Overview of Proposed/Approved Peak Demand Reduction Demonstration Projections
Memorandum to EEAC Peak Demand Reduction Subcommittee
December 2, 2016

Introduction

During the October Energy Efficiency Advisory Council ("EEAC") Meeting, select Councilors requested that the Program Administrators prepare a memorandum that provides an overview of the approved and proposed peak demand reduction demonstration projects and present the memorandum to the EEAC Peak Demand Reduction Subcommittee. The memorandum identifies the various demonstration projects that the PAs have/intend to implement during the 2016-2018 term.

Each PA has developed its own demonstration projects designed to test potentially viable cost-effective peak demand reduction technologies/strategies. Similar to all energy efficiency efforts, individual PAs develop their own PA-specific demonstrations or program enhancements to test new innovative approaches and collaborate with all PAs to share lessons learned. This collaborative approach allows the PAs to collectively test a variety of potential initiatives and leverage each others results.

Since approval of the 2016-2018 Three-Year Plan, the PAs have discussed various approaches to demand demonstration projects, and coordinated with each other to examine various technologies. The PAs issued a joint statewide RFI to help assess potential technologies and solutions. In addition, National Grid and the Cape Light Compact have worked to deploy their approved demonstration projects and continue to share lessons learned. Leveraging lessons learned from collaboration among the PAs and from other pilots around the country, Eversource and Unitil have developed their own demonstration projects and are currently seeking Department of Public Utilities approval to proceed with implementation.

As evidenced in the matrix below, using this collaborative approach, the PAs are able to use innovative approaches while collectively deploying and testing a slew of technologies in a strategic manner, while minimizing costs. The projects use various technologies and brands, and include direct load control, energy management systems, battery storage, thermal storage, behavior, training, and permanent load shift approaches.

Matrix of Demonstration Projects

PA	Residential	C&I		
		Small	Mid	Large
National Grid	• WiFi Tstat DLC (Central A/C)	• WiFi Tstat DLC	• WiFi Tstat DLC	• Interruptible load approaches
Eversource		• EMS • Lighting/HVAC controls • WiFi Tstat DLC	• Software & Controls • Onsite training • Process audits • Batteries • Thermal storage	• Software & Controls • Onsite training • Process audits • Real time info • Batteries • Thermal storage • Demand response
CLC	• WiFi Tstat DLC (Central A/C) • Behavioral • DLC on DMSHP, window A/C	• BTM thermal storage	• BTM thermal storage	
Unitil	• Battery Storage for existing solar PV systems			• Operations Changes to Reduce Demand

Key
DLC – Direct Load Control
DMSHP – Ductless Mini-Split Heat Pumps
BTM – Behind the Meter

Estimated Savings (MW)			
Demonstration Type	**2016**	**2017**	**2018**
Wi-Fi DLC	2.6	6.5	11.0
Battery Storage		3.6-5.4	3.6-5.4
Thermal Storage		0.4-8.6	0.4-8.6
Software & Controls		4.5-6.7	4.5-6.7
Active Demand Response			
Large C&I	0.3	43.8-45.5	44.3-46
Small C&I		0.5-2.7	0.5-2.7

Overview of Demonstration Projects

Residential Wi-Fi Thermostat and Wi-Fi Connected Devices Direct Load Control

Description: This solution involves using Wi-Fi connected devices, such as thermostats, to lower a residential customers demand during peak events.

Strategy: Wi-Fi enabled technologies with two-way communication through an in-home Wi-Fi network will allow the PA to control when connected devices turn on and off to maximize potential savings for customers with minimal impact on comfort. Wi-Fi thermostat allows the house to be pre-cooled prior to a demand response event and manages the indoor temperature

during such an event. National Grid also plans to test small-scale demand response with connected washers and dryers, hybrid and electric hot water heaters, mini-splits, and smart window air-conditioning. Cape Light Compact plans to also incorporate mini-splits and smart window air-conditioning. National Grid and Cape Light Compact are offering participants different incentive structures and different triggers for events. In addition, the two PAs are offering different paths of participation, including limits on number of events called, in order to assess customer willingness to participate in a demand response program under different conditions.

PA: National Grid
Estimated Budget: $14.5 million (2016-2018)
Estimated Savings: 2.6-11 MW
Seasons: Summer

PA: Cape Light Compact
Estimated Budget: $385,000 (2016-2018)
Seasons: Summer

For more information, please see 2016-2018 PA-specific offerings in Appendix L of the 2016-2018 Three-Year Plan, as well as National Grid's October 2016 Residential Peak Demand Reduction presentation and Cape Light Compact's October 2016 Peak Demand Reduction presentation available on the EEAC website.

Battery Storage
Description: This solution involves behind-the-meter batteries for energy storage at large commercial, big box retail, manufacturing, and residential customer facilities.
Strategy: There are various business models offering battery storage such as vendors selling the equipment directly to customers or vendors offering a full Performance Partnership Agreement ("PPA") whereby the vendor and the customer split the cost savings. The business model will likely have an impact on how the battery is run, and what incentives are required to maximize utility system benefits from battery discharge. Eversource will target C&I customers and intends to select more than one battery storage vendor, with those selected having different business models, through its RFP process, in order to understand which business model is most advantageous to reduce system-wide peak demand and maximize other benefits. Unitil will contract with one or two specialized vendors – those that install both battery storage and solar PV systems for residential applications.

PA: Eversource
Estimated Budget: $5,000,000 (2017-2018)
Estimated Savings: 3.5-5.3 MW
Seasons: Year Round (where applicable)

PA: Unitil
Estimated Budget: $114,000
Estimated Savings: 25-35 kW

Seasons: ISO-NE Summer and Winter Peak Capacity periods

For more information, please see Eversource's October 2016 Summary and Peak Demand Reduction presentation available on the EEAC website; and Unitil's October 2016 Summary and Peak Demand Reduction presentation available on the EEAC website.

Thermal Storage

Description: Eversource proposes to test two types of thermal storage technologies for peak demand reduction: ice storage and phase change materials. 1) Ice Storage - By using HVAC equipment to create ice (or chilled water) at night and then drawing on that thermal mass during the day, this technology has significant potential to reduce peaks due to air conditioning compressor loads. 2) Phase Change Material - A phase change material (PCM) absorbs and releases thermal energy in order to maintain a regulated temperature. Cape Light Compact will also test ice storage technology as described above, but will be deploying the technology for small commercial customers in select areas.

Strategy: Eversource proposes to test the viability and cost effectiveness of ice storage as a demand solution for small and medium business customers with air conditioner units between 3 and 20 tons. Eversource anticipates partnering with an ice storage vendor to help recruit customers into this demonstration project. Eversource proposes to test PCM at large C&I facilities (e.g., warehouses) with cold storage or freezers. Eversource anticipates using internal account executives and program managers to recruit customers into this demonstration project. Cape Light Compact will also test viability and cost-effectiveness of ice storage, and has recruited several likely participants for deployment at a small scale. Deployments are being selected to demonstrate the potential to deliver customer and system benefits by reducing the impact of increasing air conditioning loads in areas where the population has significant seasonal fluctuations, like Cape Cod.

PA: Eversource
Estimated Budget: $3,900,000
Estimated Savings: 0.38-8.53MW
Seasons: Summer (Ice Storage), Year Round (Phase Change Material)

PA: Cape Light Compact
Estimated Budget: $675,000
Seasons: Summer

For more information, please see 2016-2018 PA-specific offerings in Appendix L of the 2016-2018 Three-Year Plan, as well as Eversource's October 2016 Summary and Peak Demand Reduction presentation available on the EEAC website, and Cape Light Compact's October 2016 Peak Demand Reduction presentation available on the EEAC website.

Software and Controls

Description: There have been a number of software developments in the last few years whose specific purpose is focusing on 'choreographing' energy loads, either within a building or across the grid, in order to reduce the coincident load and drive down demand. Software and controls

can now coordinate a wide range of customer assets, and some software solutions have the potential to scale up quickly at relatively low cost.
Strategy: Eversource anticipates working with more than one software vendor to test different software approaches, e.g., energy management portals that provide dynamic load monitoring and control, and software for digital queuing of electric loads. Potential software solutions will include applications that range from a complete automation of demand management to applications that are more amenable to customers accustomed to, or preferring, a more hands-on approach to manage their energy and demand usage and costs. Unitil will work with one vendor which has proprietary software that will predict ICAP events and advise customers on reducing their ICAP charges as well as reduce their demand during ISO-NE Summer Peak Periods.

PA: Eversource
Estimated Budget: $4,140,000
Estimated Savings: 4.44-6.67 MW
Seasons: Year Round (where applicable)

PA: Unitil
Estimated Budget: $32,000
Estimated Savings: 200—300 kW
Seasons: ISO-NE Summer Peak Capacity periods, Year Round (where applicable)

For more information, please see Eversource's October 2016 Summary and Peak Demand Reduction presentation available on the EEAC website; and Unitil's October 2016 Summary and Peak Demand Reduction presentation available on the EEAC website.

Demand Response
Description: This approach involves recruiting customers to agree to reduce loads during peak demand events, similar to what currently is procured in the Forward Capacity Market. Customers are compensated for their participation, and may participate through a variety of programs that range from full third-party-automation of the response to customers manually curtailing loads themselves.
Strategy: Eversource proposes to test two approaches to active demand response: a Wi-Fi thermostat active demand response program focused on small C&I customers, and a comprehensive demand response program focused on large C&I customers. National Grid plans to provide incentives to procure additional demand response resources, incremental to those currently under contract to provide to FCM. The incentive approach is demand control strategy agnostic, except for fossil-fuel generation which is excluded, and follows ISO-NE baseline requirements to see if additional demand response resources can be incentivized.

PA: Eversource
Estimated Budget: $5,270,000
Estimated Savings: 3.7-7.7 MW
Seasons: TBD (It is anticipated that most curtailable loads will be AC related but other loads will be investigated)

PA: National Grid
Estimated Budget: $15,900,000
Estimated Savings: 40 MW
Seasons: TBD (It is anticipated that most curtailable loads will be lighting, HVAC, or process related but other loads will be investigated)

For more information, please see 2016-2018 PA-specific offerings in Appendix L of the 2016-2018 Three-Year Plan, as well as Eversource's October 2016 Summary and Peak Demand Reduction presentation available on the EEAC website, and National Grid's October 2016 C&I Peak Demand Reduction presentation available on the EEAC website.

Integrated Energy Efficiency and Demand Reduction
Description: These demonstration projects will cover measures/strategies that are already cost-effective due to their energy savings but will have an additional emphasis places on demand savings. Proposed or ongoing projects include on-site operator training, EMS/controls at small businesses, process audits, and provision of real time information.
Strategy: Eversource proposes to leverage relationships with Memorandum of Understanding (MOU) customers and other large customers to implement and test these measures.

PA: Eversource
Estimated Budget: TBD
Estimated Savings: TBD
Seasons: Year Round (where applicable)

For more information, please see Eversource's October 2016 Summary available on the EEAC website.