Scaling Up Decarbonization of Heating -- Challenges and Lessons Learned from Maine

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Efficiency Maine Trust

• Independent, quasi-state agency

• Runs programs to promote energy conservation and clean energy for all customer groups, all energy types, in all areas of Maine

• Provides rebates, financing, customer engagement, and registry of vendors

• Funded by:
  o Electric and natural gas utility ratepayers
  o Regional Greenhouse Gas Initiative (RGGI)
  o ISO New England grid operator (Forward Capacity Market)
  o Grants and contracts
Market Transformation for Heat Pumps in Maine
Actual through June 2021 & Forecast to June 2025

Graph showing the trend of heat pump installations from FY 12 to FY 25. The graph includes lines for residential, low income, commercial, and forecasted residential, low income, and commercial categories. The 100k Heat Pump Ending Goal and Starting Point are marked on the graph.
Scaling Heat Pumps in Maine – Tipping Point?

Number of Heat Pumps Installed

One (1) unit is equivalent to an efficient single-zone, mini-split heat pump that would typically displace 25.1 million BTUs (179 gal.) of heating oil per year. Larger heat pump systems are counted as more than one unit based on the heating BTU of the systems actually installed.
Scaling Heat Pump Water Heaters in Maine

Total HPWH Annual Rebates

- 2018: 6,125
- 2019: 5,988
- 2020: 8,542
- 2021: 10,783
Challenge 1 – Ensure Heat Pumps Work Well

1. Promote optimal model selection, configuration, and installation
2. Inspect completed projects
3. Educate consumers how to use heat pumps effectively
4. Validate effectiveness and drive improvements
Standards, Registration, Training

• Set high minimum standards for program eligibility
  o E.g., 12.5 HSPF for eligible single-zone mini-splits
  o E.g., in primary living area (not a garage or outbuilding)
  o Must use a Registered Trade Ally for installation

• Trade Ally must have:
  o Certification for handling refrigerants
  o Training from manufacturer or an Efficiency Maine Registered Trainer (e.g., Community College)
  o Training updates from Efficiency Maine, annually
  o Signed Code of Conduct
  o Proof of Insurance
Inspections

• Inspect 10-15% of installed measures
• In FY2021, inspected:
  o 2,591 market-rate heat pump installs
  o 224 LMI heat pumps and heat pump water heaters installs

• Virtual Inspections
  o In response to COVID-19 pandemic, using Streem video communication services
  o Inspector texts link to customer
  o Customer launches app to livestream video and sends still photos of the installation
Consumer Education

Heat Pumps FAQ

Heat Pumps – Frequently Asked Questions

- Will a heat pump reduce my annual heating costs?
- How do I find a heat pump installer near me?
- Do heat pumps work in cold weather?

Case Studies

Residential

Veronica

Veronica says she's saving over 50% a month now that she's installed a high-efficiency heating system and added insulation in the basement.

PDF

Bill

Bill installed a heat pump with the help of an incentive and low-interest loan from Efficiency Maine. Read about Bill’s heating project.

PDF

Nancy & Jim

See how one Presque Isle couple is saving an estimated 50 percent on their heating costs after installing a high-efficiency heat pump.

VIDEO

Heat Pump User Tips

Download Print Version of Tips

DOWNLOAD
Evaluation: Modern, High-Performance Heat Pumps
Heat Well in Cold Weather

Heat Pump Performance Versus Temperature

Temperature Bin

COP

Metered Performance  Modeled  Linear (Metered Performance)  Linear (Modeled)
Heat Pump Satisfaction in Surveys

- 85% rated 8-10
- Avg. = 8.81
- n = 2,950

Q: On a scale of 0 - 10 how do you rate your overall satisfaction with your heat pump(s)?
Average Heat Pump Satisfaction by Length of Ownership

Years of Heat Pump Ownership

Average Score

- 1: 9.08
- 2: 8.83
- 3: 8.82
- 4: 8.73
- 5: 8.71
- 6: 8.77
- 7+: 8.94
Challenge 2 – Sustain Growth in Heat Pump Market

1. Expand growth across customer segments
2. Expand to whole-home (whole-building) solutions
3. Deliver benefits in disadvantaged communities
4. Build public support and policymaker support
New Construction

- Developers and consumers are finding it cheaper to go all electric when building new homes
- New homes built in Maine in the past three years:
  - 20% all electric
  - 17% heat pump hybrid with Natural Gas or Propane

What about Retrofits?

- More Maine homeowners are shifting to:
  - All Heat Pump, or
  - Heat Pump primary with space-heater assist/backup, using:
    - Wood stove
    - ER heaters
    - Propane stove

Source: Ridgeline Analytics, August 2021
Expanding heat pump systems into commercial buildings

- Variable refrigerant flow (VRF) systems
  - use heat pump technology to efficiently heat and cool building spaces
  - can simultaneously send heat and air conditioning to different rooms in the same building

- Should be considered in new construction or retrofits for:
  - offices
  - hospitals
  - schools
  - long-term care facilities
  - hospitality venues, or
  - other large spaces with many rooms.
Enhanced Rebates for High-Barrier Customers

**Low- & Mod-Income (LMI)**

**Rebates**
- 100% for Lowest-Income (as funds allow)
- Lower- and Moderate Income
  - $2,000 for first eligible heat pump
  - Up to $400 for second eligible heat pump
  - Inclusive Finance for balance

**Eligibility**
- Owner occupied 1- or 2-unit
- Not on natural gas heat
- Participant in LIHEAP or meets home value requirements
  - Property Tax Valuation – Caps by County
  - Cap ranges from $80,000 - $130,000
- HSPF of 13.0 or higher (per AHRI)

**Small Business**

**Rebates**
- $1,600/system for a single zone
- Limit 3 systems per address

**Eligibility**
- Small General Service customers (<25 kW)
- Not on natural gas heat
- HSPF 12.5 or higher (per AHRI)
Equity Issues -- Distribution of Heat Pump Rebates (Residential) Excels in Rural and Northern Maine
Supportive State Policies

Climate Change

- Setting targets - Public Law, ch. 476 (2019) Requires a State Action Plan to achieve GHG targets
  - See, “Maine Won’t Wait” at https://climatecouncil.maine.gov/
  - Sets target, by 2030, of 115,000 whole house HPs plus 130,000 homes partially heated by HP
- Funding carbon reductions
  - 100% of revenues from RGGI carbon allowances go to Efficiency Maine programs
  - Efficiency Maine uses a portion to fund heat pump “Retrofits”

Funding Beneficial Electrification

- State law requires Efficiency Maine to direct all revenues from the Forward Capacity Market to help install 100,000 high-efficiency heat pumps in the next 5 years;

Funding Energy Conservation

- A portion of heat pump sales are “Lost Opportunities,” for which Efficiency Maine provides rebates using electric conservation funds
Challenge 3 – Pave the Way for the Long-Haul Transition

1. Build out and optimize the grid to meet evolving demand
2. Keep electricity prices affordable & competitive
3. Deploy codes and standards
Thank you!

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