Appendix J

Heat Pump Water Heater Analysis and Considerations

Appendix J
Analysis of the Opportunity for Heat Pump Water Heaters

By Ian G. Burnes and Laura Martel
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Introduction

1. What is the purpose of this testimony?

This testimony describes the heat pump water heater measure and provides evidence about the quantity of heat pump water heater installations that are achievable for incorporation into the Trust's Fifth Triennial Plan.

2. Who is introducing this testimony?

The testimony is provided by Ian Burnes and Laura Martel. At the Trust, Mr. Burnes is the director of strategic initiatives and Ms. Martel is the evaluations manager.

3. Mr. Burnes, please state your name, title and business addresses.

My name is Ian Burnes, and I am employed by EMT as the Director of Strategic Initiatives. My business address is 168 Capitol Street, Suite 1, Augusta, ME 04330.

4. Please summarize your educational and professional experience.

I have a Bachelor of Arts Degree in Economics from Wesleyan College. I have been working at the Trust since 2009. My responsibilities include the oversight of the strategic initiatives team that implements the Trust's customer tracking database, maintains the Technical Reference Manuals, oversees the program evaluations and manages the Trust's resource in ISO-NE's Forward Capacity Market. Before coming to the Trust, I worked at the Governor's Office of Energy Independence and Security.

5. Ms. Martel, please state your name, title and business addresses.

My name is Laura Martel, and I am employed by EMT as the Research and Evaluation Manager. My business address is 168 Capitol Street, Suite 1, Augusta, ME 04330**.**

6. Please summarize your educational and professional experience.

I have a Bachelor of Science Degree in Ocean Engineering from Florida Atlantic University and a Master of Engineering in Acoustics from Pennsylvania State University. I have over 18 years of technical leadership, project management, and research and evaluation experience. I was hired by EMT in 2014 to design and implement impact and process evaluations for energy efficiency programs. Prior to joining EMT, I was with Lockheed Martin in Manassas, Virginia, where I served in various engineering, management and technical leadership roles of increasing responsibility.

7. Which programs and/or budgets will include heat pump water heaters during TPV?

The Trust uses a variety of channels and/or initiatives to reach the different markets for heat pump water heaters. This appendix describes the portion of the water heating market the Trust believes it can acquire

through different programs during the Triennial Plan V period. Breaking down the potential by program also reflects the different customer decision making approaches reflected in the water heating market.

The three EMT programs that offer incentives for heat pump water heaters are Distributor Initiatives, Retail Initiatives, and Low Income Initiatives. Distributor and Retail Initiatives are funded through the Electric Efficiency Procurement, as most of the savings achieved are electric.

The Low Income Initiatives program funds heat pump water heater incentives based on the existing (baseline) water heater. For homes replacing electric resistance water heaters, Electric Efficiency Procurement funding is used. For homes with oil- or propane-fired water heaters, the Trust's plan is to use NECEC funding.

8. Please provide a high-level overview of EMT's approach for calculating the cost-effectiveness of heat pump water heaters in Triennial Plan V.

Through the retail and distributor channels, this measure involves the purchase and installation of a new heat pump water heater in place of a new code-compliant or standard efficiency water heater or as an early replacement of an operational water heater. Savings and measure cost calculations are dependent on the baseline (counter-factual scenario) assumed. Because some water heater purchases are made as emergency replacements of failed systems (replace-on-burnout), some are purchases for new homes or businesses (new construction), and some are pre-emptive replacement of operational water heaters (retrofit), a blend of baselines must be accommodated. Additionally, for replace-on-burnout and new construction, where the baseline is the purchase of a new water heater, various system options must be addressed in the calculations.

Given the multiple decision types implicated in a potential water heater purchase, the Trust commissioned Michaels Energy in 2020 to conduct a survey study of recent program participants from the heat pump water heater measures promoted through the Retail Initiatives and Distributor Initiatives. The results of the survey were used to determine the appropriate baseline to use for savings and measure cost calculations.[1]

Based on the study results, the Trust calculates energy or fuel savings assuming a blended fuel mix, because many of the program participants upgraded from an existing water heater, while others replaced water heating from another fuel with a heat pump water heater. The study calculated a blended energy savings as follows:

- Electric – 56.4%
- Oil – 34.1%
- Kerosene – 1.0%

[1] Brian Uchtmann, *Heat Pump Water Heater Free-ridership and Baseline Assessment Results Memo*, Michaels Energy, June 26, 2020.

- Propane – 6.6%
- Natural Gas – 1.9%

Similarly, the measure cost used in heat pump water heater calculations reflects a blend of the costs associated with the different decision types. The study's authors determined the average measure cost reflected a blend of 19% retrofit projects and 81% new construction/replace-on-burnout projects. Costs for retrofit projects include the full cost of installation, including labor. Costs for new construction/replace-on-burnout include the incremental cost of the equipment between the standard practice and a heat pump water heater. Please see Appendix B-2 for the budget amounts and heat pump water heater targets per program.

Through the Low Income Initiatives, the Trust oversees and funds direct-install projects that are retrofit installations in homes with operational water heaters. The Trust targets two different baseline scenarios – homes with electric resistance water heaters and those with oil- or propane-fired tankless-coils. Savings for the projects administered through this program are calculated against the existing water heater. Costs for these projects are the full installation cost, including labor. See Appendix B-2 for the heat pump water heater targets for the Low Income Initiatives.

9. How was the opportunity for heat pump water heaters determined for the Triennial V period for Retail Initiatives and Distributor Initiatives?

For Retail Initiatives and Distributor Initiatives, the Trust reviewed past program activity, focusing particularly on the achievable program pace demonstrated when rebate levels and program implementation motivated the most activity. Each of these programs has been able to achieve a pace equivalent to 7,000 heat pump water heaters per year. Therefore, the Triennial Plan V budget modeling assumes 7,000 heat pump water heaters per year for Retail Initiatives and 7,000 heat pump water heaters per year for Distributor Initiatives.

10. How do the customers for the Retail Initiatives and Distributor Initiatives differ, and how does that impact program budgets?

Retail stores sell water heaters to homeowners, building managers, plumbers, and contractors. Sales are often unassisted, with price being a primary deciding factor. Retail sales are often prompted by emergency replacement situations, making in-store availability a requirement for purchase. The Trust has worked closely with retail partners to make supply chain improvements and ensure in-store inventory of the heat pump water heaters. Setting rebates at levels that drive more heat pump water heater sales than the traditionally popular and lower-priced emergency replacement water heater motivates retail stores to maintain store inventories, provide prominent product placement, and negotiate manufacturer discounts. For Triennial Plan V, rebates for heat pump water heaters are modeled to fully cover the incremental cost difference between a heat pump water heater and an emergency replacement water heater.

Distributors sell mainly to plumbers and other contractors, providing equipment primarily for emergency replacements and new construction. Plumbers pass the price of the equipment on to their customers. While this tends to make them less price sensitive, they do need to compete against other plumbers so it is important that they can select a heat pump water heater without being underbid by plumbers that

specify standard water heaters in their bids. Instant discounts avoid requiring the plumber to pay any of the price difference up-front or deal with an application process. The Trust has been successful in converting emergency replacement water heater sales to heat pump water heater sales by lowering the cost of the heat pump water heater below that of the emergency replacement water heater and reimbursing the distributor for the processing required to submit instant discount requests. The difference in cost to the contractor helps overcome plumbers' reluctance to adopt new technology and offsets additional installation complexity.

11. Does the Trust anticipate reaching any low-income customers installing heat pump water heaters through the Distributor Initiatives and/or Retail Initiatives programs?

Yes. A program survey conducted in late 2019 found that 14.2% of heat pump water heater participants in the Retail Initiatives, and 14% of the heat pump water heater participants through the Distributor Initiatives, qualified as low-income households.[2] See Appendix H for discussion on how the Trust's programs are meeting the statutory allocation requirements for low-income households.

12. How was the opportunity for heat pump water heaters determined for the Triennial V period for Low Income Initiatives?

Past program performance has shown that lack of customer engagement and plumber capacity are limiting factors in direct install projects at low-income homes. The Trust has projected activity for these projects in homes needing emergency replacement water heaters based on a linear regression of program activity across the past four years. These projects are funded with Electric Efficiency Procurement funds.

During the Triennial Plan V period, low-income households heating water with oil and propane will be eligible through a targeted initiative using approved funding from the NECEC settlement. The funding from this settlement that the Trust intends to use for installing heat pump water heaters in low-income households will be remitted in quarterly payments through the end of calendar year 2022. With these funds, the Trust will target homes with tankless coil water-heating systems that run off the home's central boiler. These tankless-coil systems are extremely inefficient, especially in the summer when the boiler must maintain a high temperature to be ready to provide hot water on demand. Switching the domestic hot water to a source other than the boiler allows the boiler temperature to be lowered significantly in the summer or turned off entirely. This represents a significant opportunity to lower the energy burden of low-income households by targeting inefficient water heating through tankless-coil systems. The Trust began a direct installation initiative at the end of FY2021 targeting low-income homes heating water with tankless-coil systems. Because there is no promise of continued funding beyond December of 2022, the Trust has not attempted to make a forecast of activity levels beyond the first year of the Triennial Plan V period.

13. Does this conclude your testimony?

Yes.

[2] Uchtmann, Heat Pump Water Heater Memo, p. 2.