

# Maine Climate Council

## Building, Infrastructure, and Housing Working Group

### Co-Chairs:

Kathleen Meil, Maine Conservation Voters

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GOVERNOR'S OFFICE OF  
Policy Innovation  
and the Future



MAINE DEPARTMENT OF  
Environmental Protection

December 7, 2023

# Meeting Goals

- Develop an understanding of the buildings-related targets in *Maine Won't Wait* and where they came from
- Discuss how the working group will spend its time

# Agenda

- Welcome and introduce new working group members
- Review Buildings, Infrastructure & Housing (BIH) targets and progress
- Prioritization discussion
- Next steps

# Residential, commercial and industrial buildings account for 45% Maine's CO<sub>2</sub> emissions



**21%**

**Residential**



**12%**

**Commercial**



**12%**

**Industrial**

Residential, commercial and industrial emissions account for 45% of all carbon dioxide emissions from fossil fuel combustion in Maine




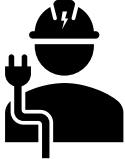
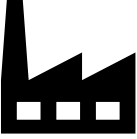

Data source: Maine Department of Environmental Protection 9th Biennial Greenhouse Gas Emissions Report



# Three paths to reducing greenhouse gas emissions

Maine can reduce greenhouse gas emissions by using cleaner energy, increasing energy efficiency, and utilizing lower-carbon building materials

Data source: Maine Won't Wait

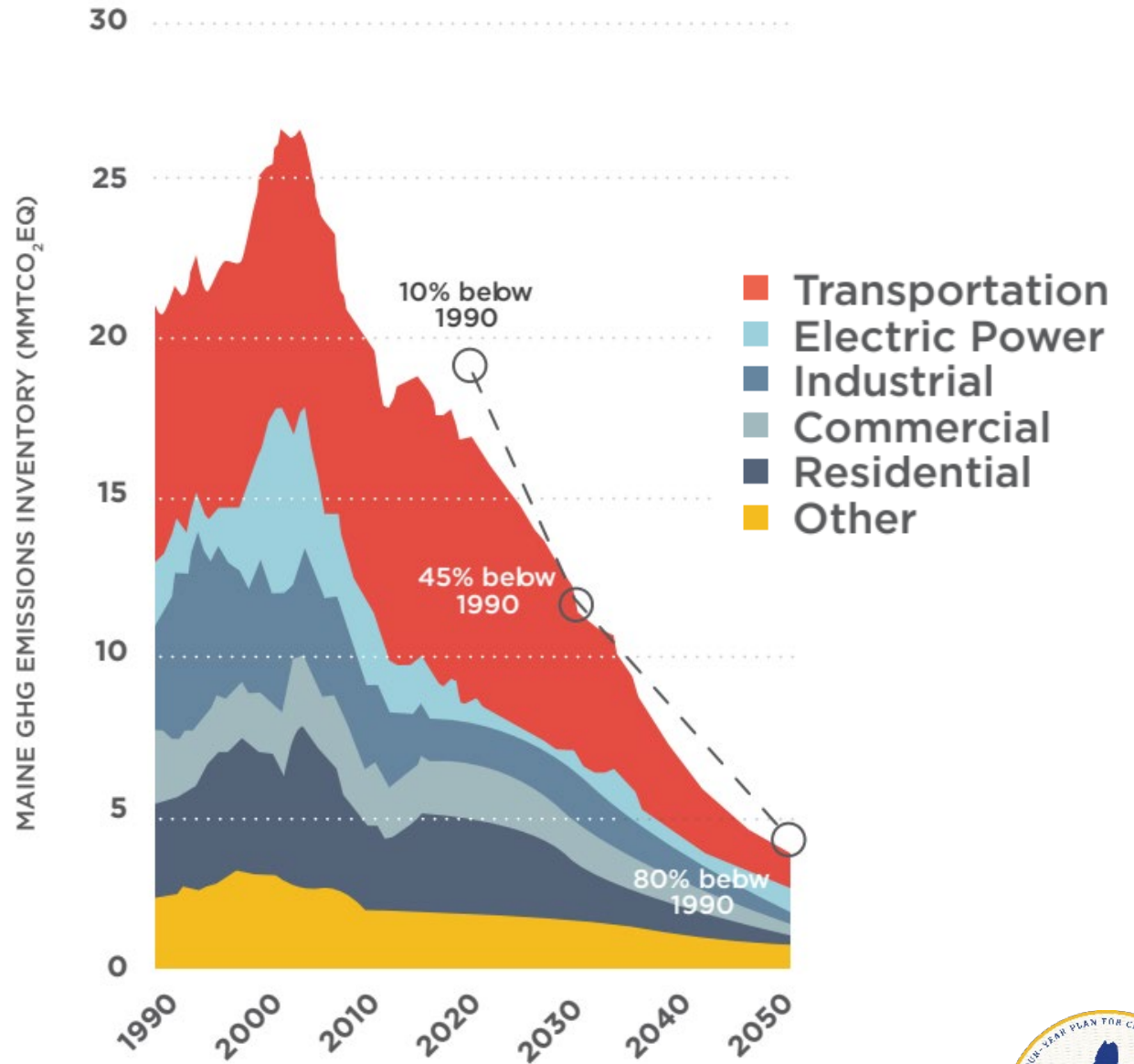
		<b>Lower-carbon building materials</b>
		<b>Energy efficiency</b>
		<b>Cleaner energy</b>





# Emissions reductions by sector needed to meet Maine's emissions targets by 2050

Maine emissions by source  
1990 - 2050 modeling



Source: Synapse Energy Economics.

# Economy-Wide Modeling Assumptions

	2030	2050
Number of households with retrofit heat pumps (installed after 2018) and legacy fossil systems	130,419	26,101
Number of households with whole home heat pump systems	115,636	487,355
Weatherized households	40,000	80,000

**Maine emissions by source**  
1990 - 2050 modeling

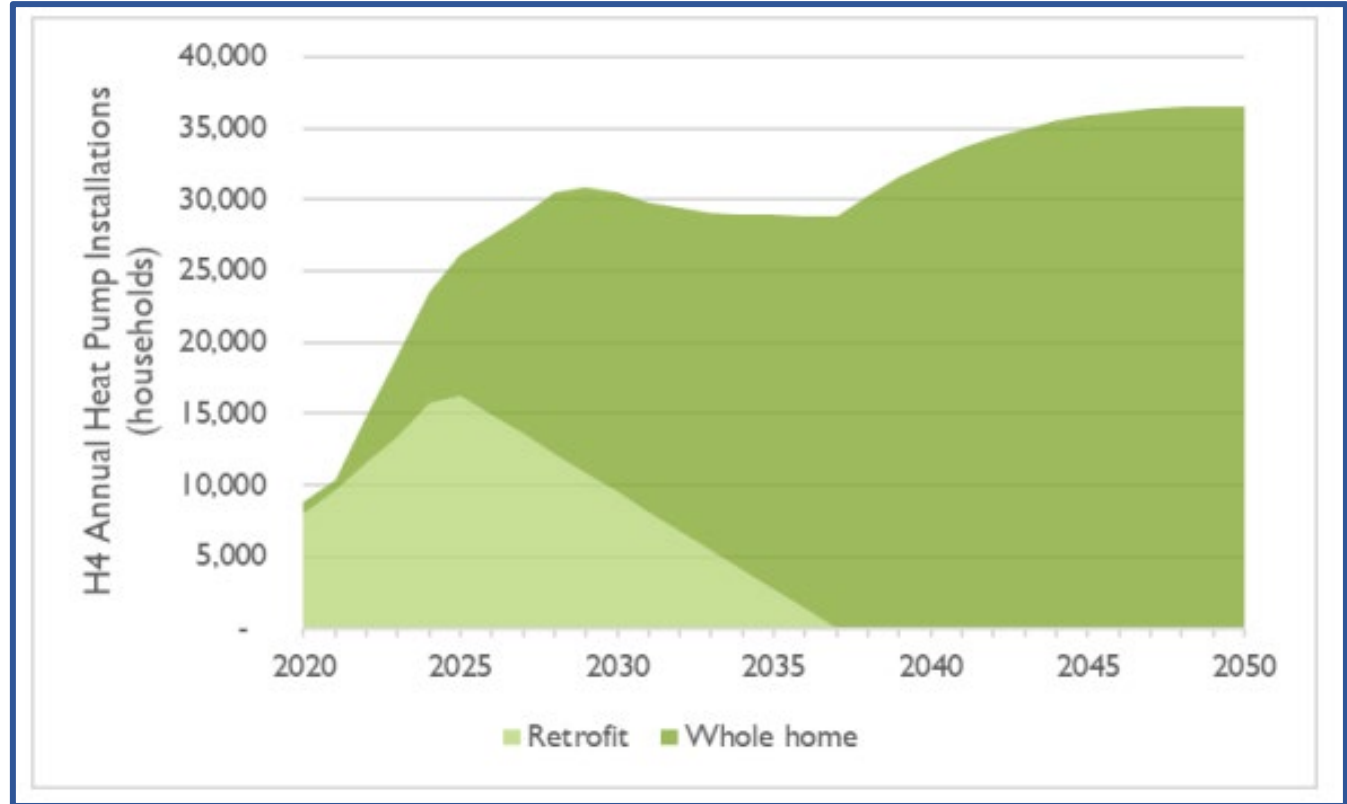
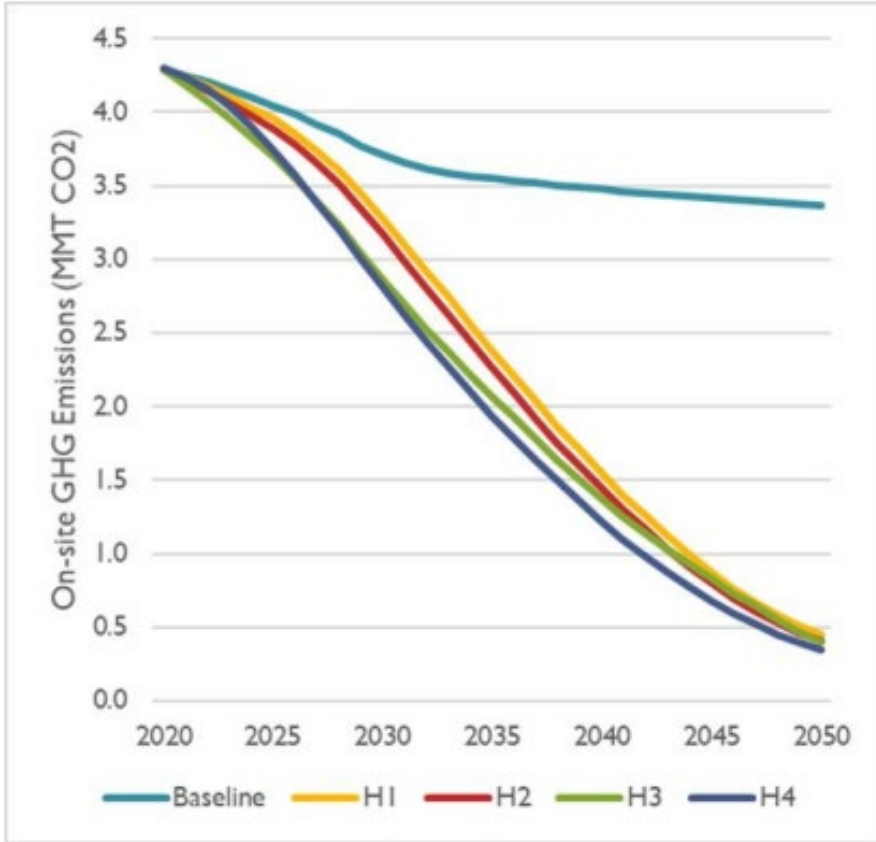
Source: Synapse Energy Economics

# Buildings Sector Modeling Assumptions

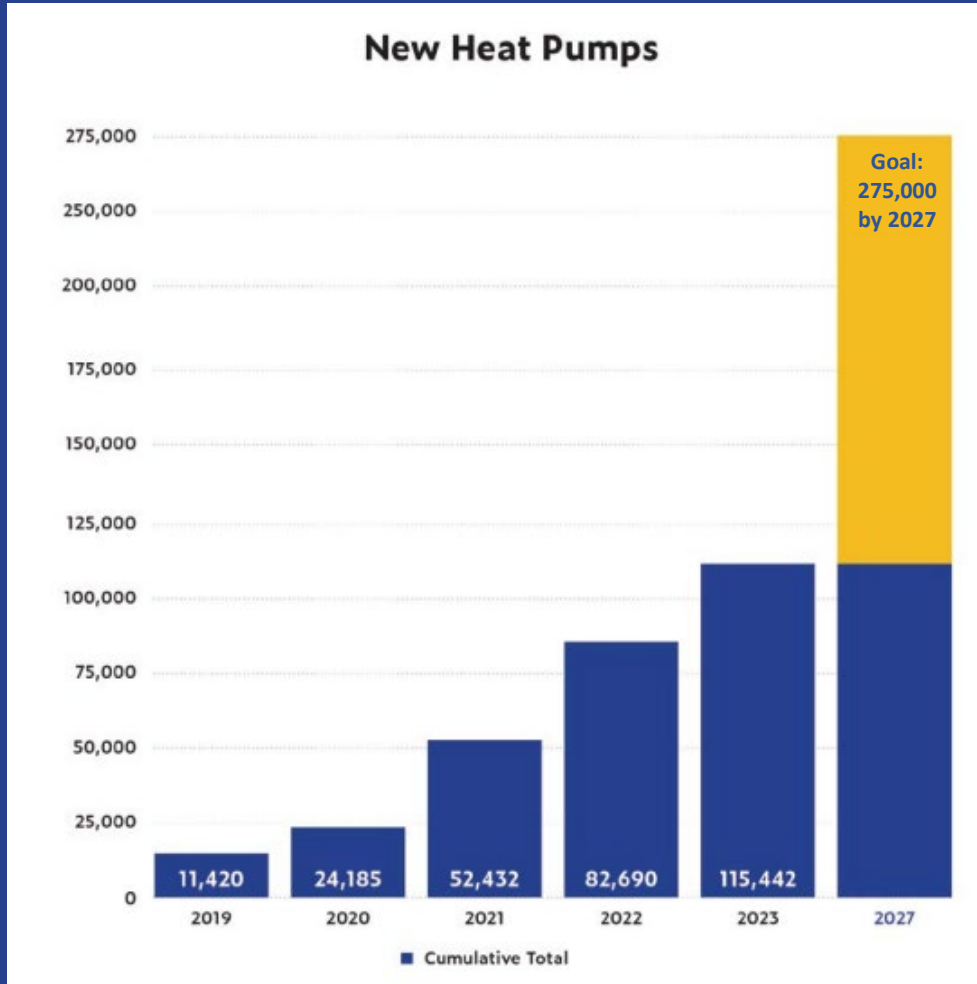
Baseline	H1	H2	H3	H4
<b>Continued efforts to install residential retrofit heat pumps—baseline efficiency</b>	<b>Full Electrification—baseline efficiency</b>	<b>Electrification—aggressive efficiency</b>	<b>Electrification—baseline efficiency and low carbon fuels</b>	<b>All strategies to meet 2030 emissions target</b>
<ul style="list-style-type: none"> <li>• 2.2% cumulative residential space heat energy reduction by 2050 through weatherization</li> <li>• 41% of households have heat pumps or legacy resistance heating by 2050</li> </ul>	<ul style="list-style-type: none"> <li>• 2.2% cumulative residential space heat energy reduction by 2050 through weatherization</li> <li>• 90% of households have heat pumps and 90% of commercial heating load is electrified by 2050</li> </ul>	<ul style="list-style-type: none"> <li>• 20% cumulative residential space heat energy reduction by 2050 through weatherization</li> <li>• 90% of households have heat pumps and 90% of commercial heating load is electrified by 2050</li> </ul>	<ul style="list-style-type: none"> <li>• 2.2% cumulative residential space heat energy reduction by 2050 through weatherization</li> <li>• 67% of households have heat pumps and 60% of commercial heating load is electrified by 2050</li> <li>• Remaining load in 2050 is primarily supplied with biodiesel and fuel oil blends and renewable natural gas</li> </ul>	<ul style="list-style-type: none"> <li>• 2.9% cumulative residential space heat energy reduction by 2050 through weatherization (1.5% by 2030)</li> <li>• 90% of all residential and commercial heating systems that burn out are replaced with heat pumps by 2030</li> </ul>



# Buildings Sector Scenarios



# Heat pump goal reached, new target set



Source: Efficiency Maine & MaineHousing. Note: Efficiency Maine's reported numbers are aggregated to their fiscal year which runs from July 1 of the previous year to June 30 of the stated year. MaineHousing's reported numbers are based on a given calendar year.

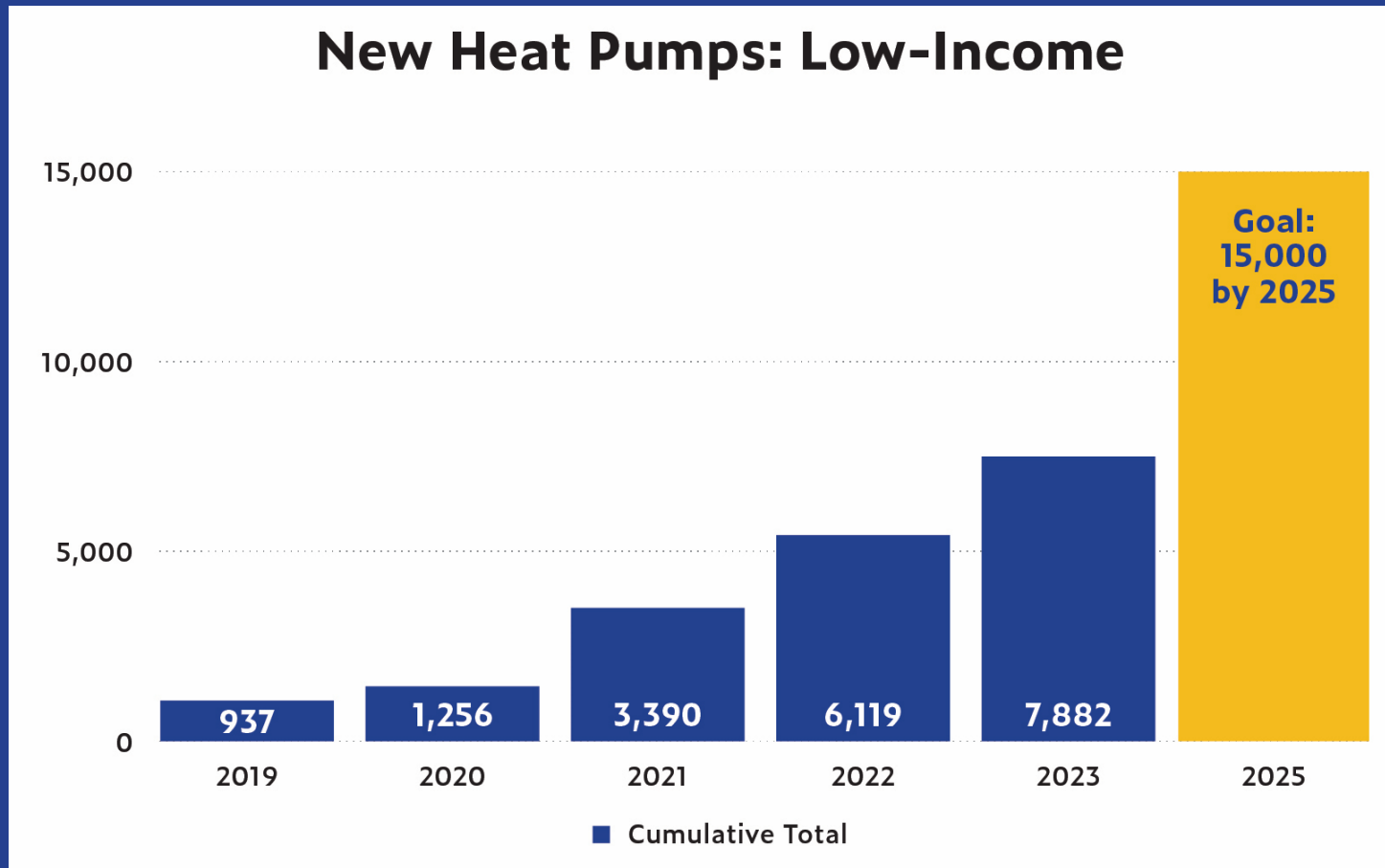
## *Done:*

Install at least 100,000 new heat pumps in Maine by 2025

## *New goal:*

Install additional 175,000 heat pumps in Maine by 2027

# Heat pumps for low-income households

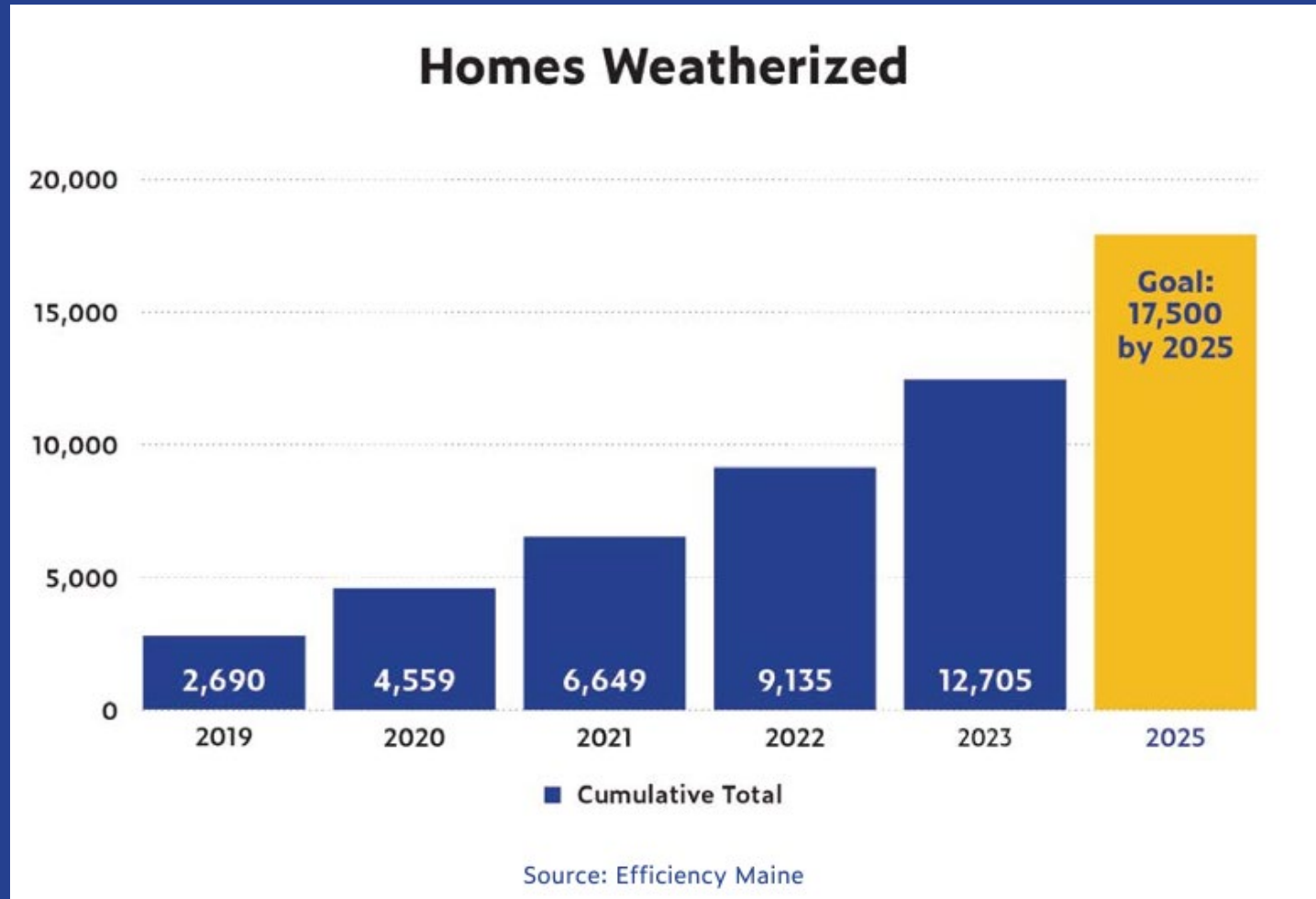


**Goal:**  
Install at least 15,000 new heat pumps in income-eligible households by 2025

**Equity Goal #1:**  
Increase...heat pump installation for low-income households, renters, and in rural communities

Source: Efficiency Maine & MaineHousing. Note: Efficiency Maine's reported numbers are aggregated to their fiscal year which runs from July 1 of the previous year to June 30 of the stated year. MaineHousing's reported numbers are based on a given calendar year.

# Home weatherization on pace



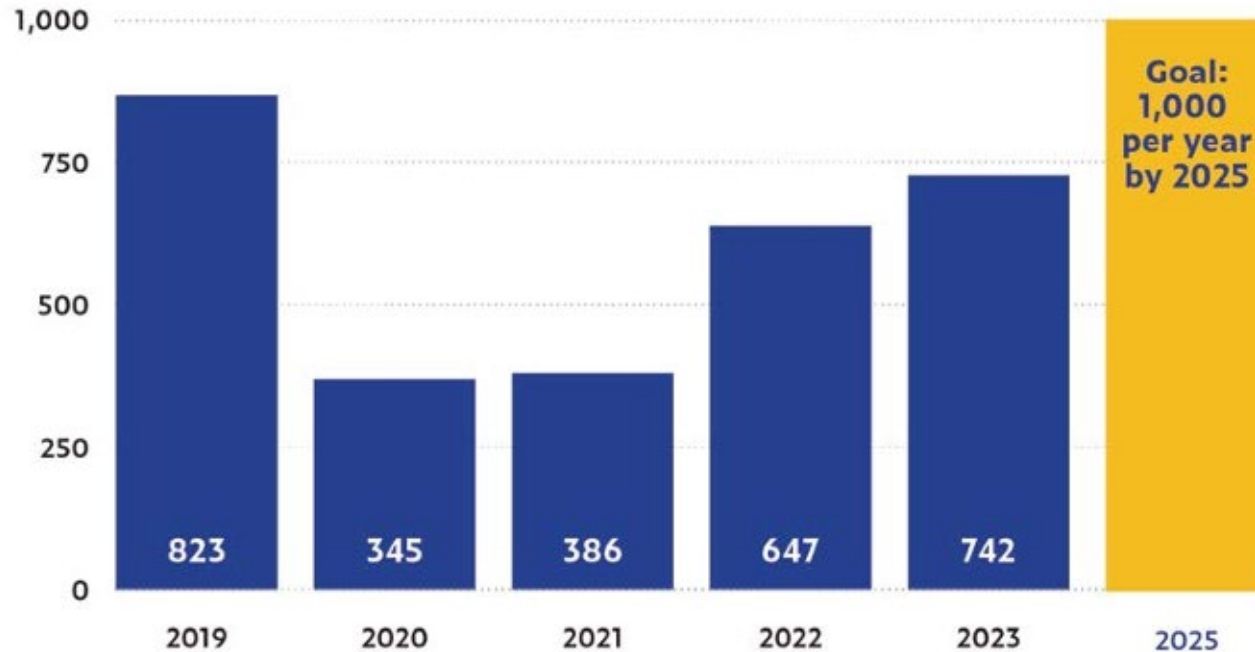
## *Goal:*

Weatherize  
17,500 homes  
and businesses  
by 2025

—  
35,000 homes  
and businesses  
by 2030

# Weatherization of low-income homes

## Homes Weatherized: Low-Income



Source: Efficiency Maine & MaineHousing

### *Goal:*

Weatherize at least 1,000 low-income units per year

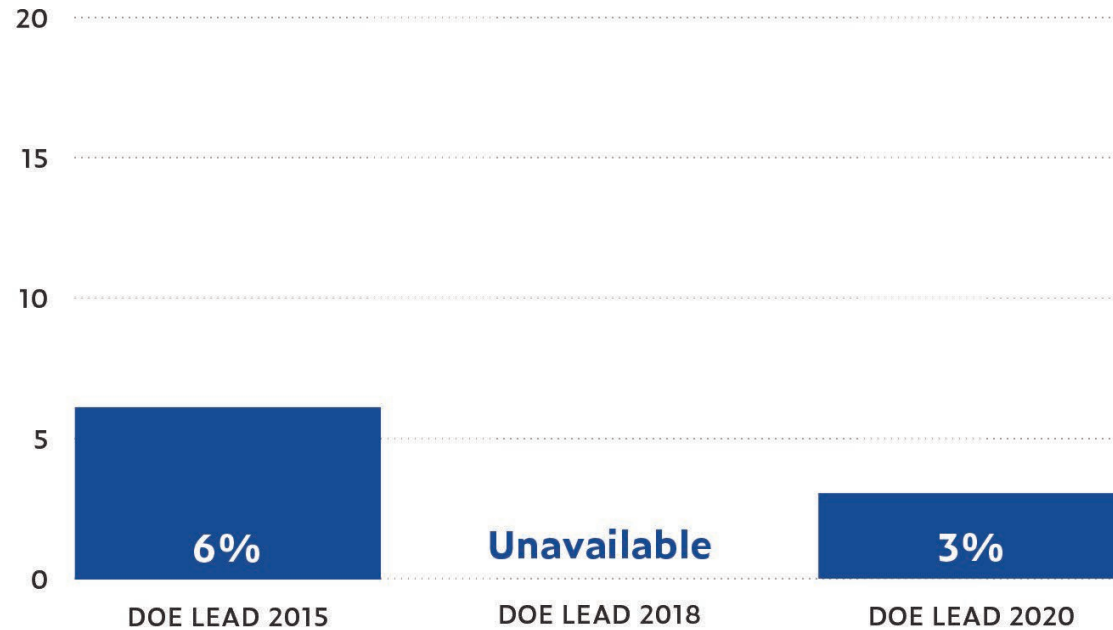
### **Equity Goal #1**

Increase weatherization...for low-income households, renters, and in rural communities



# Lowering energy burden for Mainers

## Energy Burden



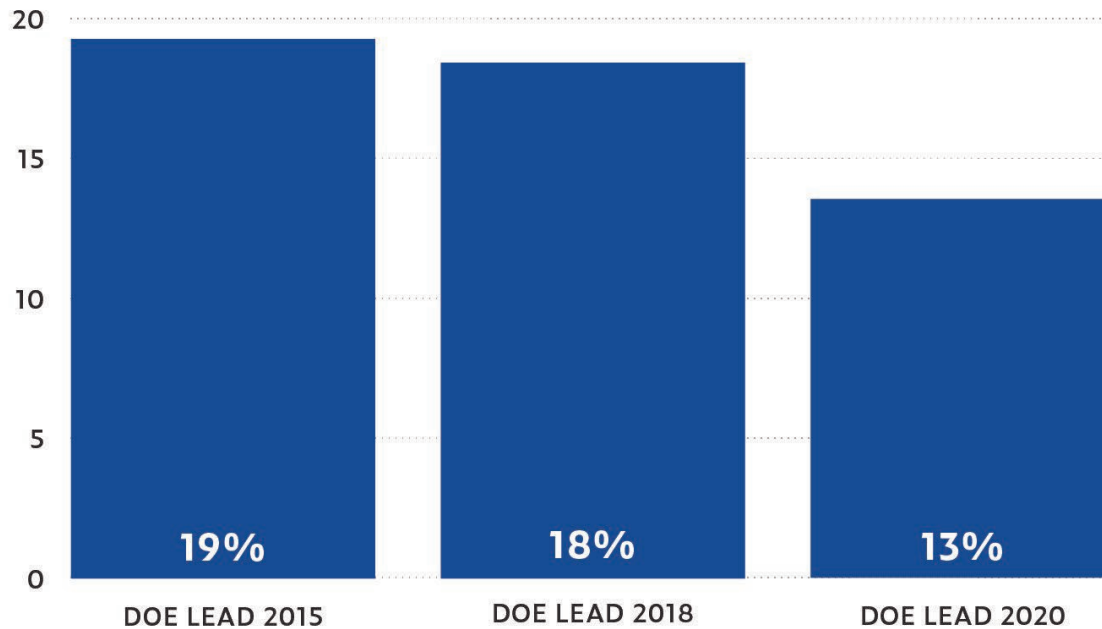
Source: Governor's Energy Office and US Department of Energy

**Average energy burden** down 50% in five years **across all Maine households**

$$\text{Energy burden} = \frac{\text{Income spent on energy costs}}{\text{Total income}}$$

# Lowering low-income energy burden

## Low Income Energy Burden



Source: Governor's Energy Office and US Department of Energy

**Average energy burden** down 26% in five years **across all Maine low-income households**

$$\text{Energy burden} = \frac{\text{Income spent on energy costs}}{\text{Total income}}$$

# Energy Efficient New Construction

Single family analysis prepared by Energy Resources Group, based on the National Renewable Energy Lab's (NREL) "Building Energy Optimization Tool" (BeOpt) and RMI (2018) "The Economics of Zero Energy Homes."

TABLE 3: NEW SINGLE FAMILY BUILDS – SUMMARY OF INCREMENTAL COST AND CO<sub>2</sub> SAVED

Scenario	Climate Zone (IECC)	Incremental Cost (Present Value)	MMBTU/Year Savings	CO <sub>2</sub> /Year Savings (lbs)	Cost (PV)/CO <sub>2</sub> Saved
Single Family, Portland	6	-\$395.00	63.30	9,238.63	-\$0.04
Single Family, Bangor	6	-\$809.00	72.10	10,522.99	-\$0.08
Single Family, Caribou	7	\$855.00	81.50	11,894.91	\$0.07

**Result:**  
2021 IECC standard adopted by Maine Technical Codes and Standards Committee

# Energy Efficiency in Affordable Housing

Multifamily new construction analysis based on Avesta Housing (2020a-c) data on multifamily projects in Maine 2015-2019.

TABLE 4: NEW MULTIFAMILY BUILDS – SUMMARY OF INCREMENTAL COST AND CO<sub>2</sub> SAVED

Building Design	Initial Costs	Operating Costs/Year	MMBTU/Year	CO <sub>2</sub> /Year (lbs)	Initial
<b>Per Ft<sup>2</sup></b>					
Code Compliance	\$164	\$1.80	0.09	10.48	—
Passive Design	\$165	\$0.99	0.03	4.27	—
High Performance	\$161	\$0.84	0.04	4.83	—
LEED	\$170	\$0.95	0.04	5.48	—
<b>All Non-Code Compliance</b>	<b>\$165</b>	<b>\$0.90</b>	<b>0.04</b>	<b>4.89</b>	—
<b>Incremental Difference from Code Compliance</b>					
Passive Design	\$0.87	-\$0.81	-0.06	-6.21	\$0.14
High Performance	-\$3.19	-\$0.96	-0.05	-5.64	-\$0.57
LEED	\$6.02	-\$0.85	-0.05	-5.00	\$1.20
<b>All Non-Code Compliance</b>	<b>\$0.37</b>	<b>-\$0.89</b>	<b>-0.05</b>	<b>-5.59</b>	<b>\$0.07</b>
<b>% Difference from Code Compliance</b>					
Passive Design	0.5%	-44.9%	-68.1%	-59.2%	—
High Performance	-1.9%	-53.4%	-57.5%	-53.9%	—
LEED	3.7%	-47.2%	-50.9%	-47.7%	—
<b>All Non-Code Compliance</b>	<b>0.2%</b>	<b>-49.7%</b>	<b>-58.0%</b>	<b>-53.3%</b>	—

**Result:**  
MaineHousing required to achieve Passive House standard in all new construction by 2024

# Demand Management

- Efficiency Maine Programs / Capacity
  - Managing load now
    - Demand Response Initiative
    - Load Shifting Initiative (EV batteries, small home batteries)
    - DERMS platform in place
  - Managing load in the future
    - Connected Communities Pilot
    - Heat pumps & thermal storage pilot
- Maine PUC
  - Integrated Grid Planning Docket ongoing
- GEO
  - Pathways to 2040 ongoing



# New and continued *opportunities*

1. Continue progress in heat pump installation and home weatherization
2. Advance energy efficient building codes
3. Continue improving energy efficiency in affordable housing, schools, and public buildings
4. Develop more financing options to support energy efficiency and clean energy goals
5. Manage the impact of building loads on the grid

# Key ideas expressed last meeting

We need "lead by example" and demonstration projects to overcome barriers

We need to keep an affordability lens

Let's look at codes, and training around code enforcement

There's been tech advancement - let's catch up

Demand mgmt will be important

Don't forget alternative fuels - RNG and hydrogen

# Poll:

1. What are the most important considerations the BIH working group should discuss as it develops recommendations for Maine's updated climate action plan? - Menti poll
2. What topics would you like to see presentations on, and can you recommend any specific guests? - in the Zoom chat



# Public Comment

