

Save Money on Home Energy Improvements

January 18, 2023

Mike Simons, Abode Energy Lisa Wolf, Wellesley Municipal Light Plant Loie Hayes, Green Energy Consumers Alliance Mary Gard, Sustainable Wellesley Wellesley's Greenhouse Gas Emissions (2021)

- Buildings are >60% of Wellesley Emissions
- Residences about 40%



Home Energy Use

55% of home energy use is for heating and cooling

Heat pumps are the most efficient equipment

18% of home energy use is hot water heating.

Electric and heat pumps are the most efficient equipment



Why take action:

Do something to fight climate change

Energy bill growing and unpredictable

Drafty, uncomfortable rooms

Aging, unreliable equipment

Unhealthy indoor air

Future mandates

Incentives!

January 18, 2023 Heat Pumps, Weatherization, and Water Heating

Presented by: Michael Simons

Training & Development Manager- Abode

What is a heat pump?



Heat Pumps Do Not Generate Heat, They Move It



WINTER WEATHER AND HEAT

PUMPS

10 Years of Heating Season Data



MAXIMIZE THE USE OF YOUR HEAT PUMP

- 70-80% of our heating seasons is spent at 32°F and above
- Heat pumps can still operate well below zero
- If you are keeping your heating system
 as a backup, use it only when needed



Temperature (F)

WINTER WEATHER AND HEAT



MAXIMIZE THE USE OF YOUR HEAT PUMP

 Heat pump operating cost is highly cost competitive
 Reduce your carbon footprint

Fuel	(Cost	Units
Elec. Resistance*	\$	0.15	kwh
Propane*	\$	3.71	gallons
Oil	\$	4.61	gallons
Heat Pump*	\$	0.15	kwh
Natural Gas*	\$	2.20	therms
*As of 1/4/2	023	From E	IA

Fossil Efficiency	0.9
temp	Heat Pump COP *
-15	1.95
5	2.085
17	2.22
47	4.705
60	4.705



Operating Cost: WMLP Rate Compared to Investor Owned Utility

54 59



Heat Pump Options: Ducted vs Ductless



Existing Furnace:

- Likely an easy switch to a centrally ducted heat pump system. For larger and less efficient homes may need to pursue dual fuel or supplement with additional heat source
- Likely won't address comfort issues if

Ductless Indoor Variations

Wall Hung













Ducted Indoor Variations

Compact (Short- Central Ducted run) Ducted



Low Static: A few rooms Med Static: An entire floor High Static: An entire floor or home





Outdoor & Indoor Unit Variations

Single-Zone (mini split)

• 1 to 1



Multi-Zone (multi split) • 2 to 4



Multi-Zone (w/ branch box) • 2 to 8



Heat Pump System Sizing



Heating Load 50,000 BTUs



Heating Load 24,000 BTUs





2.5 Ton Standard Heat Pump



2.5 Ton Standard Heat Pump Cold Climate Heat Pump Without Capacity Drop

Case Study: Heat Load & Weatherization









A properly designed heat pump system meets 100% of any weatherized home's heating needs.





Heating / Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated	Max
Heating	47°F	70°F	Btu/h	27,000	54,000	54,000
			kW	1.4	4.22	4.22
			COP	5.65	3.75	3.75
Heating	17°F	70°F	Btu/h	11,620	38,000	54,000
			kW	0.92	4.13	6.87
			COP	3.7	2.7	2.3
Heating	5°F	70°F	Btu/h	8,020	-	54,000
			kW	0.74	-	7.91
			COP	3.18	-	2

Key Takeaways:

- Annual operating cost dropped from ~\$3,200 down to \$1,600
- Install cost switched from 50k to 25k
- Reduced load on electrical panel by 30 AMPs, meaning there is the ability to add an EV charger.

Heat Pump Water Heaters

Heat pump water heaters are an efficient hot water system that transfers heat from the surrounding air to heat your home's water without burning fossil fuels.

- UEF between 2.2 and 3.5+ compared to 0.6-.95 for conventional water heaters
- Lower greenhouse gas emissions
- Many homes can benefit from dehumidification in the basement





Considerations

Venting





- Venting can either be balanced, pressurize, or depressurize a space
- The output of the water heater is cool dry air
- May need venting if in a utility closet

Garages should be avoided at all cost 750 cubic feet is typically required Usually needs to be 50F + year round to operate efficiently Electrical



- Usually need a dedicated 30AMP 2-pole breaker.
- A 100AMP service can likely accommodate this upgrade

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SAVE BIG ON HOME HEATING AND COOLING

Rebates and Incentives for Electrifying Your Heating



January 18, 2023 Lisa Wolf Sustainability Coordinator Ways to Reduce Your Carbon Emissions





WMLP supports residents at each step to prepare for heat pumps:

- 1. Energy Audit (free)
- 2. Weatherization (incentivized)
- 3. Heat Pump Consultation (free)
- 4. Installation (rebates)

How you heat your home determines which incentives and retrofit options are available to you

	Natural Gas	Propane	Oil	Electric Resistance
Heating System	Furnace (Heated air conveyed through a duct system)	Furnace	Boiler (Water / steam circulated through radiators , etc)	Heating elements (radiate from radiators, baseboards, etc)
Incentives	Mass Save		WMLP	
Retrofit Options	Use existing ducted system	Use existing ducted system	Install ductless mini- splits	Install ductless mini- splits

Step 1. Energy Audit

An audit report will:

- Suggest whole-home decarbonization pathways
- Identify insulation requirements
- Cover benefits from upgrading heating systems, appliances and hot water heaters
- Provide guidance on available rebates
- Evaluate whether a panel upgrade is needed

If you heat your home with gas:



Call 855-891-9899

If you heat your home with oil, propane, electric resistance:



Call 888-577-8448



SERVICES

GOVERNMENT

DEPARTMENTS

COMMUNITY





Free Home Energy Assessment

Energy Hotline

Home > Departments > Departments G-N > Municipal Light Plant > MLP Sustainability Initiatives > Free Home Energy Assessment

Free Home Energy Assessment

If you heat your home with natural gas, call 855-891-9899, National Grid, to schedule your FREE home energy assessment.

If you heat your home with oil, propane or electricity, call 888-577-8448, Center for EcoTechnology, to schedule your FREE home energy assessment.

Benefits of a Home Energy Assessment

- $\circ~$ Learn how you can lower energy use and save money
- Free energy-saving LED light bulbs
- 2 free smart power strips
- Free water-saving faucet aerators and shower heads
- Digital programmable thermostats to replace old models
- $\,\circ\,$ Inspection of heating & cooling equipment for safe operation and CO2 levels
- Identification of areas lacking insulation, such as basement, exterior walls, overhangs, attic, knee walls, crawl ceilings

Greenhouse Gas Emission Reduction

Energy Efficiency Rebates

LED Streetlight Project 2018

WECARE Program

Step 2. Weatherization

The most cost-effective way to reduce carbon output and energy bills

- Only 1 in 5 homes built before 1980 are properly insulated
- Primary methods are attic and wall insulation, insulating windows and gap sealing
- Lowers household energy use and saves money
- Required by Mass Save for whole home conversion









Step 3. Heat Pump Consultation

Consultation services provided by MassSave (gas) and Abode (non-gas):





A consultation will provide guidance on:

- Most efficient design for your goals and unique needs of your home
- Designing a system for cold temperatures
- Available rebates and incentives
- Guidance on working with installers
 - Start getting installer quotes now—don't wait until your boiler quits!
- Objective, impartial evaluation of proposals received



Heat Pump Program

Level Your Load

Wellesley Drives Electric

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Home > Departments > Departments G-N > Municipal Light Plant > Reduce Your Carbon Footprint > Heat Pump Program

Clean Comfort Heat Pump Program

Ready to Update Your Old Heating and AC Systems?

Now is the ideal time to convert to a Heat Pump – get winter heating and summer cooling in one!

- Receive up to \$10,000 in rebates from MassSave (gas customers) or WMLP (non-gas customers)
- Save up to an additional \$10,000 with the NEW Inflation Reduction Act incentives
- $\circ~$ Lower annual energy costs
- Increase your home resale value
- Improve efficiency of heating and cooling your home
- Enjoy cleaner, quieter, more comfortable heat and AC
- $\circ~$ Reduce your carbon footprint by >40%

To learn more, contact Abode for a FREE consultation

(or call (339) 707-0918 to schedule a consultation)

View the <u>Air Source Heat Pump Rebate Program Requirements</u>

Click to Find a list of participating contractors



Step 4. Install System



Which incentives are available to you depends on how you heat your home

Category	Home Upgrade	WMLP	MassSave (gas heat customers)
	Gas to ASHP		up to \$10K
	Oil, Propane to ASHP	up to \$10K	
Heating	Electric Resistance to ASHP	up to \$5K	
	Heat Pump water heater	\$500	\$750
	Ground Source HP	up to \$10K	up to \$15K
Transportation	EV		\$2.5K
Transportation	Charger	50% up to \$350	
	Audit	FREE	FREE
Efficiency	Weatherization (insulation and air sealing)	50% up to \$1,500	75% to 100% off insulation; no-cost air sealing of leaks
Efficiency	LEDs	FREE with Audit	
	Windows		\$75/window
	WiFi Thermostat	50% up to \$125	up to \$100
Electrical	Electrical Panel	\$750	
Electrical	Integrated Controls	\$100/ea up to \$400	up to \$1,500
	Electric Induction Stove	\$100 (from electric) \$500 (from gas)	\$500
Appliances	Heat Pump clothes dryer	\$100 (from electric) or \$250 (from gas)	up to \$50
	Dehumidifier, regrigerator, dishwasher	\$50	\$30
	Lawn Equipment	\$25-\$75	up to \$75

SUMMARY

- 1. Get a Free Energy Audit
- 2. Weatherize Your Home
- 3. Get a Free Heat Pump Consultation
 - a. Get **Quotes** from Preferred Contractors
 - b. Choose Contractor
- 4. Apply for Utility and Federal rebates

IRA Incentives for Building Electrification

HOMES Program, rebates administrated by states

\$4.3 billion for US

\$73 million for Mass.

- Rebates based on projected energy savings of total retrofit
- No income restrictions: up to 50% of project cost
- Low-income adder: up to 80% of project cost
- HERS Raters can project savings
- Starts in 2023



Source: <u>Atlas Buildings Hub</u> AMI Source: <u>Area Median Income Lookup Tool (fanniemae.com)</u>



High Efficiency Electric Home Rebates

\$4.5 billion for US

\$73 million for Mass.

- income-qualified rebates
- <80% AMI: up to 100% of cost
- <150% AMI: up to 50% of cost
- Cap: \$14,000/unit
- Starts in 2023
- Can't be combined for same measure



Source: <u>Atlas Building Hub</u>

AMI Source: Area Median Income Lookup Tool (fanniemae.com)

Residential Energy Efficiency Tax Credit

\$12.5 billion

- 10 years, starting in 2023
- increases credit amount from 10% to 30% for qualified energy efficiency improvements
- removes lifetime cap so you can claim this annually for new

measures	Windows, Skylights; Central A/C; Electric Panels; High Efficiency
\$600	Fossil Fuel Water Heaters, Furnaces and Boilers
\$2,000	Electric or Natural Gas Heat Pump Water Heaters, Electric or Natural Gas Heat Pumps, and Biomass Stoves and Boilers



Residential Clean Energy Tax Credit

\$22 billion

- Extends for 10 years a tax credit that was set to expire
- 30% from 2022 till 2032; 26% in 2033, and 24% in 2034
 - geothermal heat pumps
 - solar PV
 - solar water heating
 - home battery storage *for the first time with or without solar*



Stack Your Incentives

Utility Rebates + Federal (IRA) Rebates + Federal Tax Credits

+

State Tax Credits (Solar Only)

= Big Savings on Energy Efficiency for Existing Homes



Step 1: Utility Rebates

Choose One, depending on how you heat your home:



....if you heat your home with natural gas

OR

MLP



....if you heat your home with oil, propane or electric resistance

Step 2: Federal Rebates Choose One: HEERHA (IRA § 50122) OR HOMES (IRA § 50121)

If you make less than 80% of the Area Median Income:

HEERHA = 100% of efficiency upgrade costs, with limits

HOMES = \$4,000 for a 20% Reduction in Whole Home Energy Use \$8,000 for a 35% Reduction in Whole Home Energy Use

If you make 80-150% of the Area Median Income:

HEERHA = 50% of efficiency upgrade costs, with limits

HOMES = \$2,000 for a 20% Reduction in Whole Home Energy Use \$4,000 for a 35% Reduction in Whole Home Energy Use

If you make **more** than 150% of the Area Median Income:

HEERHA = Not eligible

HOMES = \$2,000 for a 20% Reduction in Whole Home Energy Use \$4,000 for a 35% Reduction in Whole Home Energy Use



<u>Step 3</u> 30% Federal Tax Credit

Annual cap of \$1,200 (or \$2,000 for heat pumps) and requires income tax liability (25C) No cap for clean energy installations (25D)

You can take this credit every year for the next 10 years

The Jones Family, <80% AMI

Heat Pump Cost: \$25,000

- → Utility Rebate
 - \$10,000
 - → IRA (federal) Rebate
 - ◆ HEERHA: \$8,000
 - → 30% Federal Tax Credit
 - If enough taxable income and capped at \$2,000

Net Cost: \$5,000



The Kim Family, 80-150% AMI

Heat Pump Cost: \$25,000

- → Utility Rebate
 - \$10,000
 - → IRA Rebate
 - ◆ HEERHA: \$4,000
 - → 30% Federal Tax Credit
 - ◆ \$2,000 limit



Net Cost: \$9,000

The Gomez Family, 150%+ AMI

Heat Pump Cost: \$25,000

- → Utility Rebate
 - ♦ 10,000

→ IRA (federal) Rebate

- ♦ HOMES: \$2,000 (for 20% energy use reduction. It would be \$4,000 rebate if 35% energy use reduction was achieved)
 - → 30% Federal Tax Credit
 - ◆ \$2,000 limit_

Net Cost: \$11,000



Wellesley Example: Stack Your Incentives

Example: CONVERSION TO A \$25,000 HEAT PUMP SYSTEM

Cost to you	5,000	9,000	11,000
+ IRA Tax Credit of 30%: ²	2,000	2,000	2,000
+ IRA (HEERHA) Rebate <u>or</u> IRA (HOMES) Rebate:	4-8,000 4-8,000	4,000 2-4,000 ¹	0 2-4000 ¹
Utility Rebate :	10,000	10,000	10,000
<u>80% AN</u>	<u>MI*</u>	<u>80-150% AMI</u>	<u>150%++ AM</u>

¹ \$2,000 assumes home energy use reduction of 20%; if reduction is 35%, the rebate would be \$4,000
 ² Apply against cost minus rebates; assumes enough tax liability for a credit; capped at \$2,000

Wellesley: STACK YOUR INCENTIVES (not a complete list)

[mass save Savings through energy efficiency	Or	DEDCATED TO EXCELLENCE DEDCATED TO EXCELLENCE ENERGY EFFICIENCY REBATES	+	IRA REBATE ¹	+	IRA Tax Credits ²	+	Other State Incentives
Solar / battery	00	or	00	+	00	+	30%	٦	15% solar tax credit
Air-Source HP	\$10,000	or	\$10,000	+	\$2-8,000	+	30%		0 % Property Tax
Ground-Source HP	\$15,000	or	00	+	\$2-8000	+	30%	1	Solar and Heat Pumps
Heat Pump H2O Heater	\$750	or	\$500	+	\$1,750	+	30%		Exempt from 6.25% MA
Insulation and Sealing	75-100%	or	50%	+	\$1,600	+	30%	J	
Electric Panel Upgrade	\$750	or	\$750	+	\$4,000	+	30%	-	
Induction Stove	\$500	or	\$100-500	+	\$840	+	00		
HP Clothes Dryer	\$50	or	\$100-250	+	\$840	+	00	-15	STATE
Energy Star Doors/Window	rs \$75/wind	low	00		00	+	30%	-	ENERGY EFFICIENCY INCENTIVES for INCOME FLIGIBLE

RESIDENTS

Including 0% interest loans

¹IRA Rebate amounts depend on income and program selected (HEEHRA or HOMES)

²Up to certain dollar limits, except unlimited 30% for clean energy production (solar, battery, etc.), prevailing wage and apprenticeship requirements

Kim Family: 80-150% AMI, oil-heated home

Year	Replace	Buy	Cost	IRA (HEERHA) Rebate	WMLP Rebate	IRA Tax Credit	State tax Credit	Final Price	Amount Saved
2023	100A electric panel	200A Smart Panel	\$2,000	1,000	750	75		175	1,825
		insulate and air seal	\$1,600	800	800	not needed		0	1,600
		new elec. wiring	\$2,000	1,000		300		700	1,300
2024	oil burning furnace	air source heat pump	25,000	4,000	10,000	2,000		9,000	16,000
	window ac units	whole home AC	0					0	?
2025	oil fired water heater	heat pump water heater	3,000	875	500	488		1,137	1,863
2026	gas stove	elec induction stove	1,500	420	500	174		406	1,094
2027	old elec clothes dryer	heat pump dryer	1,500	not allowed	100	not allowed		1,400	100
2028	old front & back door	2 Ene.Star exterior doors	2,000			600		1,400	600
	Six Year Subtotal:		38,600	8,095	12,650	3,637		14,218	24,382
TBD:									
2029	electricity costs	solar panels	19,000			5,700	1,000	12,300	6,700
2030	peak demand	battery storage	12,000			3,600		8,400	3,600
	Eight Year Total:		\$69,600	\$8,095	\$12,650	\$12,937	\$1,000	\$34,918	34,682

What's Your Plan?

MassCEC Clean Energy Home Plan

IRA Guidance: <u>Rewiring America "IRA" Calculator</u> <u>Rewiring America Digital Guide</u>

IRS Tax Credit Guidance: (§25C and §25D)

Utility Rebates: <u>Wellesley MLP Rebates</u>

MassSave Rebates for Weatherization, Heat Pumps, Appliances and Loans

Enhanced (Income-Based) MassSave Rebates

Heat Pump Advice: Abode Energy

Solar Advice: Sagewell

Wellesley Energy Coach Program

- Become a Wellesley Energy Coach
 - Free Training
 - Provide expert guidance to Wellesley residents
 - Areas of expertise: Heat Pumps, EV's, Solar, Batteries, Waste Reduction, ...
 - Contact: info@sustainablewellesley.com for more information or to volunteer
- Get expert guidance from a Trained Energy Coach (coming soon)
 - Calculate your EUI
 - Get guidance on rebates
 - Guidance on benefits of electrification







Following slides not presented:

IRA Contractor Incentives

\$500 to contractor for each retrofit where a rebate was awarded to a Homeowner under HEERHA

\$200 to contractor for each retrofit where a rebate was awarded to Homeowner under HOMES, in communities that the Secretary of Energy determines to be socially, economically or environmentally disadvantaged

\$200 million available to states to develop workforce training programs for energy efficiency contractors.

IRA Landlord or Developer Incentives

- > HEERHA rebates apply to multifamily properties if 50% or more of the tenants are low to moderate income.
- Commercial Building Tax Deduction (179D) for energy retrofits of multifamily homes that are four floors or higher (and other commercial property), up to \$5.00/ square foot, based on reduced building energy use intensity (EUI)
- The New Energy Efficient Home Tax Credit (45L) provides up to: \$5,000 credit to developers of homes that qualify for the Department of Energy's Net Zero Energy Ready Homes standard, or \$2,500 credit for developers of homes that meet requirements of the Energy Star "Single-Family New Homes' or 'Manufactured Homes' Programs. Both credits apply to new single family, multifamily and manufactured homes, as well as existing homes that undergo a deep retrofit.
- > 30% Energy Efficient Home Improvement Tax Credit (Heat pumps, etc.) (25C)
- > 30% Residential Clean Energy Tax Credit (Solar, Batteries, etc.) (25D)

Ideas for Renters

https://content.rewiringamerica.org/reports/electrify-home-guide.pdf



A GUIDE TO COMFY, HEALTHY, CARBON-FREE LIVING

BY JOEL ROSENBERG, REWIRING AMERICA

Appendix IV

Renter Checklist

- \rightarrow If you're a renter, this list will help you Electrify Everything in Your Home as you go through Rewiring America's guide: rewiringamerica.org/electrifyhome-guide
- → Also download Redwood Energy's Pocket Guide to All-Electric Retrofits of Single-Family Homes to see product options for many of these items: redwoodenergy.net/research

Which of these modern electric options do you want working for you?

. Purchase Renewable electricity	HAVE	WANT
Your utility's renewable plan If shared meter ask landlord to switch Community Solar subscription Community Wind subscription Reduce your electricity needs LED light bulbs Power strips to shut off standby loads		
Space Heating and Cooling	HAVE	WANT
Packaged heat pumps Window unit heat pump Portable heat pump Other heating options:		
Plug-in space heater Electric blanket Electric fireplace		
Electric outdoor patio neater	HAVE	WANT

4. Hot Water

3

Reduce your hot water needs	E
Leaks and drips fixed	0
Low-flow shower heads	0
Low-flow faucets & aerators	C

Appendix IV

	HAVE	WANT
\$50+ portable induction burner		
Other electric cooking options:	_	-
Electric crockpot		
Electric wok	П	П
Countertop togster oven		
Electric camp stove		
Electric barbeque		
Clothes washing	HAVE	WANT
Clothes drying rack or clothesline		
Combined washer / condensing dryer, 120V ventless		
Electric Vehicles	HAVE	WANT
Driving plan		
Plug-in Hybrid Electric Vehicle (PHEV)		
All Electric Vehicle (EV)		
120V Level 1 Charger (included with EV)		
Other electric transportation:		
Electric bicycle		
Electric scooter		
Electric skateboard		
EV Charger	HAVE	WANT
and a second second second		
Try included 120V Level 1 charger first		
Try included 120V Level 1 charger first Ask landlord about installing Level 2 charger		
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Try included 120V Level 1 charger first Ask landlord about installing Level 2 charger Ask employer about installing Level 2 charger Ask employer about installing Level 2 charger 1. Home Battery Storage Standalone backup battery ther activities Electric leaf blower Electric chain saw Electric chain saw Electric lawn mower Electric snowblower	HAVE	WANT WANT WANT