges – defective hardware, software glitches, programming errors, communication with vendor servers.</p>

BYOB Program Business Model Elements

Bring-Your-Own-Battery

Participating customers provide their own battery and inverter. The program does not incentivize equipment. (MA offers a complementary program that incentivizes batteries co-located with solar PV.)

Builds on the ISO-NE FCM Model

The battery program builds on utility and customer experience with the ISO-NE forward capacity market. Participants receive day-ahead notification of DR events and are incentivized based on performance.

Significant Role for Third Parties

The program relies heavily on DR aggregators and manufacturers. Outsourcing minimizes utility involvement.

Pay-for-Performance

Utilities only pay for actual dispatch during DR events. The amount of capacity dispatched (kW) is multiplied by the pre-determined incentive for each kW supplied. Average performance across the season is used to calculate the final incentive payment.

Large Incentives

The Daily Dispatch program pays unusually high incentives for a demand response program. Incentive levels are cost-effective under the DRIPE methodology approved by regulators in four of the five states studied (New York is typically more independent). Regulatory approval of this approach minimizes risk to the utility.

Program Business Model Elements

ISO-NE Forward Capacity Market (FCM) Model Design

ConnectedSolutions builds on utility and customer experience with ISO-NE and NY-ISO wholesale market. Many of the C&I participants in were already participating in the FCM and brought these strategies to the new program.

ConnectedSolutions versus ISO-NE Forward Capacity Market

Program	Day-Ahead Market	Performance Incentives	Performance (\$/kW)	Upfront Capacity Payment
ConnectedSolutions	✓	✓	Pre-determined by program	⊘
ISO-NE Forward Capacity Market	✓	✓	Market clearing price	✓

Unlike ConnectedSolutions, the FCM has two kinds of incentives incentives. These are (a) an upfront capacity payment that is independent of performance and (b) a performance incentive for dispatched energy during DR events that is based on the market clearing price.

DRIVE Cost Effectiveness Methodology

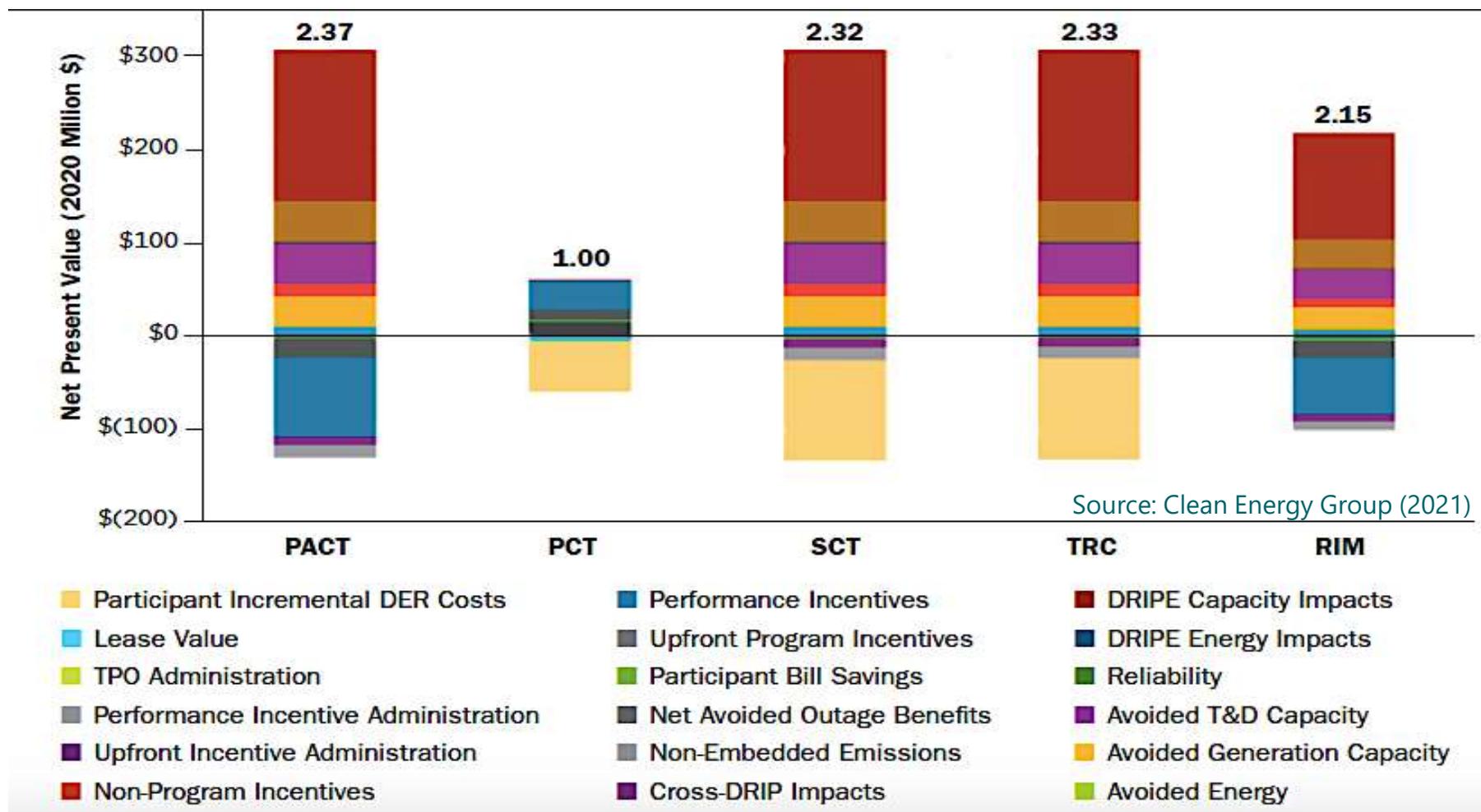
The ConnectedSolutions programs are cost effective under the criteria used in the New England states that includes *Demand Reduction Induced Price Effects* (DRIVE) by Synapse Energy. **The high calculated estimates of avoided cost make it possible for program administrators to offer high incentives.**

Daily Dispatch Incentive Costs, Demand Reductions, and Benefit Projections from Benefit-Cost Model (MA Example)

	2020			2021		
	Incentive Costs	Planned KW Reductions	Planned Benefits	Incentive Costs	Planned KW Reductions	Planned Benefits
Residential Daily Dispatch Offer Incentive costs, Demand Reduction, and Benefits Projections from Planned Benefit-Cost Models						
Eversource	\$41,250	150	\$178,241	\$68,750	250	\$297,351
National Grid	\$396,880	1,763	\$1,923,750	\$606,936	2,696	\$2,944,976
C & I Dispatch Offer Incentive Costs, Demand Reduction, and Benefits Projections from Planned Benefit-Cost Models						
Eversource	\$1,250,000	5,000	\$5,941,363	\$2,500,000	10,000	\$11,894,038
National Grid	\$1,125,000	5,000	\$5,455,988	\$1,575,000	7,000	\$7,646,301

DRIFE Cost Effectiveness Methodology

Benefit/Cost Ratios for Energy Storage Under Different Cost Effectiveness Tests



BTM Battery Storage Programs (ConnectedSolutions)

- 1 Battery Ownership** Customer and third-party battery ownership accelerates development of competitive battery markets and minimizes utility cost and risk
- 2 Pay-for-Performance** Pay-for-performance for customer dispatch during DR events ensures that utilities only compensate customers for actual load reductions
- 3 Energy Export** Payment for energy export encourages larger batteries, makes more battery systems cost-effective, and provides greater grid benefits
- 4 Customer Control** Customers can prioritize use of batteries for personal use (resiliency) because they are permitted to opt-out of DR events
- 5 Multi-year Contracts** Multi-year customer contracts with utilities (5 years) reduce risk for investment in large batteries and help the program build a pipeline

BTM Battery Storage Programs (ConnectedSolutions)

6 DR Aggregation

Resources in both the residential and C&I programs are aggregated by third-parties. This makes it feasible for small batteries (~5 kW) to participate and allows a wider range of batteries in the programs.

7 EE Program Funding

Provides a stable source of funding through the state's energy efficiency programs which provides certainty for stakeholders.

8 Compound Benefits

Allows other incentive opportunities, including participation in ISO-NE forward capacity market and NY-ISO market, thus maximizing C&I customer value on their battery investments.

9 Policy Tool

Gives state policymakers an additional tool to address energy policy goals

ConnectedSolutions BTM Program Features

Program Enrollment

Residential Customers

Residential customers normally enter the program in one of two ways :



Residential Wi-Fi thermostat control program.



Incentives for home battery storage systems that are co-located with solar PV.

C&I Customers

C&I customers normally enter the program through their DR providers. Many participants were already familiar with how such programs work. Some participated in the C&I demonstration project.



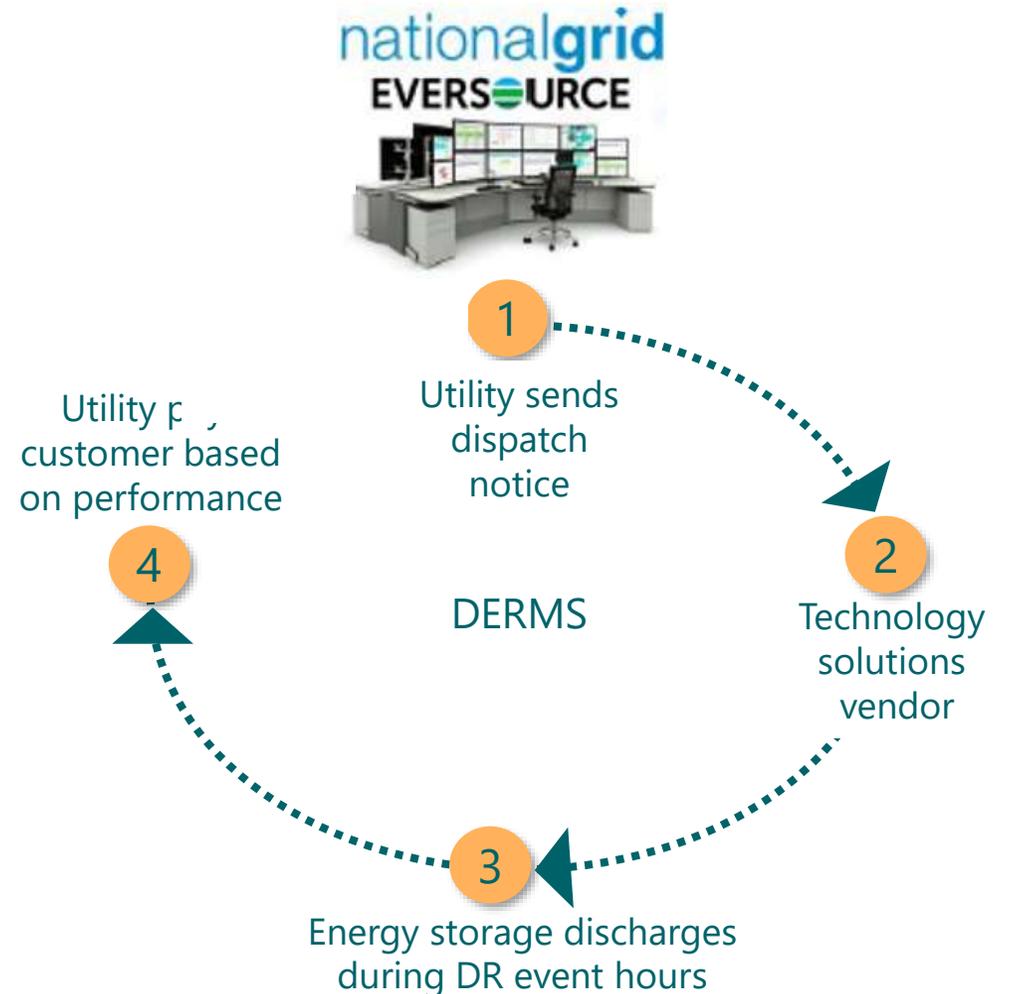
Other customers carried over their DR strategies from an existing ISO-NE or NYISO program that they were enrolled in.



ConnectedSolutions BTM Program Control Features

Distributed Energy Resource Management System (DERMS)

- DERMS platforms automate DR, monitor asset-level loads and control customer equipment.
- Eversource and National Grid both use a non-model-based DERMS that do not operate in real-time and are not integrated with the utility distribution system.
- Third party DERMS platforms interface with utility DERMS. EnergyHub's DERMS manages enrollment, monitoring, data management and asset control.
- BTM resources are built up in a hierarchy with the DERMS (virtual top node) and DR assets (end nodes) underneath.



Program Design Lessons for BYOB BTM Storage



CleanEnergy Group compiled a set of lessons for other states and program administrators.

CEG is a non-profit advocacy group that provided earlier technical support that was instrumental in the design of the ConnectedSolutions program model.

1 Follow the example in other states

- a) Integrate peak demand reduction into your state's energy efficiency plan
- b) Specify that BTM batteries are eligible for active demand response
- c) Show that batteries pass benefit/cost tests required for inclusion in the efficiency plan
- d) Program administrators develop a BTM battery program within that efficiency plan
- e) Ensure that the state's policy goals are supported by this battery program
- f) Resolve interconnection issues and improve procedures

Program Design Lessons for BYOB BTM Storage

2

Provide incentives and financing to subsidize costs of battery systems.

[Autor note: ConnectedSolutions does not follow this guidance. Customers fund their own batteries which is an important program attribute.]



3

Offer long-duration customer pay-for-performance contracts. This is critically important to minimize risk and procure financing—the longer the better. ConnectedSolutions is 5 years.



4

Allow power export to the grid. Counting exported power toward customer performance prevents regional peak demand reduction contributions from being limited by the size of the customer's load.



5

Avoid excessive metering requirements. Simple solutions, such as using inverter readings, are recommended over more complicated and costly solutions.



Program Design Lessons for BYOB BTM Storage

6

Coordinate between clean energy incentive programs. BTM battery storage customers may need to stack multiple incentives and revenue streams to make their investment pay off. The state's suite of clean energy regulations and programs must work together.



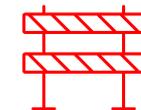
7

Recognize the importance of customer resilience. To make pay-for-performance battery programs work, policy makers and utility program administrators need to acknowledge and support the resilience needs of individuals and communities.



8

Predict and address interconnection barriers early. Some BTM storage projects have been delayed or cancelled due to unexpected high costs of interconnection when line upgrades are required. States should assess utility hosting capacity at the outset.



Further Reading and Thank you!

1. [ConnectedSolutions, A New State Funding Mechanism to Make Battery Storage Accessible to All](#), Prepared by Clean Energy Group, February 2021
2. [Avoided Energy Supply Components in New England: 2021 Report](#), Prepared for AESC 2021 Study Group. March 15, 2021.
3. [Residential Energy Storage Demand Response Demonstration Evaluation](#), Summer Season, Prepared by Navigant for National Grid and Unitil, 2019.
4. PLMA Conference, [Integrating Distributed Energy Resources onto the Utility System](#), Presented by Michael Goldman, Eversource Energy, May 15, 2019.
5. [Behind the Meter Battery Market Study](#), SDG&E Emerging Technologies Program, February 2020
6. [Energy Storage Markets - 2019](#), SCE Emerging Markets and Technology Program, May 2020