Alexandra Bothner, Eversource

Poster Title: Net Energy Use of Behind-the-Meter Battery Storage Systems

Abstract: Battery energy storage systems are of particular interest to the utility industry as a way to reduce peak demand, resulting in cost savings for both the utility and its customers. By charging batteries during times of lower demand, and discharging during peak hours, overall demand can be smoothed. Potential savings resulting from battery storage systems would come largely from reduced capacity charges (ICAP) and lowered demand charges for customers. However, due to the inefficiencies associated with battery cycling and maintaining charge, storage systems also result in an overall higher net use of energy. As such, there is interest in examining the tradeoff between peak demand savings and the increase in net energy usage for these systems.

A large investor-owned utility is currently running two demonstration projects with two different vendors for commercial-scale, behind-the-meter batteries. Each demonstration project uses a different strategy for optimizing battery use: one is focused on providing longer-duration dispatches to address local and system peak hours, while the other is geared toward more continuous use to address customer-specific peaks. An independent evaluation of these demonstration projects will utilize a combination of battery charging and discharging data, and facility interval data to determine the frequency, magnitude, and timing of discharge of the batteries. The evaluation team will analyze how effectively the different dispatch patterns reduced customer peak and utility peak demand, and the net energy usage implications of the battery solutions. The evaluation commenced in the summer of 2018 and will conclude in the winter of 2020. The first evaluation dataset and report containing the results from the summer of 2018 will be available at the end of 2018.

Early results suggest that partial charge and discharge of a battery may result in lower round-trip efficiency, as compared to full discharge. This poster will assess whether discharge strategies focused on full discharge are more efficient. Specifically, it will examine the total peak demand reduction that each demonstration project achieved, and compare this to the net increase in energy usage that resulted from operation of the batteries. This may help determine what types of battery storage systems and methods of operation would prove most effective for demand management programs, and which may result in the greatest level of savings for customers. Graphic content for this poster will include graphs and tables of site, grid, and battery energy usage for the demonstration projects, and will also include photos of the installed battery systems.

The results of this evaluation may also be relevant in assessing other effects of battery storage. Although they will not be the key focus of this poster, these topics could include:

- Assessment of peak energy savings against the potential costs of increased total energy usage
- Potential implications on carbon emissions based on the timing of peak load reduction and the net difference in energy usage
- Cost-effectiveness of the two strategies for battery operation