

Cape Light Compact Demand Response Demonstration Offering **Mid-Term Modification for C&I Thermal Storage**

As part of its approved 2016-2018 Energy Efficiency Plan, the Cape Light Compact (“Compact”) included a Demand Response (“DR”) Demonstration Offering (“Offering”) that focused on installing connected devices in participating homes and businesses, and using these connected devices to curtail usage during demand response events called by the Compact. The Compact leveraged its experience with its Residential Behavior/Feedback core initiative to inform development of its DR Offering. Both efforts were primarily focused on residential customers.

Since early 2016, the Compact has actively participated in discussions with other Program Administrators (“PAs”) through the Demand Reduction Working Group and the Energy Efficiency Advisory Council (“EEAC”) Peak Demand Reduction Subcommittee on peak demand reduction topics, including the PAs’ demand response demonstration projects. As part of these discussions, the PAs have coordinated their approved and proposed demonstration offerings to maximize learning potential by testing different technologies across different customer classes and locations. In keeping with this coordinated approach, the Compact proposes to expand its current DR Offering to include a thermal storage component for commercial and industrial (“C&I”) customers.

The Compact’s expanded DR Offering builds on its current demand response activities in an effort to test technologies and delivery approaches that seek to reduce peak electricity demand. More importantly, its proposal is consistent with the work undertaken by the PAs through the Demand Reduction Working Group, and the EEAC through the Demand Reduction Subcommittee. The Compact is proposing this expansion in order to better inform the design of future demand response programs by deploying a broader range of technologies across a wider range of customer types.

Offering Enhancements

The Compact proposes to install Ice Bear thermal energy storage units (“Ice Bears”) on 5 to 10 commercial customers in grid-constrained areas with high seasonal population fluctuations. The Ice Bear is a load-shifting technology that works in concert with installed air conditioning (“a/c”) units to reduce load from a/c compressors during peak hours of the day. The Ice Bear makes ice during off-peak hours, and uses this thermal mass during the day in place of the a/c compressor to cool the air, thereby reducing the load caused by the compressor during peak hours. The primary system benefit of this technology is reduced electric demand during peak hours, which brings attendant locational transmission and distribution (“T&D”) benefits of increased reliability and potential deferment of distribution system upgrades.

For the customer, the technology benefits can include demand charge reduction and increased a/c compressor life. Both customer-facing and grid-facing benefits will be dependent on customer-specific characteristics including location, rate class, usage pattern, drivers of on-site-demand, etc. The Compact will work with the vendor to deploy projects at customer locations that are likely to maximize these benefits.

The Compact chose to test this technology because:

- Dispatch has no impact on customer comfort, meaning no customer fatigue
- Dispatch and resulting load reduction is reliable
 - Remotely dispatchable
 - Does not rely on any customer action to dispatch
 - Dispatch cannot be overridden by customer
- It is relatively simple – the core components are the same as an a/c unit, so it can be maintained by local a/c technicians
- There are no safety concerns, unlike many other storage technology types
- Storage capability does not degrade over time
- System performance is continuously monitored in real-time
- It has been successfully deployed elsewhere in the United States
- Can operate every day of the cooling season, over multiple hours
 - High probability of overlap with ISO-NE peak load day and hour, which reduces ICAP tags and can lower power supply costs

Research Opportunities

The Compact intends to answer the following research questions with its proposed Offering:

- Which value streams are available to different customers, and which are the most important to them?
 - For future programs, could the customer value be sufficient to motivate them to pay some of the costs to purchase/install the technology?
 - Could the customer pair the technology with a power supply contract to lower costs for the customer/increase customer value?
 - Within the commercial rate class, which customer/business types can get the most value from the technology?
- What are the grid-facing benefits?
 - Is it reliable enough to potentially defer T&D upgrades?
 - Can it be brought to scale in order to potentially defer T&D upgrades?
 - Can the locational T&D benefits be quantified?
- How much of the peak period will it be able to cover given the Compact territory's climate?
 - Will it be enough to cover the Cape Cod and Martha's Vineyard and/or system peak? Could it cover a longer period?

The Compact recognizes that Eversource also proposed ice storage as part of its DR demonstration offering. The Compact and Eversource have coordinated their approach in proposing these offerings in order to maximize coverage of research opportunities for the projects. The Compact's Ice Bear proposal differs from Eversource's in several key ways:

- The Compact is specifically targeting deployment in distribution-constrained areas in order to assess the potential locational value of this technology (potential to alleviate those constraints)

- The Compact has a unique climate and customer base within MA, which results in different peak hours of the day during the cooling season. These Compact-specific characteristics are likely to result in operational differences for the technology (how long of a period it will be able to offset), and locational-specific values for the peak hours that are offset by the technology (energy and/or capacity)
- The Compact has the ability to leverage its power supply programs to potentially bring additional value to participants in the future

The Compact and Eversource are committed to continuing to collaborate and coordinate closely through the Demand Reduction Working Group to ensure effective coverage of research topics and questions related to the Ice Bear projects, including targeting different types of customers/businesses within small-medium C&I customer classes.

Proposed Budget

As part of its 2017 Energy Efficiency Surcharge (“EES”) filing, the Compact sought to reallocate the remaining three-year Residential Behavior/Feedback core initiative budget to partially fund this thermal storage project aimed at reducing summer peak load. Reducing summer peak load was also the goal of the Compact’s Residential Behavior/Feedback core initiative. Because the DR Offering and the Residential Behavior/Feedback core initiative share similar goals of saving energy by adjusting customer behavior, the Compact viewed it appropriate to reallocate funds between these budgets.

Nevertheless, the Department excluded from the Compact’s 2017 EES the proposed reallocation of its Residential Behavior/Feedback core initiative budget to its DR Offering budget for 2017 and 2018. The Department noted that an EES filing is not the appropriate place to propose significant budget changes and viewed the Compact’s proposal as a modification to the Compact’s approved Three-Year Plan that requires EEAC review. See D.P.U. 16-177, Order at 5.

The Compact is suspending enrollment in the Residential Behavior/Feedback core initiative due to high costs and evaluations that found less-than-anticipated savings. The Compact intends to maintain functionality for existing Residential Behavior/Feedback core initiative participants for the remainder of the 2016-2018 Three-Year Plan term.

In accordance with the Department’s directive, the Compact is currently seeking the support of the EEAC to fund its DR Offering by shifting \$508,103 of its approved Residential Behavior/Feedback core initiative budget to support the increases in its DR Offerings of \$205,602 for its Residential DR Offering and of \$907,567 for its C&I DR Offering. The total increase over the three-year plan budget would be \$605,066.

The additional Residential DR Offering budget will allow the Compact to expand and improve its existing approved Residential DR Offering in such ways as incorporating mini-splits as controllable devices, enabling text message alerts, and moving to a more popular thermostat model, among other improvements. The additional C&I DR Offering budget will fund the Ice Bear project as described above.

Table 1 summarizes the Residential Behavior/Feedback core initiative and the DR Offering budgets proposed in the Compact’s Mid-Term Modification (“MTM”) compared to the budgets approved in the Compact’s 2016-2018 Three-Year Plan.¹

Table 1: Plan and MTM Budgets

Budget	2016-2018 Plan				Proposed in MTM			
	2016	2017	2018	2016-2018	2016	2017	2018	2016-2018
Res. Behavior Feedback Initiative	323,850	326,115	329,832	979,797	170,611	153,448	147,635	471,695
Demand Response Offering (total)	185,897	267,797	349,697	803,391	186,560	890,000	840,000	1,916,560
C&I	18,590	26,780	34,970	80,340	17,907	485,000	485,000	987,907
Residential	167,307	241,017	314,727	723,051	168,654	405,000	355,000	928,654
Grand Total	509,747	593,912	679,529	1,783,189	357,172	1,043,448	987,635	2,388,255

Table 2 shows the difference between the approved 2016-2018 Three-Year Plan budgets and the proposed MTM budgets (calculated by subtracting the 2016-2018 Three-Year Plan budget from the MTM budget).

Table 2: Difference between Plan and MTM Budgets

Budget	Difference			
	2016	2017	2018	2016-2018
Res. Behavior Feedback Initiative	(153,239)	(172,667)	(182,198)	(508,103)
Demand Response Offering (total)	663	622,203	490,303	1,113,169
C&I	(683)	458,220	450,030	907,567
Residential	1,346	163,983	40,273	205,602
Grand Total	(152,576)	449,536	308,106	605,066

As shown in Table 2, the net difference between the budgets approved in the 2016-2018 Three-Year Plan and the budgets proposed in the MTM for the combined Residential Behavior/Feedback core initiative and DR Offering budgets is \$605,066.

Conclusion

The Compact recognizes the important roles that demand response and energy storage will play in balancing supply and demand on an electric grid with an increasing amount of interconnected renewable energy sources. The Compact seeks approval of its Mid-Term Modification in order to expand its DR Offering to improve its Residential DR Offering, include storage as an additional technology type being tested in Massachusetts, and to broaden the customer base it is reaching through its DR efforts. This project will provide data and answers to key questions that will better enable the Compact to assess the demand reduction potential of different technologies and cost-effectiveness, set appropriate demand reduction targets, and determine the potential for scalability in future energy efficiency plans.

¹ For a summary of the bill impacts resulting from the proposed MTM, please see accompanying 3/1/17 presentation to the EEAC Executive Committee.