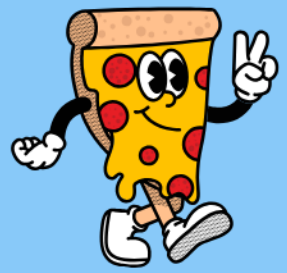
HEAT PUMP FORUM & PIZZA PARTY



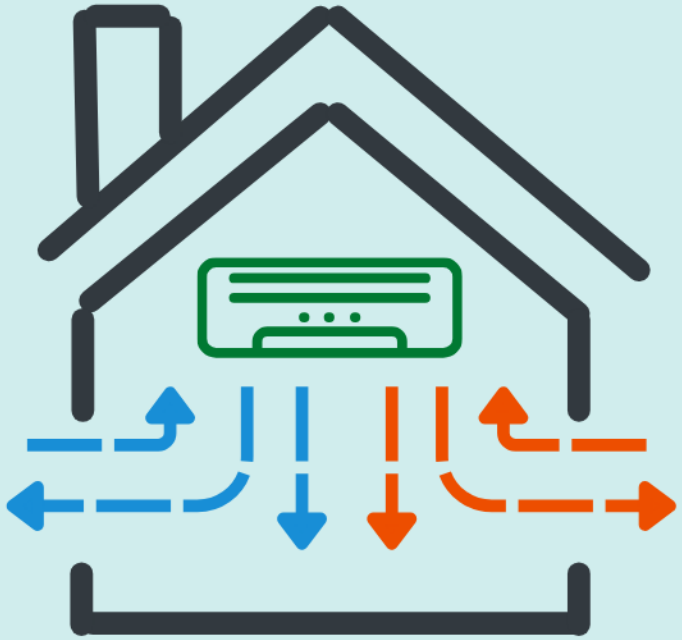
THURSDAY, OCTOBER 16TH

WELLESLEY FREE LIBRARY - WAKELIN ROOM

6:30 PM THROUGH **8:30 PM**

LEARN HOW: **heating** and **cooling** with heat pumps can lower your **energy bills** AND **carbon footprint**!

QUESTIONS ANSWERED ON: technology, installation, and how to take advantage of **financial incentives**



WELLESLEY MLP MUNICIPAL LIGHT PLANT
DEDICATED TO EXCELLENCE

Wellesley Climate Action
Be part of it!

WELLESLEY FREE LIBRARY

Welcome & Overview

Tonight's Agenda

I. Welcome & Forum Overview – Tess Ruderman, WMLP

II. Climate Action & Town context – Marybeth Martello, CAC

III. Home Energy Audit & Weatherization – Craig Powers, Center for EcoTechnology

IV. Heat Pump Technology & Installation 101 – Paxton Halsall & Jaime Haber, Abode Energy Management

V. Rebates and Financing – Tess Ruderman, WMLP

VI. Closing Thoughts – Chris Chan, WMLP

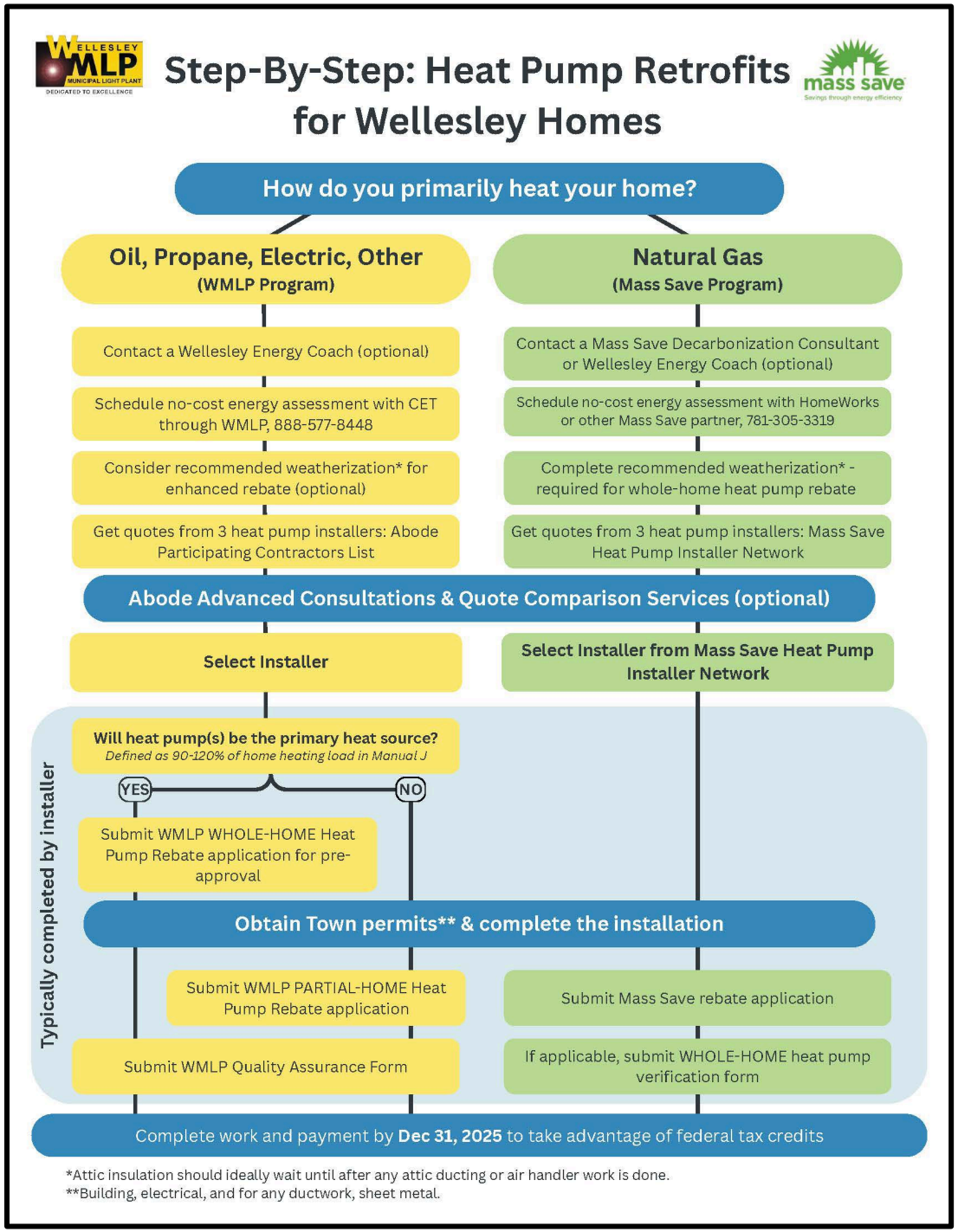
VII. Quiz & Prizes

Rebate Pathways – Important Questions

1. How do you currently heat your home?

2. Once installed, will your new heat pump system be the primary heat source?

Key Steps to Getting a Heat Pump



Resources to Get Started

Wellesley Energy Coaching

wellesleyma.gov/2086/Energy-Coaching
energycoach@wellesleyma.gov

Mass Save Heating Comparison Calculator

Adjust electric price to $0.17/kWh
MassSave.com/residential/heating-comparison-calculator

HOME ENERGY ASSESSMENT

No-cost home energy assessments - sign up for an assessment depending on your existing primary heating fuel.

Oil, Propane, Electric, Other

Schedule with CET 888-577-8448

Natural Gas

Schedule with HomeWorks Energy 781-305-3319

or another Mass Save® Home Performance Contractor 866-527-SAVE (7283)

TECHNICAL ASSISTANCE

Free heating & cooling consultations at any step in the process! Sign up for step-by-step assistance depending on your existing primary heating fuel.

Oil, Propane, Electric, Other

Abode Energy Heat Pump Consultation
AbodeEnergy.com/WMLP

Natural Gas

Mass Save® Decarbonization Consultation

Heat Pumps & Wellesley's Climate Action Plan

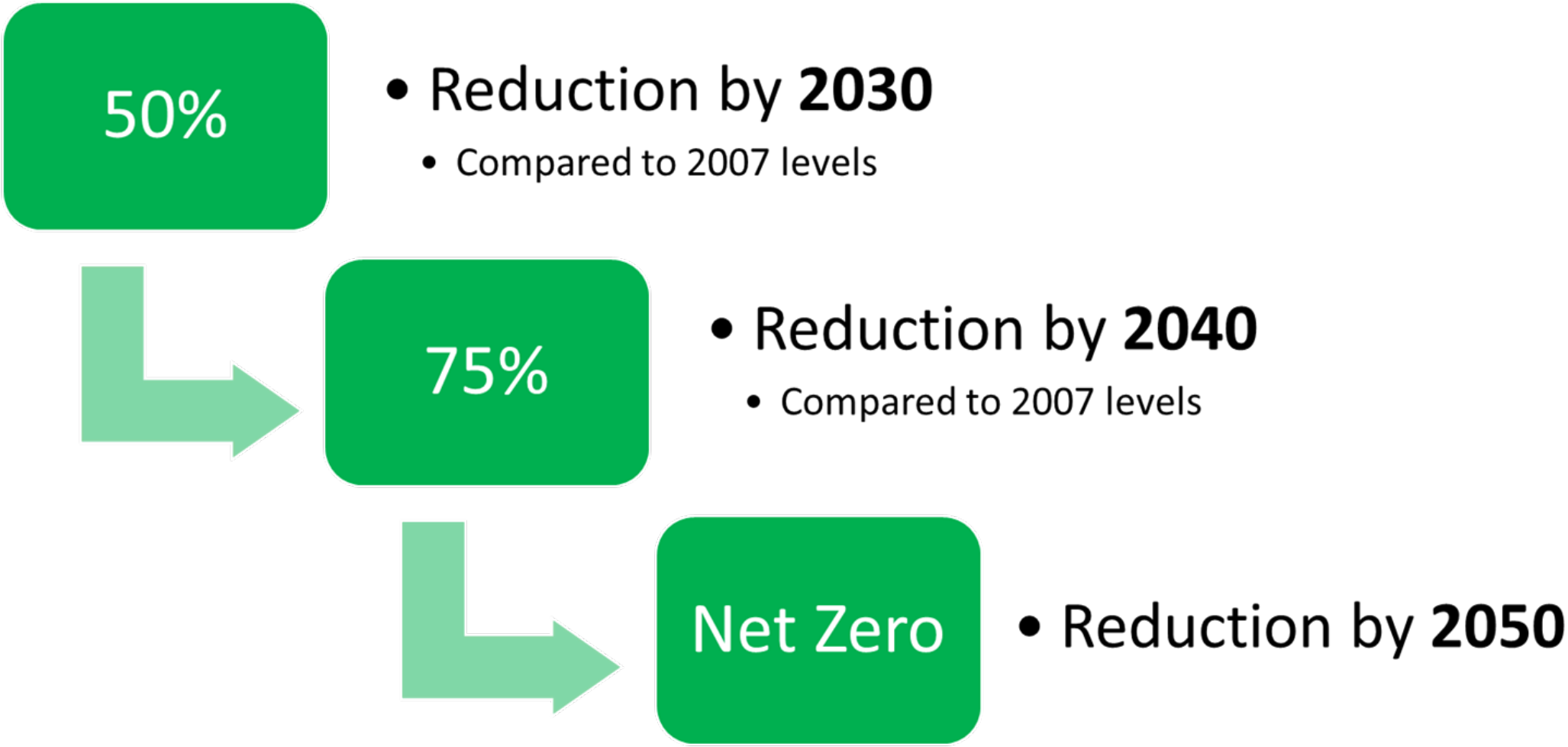
Marybeth Martello

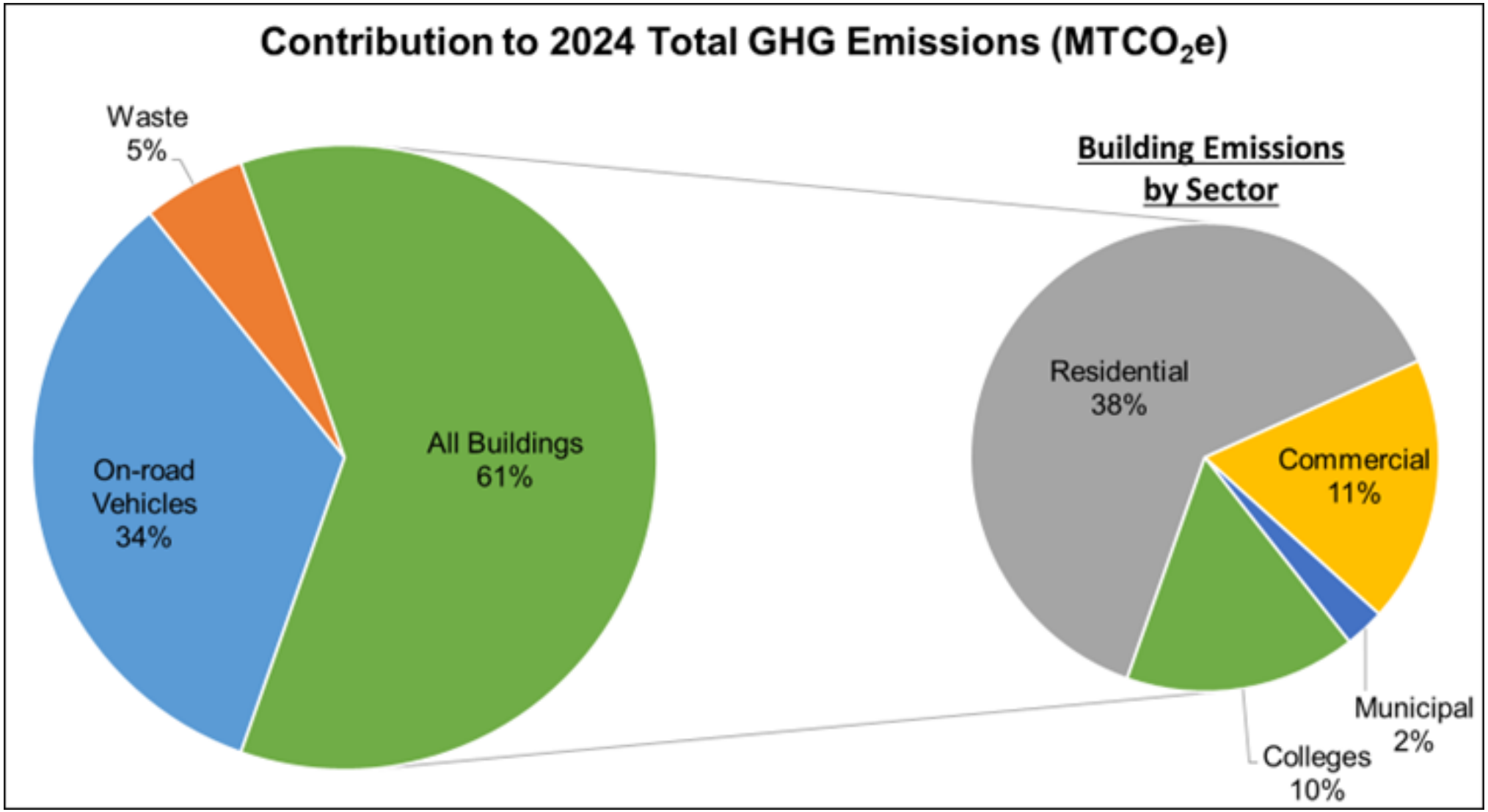
Sustainability Director, Town of Wellesley

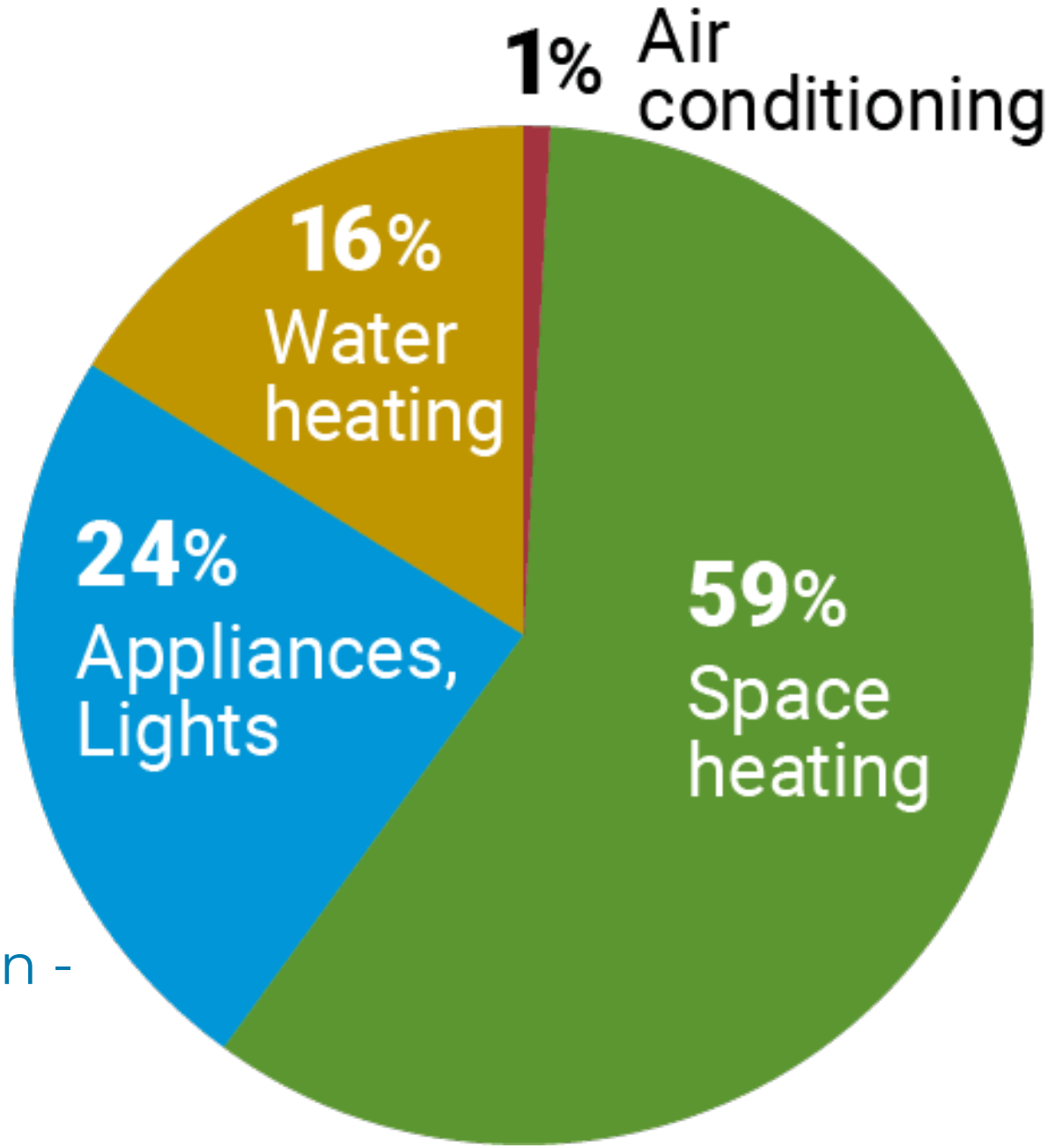
mmartello@wellesleyma.gov

Greenhouse Gas Emissions Reduction Goals

(set by Town Meeting in 2021)

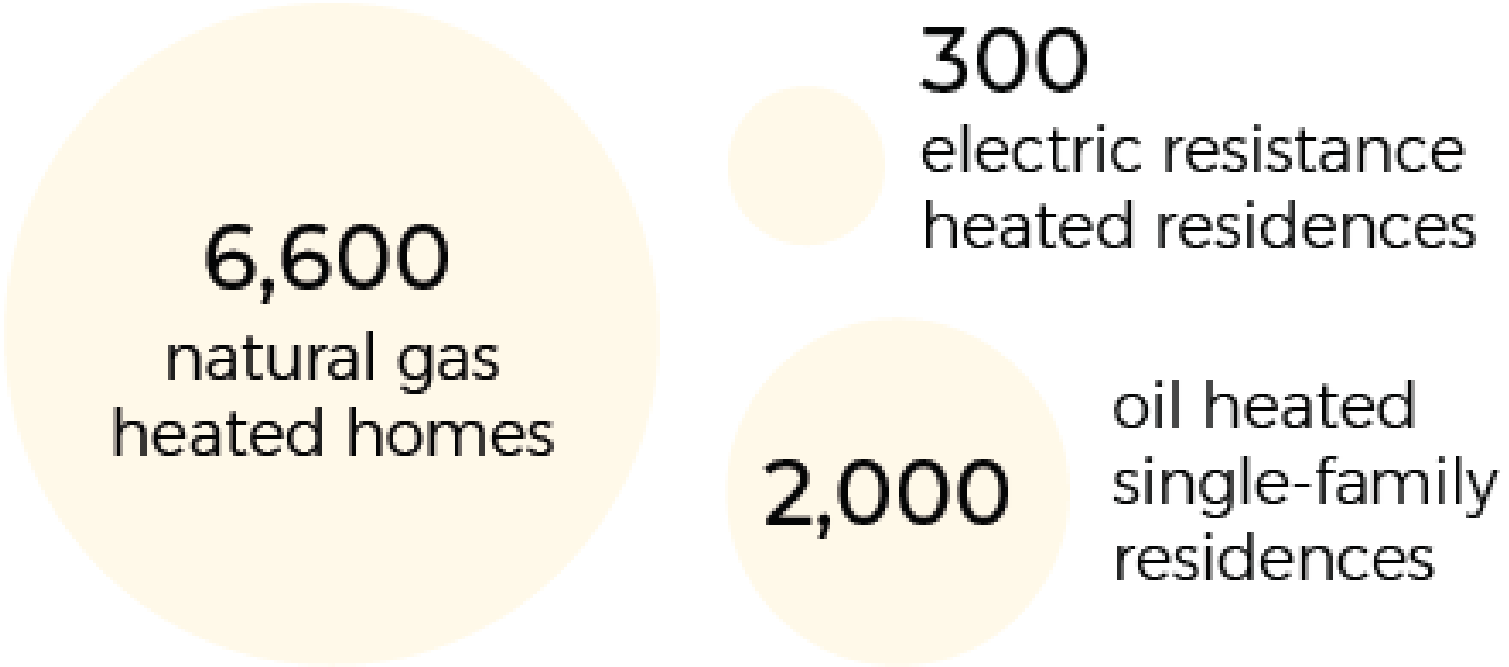


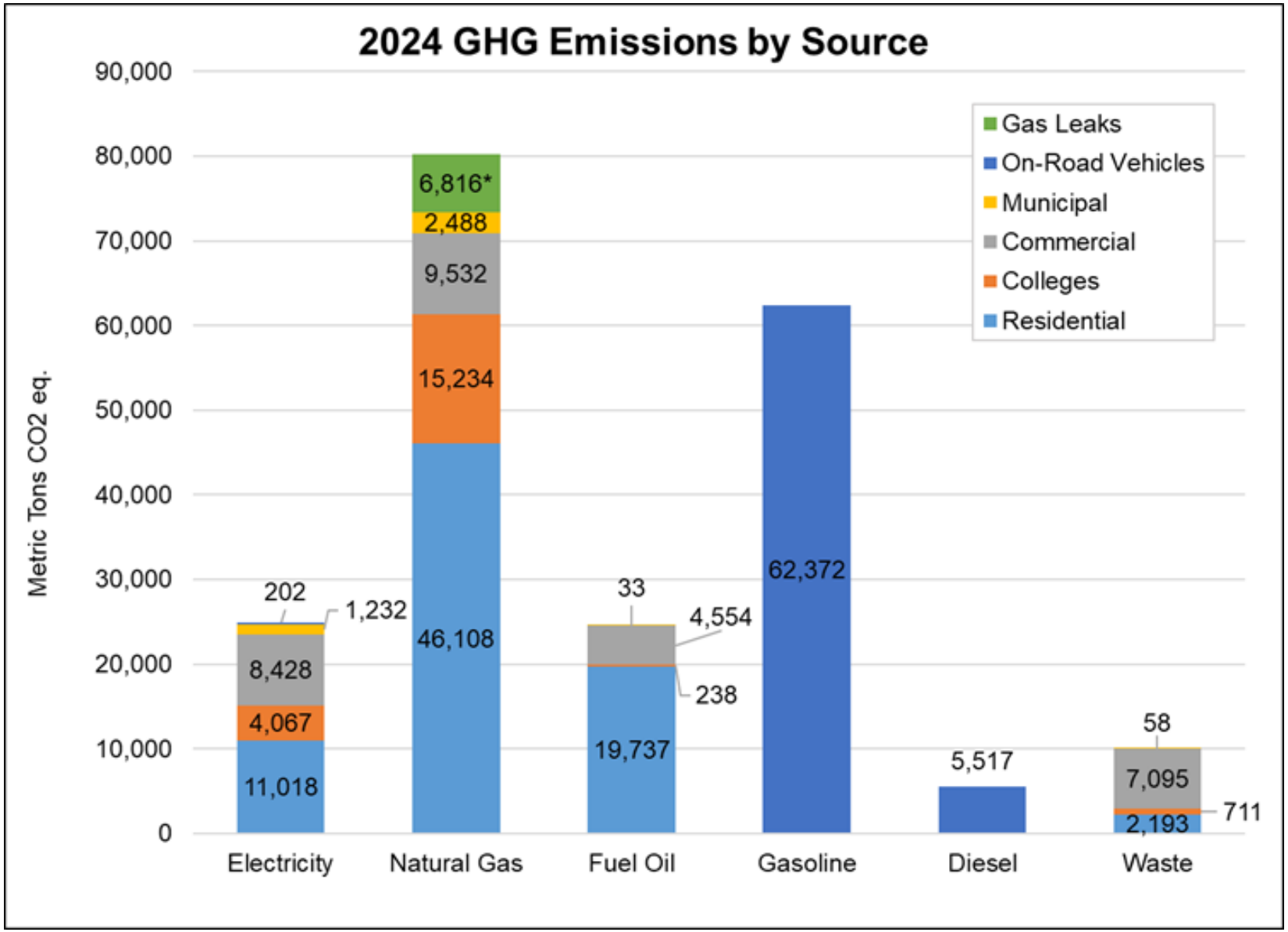

Contribution to 2024 Total GHG Emissions ($MTCO_2e$)
Waste
5%
On-road
Vehicles
34%
All Buildings
61%
Building Emissions
by Sector
Residential
38%
Commercial
11%
Municipal
2%
Colleges
10%



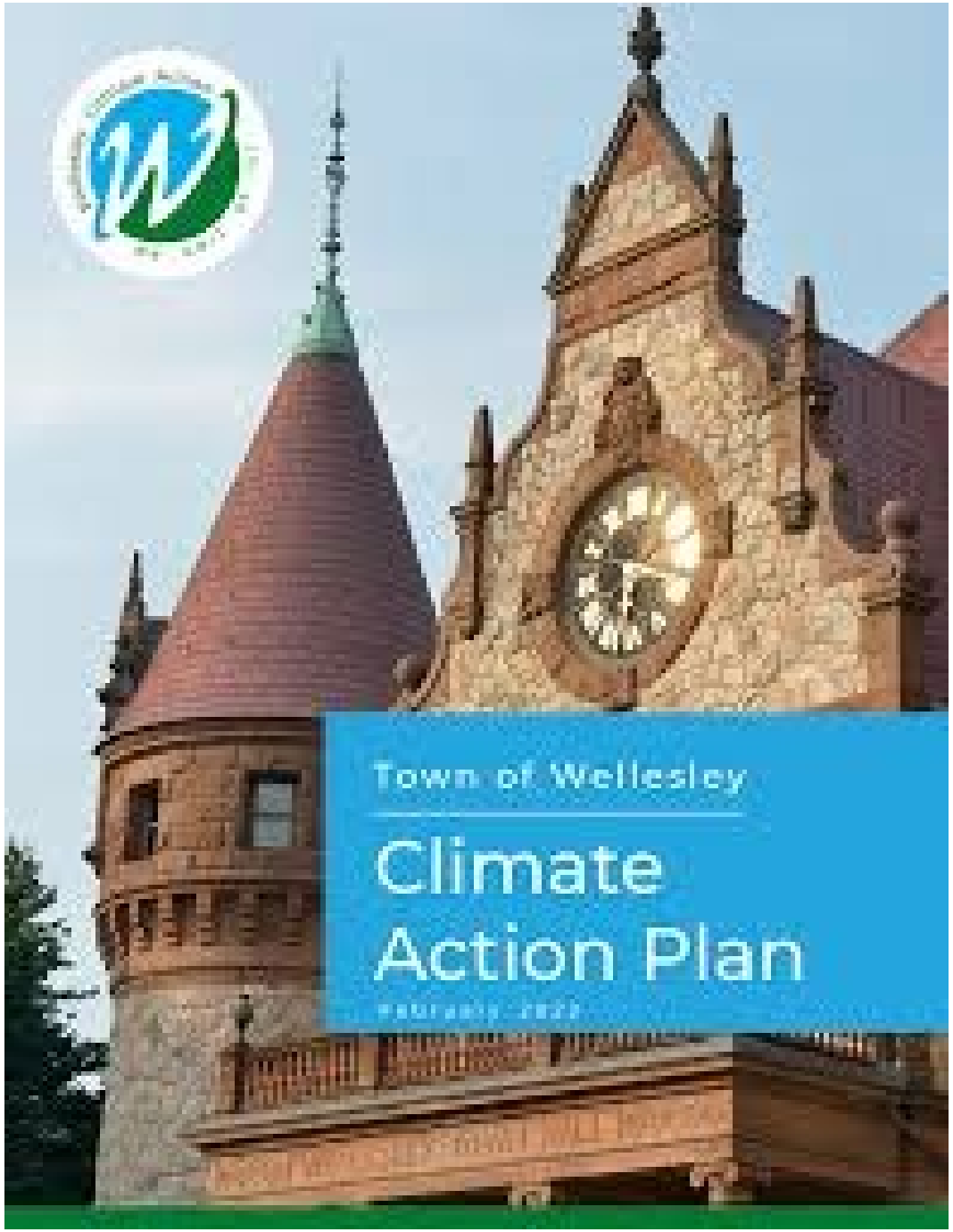
Household Energy Use in Massachusetts, page 1, EIA (U.S. Energy Information Administration - 2009).

Wellesley Housing Stock

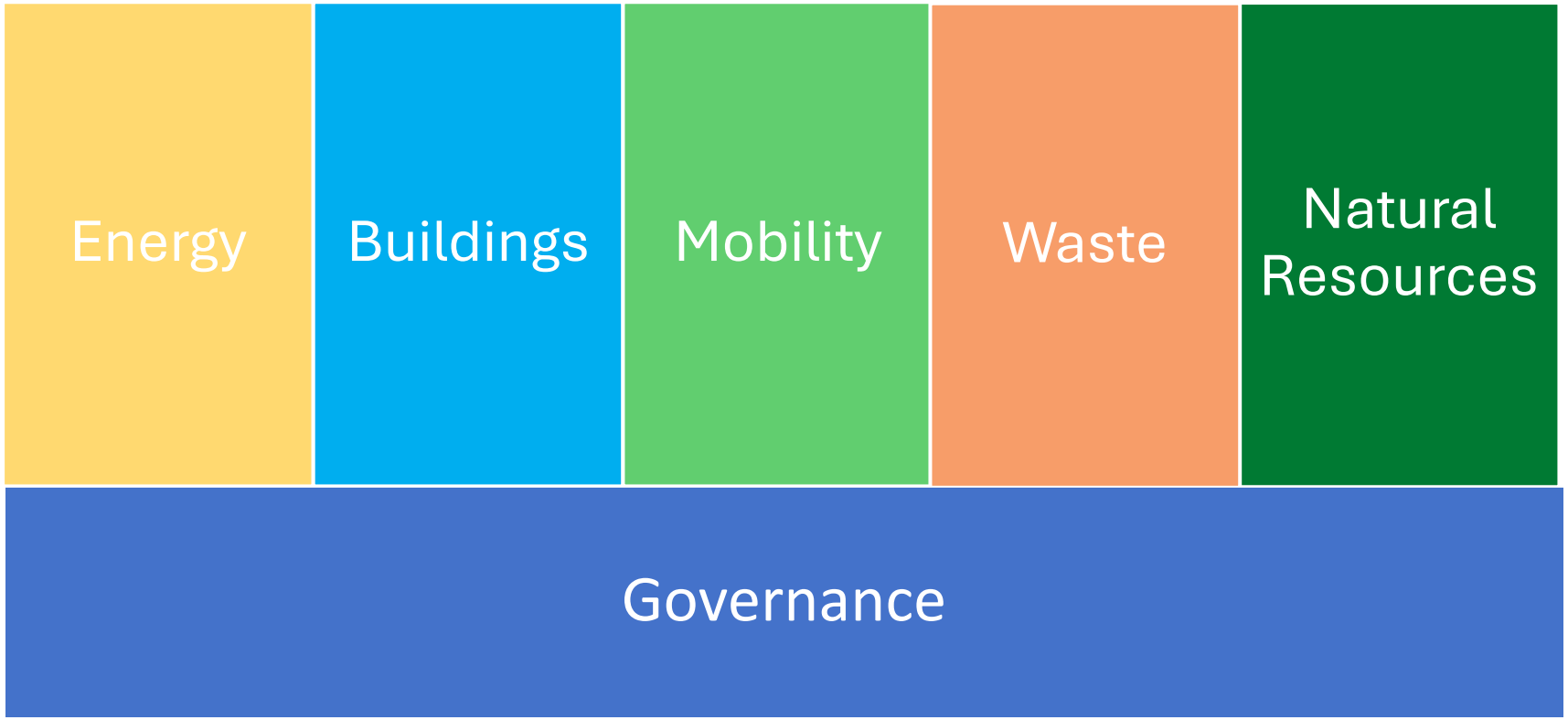



2024 GHG Emissions by Source
Metric Tons CO2 eq.
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Gas Leaks
On-Road Vehicles
Municipal
Commercial
Colleges
Residential
6,816*
2,488
9,532
15,234
46,108
202
1,232
8,428
4,067
11,018
33
4,554
238
19,737
62,372
5,517
58
7,095
711
2,193
Electricity
Natural Gas
Fuel Oil
Gasoline
Diesel
Waste

Townwide Roadmap



Climate Action Plan Pathways



WELLESLEY CLIMATE ACTION

BE PART OF IT

- Weatherize
- **Heat and cool with heat pumps**
- Go solar
- Get around sustainably
- Reduce waste
- Landscape sustainably

What? Why? How?

https://wellesleyma.gov/1505/Be-Part-of-It

Economic & Environmental Benefits

- Heating and cooling
- MLP's low, stable, low-carbon electric rates
- Incentives
  - Gas to air-source – up to $10,000
  - Gas to ground-source – up to $15,000
  - Non-gas to air-source = up to $10,000
  - Sales tax exemption
  - Tax credits (if installed by Dec. 31, 2025)
- Up to 4X efficiency of fossil fuel heating
- Healthier indoor air
- Greater humidity control
- Safety
- Lower greenhouse gas emissions

Leading by example

WELLESLEY MLP
MUNICIPAL LIGHT PLANT
DEDICATED TO EXCELLENCE

CET
Resilient climate solutions

Decarbonization Audits and Weatherization

What is Decarbonization?

- Decarbonization is reducing carbon production by decreasing/eliminating the greenhouse gas emissions produced by burning fossil fuels.

Where do we begin?

- To achieve large-scale decarbonization as a society, individuals need to begin undertaking smaller scale decarbonization efforts in their own lives/homes.
- This is where we (CET) come in!

Decarbonization Audits

What is the Purpose of a Decarbonization Audit?

- The main objective of the decarbonization audit is to find ways the customer can reduce their carbon footprint.

- Many Decarbonization measures will also lower utility spending and improve the comfort of the home.
- Wellesley has a municipal rebate program that incentivizes various decarbonization measures. Your auditor will help you to navigate the rebate process.

What are we looking at during your audit?

- Opportunities for weatherization (insulation and air sealing measures)
- HVAC and DHW system type and efficiency
- Age and efficiency of your kitchen and laundry appliances
- Your good habits that help to reduce carbon emissions
  - Recycling
  - Composting
  - Water Conservation

What is Weatherization?

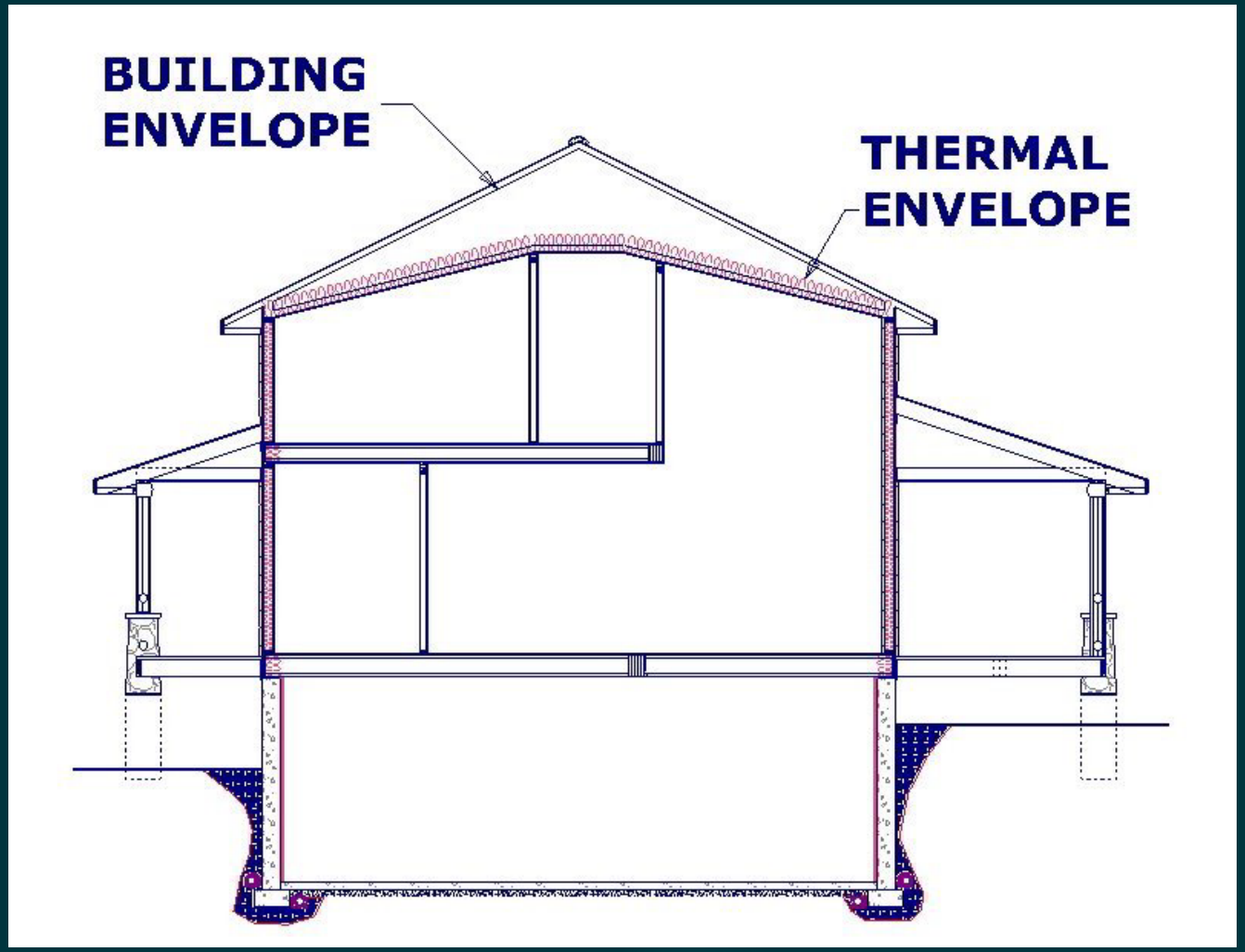
Common Weatherization measures:

- Sealing air leaks
- Improving insulation
- repairing/replacing windows and doors

Why is Weatherization important?

Weatherizing your home has the following benefits:

- Reduces energy bills by keeping conditioned air inside
- Improves indoor air quality and comfort year-round.
- Helps fight climate change by using less energy and reducing the direct emissions of your home
- Prepares your home to get the most out of modern technologies like heat pumps.



How Does Weatherization Relate to Heat Pumps?

- Heat pumps work best in well-sealed, insulated homes.
- Without weatherization, heat pumps must work harder, increasing costs.
- Proper weatherization ensures your heat pump performs efficiently in all seasons.

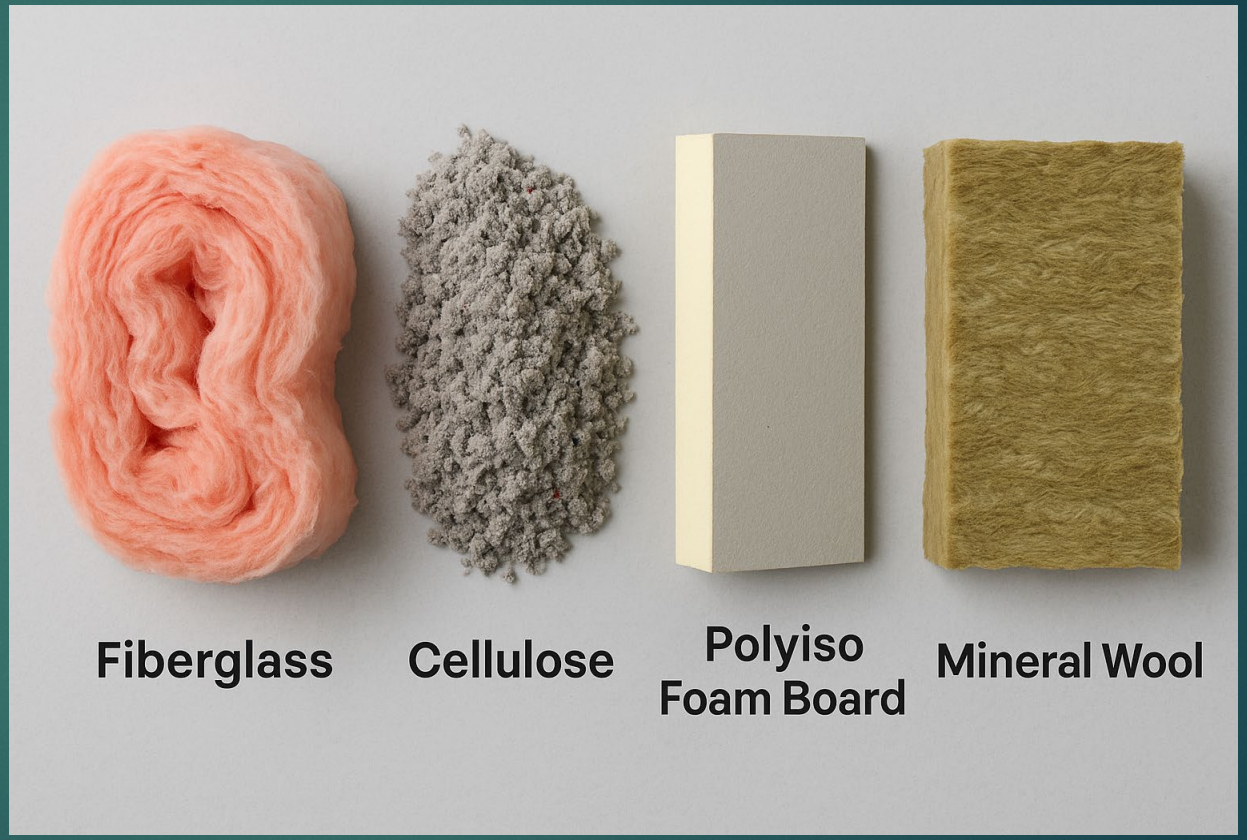
Common Insulation Materials

Fiberglass:
Spun glass fibers formed into batts or loose fill; commonly used insulation with good thermal performance and fire resistance.

Cellulose:
Recycled paper treated with fire retardants; blown into wall cavities or attics for dense, air-tight insulation.

Polyiso Foam Board:
Rigid foam insulation with a high R-value per inch; often used on exterior walls and roofs to reduce thermal bridging.

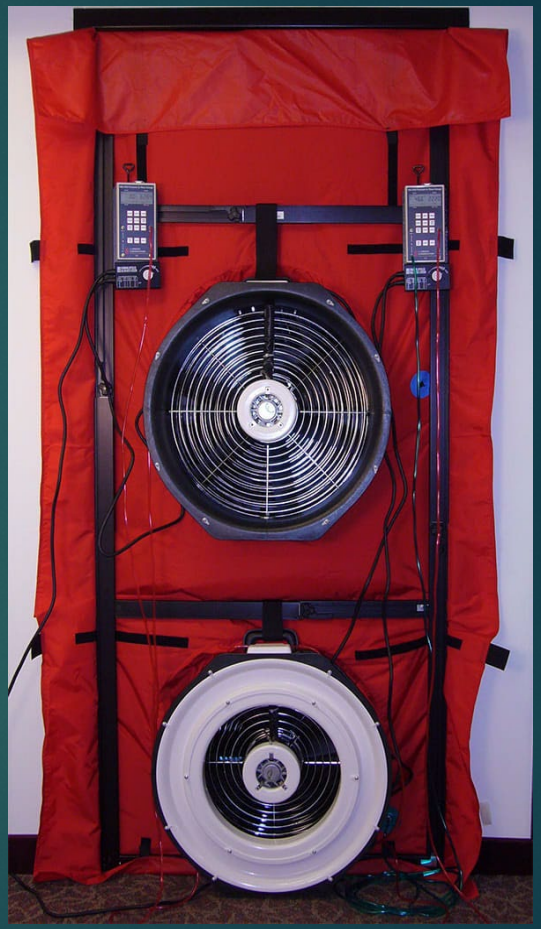
Mineral Wool:
Fibers made from rock or slag; provides excellent fire resistance, soundproofing, and moisture resistance.



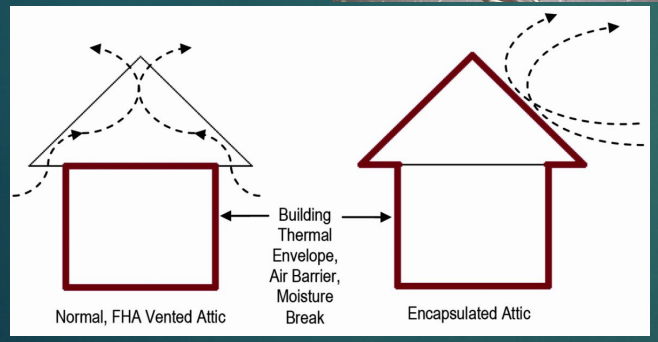
Air Sealing

- Air sealing will reduce uncontrolled air movement in your home.
- While the most obvious areas of air infiltration are around doors and windows, the greatest energy and air loss occurs in the attic and the basement.
- The air infiltration rate can be assessed with a blower door test

Common leakage areas include:
- the attic access
- chimney chases
- plumbing and electrical penetrations
- Top plates,

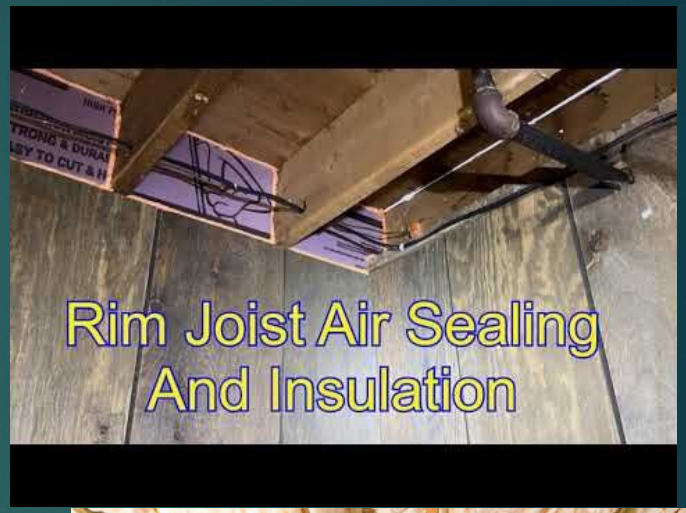


Common Insulation Targets



Attic

Exterior Walls



Basement or Crawlspace

Doors & Windows

- Door and window replacement is generally very costly and provides less energy savings than insulation

- Door and window replacement should only be prioritized in homes with adequate insulation or when the existing doors/windows are damaged/pose a security risk.

Additional Energy Saving Measures

Air Source Heat Pumps

Solar

Induction Stoves

Electric Vehicles

Heat Pump Hot Water Heaters

Heat Pump Clothes Dryer

Bang For Your Buck

Air sealing and insulation are the most cost-effective home upgrades because they directly address heat loss and air leakage.

By tightening the building envelope, you

- Save money on heating and cooling;
- Reduce drafts and improve year-round comfort;
- Improve HVAC performance and lifespan;
- Decrease your carbon footprint by reducing wasted energy;
- Get the fastest payback of any energy-saving improvement; and
- Prepare your home for heat pumps and other efficiency upgrades.

Sign up for a Decarbonization Audit tonight!

Primary heating fuel:

Oil, propane, or electric

CET

Resilient climate solutions

No-cost to you through WMLP

Natural gas

mass save

Savings through energy efficiency

No-cost to you through Mass Save

WMLP Heat Pump Forum: Heat Pump Technology & Installation 101

Thursday, October 16, 2025

Paxton Halsall - Associate Program Manager,
Abode Energy Management

Jaime Haber - Residential Decarbonization Advisor,
Abode Energy Management

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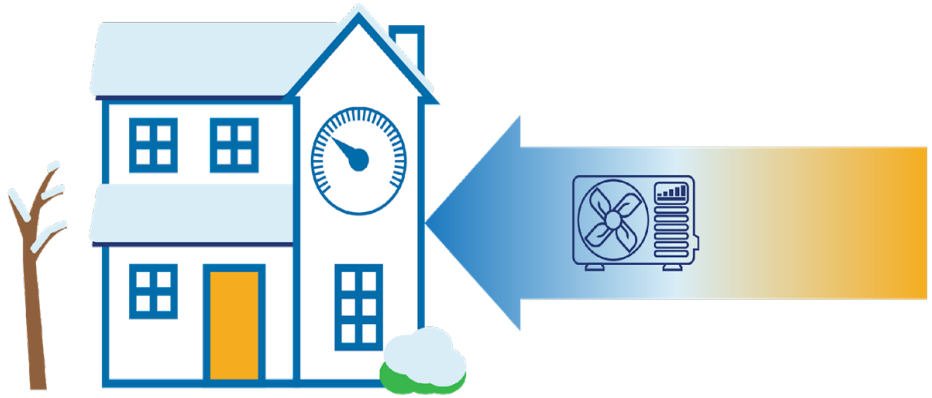
1% FOR THE PLANET

Heat Pumps Have Many Benefits

- Provide high-efficiency heating and cooling in one unit – heat pumps can be 300% efficient or more!
- Improved indoor air quality
- Potentially lower heating and cooling costs
- When powered by renewable energy, their environmental benefits are even greater

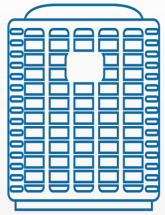
What is a heat pump?

Summer:
Pumps heat
from the inside
to the outside



Winter:
Pumps heat
from the
outside to the
inside

Same technology as:



Air Conditioner

Refrigerator

What is a "Cold Climate" Air Source Heat Pump (ccASHP)?

- 15+ years ago, most heat pumps were only truly suitable for milder climates

- More recently, heat pump technology has caught up and can now easily service colder climates
  - In 2023, **Maine** was the nation's leading installer of cold climate heat pumps[1]

- The ENERGY STAR Cold Climate ASHP certification requires third-party verified performance for low temperatures, testing ASHPs down to 5°F, though the majority of ccASHPs provide effective heating even as outdoor temperatures drop to 0°F or below (some as low as -15°F!)

- Much of the success has to do with the types of refrigerants used, which allow the heat pump to still absorb a lot of heat energy even on colder days

- Both WMLP and Mass Save rebates require ccASHPs

(1) https://www.rewiringamerica.org/research/climate-change-impact-northern-states

Three critical components of system design:

- Distribution
- Sizing (Capacity)
- Capacity Maintenance Ratio

Components of a heat pump system:

Outdoor condenser

+

Indoor unit(s)

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Ductless Indoor Units – AKA "Minisplits"

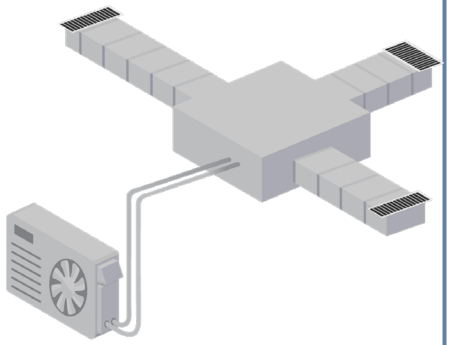
Wall Hung

Floor Mount

Ceiling Cassette

Ducted Indoor Units – Same as traditional "Central Air"

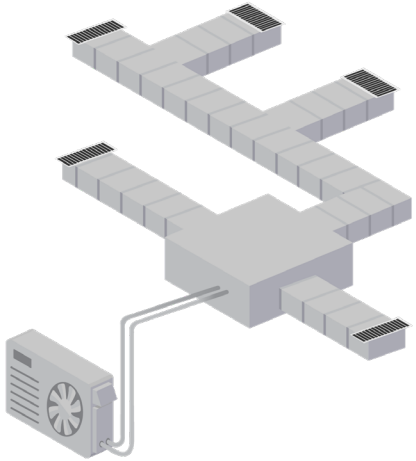
Compact Ducted



Low Static: a few rooms

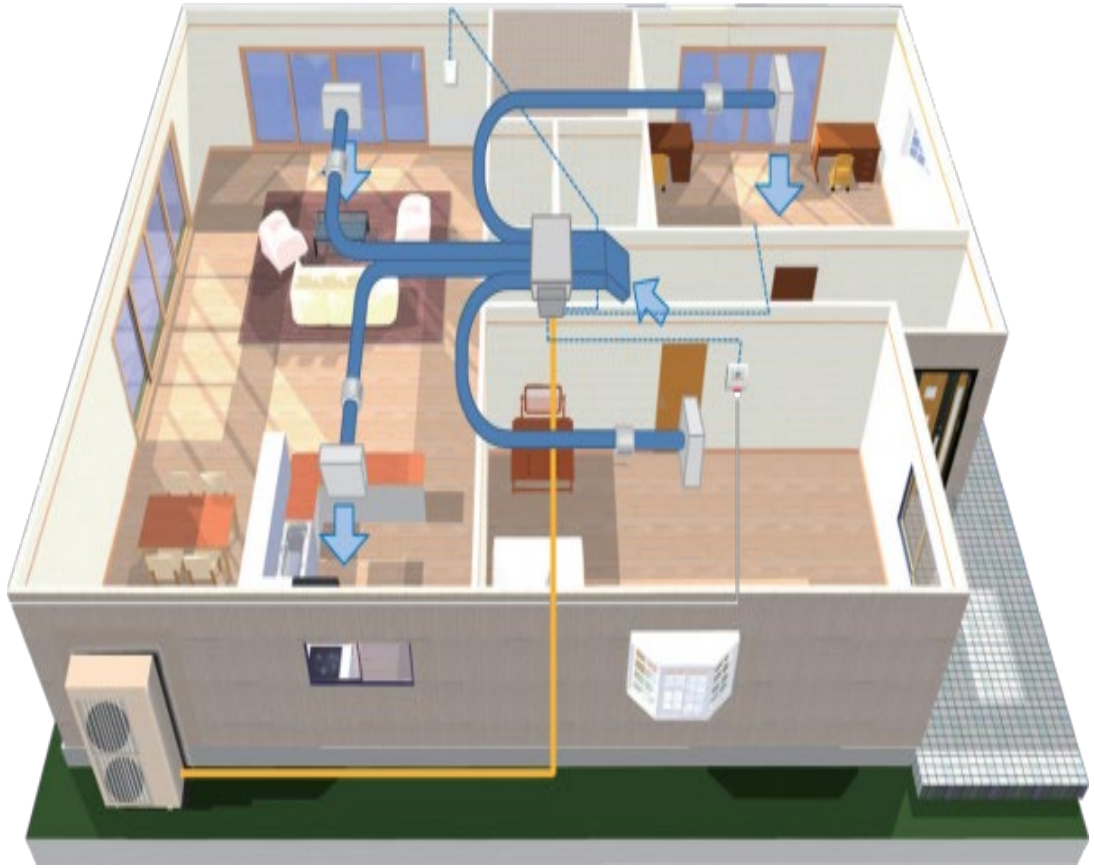
Med Static: an entire floor

Central Heat Pump



High Static: An entire floor or home

Can be paired in dual fuel configurations



Sizing Considerations: The Goldilocks Effect

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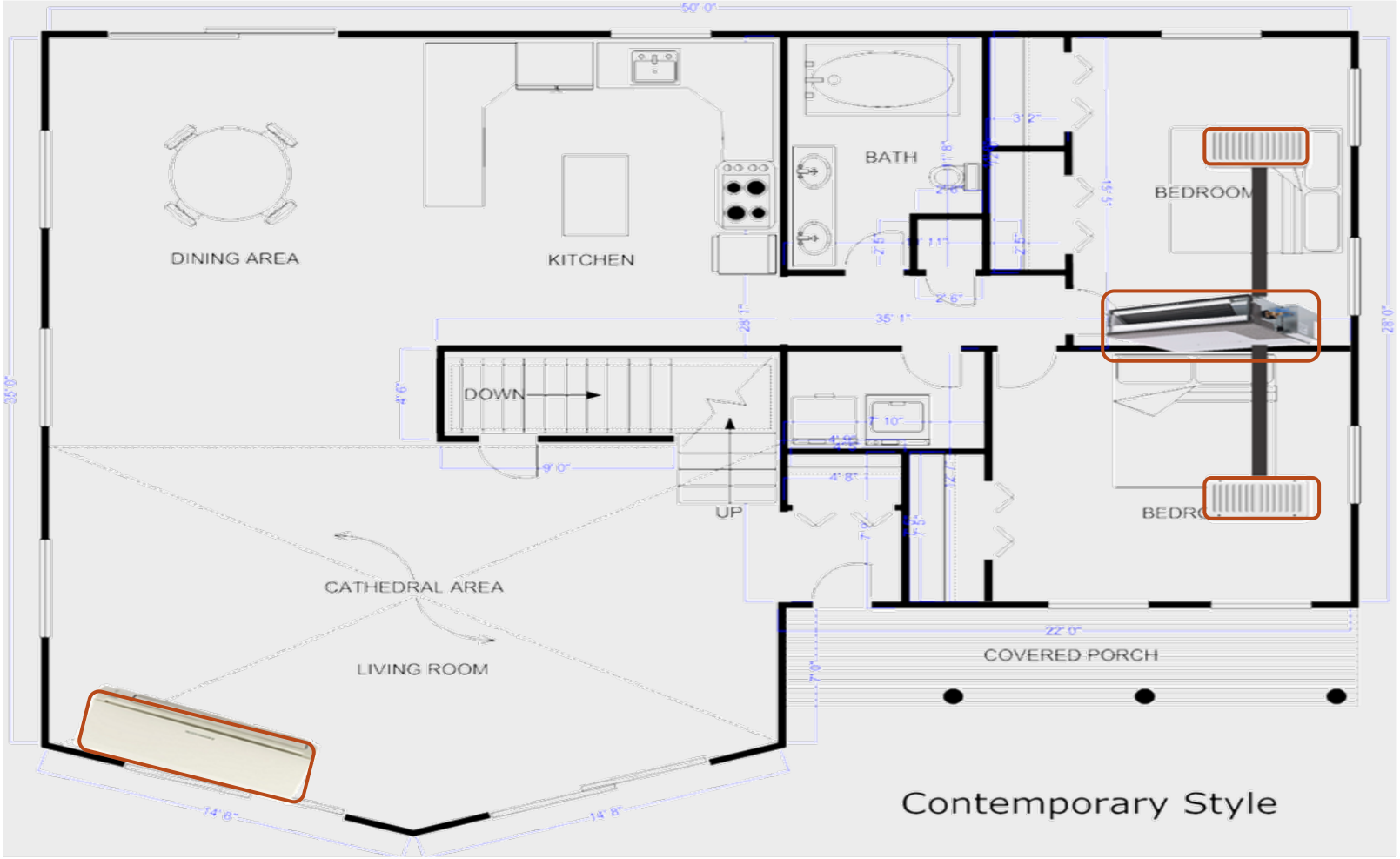
Undersized: overworked equipment, comfort issues, increased electric usage, higher operating costs

Oversized: short-cycling equipment (wear & tear and comfort issues), poor overall performance, higher operating costs

Properly Sized System:

"Just Right"

- Peak operating efficiency and proper modulation
- Installed equipment matches manufacturer's submittals
- Better comfort, less maintenance, better humidity control



*Not to scale

Weatherization is Relevant to Heat Pump Sizing!

"MANUAL J" CALCULATION:

A holistic approach to determining the proper size for the heat pump. Considers how well insulated the house is, how good the windows are, how much air infiltration the home has, how much volume of space is being conditioned, and more.

IMPORTANT FOR RIGHT-SIZING:

Make sure when the HVAC contractor runs the Manual J calculation, they factor in the **final values** that will be achieved for the home's insulation – this will make sure the heat pumps are sized to match the improved home.

OUTDOOR DESIGN CONDITIONS

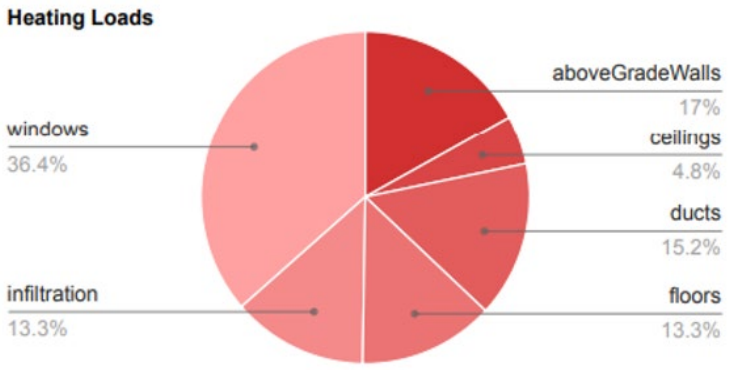
Weather station: Boston, Logan IAP

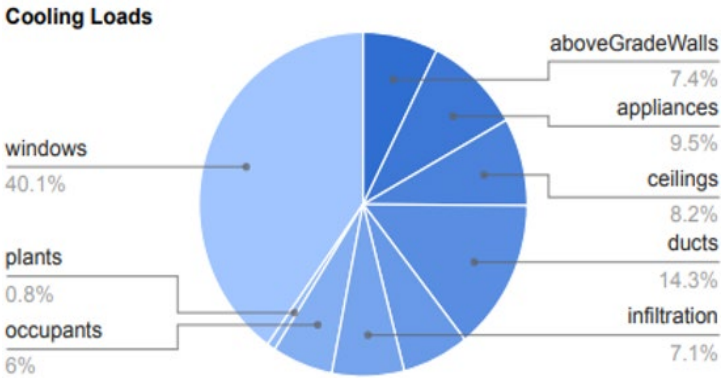
Summer Outdoor F:	88	Summer Indoor F:	75	Design Grains:	28	Daily Range:	Medium
Winter Outdoor F:	12	Winter Indoor F:	70	Cooling RH:	50	Elevation (Ft):	30

LOAD CALCULATION TOTALS

HVAC System: HP

Heated square footage:	2,430	Heating BTUH:	71,489
Cooled square footage:	2,430	Cooling BTUH:	35,913
Heated volume (above grade CF):	21,867	CFM:	1,639
Cooled volume (above grade CF):	21,867	Sensible cooling:	32,467
Exposed wall area (SF):	2,674	Latent cooling:	3,445
		SHR:	0.904





Will a heat pump keep me **warm** during **cold** snaps?

Maintaining performance at low outdoor temperatures = “Capacity Maintenance Ratio”

Measures how much capacity (BTU/h) is retained between two outdoor temperatures (i.e., Max capacity at 5°F vs Rated capacity at 47°F)

Example	System 1	System 2
Design Heating Load (~10° day):	**48,000** Btu/h (4 tons)	
Equipment's Nominal Capacity (47° day):	**48,000** Btu/h	**48,000** Btu/h
Capacity Maintenance Ratio:	72%	100%
~Capacity @ Design Load	**34,600** Btu/h	**48,000** Btu/h

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Will you keep your existing heating system? (Partial-home vs. Whole-home*)

Consider utilizing *integrated controls* to:

- Keep your existing heating system from competing with your heat pump system
- Prioritize your heat pump for energy savings

Sizing Questions:

- How much of the home's heat load are you trying to cover/meet?
- Do you plan to keep your existing system, and if so, how often do you plan to use it?

Customers who install new heat pump system/s designed to condition 100% of the home's living space by volume and supply between 90-120% of the heating load at the correct design temperature but choose to retain their existing system (e.g., for backup heat or for hot water only) are eligible for a lower $8,000 whole-home rebate.

How much do heat pumps cost?

Air Source Heat Pumps can range between ~ **$6,000 - $9,000+ per ton** installed, but this depends on many different factors.

Cost Considerations:

- Ducted vs Ductless
- Weatherization or "tightness" of the home
- Whole-home or partial-home heating/cooling
- Auxiliary/ER back-up
- Home size & layout
- Heating/cooling goals
- Contractor/Contract
- Equipment/Brand/Warranty
- Lots more!

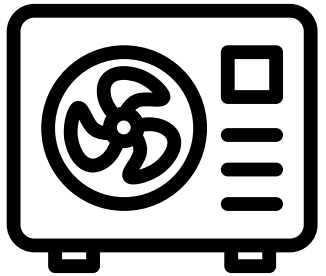
Our advice when working with HVAC installers:

1. Request a Manual J (heat load/sizing calculation) from your installer
2. Request they quote models that meet the specific demands of your situation **and** are rebate-eligible with WMLP
3. Determine and confirm the placement of outdoor unit(s) and piping, and pre-evaluate the home's electrical panel
4. Confirm their availability to assist with the WMLP rebate process and secure any required permits and inspections

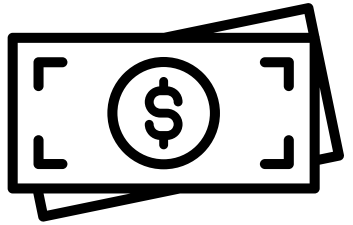
Heat Pump Process: WMLP customers (oil, electric, propane)

Get **at least three quotes** for your heat pump project. Abode and WMLP offer a participating contractor list of installers that customers can choose from.

Take advantage of a **no-cost Quote Comparison Report**. Compare up to 5 quotes!



Select an installer and apply **beforehand** when pursuing whole-home rebates. Once approved, move forward with install.



Receive your WMLP rebates after all **post-install requirements** have been met.

Abode.Energy/WMLP

(Gas customers: go to MassSave.com)

PAGE 1: SUMMARY

Equipment Summary

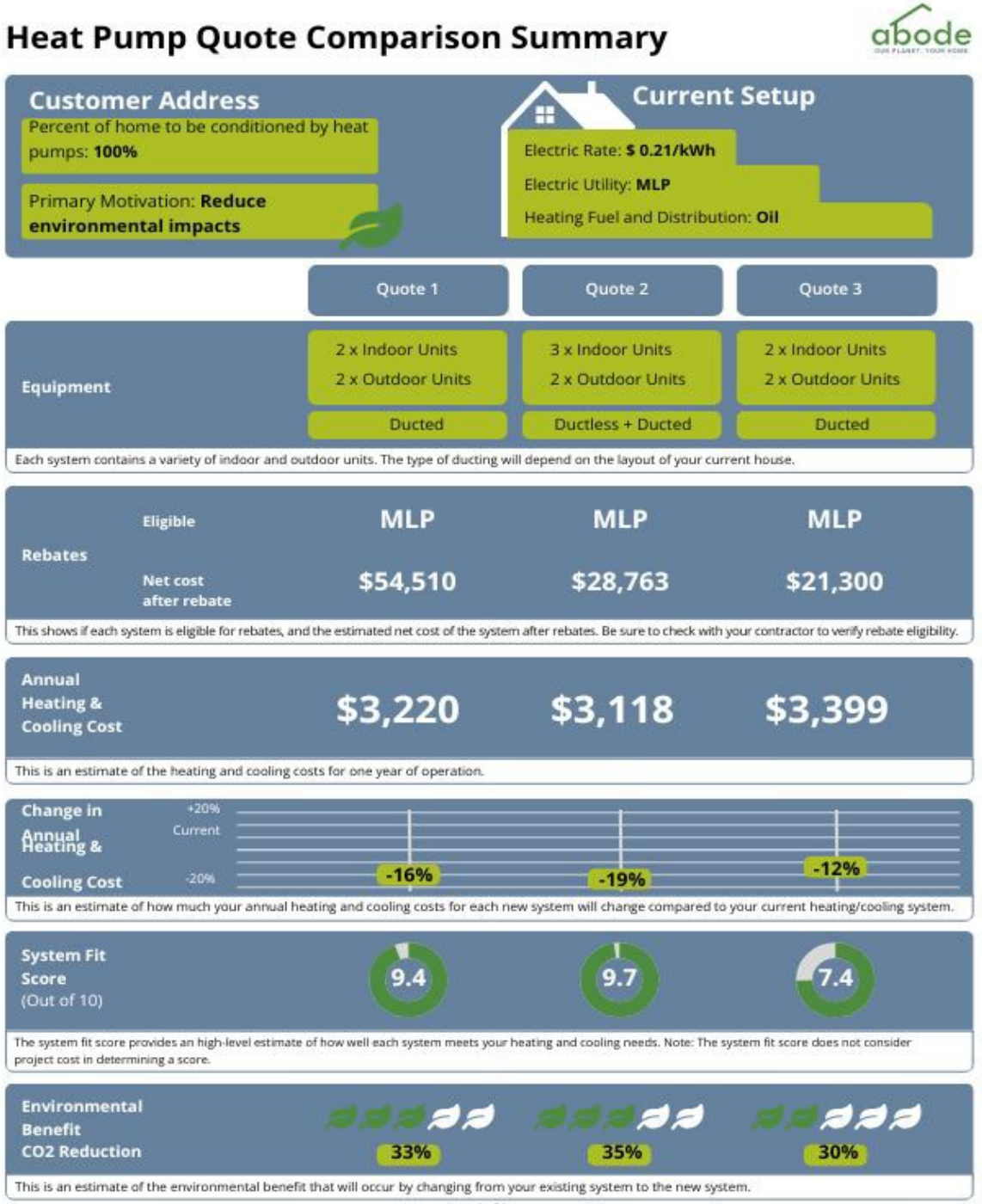
Qualified Product Lists
- Highlights equipment that meets rebate requirements (pricing is NOT factored into System Fit scores)

Operating cost
- Estimated annual heating and cooling cost

Change in Operating Cost
- Change relative to estimated existing operating cost

System Fit Score
- Explained on the next slide

Environmental benefit/CO_2 reduction
% change in CO_2



Thank You!

Paxton Halsall - Associate Program Manager, Abode

Jaime Haber - Residential Decarbonization Advisor, Abode

Email: WMLP@AbodeEnergy.com
Phone: (339) 707-0918

Abode.Energy/WMLP

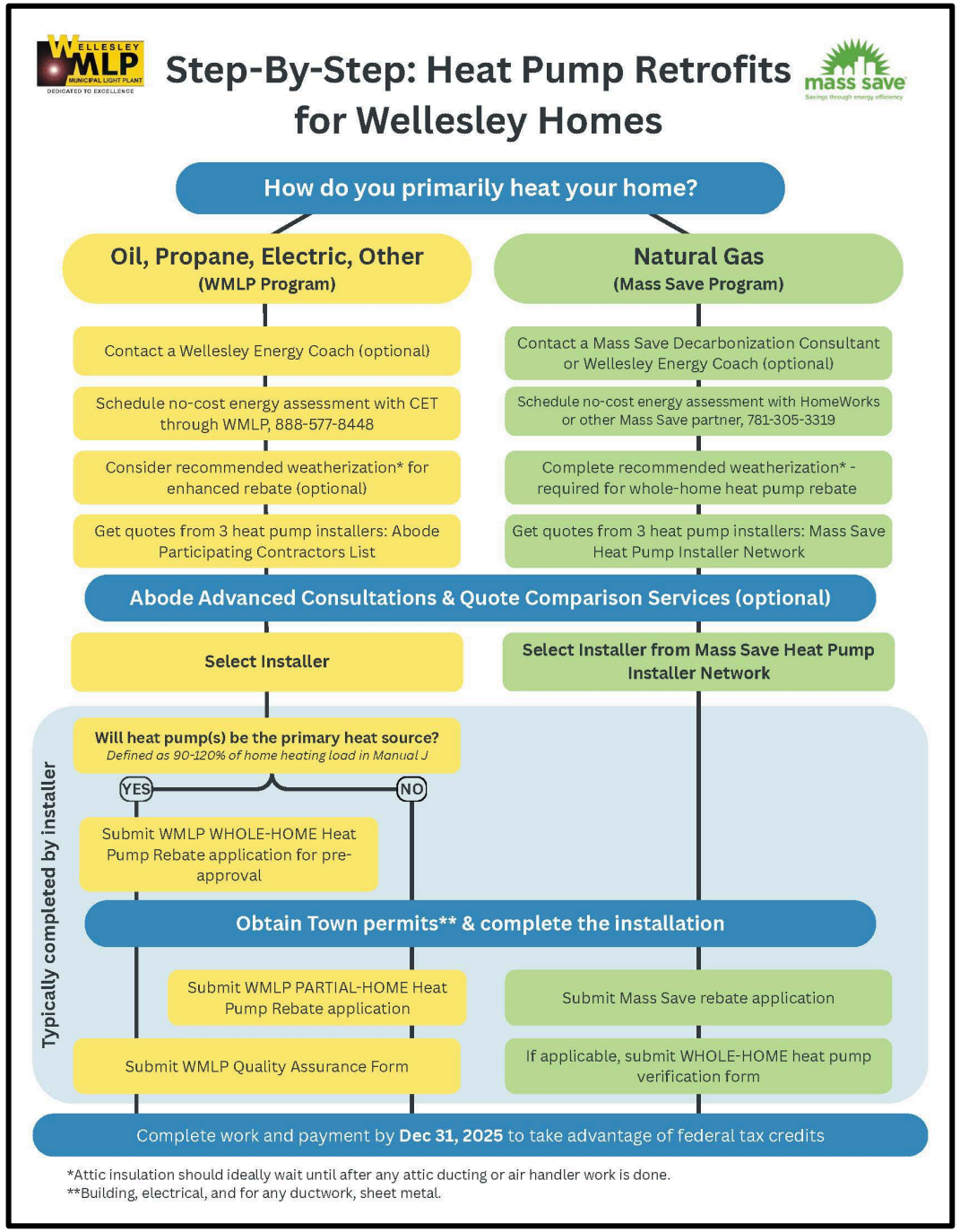
Rebates and Financing

Installation Costs in Wellesley

	Partial Home	Whole Home
Most fall within	1-3 tons	3-6 tons
Median cost per ton	$7,200	$7,300
Median cost before rebate	$19,900	$34,500
80% fall within	$15,000 - $25,000	$25,000 - $40,000

...a Ballpark Idea

Key Steps to Getting a HP (reprise)



Rebates & Tax Credits

Summary of Rebates & Tax Credits

If you primarily heat your home with:	Wellesley MLP — Oil, Propane, Electric, Other	mass save — Natural Gas	Federal Tax Credits (Expire Dec 31, 2025) — Any fuel
Weatherization	**50% of cost** up to **$1,500** OR **50% of cost** up to **$2,500** if completed within 6 months of a WH heat pump installation	**75% - 100% of cost**	**30% of cost** up to **$1,200**
Whole-Home (WH) Heat Pump	**2025**: **$10,000** if removing or decommissioning your existing heating system; **$8,000** if keeping existing system **2026**: TBD	**2025**: **$3,000 per ton** up to **$10,000** **2026**: **$2,650 per ton** up to **$8,500** *Requires removal or disconnection of existing heating system, unless used only for domestic hot water heating*	**30% of cost** up to **$2,000**
Partial-Home (PH) Heat Pump	**2025**: **$1,500** per outdoor condenser unit **2026**: TBD	**2025**: **$1,250 per ton** up to **$10,000** **2026**: **$1,125 per ton** up to **$8,500** **$500** sizing bonus if sized to meet total home heating load **$500** bonus for weatherization done within 6 months	
Basic Heat Pump Rebate	None *Note: new construction or major home renovation projects are not eligible for a rebate.*	**$250 per ton** up to **$2,500** for updating an existing HP or central A/C system or installing a HP in a previously unconditioned space (e.g., new addition) or home that is not occupied in the winter (e.g., summer home)	

Additional Financing Programs

Additional Financing Programs

0% Interest Loans up to $25,000

Oil, Propane, Electric, Other

MLP Zero-Interest Energy Efficiency Loan

New program from MA Dept of Energy Resources for MLP customers

mass.gov/info-details/massachusetts-municipal-light-plant-zero-interest-energy-efficiency-loan

Natural Gas

Mass Save HEAT Loan

Re-Payment Terms Dependent on Household Income

masssave.com/residential/rebates-offers-services/financing

Energy Saver Home Loan Program

- **Mass Housing program**
- **Any existing heating fuel**
- **Home improvements must reduce total energy use by at least 20%**
- **Low interest (0.5%-2%) loans up to $100,000**
- **Household income limit $205,335 for Norfolk County**

masshousing.com/mass-community-climate-bank/energy-saver-home-loan

Now is the Time!

There is a HP solution for every home and customer

- Whole or partial home
- Ducted, ductless, or both
- Keep or remove your existing heating system

State goal – HPs in 90% of homes by 2040

- Expiring federal tax credit
- Declining rebates, rising(?) equipment prices
- Lower-GWP refrigerants (R-454B) available
- Versatility in our changing climate
- More volatile oil and gas prices
- Switch before your existing heating system fails

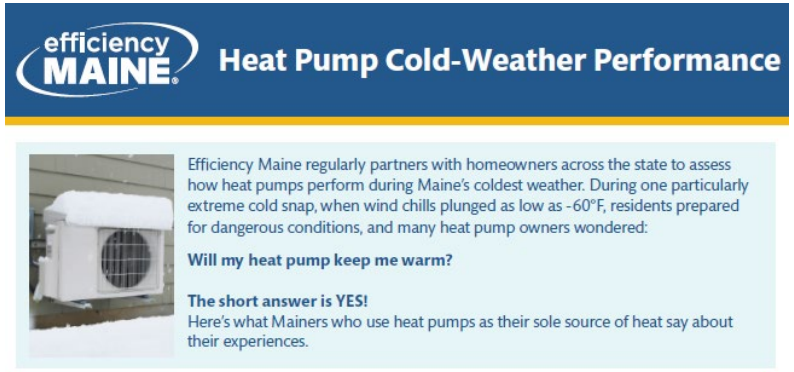
We can help!

- CET and HomeWorks Energy audits
- WMLP Energy Coaches and Mass Save® Decarbonization Consultants
- Abode Energy Management
- WMLP (Tess and Chris)
- Your installer(s)

Mass. joins 8 states in setting new electric heat pump goals

February 07, 2024 By Miriam Wasser

Installing heat pumps, which use electricity to heat and cool air, is a key part of Massachusetts' plan to get homes off of fossil fuels. (Miriam Wasser/WBUR)



efficiency MAINE **Heat Pump Cold-Weather Performance**

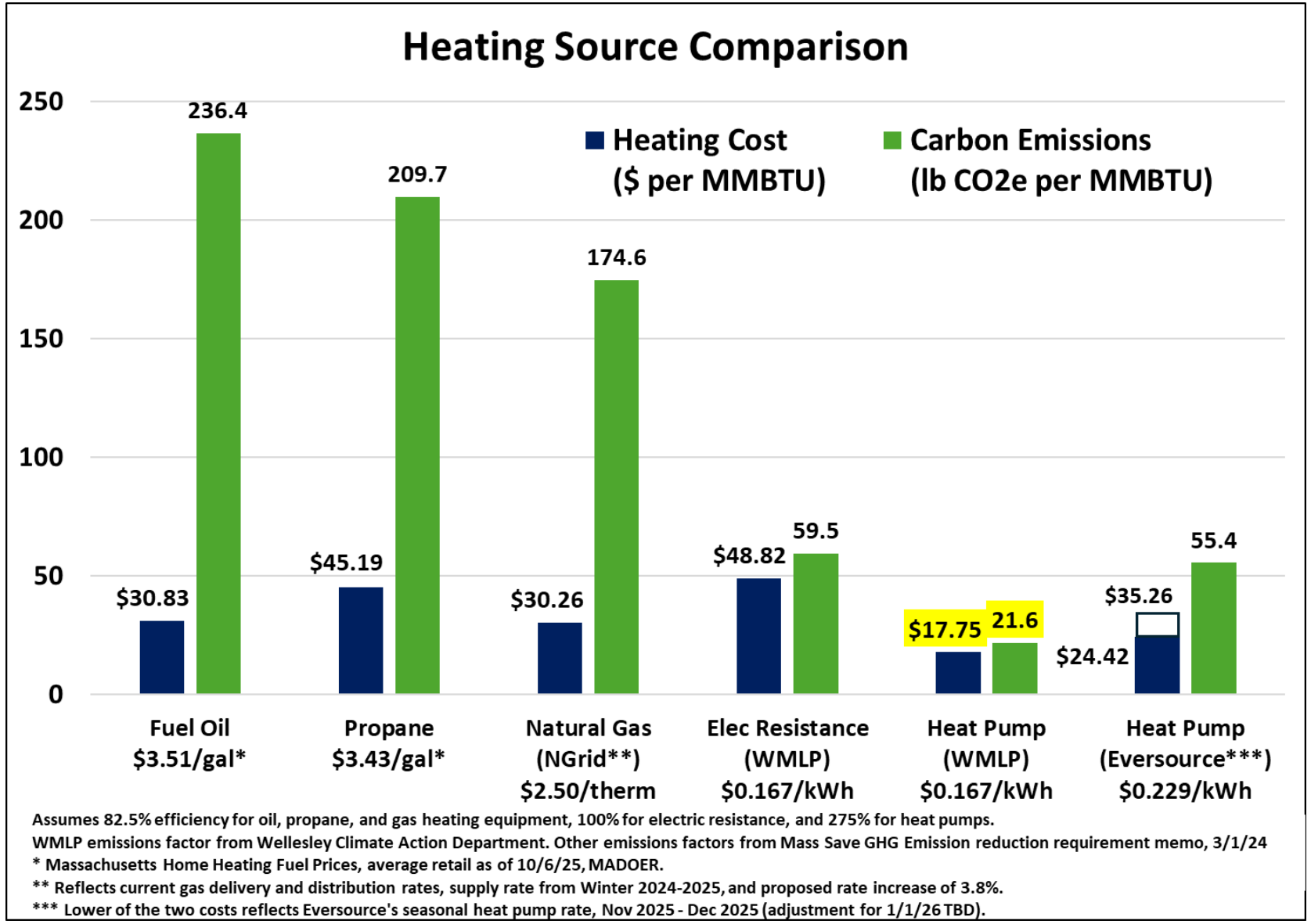
Efficiency Maine regularly partners with homeowners across the state to assess how heat pumps perform during Maine's coldest weather. During one particularly extreme cold snap, when wind chills plunged as low as -60°F, residents prepared for dangerous conditions, and many heat pump owners wondered:

Will my heat pump keep me warm?

The short answer is YES!
Here's what Mainers who use heat pumps as their sole source of heat say about their experiences.

WELLESLEY MLP
MUNICIPAL LIGHT PLANT
DEDICATED TO EXCELLENCE

And Wellesley is THE place!



Assumes 82.5% efficiency for oil, propane, and gas heating equipment, 100% for electric resistance, and 275% for heat pumps.
WMLP emissions factor from Wellesley Climate Action Department. Other emissions factors from Mass Save GHG Emission reduction requirement memo, 3/1/24
* Massachusetts Home Heating Fuel Prices, average retail as of 10/6/25, MADOER.
** Reflects current gas delivery and distribution rates, supply rate from Winter 2024-2025, and proposed rate increase of 3.8%.
*** Lower of the two costs reflects Eversource's seasonal heat pump rate, Nov 2025 - Dec 2025 (adjustment for 1/1/26 TBD).

Case Study
Replacement of Ducted Central A/C Units with Heat Pumps
Nov 2015

Case Study: Ducted HPs (Nov 2015)

Replaced ducted central A/C units with HPs (American Standard), $28,000

- Kept existing hydro-air heating system (oil boiler) as a backup
- 1st floor 2.5-ton unit and air handler and 2nd floor 3-ton unit and air handler

Case Study: Ducted HPs (Nov 2015)

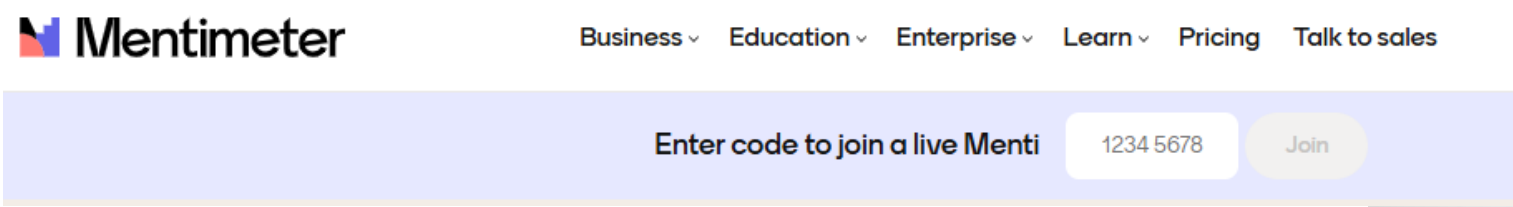
Significant and welcome energy cost savings (and increased comfort)!

- About a 45% reduction in energy use per cold day
- About a 34% reduction in energy costs per cold day

	Heating Degree Days	Heating Oil (gal)	Heating Oil ($)	Electric (kWh)	Electric ($)	MMBTU per HDD	Total Cost per HDD	(Normalized) Total Cost per HDD (1)
Winter 2013-2014	5,689	1,168	$5,103	5,852	$792	0.032	$1.04	$0.87
Winter 2014-2015	5,906	1,143	$3,985	8,680	$1,232	0.032	$0.88	$0.89
Winter 2015-2016	**4,522**	**284**	**$716**	**10,957**	**$1,556**	**0.017**	**$0.50**	**$0.56**
Winter 2016-2017	4,782	210	$634	12,680	$1,801	0.015	$0.51	$0.53
Winter 2017-2018	4,979	386	$1,307	12,212	$1,817	0.019	$0.63	$0.62
Note: (1) Applies an average unit price of $3.510 per gallon of heating oil and $0.142 per kWh for all 5 winters.								

Quiz Time!

https://www.mentimeter.com/



1. Enter Code
2. Enter first name and initial of last name
3. Answer 9 questions (accuracy and speed)

Prizes

- 1st - ecobee Smart Thermostat
- 2nd and 3rd - Smart Power Strip