Efficiency Maine Trust
Innovation Program:
Exploring Energy Storage Opportunities in Maine

Commission to Study the Economic, Environmental and Energy Benefits of Energy Storage to the Maine Electricity Industry

2019-11-6
Augusta, Maine

Overview – EMT Innovation Program

- Conduct pilot projects testing new technologies or strategies to determine their potential for advancing the Trust's purpose and goals
- Advance unfamiliar, untested products and strategies to the point that they can be incorporated into the Trust's programs
  - Ex. Air source, ductless, cold-climate heat pumps (2012) and
  - Ex. Heat pump water heaters (2016)
  - Both were pilot tested in the Innovation Program before being promoted statewide through EMT's programs
- Efficiency Maine allocates approximately 0.5% of its annual program budget to the Innovation Program

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Innovation Program -- FY19 and FY20 Pilots

- Focus -- load management technologies and strategies
- Approved Pilot Projects
  - Pilot #1 -- Demand Response: Residential Distributed Energy Resources
  - Pilot #2 -- Battery Storage: Controlling Demand Charges
  - Pilot #3 -- Passive Load Shifting: Refrigerated Space as Storage
  - Pilot #4 -- Load Shifting Using Transactive Controls and Storage
- All pilots are ongoing

Pilot #1 -- Residential Distributed Energy Resources

- Goal: Demonstrate the value of “smart” devices that are fully programmable and subject to either autonomous control or control by central dispatch
- Plan: ReVision Energy and Virtual Peaker control the fleet of DER installed in Maine homes to demonstrate load shifting value across a variety of use cases
- Fleet of controlled DERs
  - 17 Air Source Heat Pumps
  - 8 Heat Pump Water Heaters
  - 14 Battery Storage Units
  - 4 Level 2 EV Chargers
- Status: Pilot is wrapping up its testing period, running test events on the portfolio

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Pilot #1 – Metrics and Opportunity

- Heat Pump
  - Load shifting potential: 200-300 watts per unit
  - Ex. 50% of the LD1766 Target (100,000) = 10 MW of peak reduction
- Heat Pump Water Heaters
  - Load shifting potential: 100 watts average though over a multi-hour peak event
  - Ex. 50% of the 30,000 in the Triennial Plan IV enrolled = 1.5 MW of peak reduction
- EV Chargers (Level 2)
  - Load shifting potential: 7,000 watts per unit
  - 2019 EIA AEO Forecast predicts 35,000 EV's in Maine.
  - Ex. 50% of AEO Forecast participating in a 50% curtailment = 61 MW peak reduction
- Batteries
  - Load shifting potential: 5,000 watts for 2-3 hours.

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Pilot #2 -- Battery Storage: Controlling Demand Charges

- Goal: Demonstrate battery storage with intelligent controllers will help medium-sized businesses reduce peak demand charges
- Plan: Install Li-ion storage solutions for medium-sized businesses with solar generation already installed on site.
- Status: Pilot continues to seek participants; recruitment has been a challenge.

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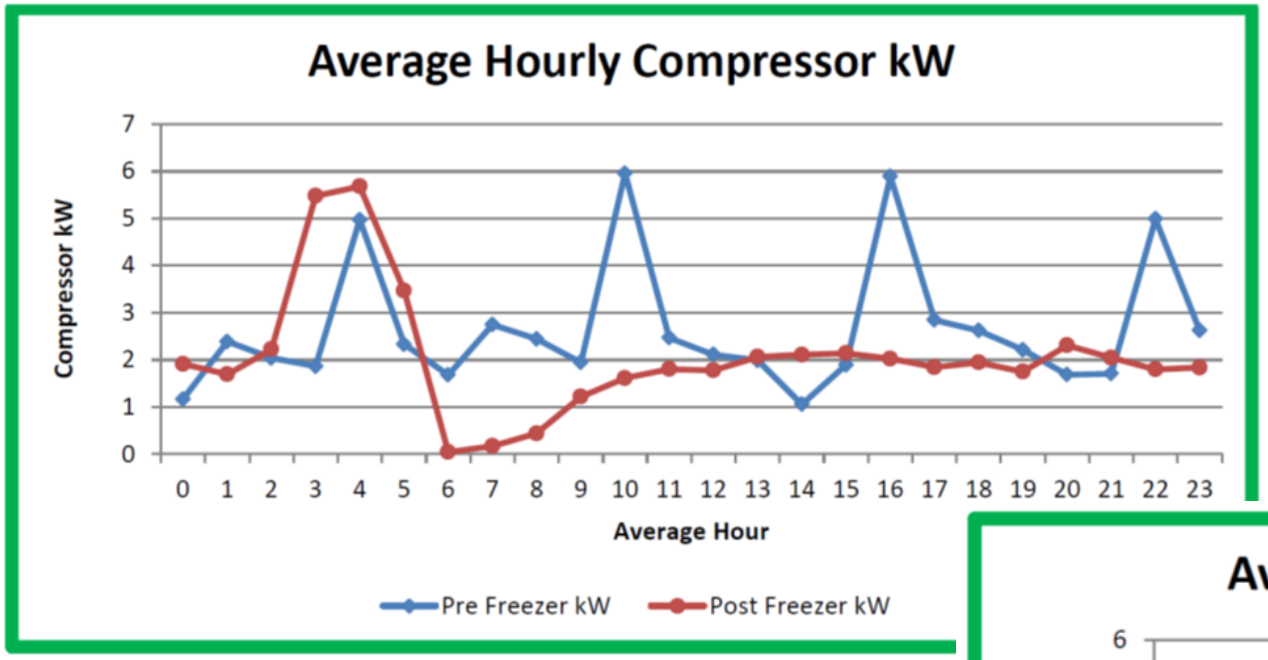
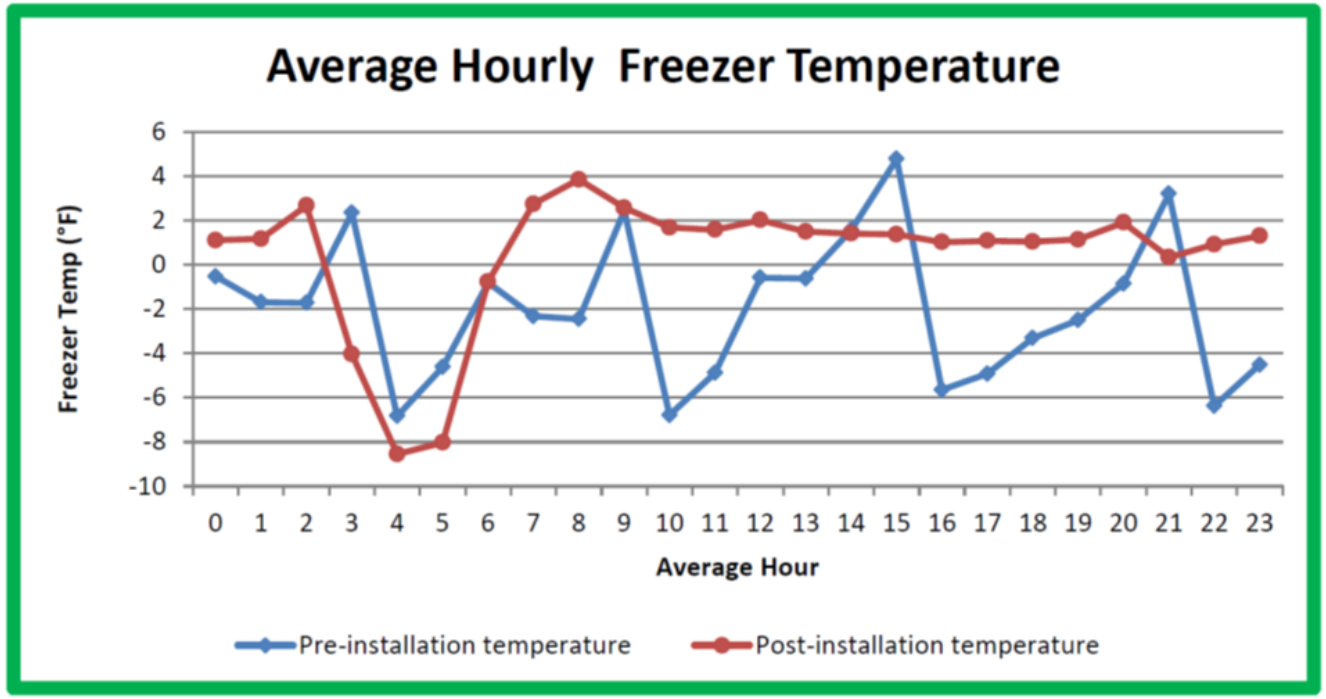
Pilot #3 -- Refrigerated Space as Storage

- Goal: Demonstrate peak load shifts using controls and phase change material in refrigerated spaces.
- Status: Pilot just started and is seeking 3-4 medium to large commercial freezers:
  - Large Blueberry storage: 275-350 kW
  - Medium Food Processor: 50-75 kW
  - Grocery Store: 15-50 kW

Pilot #3 -- Refrigerated Space as Storage





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Pilot #4 -- Transactive Controls and Storage

- Goal: Demonstrate the autonomous management of a variety of edge-based devices to better balance the grid, provide superior carbon emission mitigation, reduce energy costs for users of edge-based devices
- Plan:
  - Partnering with Isle au Haut Electric Power Company and Introspective Systems
  - Move very abundant, but potentially very low value or wasted, daytime solar production to evening and nighttime hours when its value is much greater
  - Install Air-to-Thermal-Storage heat pumps
  - Apply Introspective Systems controls

Benefit-Cost Analysis for Energy Storage

- Benefits of behind-the-meter (BTM) storage driven by avoided capacity
- Avoided Energy Supply Components for New England (AESC 2018) defines the avoided costs for New England Program administrators but the markets for capacity are different across New England.

AESC 2018 Value of Avoided Capacity

Maine	Mass.
$161/kW	$327/kW