The Opt-in Energy Code and New Construction in Wellesley

March 6, 2023

7 p.m.

Webinar co-sponsored by Wellesley Select Board and Climate Action Committee

Annual Town Meeting 2023 Article 36

Co-sponsored by Select Board and Climate Action Committee

- **ARTICLE 36.** To see if the Town will vote to adopt the Municipal Opt-in Specialized Code, so called, by accepting the provisions of 225 CMR 22, Appendix RC and 225 CMR 23, Appendix CC, with such acceptance to take effect on January 1, 2024; or to take any other action in relation thereto.

  (Climate Action Committee/Select Board)

- **MOTION**: That the Town hereby adopts the Municipal Opt-In Specialized Code, effective January 1, 2024, as set forth in the provisions of 225 CMR 22, Appendix RC and 225 CMR 23, Appendix CC.

Agenda

- Meeting protocol
- Intro to Wellesley climate goals and the Opt-in Code
- Deep dive - What makes the Opt-in Code special?
- Passive house and multi-family projects
- High performance buildings
- Q&A

Meeting Protocol

The meeting is being recorded

- Recording and slides will be shared after the webinar

Comments in the chat are welcome

- We will try to answer your question during live Q&A
- We will follow up on outstanding chat questions after the meeting
- Kindly refrain from engaging in chat dialogue during the webinar

To ask a question during designated Q & A period, please

- Raise your hand
- Type a question in the chat

Please remain muted

- Unless called on to ask a question

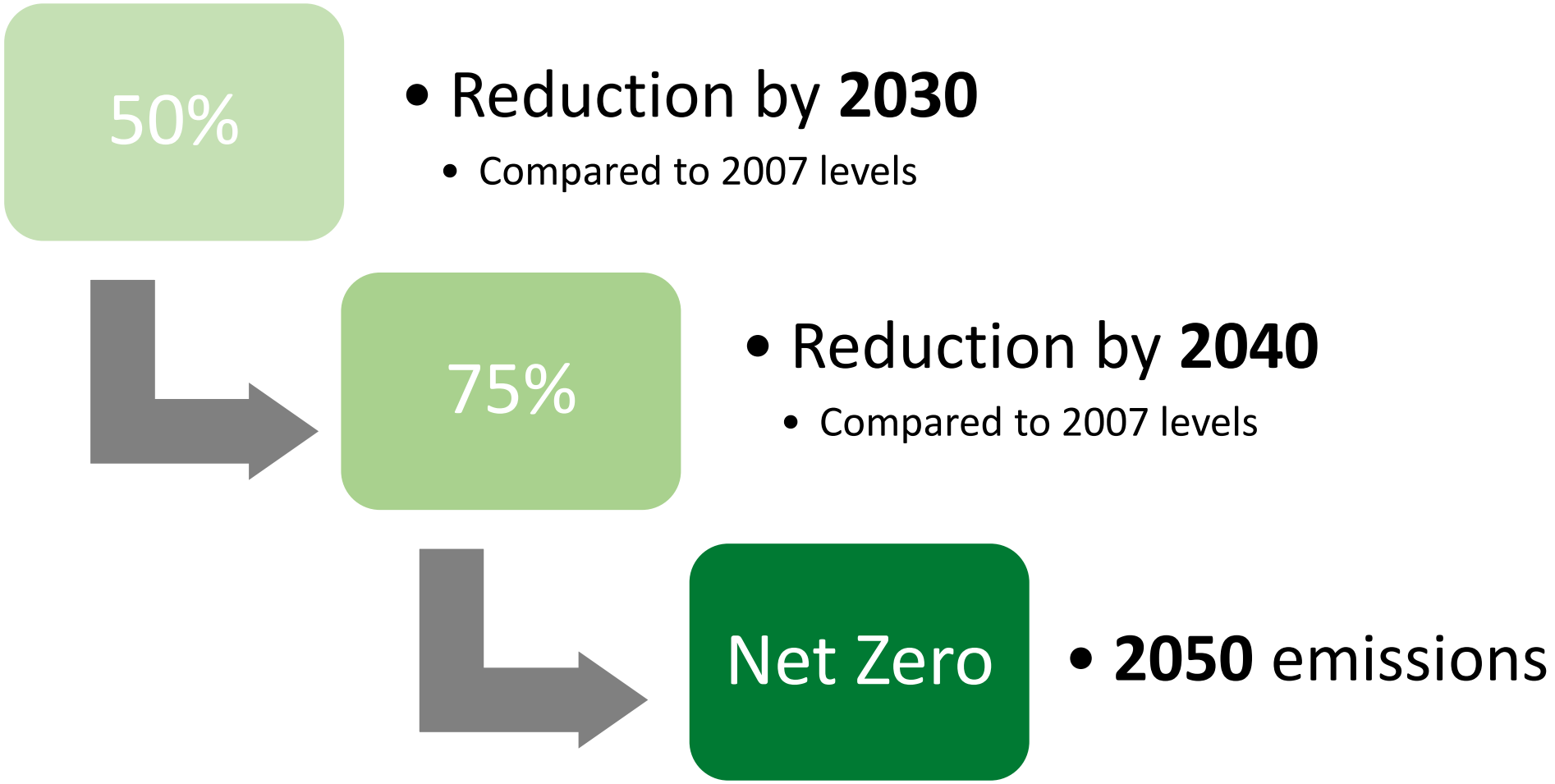
Thank you to our guest panelists

- Tom Catalano, AIA, Principal, Catalano Architects
- Mark Doughty, Principal, Thoughtforms
- Ian Finlayson, Director, Energy Efficiency Division, MA Department of Energy Resources
- Hank Keating, AIA, President, Passive House Massachusetts
- Lara Pfadt, AIA, Senior Associate, Architect, and Sustainability Strategist, Finegold Alexander Architects

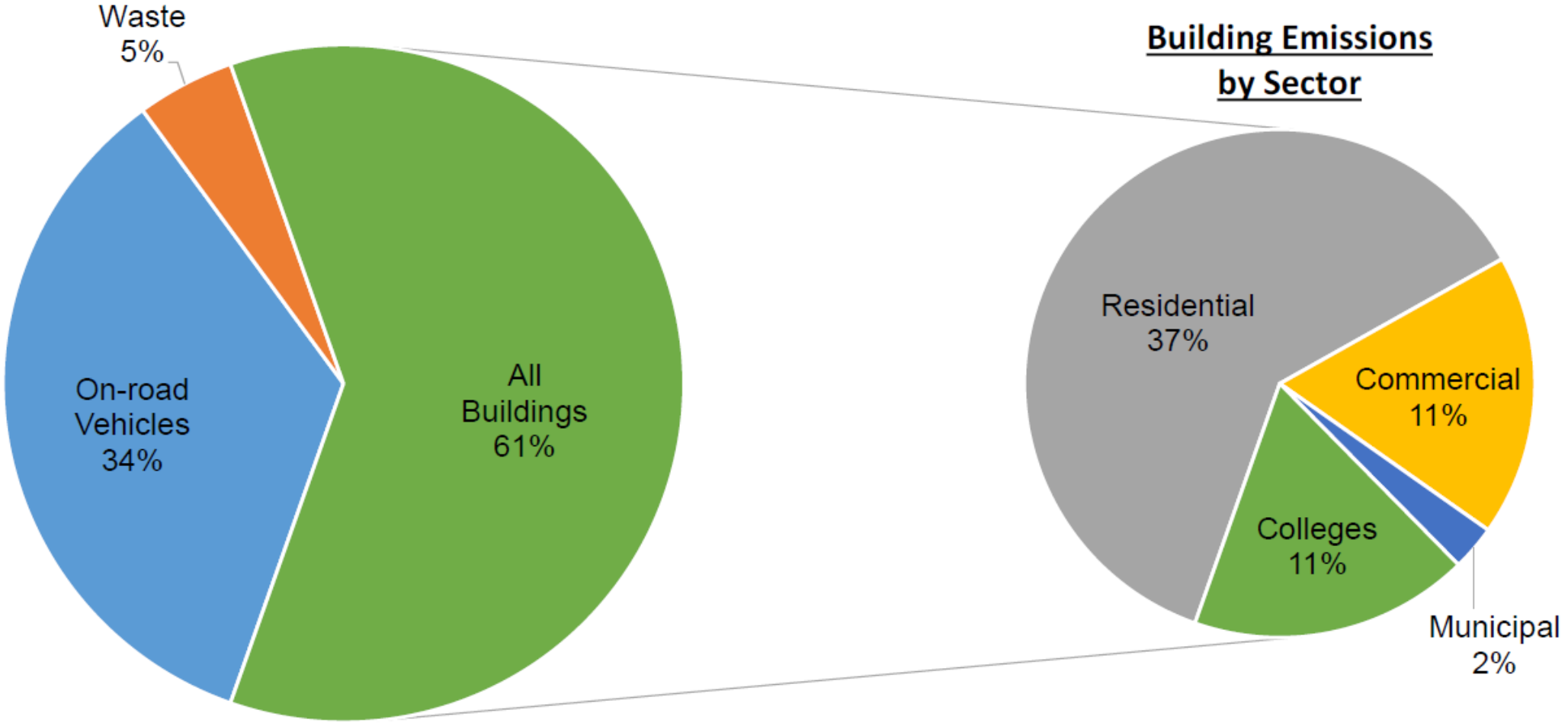
Opt-in Code Outreach

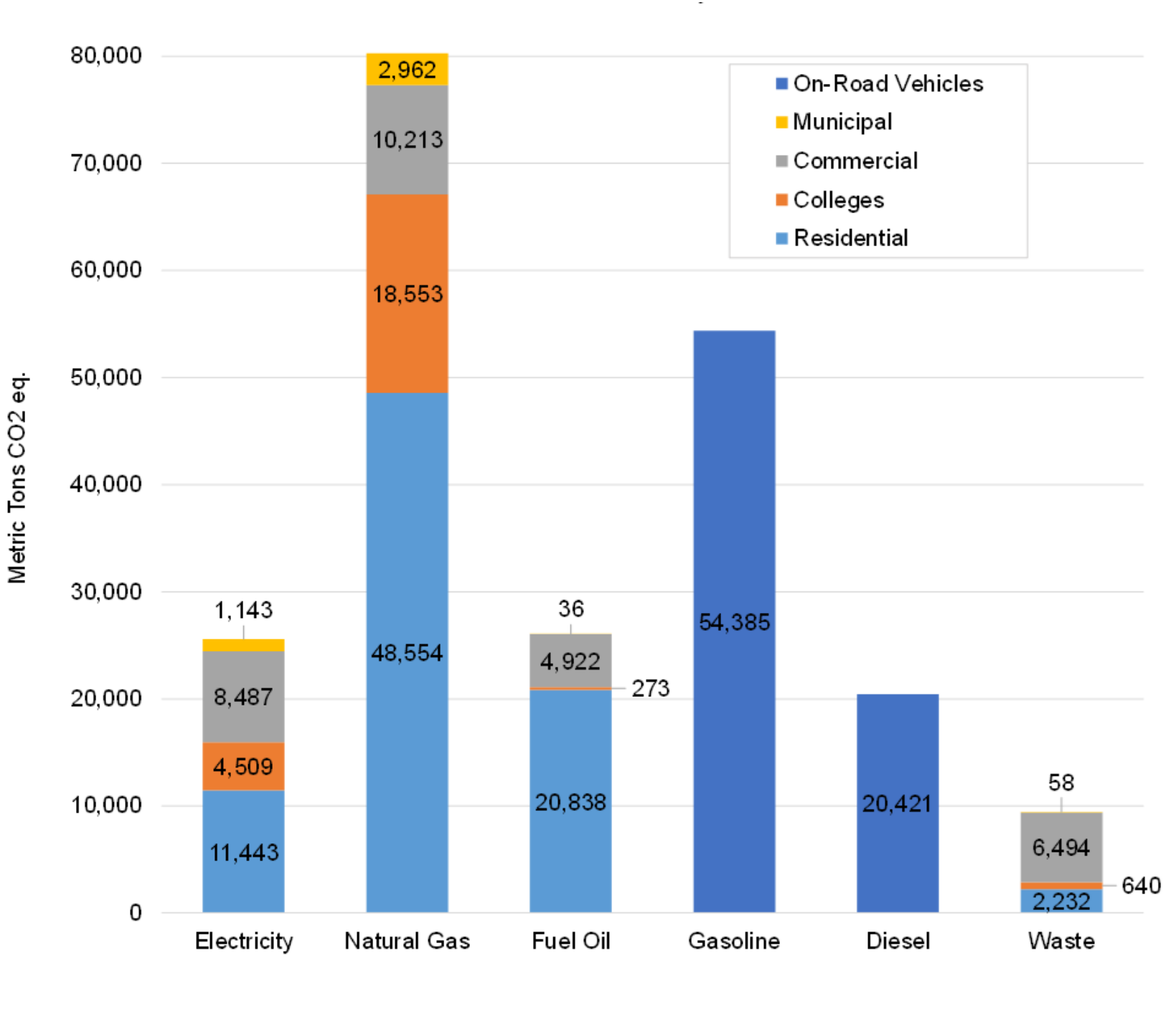
- Select Board
- Advisory Committee
- Housing Task Force
- Website resources
- One-on-one conversations with building professionals
- March 6 webinar for building professionals
- March 8 webinar for TMMs, public, and departments/boards
- Meetings with and email outreach to TMMs
- League of Women Voters event
- Wellesley Annual Town Meeting – March 27, 2023

Wellesley GHG emissions reduction goals set by Town Meeting in 2021



Our largest sources of emissions: Buildings and transportation (2021)





Wellesley Climate Action
Be part of it!

Natural gas = largest emissions source (2021)

Steps to Net Zero Buildings by 2050

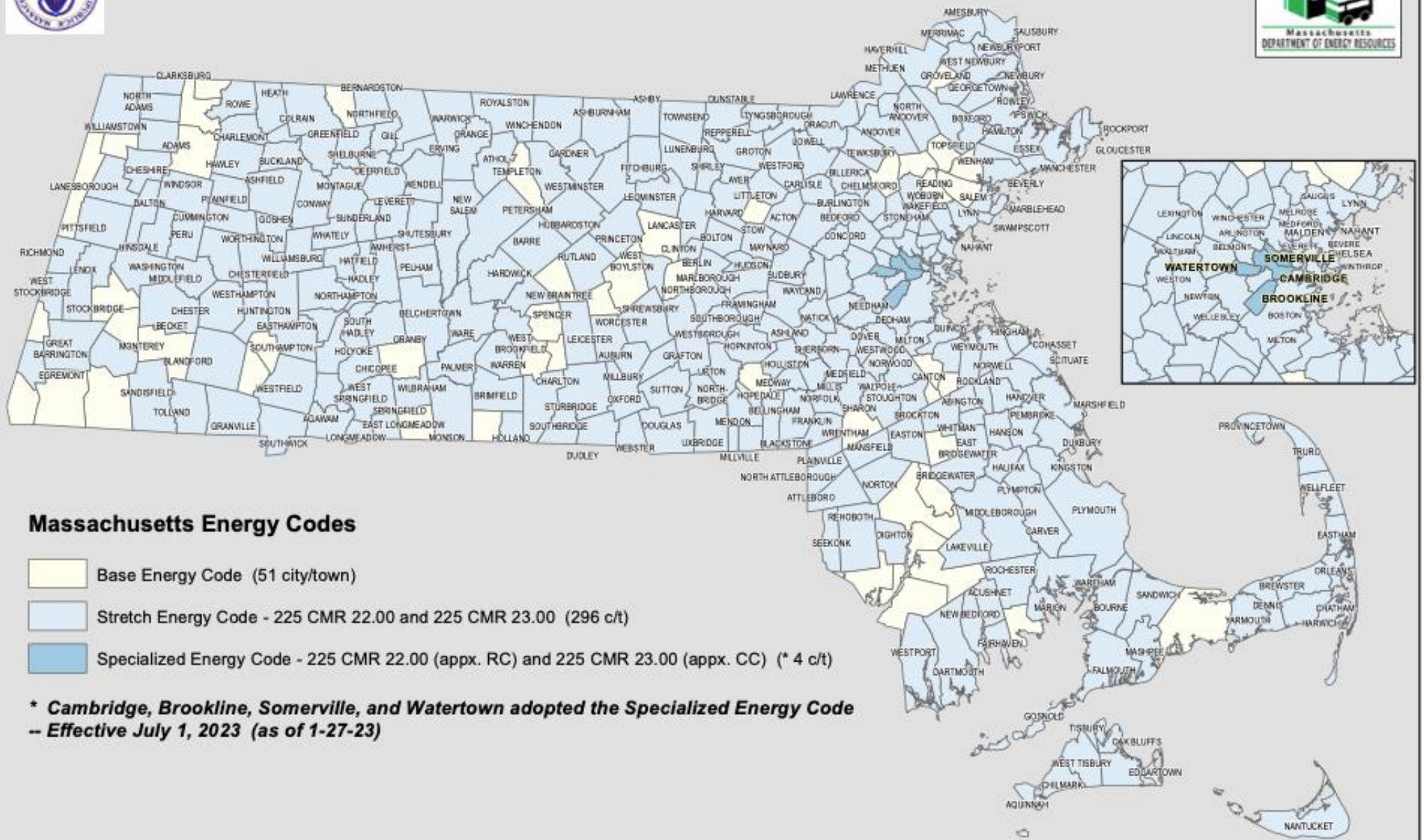
1) Minimize energy use/maximize energy efficiency
2) Electrify
3) Power with renewables

Building Energy Code

Stretch Code:
Continuous Improvement in Building Efficiency

- 2009
  - Stretch Code created
  - 20-35% greater efficiency over Base Code
- 2011
  - Wellesley adopts Stretch Code
- 2021
  - Climate Act 2021
  - DOER established as Stretch Code authority
- 2022-3
  - Straw proposals
  - Updated energy codes issued by DOER
  - ATM article co-sponsored by Select Board, Climate Action Committee

Massachusetts Building Energy Code Adoption by Municipality



Massachusetts Energy Codes

- Base Energy Code (51 city/town)
- Stretch Energy Code - 225 CMR 22.00 and 225 CMR 23.00 (296 c/t)
- Specialized Energy Code - 225 CMR 22.00 (appx. RC) and 225 CMR 23.00 (appx. CC) (* 4 c/t)

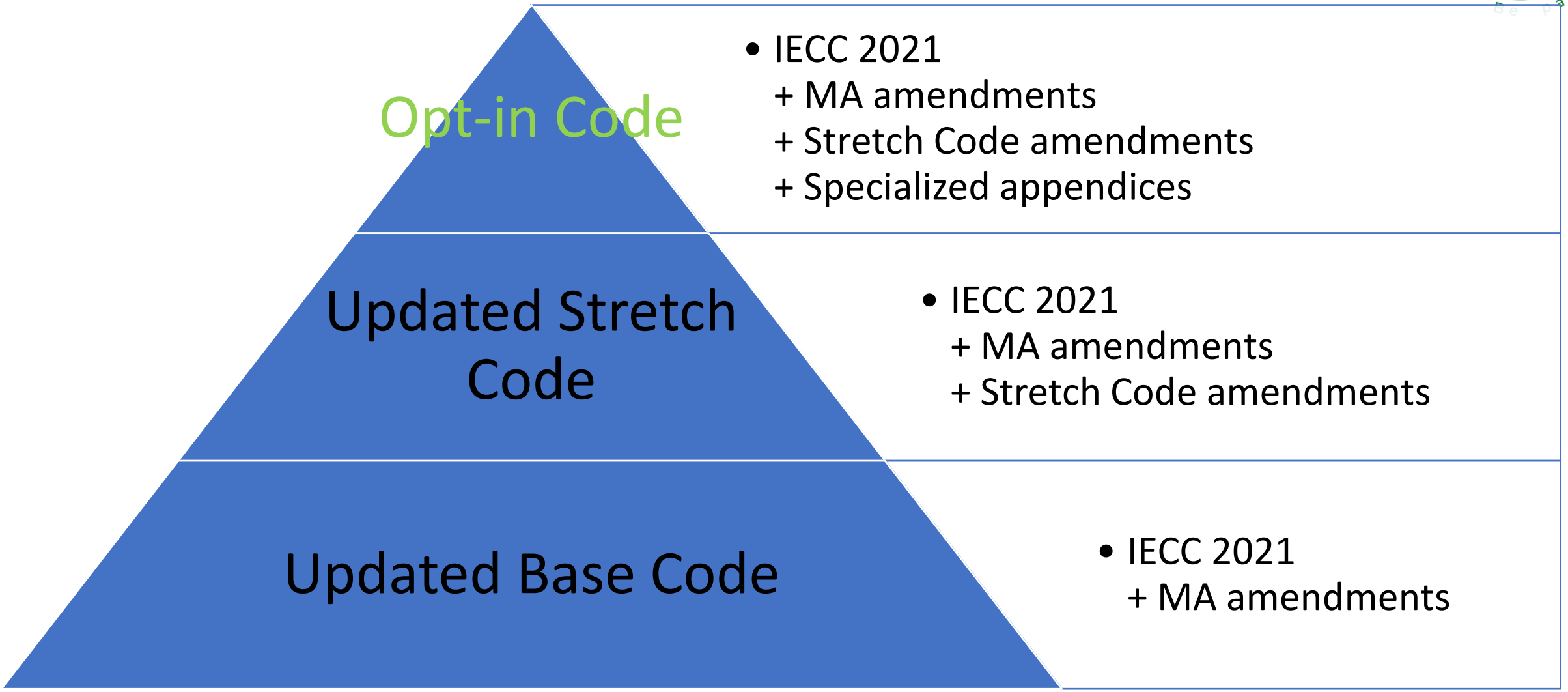
**** Cambridge, Brookline, Somerville, and Watertown adopted the Specialized Energy Code -- Effective July 1, 2023 (as of 1-27-23)***

MA DOER, 2-2-2023, jpfister

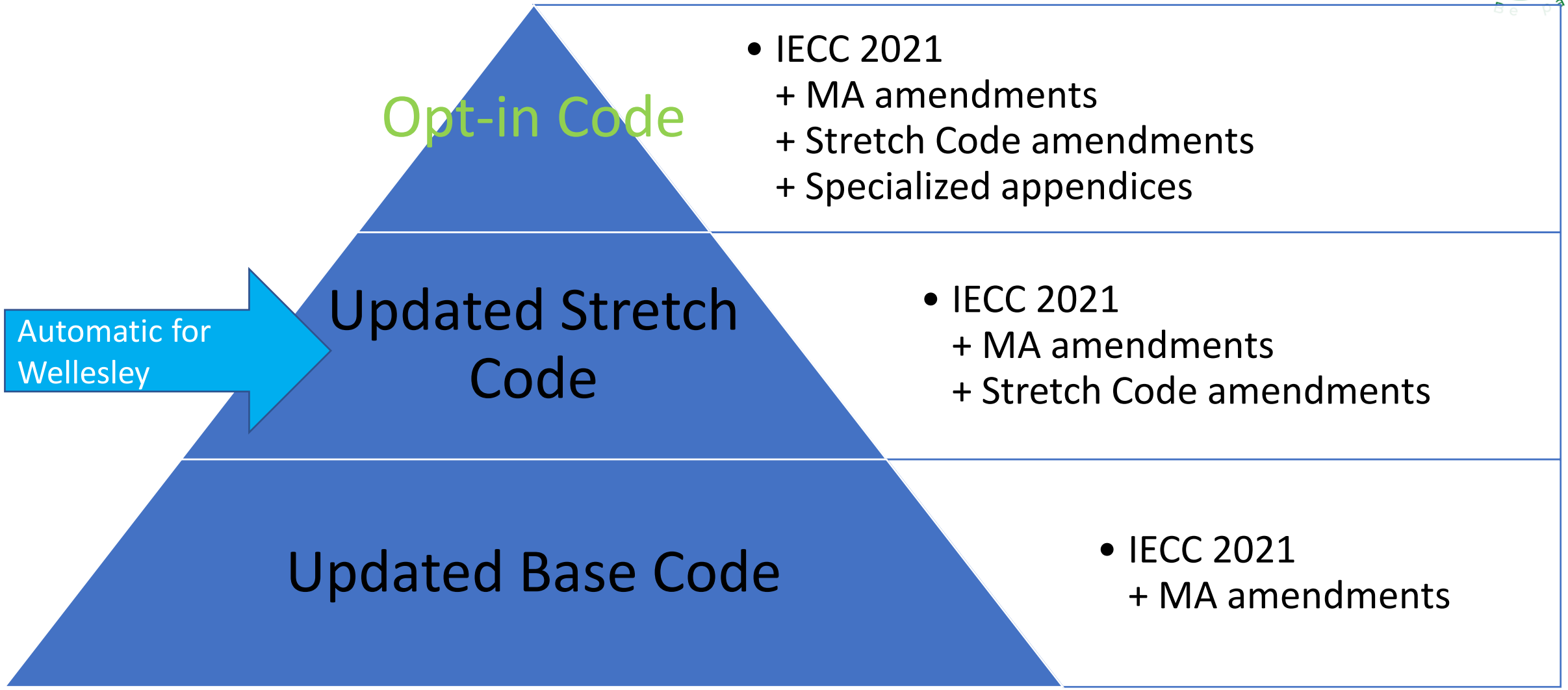
Opt-in Status

Adopted	Working Toward Adoption
Cambridge*	Arlington
Somerville*	Belmont
Watertown*	Boston
Brookline*	Lexington
Newton*	Northhampton
	Wellesley
	Stowe
	Sherborn

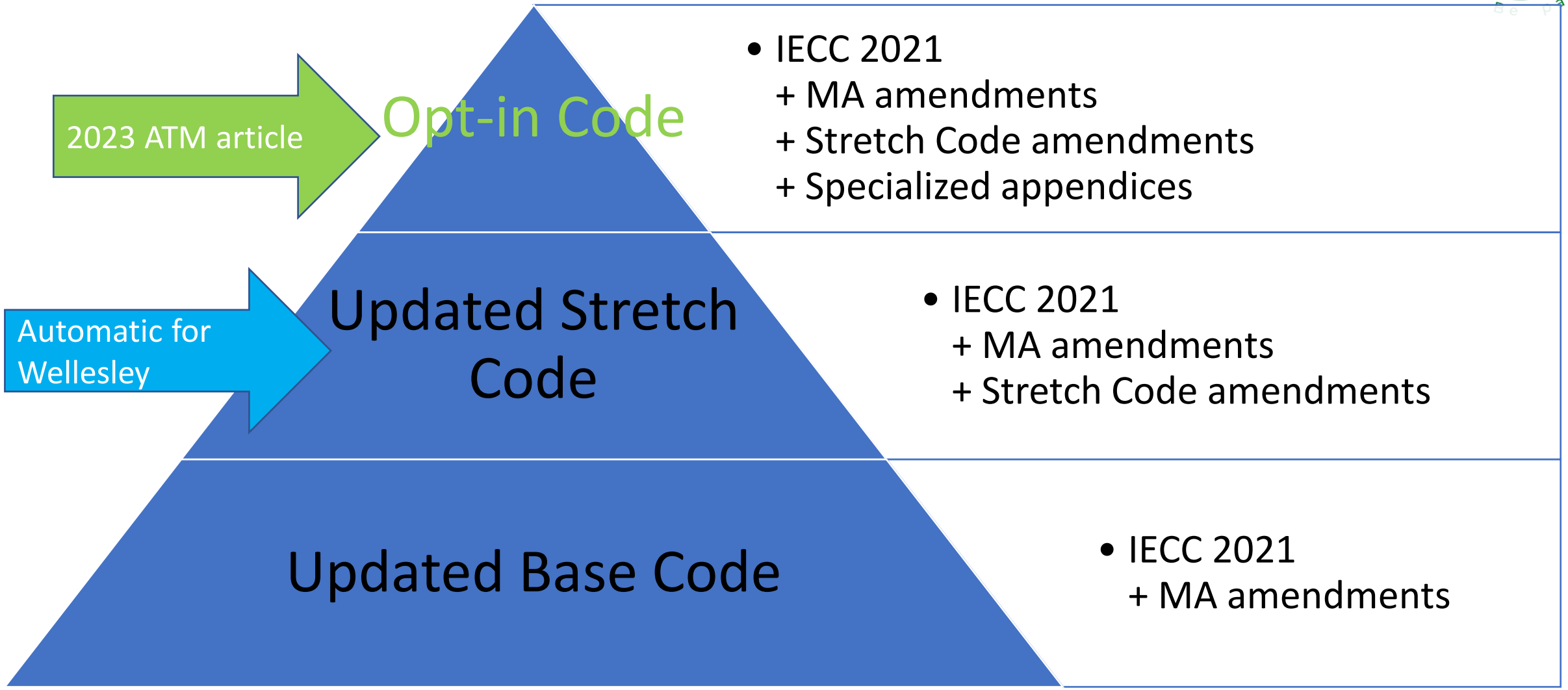
Codes that “build” on each other



Updated Stretch Code automatically applies



Opt-in Code: 2023 ATM article



Fossil Fuel Free Demonstration Project

Municipal Vote

Fossil Fuel Free "Pilot"

2023 ATM article

Opt-in Code

- IECC 2021
  + MA amendments
  + Stretch Code amendments
  + Specialized appendices

Automatic for Wellesley

Updated Stretch Code

- IECC 2021
  + MA amendments
  + Stretch Code amendments

Updated Base Code

- IECC 2021
  + MA amendments

Communities interested in the pilot

Brookline
Arlington
Cambridge
Lexington
Concord
Acton
Newton
Lincoln
Aquinnah

Boston – wait list
Salem – wait list
Somerville – wait list
Northampton – wait list

The USQ development at 10 Prospect St. is under construction in Union Square, Somerville. (Jesse Costa/WBUR)

Details on the Opt-in Code

- Applies ONLY to NEW construction
  - Not renovations or additions
- Consistent with emissions reduction goals
  - For the State of Massachusetts
  - And the Town of Wellesley
- Adds requirements (depending on project)
  - Electric pre-wiring
  - Solar
  - Passive House (for large single and multi-family)
  - Earlier start date for HERS 42

Updated Stretch vs Opt-in Specialized: RESIDENTIAL

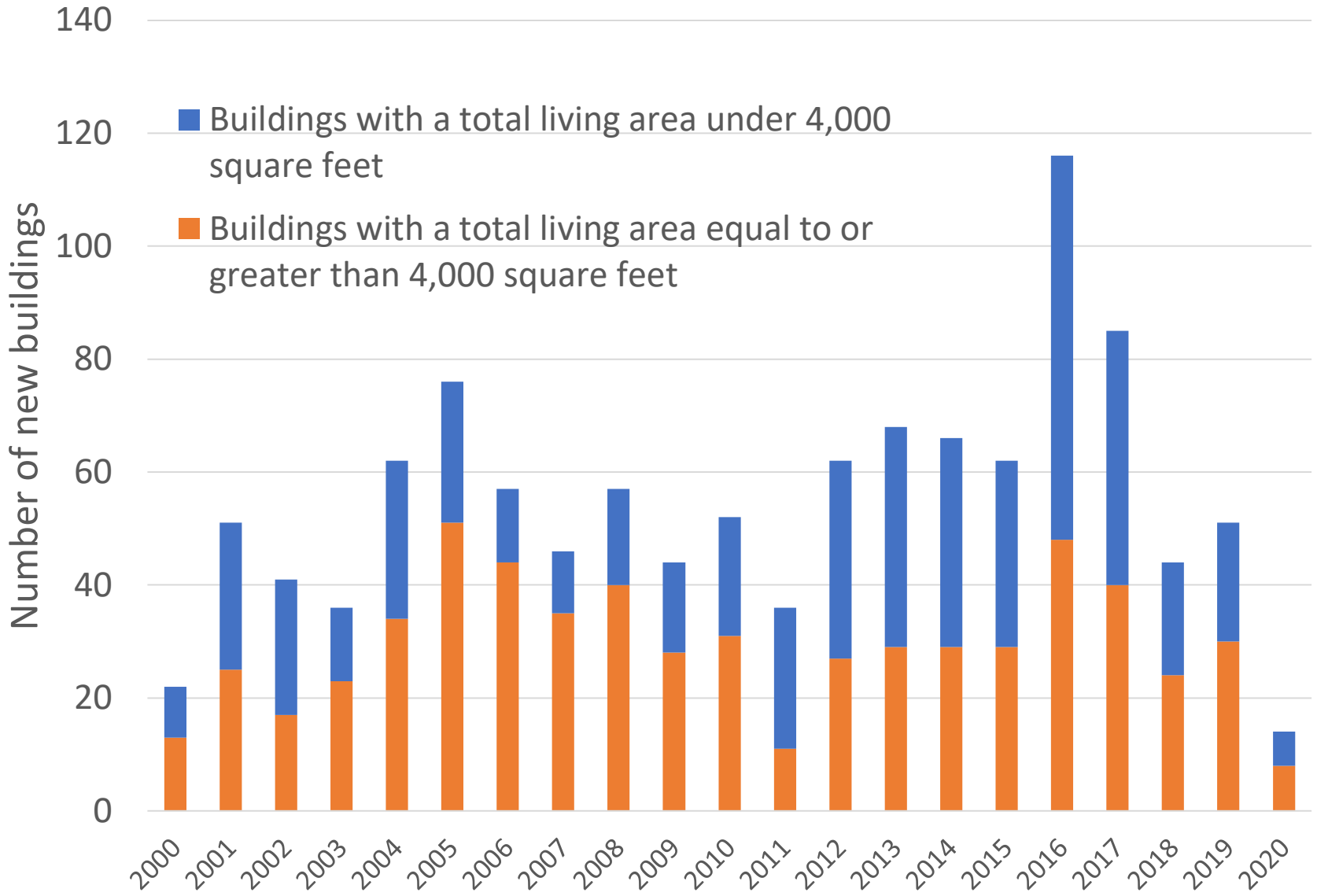
Comparison of updated Stretch and Municipal Opt-in Specialized Energy Codes for New Low-rise Residential Buildings[1]

		Minimum Efficiency		Electrification			Renewable Generation	
Building Size	**Fuel Type**	***Stretch Code***	***Specialized Opt-in Code***	***Stretch Code***	***Specialized Opt-in Code***	**Minimum EV Wiring**	***Stretch Code***	***Specialized Opt-in Code***
Dwelling units up to 4,000 sf	All-electric	HERS 45[2] or Passive House pathways	HERS 45 or Passive House pathways	Full	Full	1 parking space	Optional	Optional
Dwelling units up to 4,000 sf	Mixed-fuels	HERS 42[2] or Passive House pathways	HERS 42 or Passive House pathways	Optional	**Pre-wiring required**	1 parking space	Optional	**Solar PV: ≥4 kW for single family and ≥0.75 W/sf for multi-family (except shaded sites and Passive House certified buildings)**
Dwelling units >4,000 sf	All-electric	HERS 45[2] or Passive House pathways	HERS 45 or Passive House pathways	Full	Full	1 parking space	Optional	Optional
Dwelling units >4,000 sf	Mixed-fuels	HERS 42[2] or Passive House pathways	**HERS 0 or Phius ZERO**	Optional	**Pre-wiring required**	1 parking space	Optional	**Solar PV or other renewables to meet the Zero energy building definition**

Updated Stretch vs Opt-in Specialized: COMMERCIAL

Comparison of updated Stretch and Municipal Opt-in Specialized Energy Codes for New Commercial Buildings[1]

		Minimum Efficiency Pathway		Electrification			Renewable Generation	
Building Type	**Fuel Type**	***Stretch Code***	***Specialized Opt-in Code***	***Stretch Code***	***Specialized Opt-in Code***	**Minimum EV Wiring**	***Stretch Code***	***Specialized Opt-in Code***
Offices and Schools >20,000 sf	All Electric	Thermal Energy Demand Intensity (TEDI) or Passive House pathways	Thermal Energy Demand Intensity (TEDI) or Passive House pathways	Full	Full	20% of parking spaces for residential and business uses, 10% for other uses	Optional	Optional
Offices and Schools >20,000 sf	Mixed-fuels	TEDI or Passive House pathways	TEDI or Passive House pathways	Optional[5]	**Pre-wiring required**	20% of parking spaces for residential and business uses, 10% for other uses	Optional	**On-site solar PV: Minimum of 1.5W/sf for each sq foot of the 3 largest floors or 75% of Potential Solar Zone Area**
High Ventilation (Hospitals, Labs, etc.)	All Electric	TEDI, 10% better than 2019 ASHRAE Appendix G, or Passive House pathways	TEDI, 10% better than 2019 ASHRAE Appendix G, or Passive House pathways	Full	Full	20% of parking spaces for residential and business uses, 10% for other uses	Optional	Optional
High Ventilation (Hospitals, Labs, etc.)	Mixed-fuels	TEDI, 10% better than 2019 ASHRAE Appendix G[4], or Passive House pathways	TEDI, 10% better than 2019 ASHRAE Appendix G[4], or Passive House pathways	Optional[4,5]	**Pre-wiring required**	20% of parking spaces for residential and business uses, 10% for other uses	Optional	**On-site solar PV: Minimum of 1.5W/sf for each sq foot of the 3 largest floors or 75% of Potential Solar Zone Area**
Multi-family >12,000 sf	All Electric	TEDI, HERS 45[2], Passive House pathways, or (until July 1, 2024) 10% better than ASHRAE Appendix G	**Passive House pathways or HERS 0[3]**	Full	Full	20% of parking spaces	Optional	Optional
Multi-family >12,000 sf	Mixed-fuels	TEDI, HERS 42[2], Passive House pathways, or (until July 1, 2024) 10% better than ASHRAE Appendix G	**Passive House pathways or HERS 0[3]**	Optional[5]	**Pre-wiring required**	20% of parking spaces	Optional	Optional with Passive House
Small Commercial (<20,000 sf, except multi-family)	All Electric	Prescriptive pathway plus Stretch Code amendments	Prescriptive pathway plus Stretch Code amendments	Full	Full	20% of parking spaces for residential and business uses, 10% for other uses	Optional	Optional
Small Commercial (<20,000 sf, except multi-family)	Mixed-fuels	Prescriptive pathway plus Stretch Code amendments	Prescriptive pathway plus Stretch Code amendments	Optional[5]	**Pre-wiring required**	20% of parking spaces for residential and business uses, 10% for other uses	Optional	**On-site solar PV: Minimum of 1.5W/sf for each sq foot of the 3 largest floors or 75% of Potential Solar Zone Area**



2018-2020:
55-59% of new low-rise residential construction
≥ 4,000 sq. ft.

Incentives

- Federal, State, and Local rebates and tax credits for:
  - Weatherization
  - Electrification
  - Energy efficiency
  - Solar
- All-electric homes are generally cheaper to build
  - Heat pump(s) replaces both Central A/C + Furnace(s)
- High performance buildings are cheaper to operate

Why adopt the Opt-in Code?

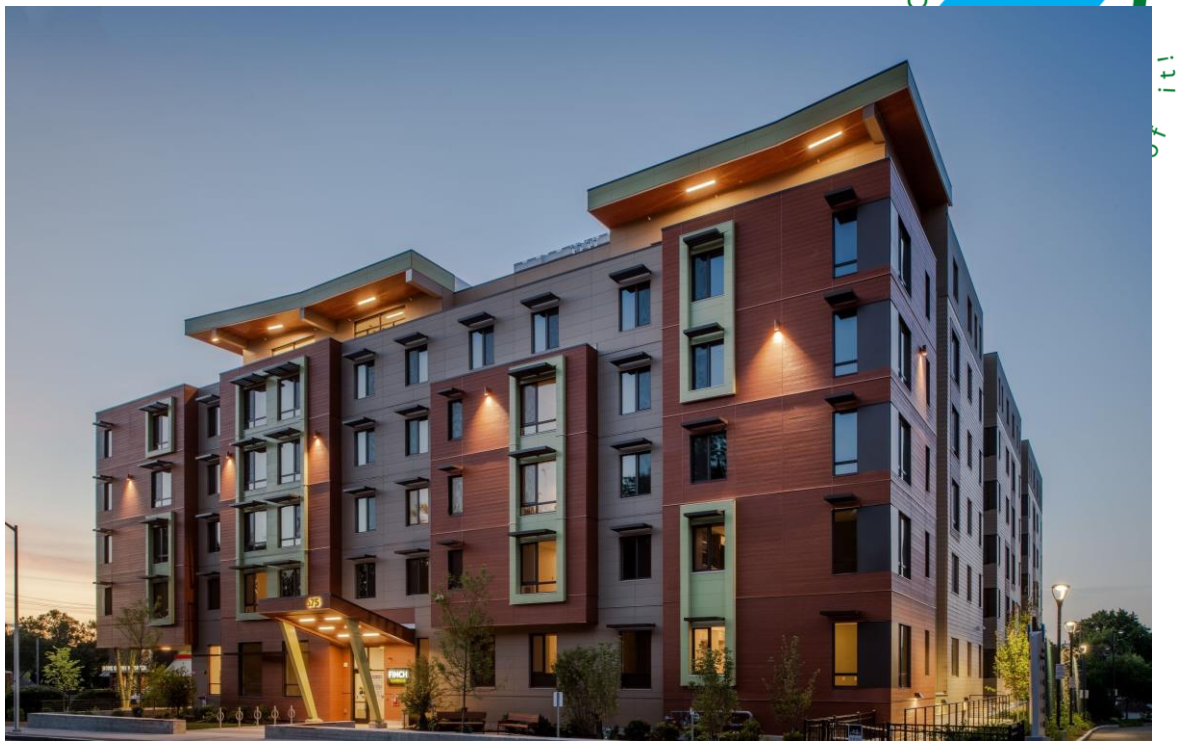
- Necessary for meeting GHG emissions goals
- Helps us stop digging the fossil fuel “hole”
  - New construction only
- Helps avoid costly future retrofits
- Promotes
  - Healthier, more comfortable indoor environments
  - Greater resilience (especially with Passive House)

Opt-in Specialized Energy Code

Summary for Wellesley

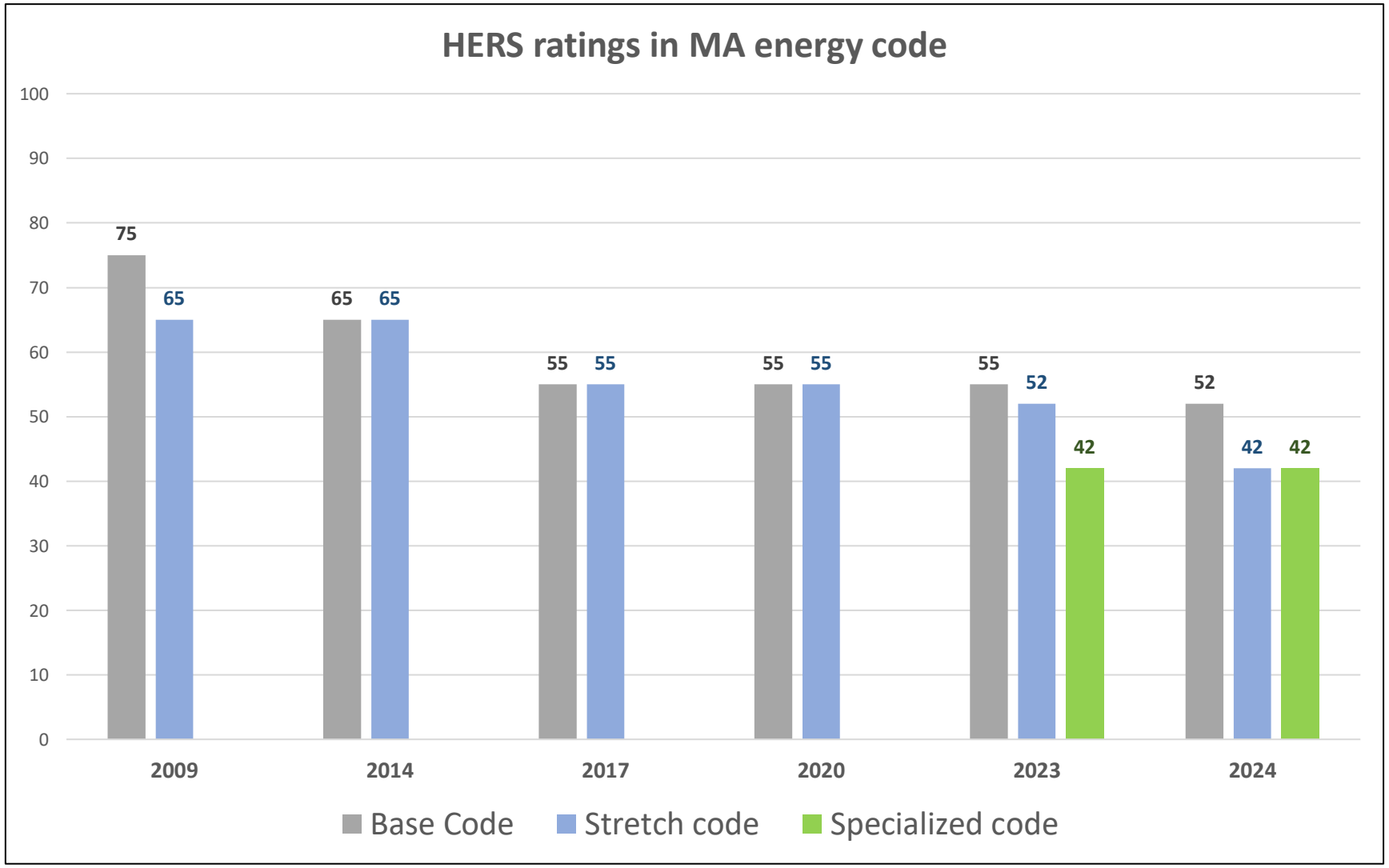
March 6, 2023

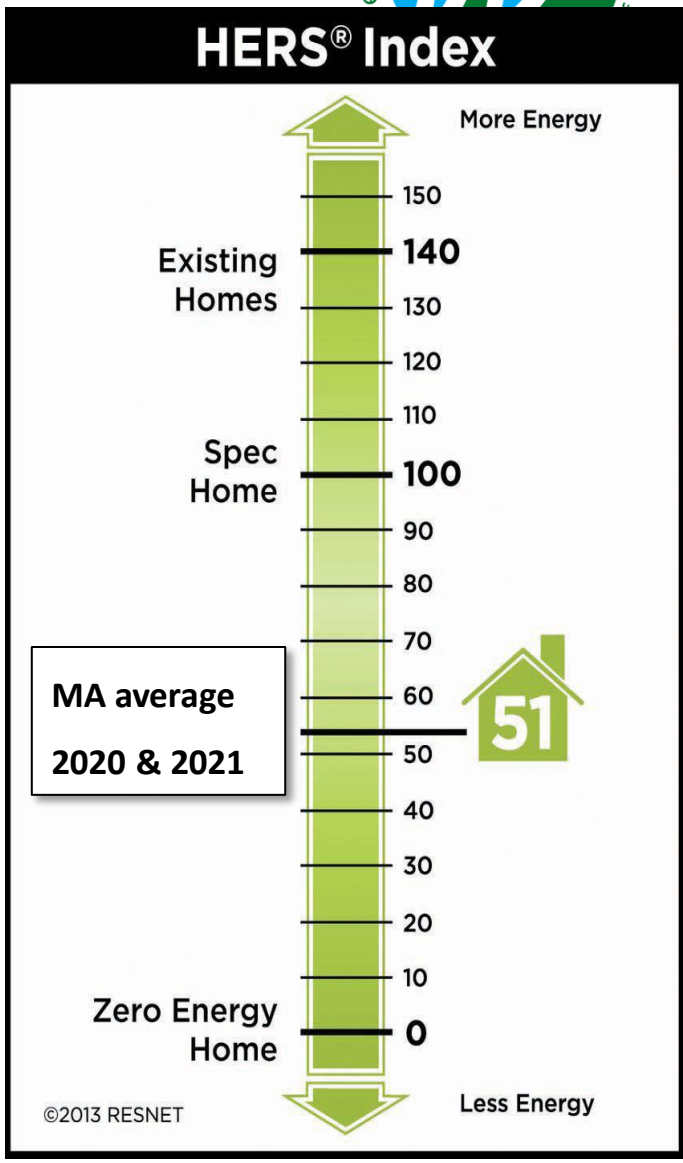
Ian Finlayson – MA DOER



RESIDENTIAL
Low Rise & Multi-family

(Simplified) History of HERS ratings in MA energy code





Specialized vs Stretch code - Residential Low-Rise

Opt-in vs Stretch code - Residential Low-Rise

Energy Source(s)	Home Size	Stretch Code (July 2024)	Opt-in Code (Jan 2024)
All Electric New Homes	Any size home	HERS 45 or Passive House	
Mixed-Fuel New Homes	Under 4,000 sq. ft.	HERS 42	**+Solar PV (min 4kw) + wiring for electrification**
		Passive House	**+ wiring for electrification**
	4,000 sq. ft. and over	HERS 42 Passive House	**+ Solar PV (to net-zero) (HERS 0 or Phius ZERO) + wiring for electrification**
Home additions & alterations	Any	Same as Stretch code	
Historic or existing homes	Any	Energy Code not applicable	

Ian Finlayson, DOER

Specialized Residential Code: Solar PV sizing

Solar required where there is a suitable solar-roof zone of 300 sq ft or more

Home Type	Solar required
All-electric	No
Passivehouse	No
Mixed-fuel <4,000 sq ft	**4 kW**
Mixed-fuel 4,000 sq ft +	**Enough for net-zero (8+ kw)**
other R-uses	0.75 W/sq ft (50% of commercial)

Specialized vs Stretch code – Multi-family

Building Type	Fuel Type	Stretch code (July 2024)	Specialized Code (Jan 2024)
New Multi-family (4+ stories & over 12,000 sf)	All Electric	HERS 45 or TEDI or Passivehouse	**Passivehouse**
	Mixed Fuel	HERS 42 or TEDI or Passivehouse	**Passivehouse + wiring for electrification**

SPECIALIZED CODE - Commercial

Specialized vs Stretch code – Commercial

Building Type	Fuel Type	Stretch code (July 2024)	Specialized Code (Jan 2024)
Schools, Offices, Municipal buildings	All Electric	TEDI or Passivehouse	
	Mixed Fuel	TEDI or Passivehouse	TEDI **+ Solar PV** or Passivehouse **+ wiring for electrification**
Other Commercial (over 20,000 sf)	All Electric	ASHRAE or TEDI or Passivehouse	
	Mixed Fuel	ASHRAE or TEDI or Passivehouse	ASHRAE **+ Solar** or TEDI **+ Solar** or Passivehouse **+ wiring for electrification**

Specialized Commercial Code: Solar PV sizing

CC105.2 On-site renewable energy. New mixed-fuel buildings shall have equipment installed for on-site renewable energy with a rated capacity of not less than 1.5 W/ft² (16.1 W/m²) multiplied by the sum of the gross conditioned floor area of the three largest floors.

> **Exception:** Where the building site cannot meet the requirement in full with an on-site renewable energy system, the building site shall install a partial system designed to utilize not less than 75% of the *Potential Solar Zone Area*.

Examples of Solar PV size:

- 4 story 200,000 sf High school: 160,000 sf on 3 largest floors

  Min. Solar = 1.5 x 160,000 = 240 kW system

- 3 story 80,000 sf Office

  Min. Solar = 1.5 x 80,000 = 120 kW system

Questions?

Contact DOER:

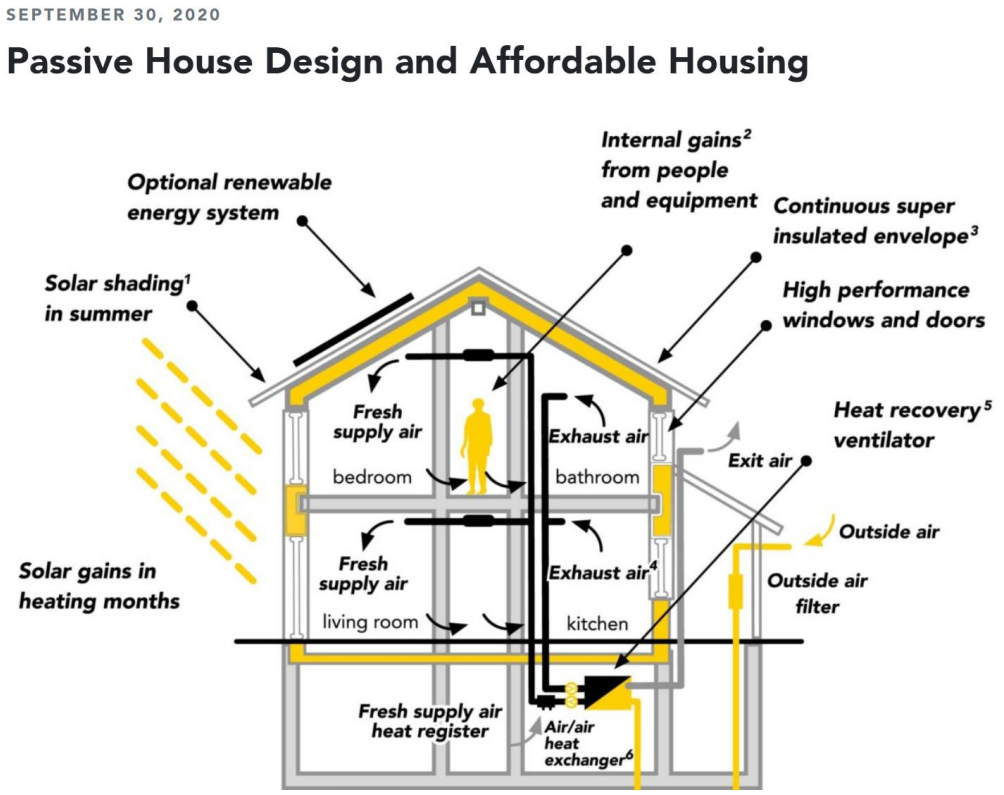
Stretchcode@mass.gov

Paul Ormond

Ian Finlayson

Passive House design principles

- Airtight building envelope
- Continuous insulation without thermal bridging
- High-performance windows (double or triple-paned)
- Optimization of solar gain
- Balanced heat- and moisture-recovery ventilation
- Minimal space conditioning system



Passive House benefits

- Best path to net zero and net positive
- Comfort
- Indoor air quality
- Resilience
- “Future proofing”
- Financially feasible

Passive House examples

- A Passive House can be any building type – home, office, school, etc.

Waverly School, Beverly

Single-Family Home, Cambridge

Winthrop Center, Boston

Design Challenge: Project Incremental Cost

MassCEC Passive House Design Challenge

Passive House incremental cost findings

- Average incremental cost: 2%
- Typical cost increases:
  - Ventilation upgrades to supply fresh air to living and bedrooms
  - Window & door upgrades
  - Thermal bridging breaks and air sealing
  - Additional testing and verification
- Typical cost savings:
  - Significantly reduced heating and cooling equipment capacity
- Best practices for reducing incremental cost:
  - Experience and training for design and construction team
  - Simple massing and roofs are less expensive.

•The American Council for an Energy-Efficient Economy (ACEEE) published a paper by MassCEC and ICF "Scaling Up Passive House Multifamily: The Massachusetts Story."

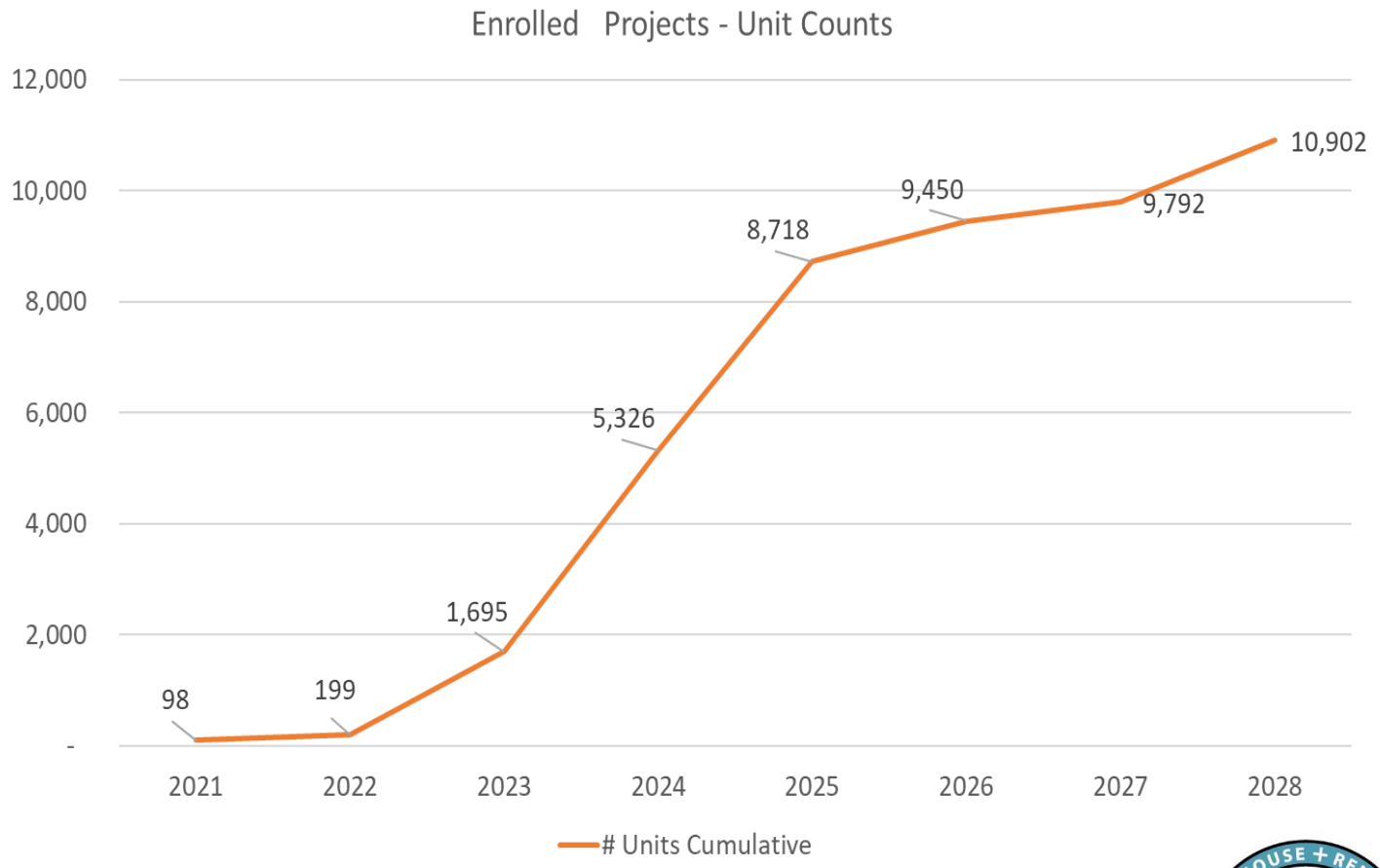
Design Challenge Projects

Table 3. Design Challenge Projects and Characteristics

Project	Location	Site Type	Construction Type	Units	Gross Square Feet
Finch Cambridge	Cambridge	In-Fill	Podium	98	111,450
Old Colony 9th & Mercer	Boston	In-Fill	Podium	55	51,272
North Commons	Northampton	Suburban	Wood frame	53	55,538
Harbor Village	Gloucester	In-Fill	Podium	30	33,186
Depot Village	Hanson	Suburban	Wood frame	48	104,981
Mattapan Station (mixed use)	Boston	In-Fill	Podium	135	178,875
Holbrook Senior Housing	Holbrook	Suburban	Wood frame	72	53,675
Bartlett Station Lot D / Kenzi	Boston	In-Fill	Podium	50	45,031

Mass Save Passive House Incentive Program

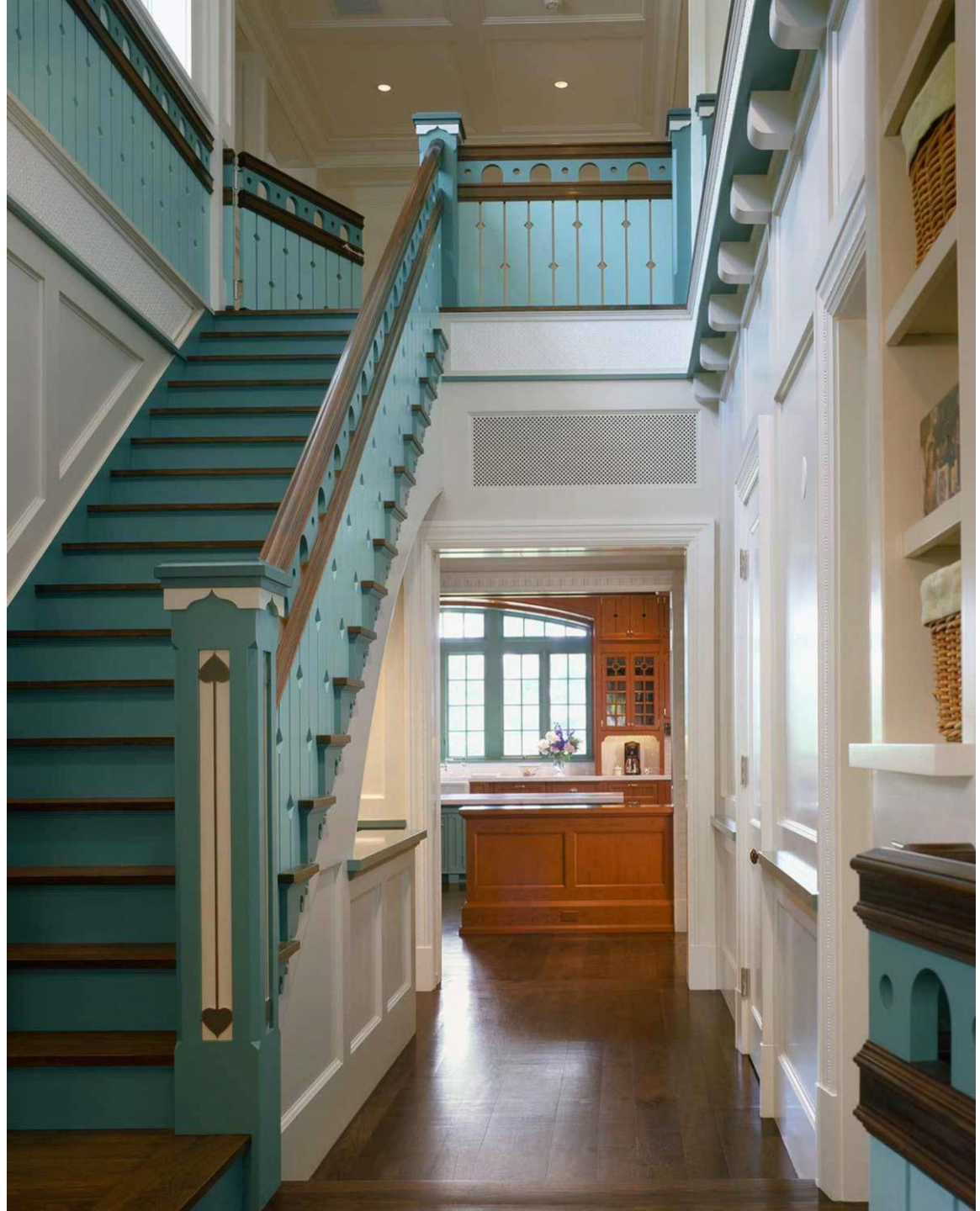
- As of December 2022, there are 152 multifamily buildings with over 10,000 units registered in this program
- About 40% of these are designated as Low-Income projects



High-Performance Homes – Common Questions

- What is the upfront premium compared to code-built?
- How much will I save on my monthly bills?
- What are the risks?
- What compromises will I have to make?

thoughtforms
build to endure




GRACE
Perm-A-Barrier


ARES STRUCTURES, LLC
CAT


GRACE
NOTICE

Questions?

Thank you!

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