

# 2022-2021 Planning Workshop #1 Briefing Document

## Topic 2: Active Demand Management

## INTRODUCTION

The Green Communities Act directs administrators of energy efficiency plans to meet “electric and natural gas resource needs... first... through all available energy efficiency and demand reduction resources that are cost effective or less expensive than supply.” The energy efficiency (EE) programs administered by the PAs have reduced energy demand for years through energy efficiency; these savings are referred to as passive demand reduction. Additional demand savings are available through Active Demand Management (ADM). ADM refers to the dynamic management of end-use customers’ energy demand using information, incentives, and technology. ADM products and services, which in recent years have been enabled by advances in technology and automation, can include:

- Direct load control
- Traditional demand response (DR) including load curtailment
- “New” forms of active demand management, including potential management during non-peak periods (e.g., for ramping or other purposes)
- Behind-the-meter (BTM) battery storage
- Thermal storage

Electric demand drives the need for electric capacity resources for generation, transmission, and distribution, which translates into costs to ratepayers. While state and regional peak demand projections are flat, significant benefits remain to increase the programs’ focus on cost-effective ADM. These benefits stem from the cost of energy and capacity, and their effects on retail prices, rather than from the system’s capacity requirements alone. Every year, imbalances between energy supply and demand lead to price spikes of varying magnitude; these spikes occur because capacity costs and peak period energy costs, which together constitute a significant portion of the cost ultimately borne by ratepayers, fluctuate considerably. ADM can be used to manage or reduce these costs. In addition, the future costs of capacity and energy are uncertain.

The electric grid is becoming increasingly dynamic as renewable resources are incorporated, technology and automation continue to advance, and growth is concentrated in discrete and sometimes isolated parts of the state. ADM bolsters the resiliency of this dynamic electric grid in the face of increasingly intermittent generation, extreme weather events, and potential attacks. For these reasons, active management and reduction of peak demand and peak period energy use can lead to significant economic benefits to Massachusetts ratepayers, even when ISO-NE forecasts of demand are flat. Cost-effective ADM can position an energy efficiency portfolio to proactively address current and future system needs.

This briefing document summarizes the status of current summer and winter demand management activities and available results. It also identifies and recommends opportunities for expansion and improvement of existing offerings, and explores the potential for additional savings from revised or additional program offerings.

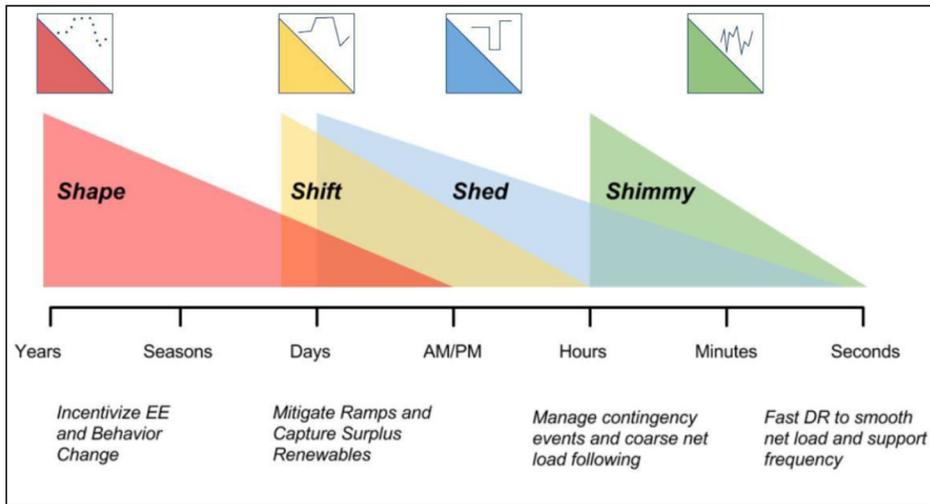
## Continued Evolution to Active Demand Management (Not Just Peak Reduction)

Modern versions of ADM are not limited to traditional demand response (DR) or load control, which typically rely on a small number of noticed events to reduce consumption when system reliability is jeopardized at peak times or at times of high market prices. These legacy DR strategies are focused solely on reducing demand with a strong focus on peak periods. ADM can also mean managing demand to meet a wider variety of system needs. In this sense, ADM is not limited to demand reduction during peak periods, but can also focus on load shifting to smooth out load shapes, meet ramping needs, or maximize the use and effectiveness of available (including “excess”) renewable resources for the grid. ADM can also help manage the load associated with

electric vehicles (EVs) and strategic electrification. Both are new electric loads that are expected to grow significantly in Massachusetts.

While the original Green Communities Act (GCA) authorized demand reduction resources and demand response, legislation in 2018 amended the GCA statute (MGL Chapter 25, Section 21) and explicitly authorized “energy storage and other active demand *management* technologies” (emphasis added).

As the EEAC considers ADM within the statewide EE portfolio, a California study on the value of ADM is helpful to understand the ways in which opportunities for demand management have evolved beyond traditional demand response and peak load shedding. In a 2017 study for the California Public Utilities Commission (CPUC), Lawrence Berkeley National Laboratory (LBL) showed that advances in automation and technology, combined with new ways to engage customers, can create managed loads that justify investments in ADM. In the study, LBL analyzed a wider range of grid needs than traditional DR has addressed historically, and the other demand resources that could address them. The study developed and defined the following typology of use types:



Source: 2025 California Demand Response Potential Study, LBL, May 2017

- **Shape:** Reshaping customer load profiles over a longer period of time through time-varying rates, energy efficiency (EE), and behavioral programs.
- **Shift:** Movement of energy demand from high-demand times to periods of surplus generation. Examples include energy storage or managed EV charging.
- **Shed:** Traditional forms of DR that can help reduce load during peak capacity events. Examples include AC switch programs.
- **Shimmy:** Dynamically adjust load within shorter time frames (i.e., minutes to seconds) in response to grid disturbances and short-run ramps. Examples include grid-interactive water heaters used for ancillary services or frequency regulation.

Source: 2025 California Demand Response Potential Study, LBL, May 2017

The California study confirmed that addressing demand at time of system peak continues to be a valuable approach, but also suggested that managing demand and shifting load during non-peak periods could provide additional benefits. This will be increasingly valuable as more renewable resources are added to the system, and as transportation is electrified.

### SUMMARY OF HIGH PRIORITY ADM RECOMMENDATIONS

High priority recommendations of the EEAC consultants related to active demand management are summarized below for ease of reference.

1. **Direct Load Control (DLC):** Increase participation in existing DLC offerings, incorporate new end uses, and expand DLC offerings to low income customers.
  - a. Increase wifi thermostat DLC penetration through tactics including bundling wifi thermostats and DLC with heating and cooling system installations including heat pumps, and co-marketing and delivery coordination of DLC with in-home audits and wifi thermostat rebates. Increase enrollment and penetration of wifi thermostats in DLC, e.g. from 3% of wifi thermostats to 15% (residential and small business).
  - b. Incorporate new end uses by expanding or adding EV charging and pool pumps, and revisit the cost-effectiveness and potential addition of appliance DLC opportunities such as water heaters and dehumidifiers.
  - c. Expand DLC offerings to low income customers.
2. **C&I Load Curtailment:** Grow the C&I load curtailment resource through integration with normal program and market sales channels and with the new construction program. Before 2022, assess the eligibility for new CHP/generators to participate in C&I load curtailment for the 2022-2024 Plan, and consider phasing out existing CHP/generators that are currently enrolled during the 2022-2024 period.
3. **Storage:** Significantly expand the program behind-the-meter (BTM) storage targets to contribute to the Commonwealth's overall storage goal of 1,000 MWh by 2025 (or 500 MW with storage duration of 2 hours), revise the program outreach and integration processes to enable increased and broader participation of customers and storage/inverter providers, and help integrate the storage program offerings into a statewide framework that leverages SMART and the Clean Peak Standard.
4. **Electric Vehicle (EV) Charging and Mobility:** Increase enrollment and participation of EV chargers in the bring-your-own-device (BYOD) ADM program offering including payment of pay-for-performance incentives. Consider co-marketing and targeted incentives for newer-technology EV chargers, and for EV chargers for some customers to provide equitable opportunities to benefit from transportation electrification. Explore/investigate co-marketing or co-delivery integration with other state EV and charger programs including potential co-funding sources. Explore possible co-marketing or program support for other mobility solutions beyond individual automobile approaches.
5. **Winter Demand Management:** Revisit the performance and cost-effectiveness of winter ADM by mid-2021 after the AESC 2021 study is complete and consider combining summer and winter efforts into an annual ADM offering. Continue winter ADM efforts in the interim in 2020-2021 by leveraging investments in summer ADM to increase utilization in winter.

These recommendations are repeated and then discussed in more detail in the sections that follow.

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## CURRENT ACTIVE DEMAND MANAGEMENT OFFERINGS

### Description

In the 2019-2021 Plan, the PAs included new statewide Active Demand Management (ADM) offerings for residential and commercial and industrial sectors designed to reduce summer and winter peak demand. These offerings were informed by several demonstrations undertaken during the 2016-2021 Plan period. The 2019-2021 offerings and the associated savings goals were developed through a collaborative process and endorsed by the Council. The DPU order on the Plan approved most of the PAs' proposed ADM offerings, including residential direct load control, C&I interruptible load curtailment, and C&I targeted dispatch. For two initiatives, residential daily dispatch and C&I daily dispatch, the DPU did not approve a full-scale deployment of the proposed due to lack of information to support the viability of these offerings. Rather, the DPU allowed each electric PA to use a portion of the proposed budget allocated to the daily dispatch offerings to design demonstration offerings to test the daily dispatch of storage. These offerings were ultimately approved for full deployment by the DPU following successful demonstrations in 2019.

### Background/Current Status

The PAs currently offer both Residential and C&I demand management programs under the Mass Save branded program called "Connected Solutions". Residential Summer active demand demonstrations were conducted by National Grid and Cape Light Compact during each Summer of the 2016-2018 plan cycle by targeting residential cooling loads<sup>1</sup>. A bring your own device (BYOD) approach was brought to the Residential Direct Load Controls program, which was launched as a full offering in the 2019-2021 plan period. Enrolled customers allow program administrators to directly control their energy consuming devices, starting with smart thermostats, and potentially later expanding to include water heaters, pool pumps and other devices.

Another pathway for participation is through the residential storage offering. Under the storage offering, customers are incentivized to decrease demand through the discharge of energy from storage in response to a signal or communication from the Program Administrators during daily peak hours in the summer and some targeted hours in winter months. The emerging technology of energy storage has been of particular interest as a potential future source of flexible electric load used for demand response. In 2019, the PAs conducted a demonstration using energy storage for daily dispatch. This included both residential and commercial/industrial applications of energy storage technologies (e.g. – Tesla Power Walls). In early 2020, the PAs submitted a compliance filing to the Department of Public Utilities seeking approval for continued offering of the daily dispatch program.

The figure below shows the three options residential customers have to participation in the active demand offerings in the 2019-2021 program cycle.

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<sup>1</sup> Res – [page 66 of 3YP](#) describes active demand Presentation from November 2019: [http://ma-eeac.org/wordpress/wp-content/uploads/November-Demand-Presentations\\_EEAC\\_11-14-19\\_PA\\_Final.pdf](http://ma-eeac.org/wordpress/wp-content/uploads/November-Demand-Presentations_EEAC_11-14-19_PA_Final.pdf)

Figure 1. 2019-2021 Residential Active Demand Participation Options

	Program Parameters	Devices
Thermostat	<ul style="list-style-type: none"> <li>• 13 to 17 events per summer</li> <li>• 3 hours per event</li> <li>• <b>\$25 for signing up</b></li> <li>• <b>\$20 per year for staying in the program</b></li> </ul>	
Battery	<ul style="list-style-type: none"> <li>• 30 - 60 events per summer,</li> <li>• 2 - 3 hours per event</li> <li>• <b>\$225/kW-summer</b></li> <li>• <b>\$50/kW-winter</b></li> </ul>	
Electric Vehicle	<ul style="list-style-type: none"> <li>• 2 to 8 events per summer</li> <li>• 3 hours per event</li> <li>• Eversource – Charger Control – R&amp;D</li> <li>• National Grid – Vehicle Control – Claiming Savings</li> </ul>	

Commercial summer active demand demonstrations were conducted by National Grid and Eversource in the summer of 2017 and 2018. Large customers with significant electric loads (typically 250kW or higher) who were able to reduce a minimum of 50kW of load were recruited for the demonstration. Unlike residential programs, the actual technologies and/or strategies used to deliver the load reductions were and still are highly customized to the individual customer site. Demonstration technologies included lighting and HVAC load shedding (using automated and manual controls), industrial process load reductions, CHP/generators, and energy storage. The primary marketing and recruitment approach for the commercial active demand program is through vendors called “Curtailed Service Providers” or CSPs. These CSPs and C&I customers have had a history of participating in ISO New England, the regional grid operator, response programs for many years. Many customers were already familiar with how these programs work and simply brought their strategies from the existing ISO program into the program administrators Summer Active Demand program.

For the 2019-2021 term, a C&I Interruptible Load Curtailment offering targets summer peak demand reductions.<sup>2</sup> The offering is technology agnostic and provides an incentive for verifiable shedding of load in response to a signal or communication from the Program Administrators coinciding with system peak conditions. Customers are incentivized based on their average performance. The storage performance offering provides enhanced incentives to customers to dispatch energy storage during daily peak hours in the summer and winter months. The figure below shows the three options C&I customers have to participation in the active demand offerings in the 2019-2021 program cycle.

2 C&I – page 121 of 3YP describes active demand Presentation from November: [http://ma-eeac.org/wordpress/wp-content/uploads/November-Demand-Presentations\\_EEAC\\_11-14-19\\_PA\\_Final.pdf](http://ma-eeac.org/wordpress/wp-content/uploads/November-Demand-Presentations_EEAC_11-14-19_PA_Final.pdf)

Figure 2. 2019-2021 C&I Active Demand Participation Options

	Program Parameters	Typical Application
Targeted Dispatch	<ul style="list-style-type: none"> <li>3 - 8 events per summer</li> <li>3 hours per event</li> <li>All PA: Curtailment <b>\$35/kW-summer</b></li> <li>Eversource only: Targeted Storage <b>\$100/kw-summer</b></li> </ul>	
Daily Dispatch	<ul style="list-style-type: none"> <li>30 - 60 events per summer,</li> <li>2 - 3 hours per event</li> <li><b>\$200/kW-summer</b></li> </ul>	
Winter Dispatch	<ul style="list-style-type: none"> <li>5 events per winter</li> <li>3 hours per event</li> <li><b>\$25/kW-winter</b></li> </ul>	

The table below shows PA active demand management preliminary performance for 2020.<sup>3</sup>

Table 1. 2020 Active Demand Reductions Performance

PA	Sector	Dispatch Type	Technology	Season	Participants	Unit	2020 Planned (MW)	2020 Enrolled (MW)	2020 Performed (MW)	2020 Evaluated (MW)	Notes
National Grid	Resi	DLC	Thermostats	Summer	14,155	tstats	6.78	7.1	7.1		Incomplete results
National Grid	Resi	DLC	Storage	Summer	217	accts	1.76	1.2	1.0		Incomplete results
National Grid	C&I	Targeted	Agnostic	Summer	440	accts	72.0	90.9	69.1		Incomplete results
National Grid	C&I	Daily	Agnostic	Summer	5	accts	5.0	9.0	4.4		Incomplete results
National Grid	C&I	Targeted	Agnostic	Winter	116	accts	13.0	42.1	25.5		Represents last winter
Eversource	Resi	DLC	Thermostats	Summer	16,529	tstats	3.0	8.3	6.6*		98% reported
Eversource	Resi	DLC	Storage	Summer	24	accts	0.15	0.42	0.093		100% reported
Eversource	Resi	DLC	EVSE	Winter	184	EVSE units			0.025*		98% reported
Eversource	C&I	Targeted	Agnostic	Summer	311	accts	55.0	88.0	26*		58% reported
Eversource	C&I	Daily	Storage	Summer	8	accts	5	4.8	0*		0% reported
Eversource	C&I	Targeted	Agnostic	Winter	60	accts	9.2	12.24	14.69		Represents last winter
Unitil	Resi	DLC	Thermostats	Summer	170	tstats	0.112	0.056	0.06		Preliminary numbers
Unitil	C&I	Targeted	Agnostic	Summer	3	accts	0.4	0.8	1.00		Preliminary numbers
CLC	Resi	DLC	Thermostats	Summer	876	tstats	1.34	0.438	N/A	N/A	
CLC	Resi	DLC	Storage	Summer	0	accts	0.12	0	N/A	N/A	
CLC	C&I	Targeted	Agnostic	Summer	23	accts	12.5	1.18			
CLC	C&I	Targeted	Storage	Summer	1	accts	2	0.28			

\*Winter values represent 2019/2020 season

<sup>3</sup> Communication with PAs. Final numbers to be included in PA 2020 Q3 Report.

### From the 2019-2021 Plan:

*“Residential active demand offerings present unique challenges for recruitment and implementation. Unlike large C&I customers, residential customers currently do not pay demand charges or time varying rates, and therefore have no inherent, direct incentive to decrease usage during specific peak demand periods. Further, some active demand technologies, such as thermostat adjustments and storage, can actually increase monthly kWh consumption due to snapbacks from load shifting and energy loss due to the roundtrip efficiency of storage. Since most residential customers’ electric rates are fixed, use of active demand technologies for peak load reductions may increase customer bills. Accordingly, there is no beneficial value proposition for individual residential customers to participate in active demand offerings absent Program Administrator incentives. However, peak demand reductions through active demand management can have a system benefit that reduces overall capacity and temporal-energy costs for all customers, and therefore, the Program Administrators have designed a model for residential active demand offerings that provides incentives for peak demand reductions to capture these system benefits.”*

Looking ahead, the key question is how much and which types of ADM does the Commonwealth need to meet future needs, particularly for the 2022-2024 Plan period?

## Recommendations

### DIRECT LOAD CONTROL

#### High Priority Recommendations

1. Increase participation in existing Direct Load Control (DLC) offerings, incorporate new end uses, and expand DLC offerings to low income customers.
  - a. Increase wifi thermostat DLC penetration through tactics including bundling wifi thermostats and DLC with heating and cooling system installations including heat pumps, and co-marketing and delivery coordination of DLC with in-home audits and wifi thermostat rebates. Increase enrollment and penetration of wifi thermostats in DLC, e.g. from 3% of wifi thermostats to 15% (residential and small business).
  - b. Incorporate new end uses by expanding or adding EV charging and pool pumps, and revisit the cost-effectiveness and potential addition of appliance DLC opportunities such as water heaters and dehumidifiers.
  - c. Expand DLC offerings to low income customers.

#### Additional Detail on the Recommendations

##### Residential DLC Offerings

- **Expand current Wifi thermostat DLC efforts, including the number of participants in the summer and use of existing infrastructure to adopt winter seasonal control efforts for both gas and electricity.**
  - **Significantly increase participation in existing Connected Solutions Wifi thermostat DLC efforts.** While this is the PAs’ most successful residential ADM activity, 2019 participation of over 30,000 households (as of Q2 2020) represented

only 3% of the dwellings in Massachusetts with central air conditioning or heat pump systems.

- **Bundle Wifi thermostats with all CAC and HP equipment incented through the programs.** For ductless HPs, this may require revising current qualifications for integrated controls.
  - **Offer additional or enhanced sign-up incentives to HVAC contractors and/or customers.**
- **Expand DLC efforts to additional end use equipment.**
- **Develop and implement a pool pump DLC offer.** While pool pumps have a low penetration (8%), they have the highest estimated per-unit peak savings of any residential end use ADM equipment type (0.61 kW). A 2019 Navigant study on DR in residential end-uses found that pool pump DLC has a BCR of 1.0 to 2.7, depending on the control strategy.<sup>4</sup>
  - **Revisit and update the demand savings and other cost effectiveness screening assumptions that originally came from the above noted residential end-use DR study for key residential end uses, most notably dehumidifiers and water heaters.** Specifically, use the updated summer demand estimates from the most recent Baseline study, which may result in improved BCRs.<sup>5</sup> Increased availability of these products with built-in Wifi controls may also increase their ADM potential. Similarly, screening these measures for both efficiency and demand savings should increase BCRs.
- **Develop a connected home component to the Residential New Construction program.** Connectivity of major end uses in the PAs' new homes program should become a requirement for participation and incentives and new homeowners should be actively recruited to participate in ADM efforts. Efficient thermal envelopes will mitigate any negative comfort impacts during control periods. As part of this effort, the RNC program should more seamlessly integrate the following end uses:
- Electric storage
  - EV charger DLC
- **Continue to explore opportunities for behavioral demand response (BDR).** While the recently completed evaluation of National Grid's did not find statistically significant demand savings for the BDR program's two events in the summer of 2019, event savings for similar programs range from 1.3% to 4.0% of whole home load.<sup>6</sup>
- **Explore and implement efforts to expand DR participation by low-income customers.** This in turn would be largely predicated on increasing the penetration of Wifi thermostats in low-income households. A report completed last year by the National Consumer Law Center

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4 Cost-Effectiveness of Electric Demand Response for Residential End-Uses. Final Report. Prepared for National Grid. Navigant Consulting, Inc. April 18, 2019

5 Massachusetts Residential Baseline Study. Prepared for the Electric and Gas Program Administrators of Massachusetts. Guidehouse. March 31, 2020.

6 2019 National Grid Behavioral Demand Response Evaluation Findings. Findings Report-Final. Prepared for National Grid. Guidehouse, Inc. April 28, 2020. <http://ma-eeac.org/wordpress/wp-content/uploads/NG-BDR-2019-Findings-Report-FINAL-2019-04-28.pdf>

addresses this opportunity and characterizes the potential barriers to increased Wifi thermostat penetration.<sup>7</sup>

- **Increase support of EV charging demand management so that all electric PAs have a similar, consistent offer.** This may be a BYOD activity and/or be tied to efforts to promote newer-technology chargers. National Grid's recently announced SmartCharge MA research program may further inform the PAs' residential EV charger efforts.<sup>8</sup> See more on this in the EV chargers and mobility section below.
- Informed by the ongoing Avoided Energy Supply Cost study and increased penetration of heat pumps, **expand Connected Solutions to include winter demand management efforts, or consider an annual offering.** (See separate section on winter active demand at the end of this document.)
- **Expand winter gas demand management efforts.** The PAs' gas demand pilot found natural gas savings of 4.7%.<sup>9</sup> PAs should implement the following changes as a result:
  - **Bundle Wifi thermostats with program-incented boilers and furnaces.**

### C&I LOAD CURTAILMENT

#### High Priority Recommendation

2. Grow the C&I load curtailment resource through integration with normal program and market sales channels and with the new construction program. Before 2022, assess the eligibility for new CHP/generators to participate in C&I load curtailment for the 2022-2024 Plan, and consider phasing out existing CHP/generators that are currently enrolled during the 2022-2024 period.

#### Additional Detail on the Recommendations

##### C&I Load Curtailment Offerings

- **PAs should market C&I ADM offerings as part of the new construction program and leverage the new lighting controls requirements to deploy demand management across more buildings.** New, more stringent code requirements for lighting controls in new construction and major renovations provide more opportunities to use commercial lighting systems for demand response. These new LED lighting systems equipped with dimming capabilities can respond to demand response events with very minimal interruption for building occupants. Demand management strategies that solely rely on dimming could be deployed in very large facilities with significant lighting loads. Dimming can be part of a broader demand response strategy combined with other end-use measures in small and medium-sized buildings.

<sup>7</sup> Smart Thermostats: Assessing Their Value in Low-income Weatherization Programs. Lusson, Karen. National Consumer Law Center. January 2020.

<sup>8</sup> <https://www.fleetcarma.com/smartchargemassachusetts/#maincontent>

<sup>9</sup> 2018-2019 Massachusetts Winter Thermostat Optimization Evaluation. Prepared for: The Program Administrators of Massachusetts. Navigant. February 28, 2020. [http://ma-eeac.org/wordpress/wp-content/uploads/MA19R03-B-WTO\\_2018-19-MA-Winter-TO-Final-Report-2020-04-01.pdf](http://ma-eeac.org/wordpress/wp-content/uploads/MA19R03-B-WTO_2018-19-MA-Winter-TO-Final-Report-2020-04-01.pdf)

- **PAs should better integrate C&I ADM offerings with their normal sales channels.** Given the PAs primary marketing strategy for C&I ADM is to rely on Curtailment Service Providers (CSPs) with existing customer relationships through ISO New England's demand response programs, there is a large amount of self-selection. PAs need to shift to a strategy that expands the overall connected loads to customers not already enrolled in ISO New England programs. This can be achieved by selling controls to C&I customers with the intention of delivering EE and ADM.
- At present, the PAs do not report C&I ADM from generators separately from customers who simply chose to curtail loads on-site through controls or process adjustments. This should at the very least be reported out in the plans and reports. **CHP and other generators - while reliable at delivering demand response curtailable loads – should be deprioritized (for example, via lower compensation compared to load curtailment) or possibly prohibited from participating in the Connected Solutions program in the future.** These assets simply shift the carbon intensive generation from remote power plants to customer sites.

## STORAGE

### High Priority Recommendation

3. Significantly expand the program behind-the-meter (BTM) storage targets to contribute to the Commonwealth's overall storage goal of 1,000 MWh by 2025 (or 500 MW with assumption of storage duration of 2 hours), revise the program outreach and integration processes to enable increased and broader participation of customers and storage/inverter providers, and help integrate the storage program offerings into a statewide framework that leverages SMART and the Clean Peak Standard.

### Residential BTM Storage and Storage Vendors

The Residential BTM Storage ADM program has had an initial rollout with a limited number of storage vendors due to the developing software integration process provided by the Distributed Energy Resource Management System (DERMS) vendor utilized by the PAs for 2020-2021. Each new equipment vendor must undergo a software integration to ensure compatibility of the control programs. The full implementation of a Bring-Your-Own-Device (BYOD) approach should provide opportunities for more storage and inverter vendors to participate. One integration option to consider is to increase access through an Open API (application programming interface) that ensures compatibility while also providing access to the program.

As an example, consider that the ability of the Direct Load Control Thermostat offering to integrate several orders of magnitude more customers is contingent upon the use of a standard API. While there were three major manufacturers comprising about forty percent of the \$1BN+ smart thermostat market as of 2018, the market and number of manufacturers is growing from the current dozen significant players. The current planned scope of the PA DLC programs includes National Grid with 9,300 thermostats and Eversource with 7,500 thermostats for a 6MW load impact for National Grid and a 4MW impact for Eversource. This large and growing volume of participants is served and enabled by standard approaches to integration.

For energy storage, a standard API analogous to the DLC Thermostat program would allow considerably more storage vendors to integrate with the DERMS. The current DERMS vendor is constrained by limited available personnel and funding as well as uncertain duration of their contract with the PAs. By creating a standard API, the software integration burden is shifted from the DERMS vendor to the storage and inverter equipment

providers. This creates a more open process not at risk of critiques of favoritism and exclusion.<sup>10</sup>

A standard API would allow the large-scale integration of what are essentially residential energy storage appliances of comparable complexity to HVAC systems – on the scale of thousands of storage units, rather than tens of units, with the same PA and DERMS vendor staffing levels. As a numerical example, of the nearly 3 million<sup>11</sup> Massachusetts electric customers, one potential target for the 2022-2024 Plan could be at least 0.1% market penetration, or approximately 3,000 customers for the Residential BTM storage ADM program. For a market size comparison there are currently already over 106,000 solar installations in Massachusetts.<sup>12</sup> Also, as of August 18, 2020 there are over 26,000 projects in the SMART qualification pipeline.<sup>13</sup>

**Table 2. Massachusetts Investor-Owned Utilities’ Customer Counts and Total 2017 Energy Sales**

<u>UTILITY</u>	<u>Residential Customers</u>	<u>Commercial Customers</u>	<u>Industrial Customers</u>	<u>MWH Sales</u>
Fitchburg Gas and Electric (d/b/a Unitil)	25,299	4,301	28	435,410
Massachusetts Electric Co (d/b/a National Grid)	1,154,508	158,129	3,965	19,903,988
Nantucket Electric Co (d/b/a National Grid)	11,761	1,626	5	155,380
Western Massachusetts Electric Co (d/b/a Eversource)	192,609	21,779	823	3,441,445
NSTAR Electric Co (d/b/a Eversource)	1,030,322	175,614	1,527	20,444,344
	2,414,499	361,449	6348	44,380,567

If we set dispatch to a specified two-hour only window as opposed to the current, variable 2-3 hour window, we could look to increase the average energy (kWh) capability of installed systems. For example, 3,000 storage customers with an average 20kWhs installed could offer a 10kW dispatch at 2 hours for a 30 MW total impact.

**C&I ADM – Battery Storage and Vendors**

The C&I ADM program provides a majority of the MWs of the current program. However, current participation is limited to a handful of customers with pre-existing energy storage assets as of the initial year of 2019. The opportunities have been expanded for program year 2020, including through the DPU approval of Daily Dispatch, but it is unclear based on current available data how many new storage deployments were created or if only already-existing storage units were enrolled for the Daily Dispatch program.<sup>14</sup>

Some roadblocks to deployment are found not in project economics but in the technical interconnection process, which is an issue that is before the DPU. This is especially important at the C&I level where the delay or costs associated with a prolonged Interconnection Study can threaten the project. The program should keep an eye on the interconnection process and any difficulty of interconnection for varying classes of C&I customers particularly those behind-the-meter systems in excess of 500kW, which are likely under the

<sup>10</sup> Open Access <https://github.com/OAI/OpenAPI-Specification>

The OpenAPI Specification (OAS) defines a standard, programming language-agnostic interface description for HTTP APIs, which allows both humans and computers to discover and understand the capabilities of a service without requiring access to source code, additional documentation, or inspection of network traffic. When properly defined via OpenAPI, a consumer can understand and interact with the remote service with a minimal amount of implementation logic. Similar to what interface descriptions have done for lower-level programming, the OpenAPI Specification removes guesswork in calling a service.

<sup>11</sup> Eversource – Massachusetts customers: 1.4 million electric in 140 communities, 296,000 natural gas in 51 communities (pre-acquisition of Columbia Gas). National Grid - 1.3 million Massachusetts customers.

<sup>12</sup> <https://www.seia.org/state-solar-policy/massachusetts-solar>

<sup>13</sup> <https://www.mass.gov/doc/smart-qualified-units-0>

<sup>14</sup> Expected to receive updated information in the 2020 Q3 report and for preparation of the ADM presentation to be provided during the November 2020 MA EEAC meeting.

SMART incentives regime but which require additional grid study associated with a similarly-sized existing load.

At both the residential and C&I levels, appropriate metering technology could be incorporated as a requirement of the program. AMI is particularly useful in the accurate dispatch for peak mitigation. However, AMI has been an issue at the DPU and is outside the scope of this briefing document.

Current 2019-2021 targets for C&I demand reduction are approximately 12MW. With the finalization of approval of Daily Dispatch per the MA DPU orders 20-33, 20-34, 20-35 and 20-36 in July 2020 and the further certainty that clarification of the 5-year incentive lock would provide, this program should be substantially expandable for the 2022-2024 Plan.

The Consultants recommend an increase in the total aggregate PA target for dispatchable energy storage for the 2022-2024 Plan. This expanded PA target would support, in part, the meeting of the Baker/Polito Administration's 2025 goal of 1,000 MWhs of deployed storage, or about 500 MW if one assumed 2-hour duration discharge for the storage. This goal may be larger than the load curtailment component of ADM – which is currently at 414 accounts and 82 MW enrolled for National Grid and 173 accounts and 36.5 MW enrolled for Eversource in the 2019 summer period.

For example, a 200MW storage ADM target with an average 2-hour duration discharge would partially support deployment of 400+MWhs or forty percent of the necessary energy storage needed to meet the Commonwealth's goal by the end of 2025. The SMART and Clean Peak Standard programs, as well as market economics, will also be driving additional energy storage deployments towards the 1,000MWh goal, though it is not currently clear the level of financial incentives and support these other two programs would provide. Currently, the incentives available through Daily Dispatch and the EE programs plus the 5-year incentive lock is the most attractive offer available to storage developers, and therefore we expect the majority of the storage developers and customers to seek to participate.

The higher evaluated rate of effective dispatch of the Battery Storage Daily Dispatch program offering relative to traditional DR/load curtailment programs makes this program very effective for targeting peak demand reduction, especially during the critical evening daily peak in Massachusetts. This strong conversion rate is due to the pay-for-performance structure of the program and has been demonstrated in other programs.

#### **Integrating storage offerings into the Commonwealth's Overall Framework**

These incentives do not operate in isolation from the regular tariff structure or the other incentive programs of the Commonwealth, specifically – the Clean Peak Standard and the SMART energy storage adder. All SMART Solar PV projects with a nameplate rating of > 500kW are per "SOLAR MASSACHUSETTS RENEWABLE TARGET PROGRAM (225 CMR 20.00) Guideline on Energy Storage Article 3" required to be paired with an energy storage system.

This SMART requirement for an associated energy storage system will drive a large number of new C&I energy storage installations in the 2022-2024 program period. The Consultants recognize that there are multiple programs and funding efforts in the Commonwealth currently targeting storage (SMART, Clean Peak Standard) and believe these overall offerings balance customer flexibility in using energy storage systems for multiple purposes (including through stacking of benefits) and help ensure that ratepayer funds are used in a manner that provides substantial peak demand reductions over the next decade.

## ADM FOR ELECTRIC VEHICLE CHARGING AND MOBILITY

### Recommendations

#### High Priority Recommendations

4. Increase enrollment and participation of EV chargers in the bring-your-own-device (BYOD) ADM program offering including payment of pay-for-performance incentives. Consider co-marketing and targeted incentives for newer-technology EV chargers, and for EV chargers for some customers to provide equitable opportunities to benefit from transportation electrification. Explore/investigate co-marketing or co-delivery integration with other state EV and charger programs including potential co-funding sources. Explore possible co-marketing or program support for other mobility solutions beyond individual automobile approaches.

#### Additional Detail on the Recommendations and Considerations

As the penetration rates of electric vehicles in the Commonwealth grow over the next Plan term, there will be increased opportunities to enable cost-effective participation in active demand management offerings through customer-owned vehicles and/or home and commercial charging infrastructure, building on approaches initiated during the current three-year plan. The EEAC Consultants recommend the following:

- a. Increase enrollment and participation of EV chargers in the bring-your-own-device (BYOD) ADM program offering including payment of pay-for-performance incentives. EV chargers should be able to participate in a BYOD program similar to the participation of other customer loads.
- b. Consider co-marketing and targeted incentives for newer-technology EV chargers, such as wifi-enabled EV chargers and/or vehicle-controlled chargers, for new or used EVs.
- c. Consider co-marketing and targeted incentives for EV chargers for some customers to provide equitable opportunities to benefit from transportation electrification. For example, consider how low income customers, renters, and customers who live in multifamily properties will be able to participate in and benefit from the transportation initiatives or co-delivery efforts.
- d. Explore/investigate co-marketing of or co-delivery integration with other state EV and charger programs including potential co-funding sources. Consider how customer engagement through the existing EE programs could be leveraged and combined with other programs to provide co-assessment, co-marketing, co-education, and potential co-delivery services to benefit customers.
- e. Explore possible program support for other mobility solutions beyond individual automobile approaches.
- f. Ensure that the appropriate benefits can be identified and reported for each of the potential program activities listed above.

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## GAS ACTIVE DEMAND MANAGEMENT

### Considerations and Opportunities

Gas Active Demand Management is a more challenging proposition than demand management and dispatch for electricity. The PAs indicate the targeted period for gas ADM is for multiple days, e.g., during a polar vortex period. Efforts in this area and the roles of the EE programs vs. LDCs (authorized through rate cases) will be determined or greatly impacted by the Eversource rate case decision made by the DPU. The recent DPU decision ordered the PAs to look at gas ADM in the EE plans.

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## WINTER ACTIVE DEMAND MANAGEMENT

### High Priority Recommendation

- 5. Revisit the performance and cost-effectiveness of winter ADM by mid-2021 after the AESC 2021 (avoided costs) study is complete, and consider combining summer and winter efforts into an annual ADM offering. Continue winter ADM efforts in the interim in 2020-2021 by leveraging investments in summer ADM to increase utilization in winter.

### Additional Detail on the Recommendation

The Consultants recommend maintaining the current winter ADM and battery dispatch offerings for further assessment and consideration including through Evaluation, Measurement & Verification (EM&V). The Winter Peak avoided costs are made less visible by the large sample period during which the Winter On-Peak Period is assessed.<sup>15</sup> This is being reviewed in the currently underway update to the Avoided Energy Supply Costs (AESC) study. The extent to which the winter electrical peak and winter price spikes are entwined with gas demand is substantial and has implications for fuel switching and emissions impacts. For the 2022-2024 Plan, consider combining summer and winter efforts into an annual ADM offering.

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<sup>15</sup> See AESC Supplemental Study – Part I: Considering Winter Peak Benefits