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ENERGY RESOURCES

All roads lead to ‘Thermal Code’

A Policy Roadmap for low carbon buildings at scale

Ian Finlayson

October 8, 2025

Overview

Where are we in the building energy transition?

Why Passive Buildings?

Do you really need a Stretch code?

What are the other tools in the toolbox?

How's it going in MA?

Q&A

Ian Finlayson

Deputy Director, Buildings Codes and Policy

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Quiz: What is the common link?

China

Costa Rica

Ethiopia

Nepal

Norway

Vietnam

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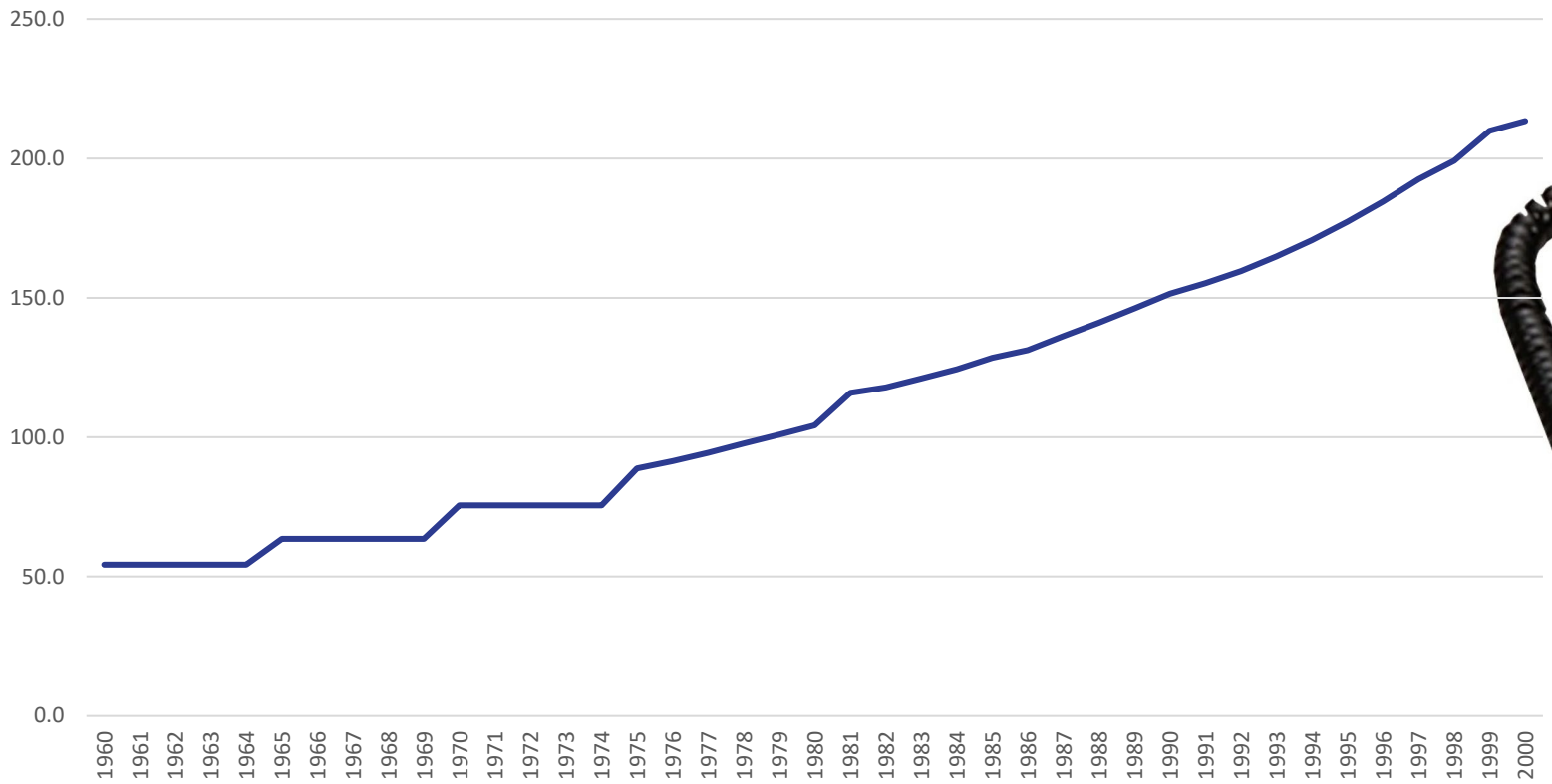
Quiz: What is this chart of?

North America (millions)



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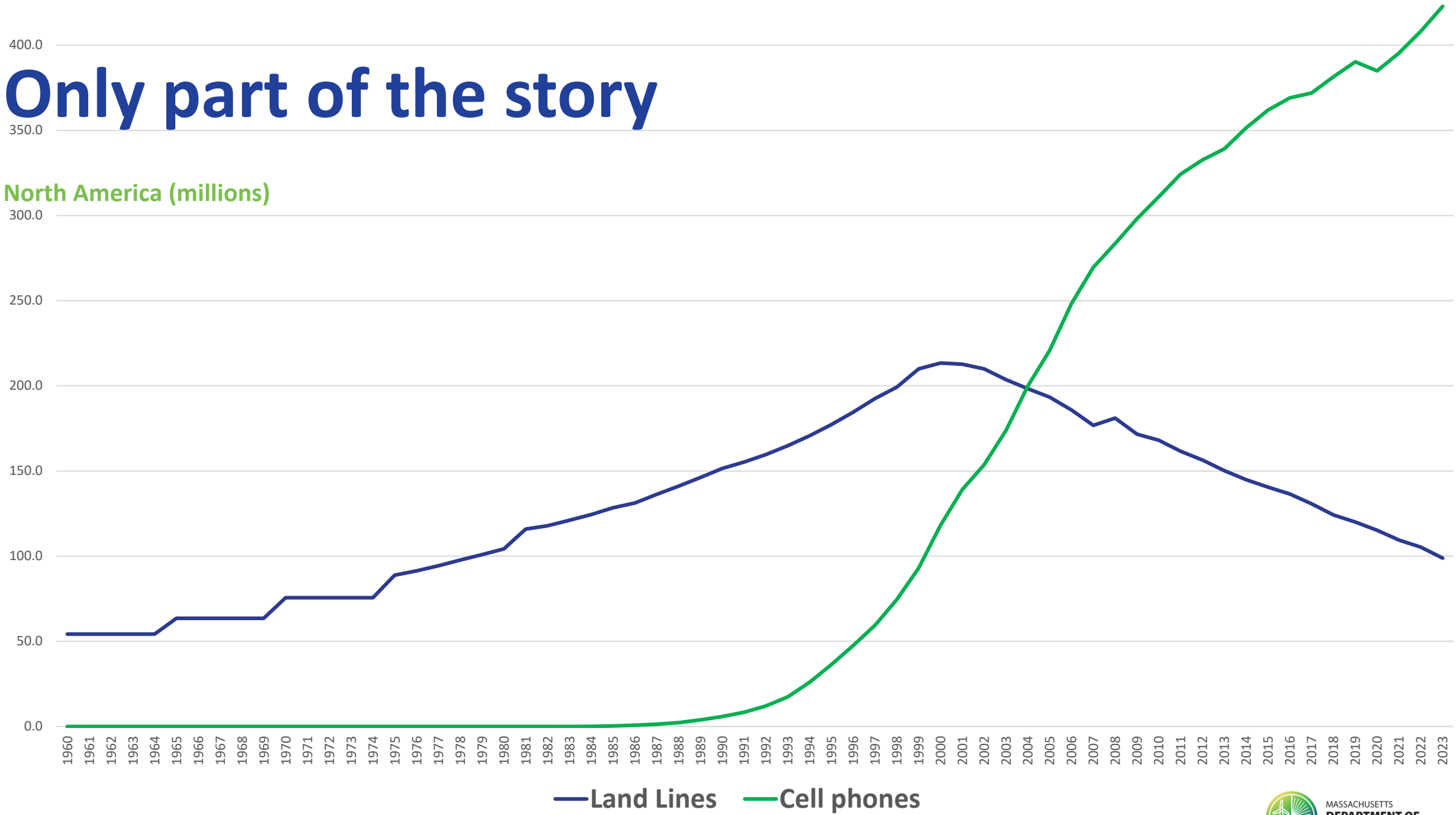
Only part of the story



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Quiz: What is the common link?

Higher EV market share than the USA (9.8%):

China	55% (2025 ytd)
Costa Rica	15.4% (2024)
Ethiopia	60% (2024)
Nepal	76% (2024)
Norway	98% (2024)
Vietnam	72% (2024)

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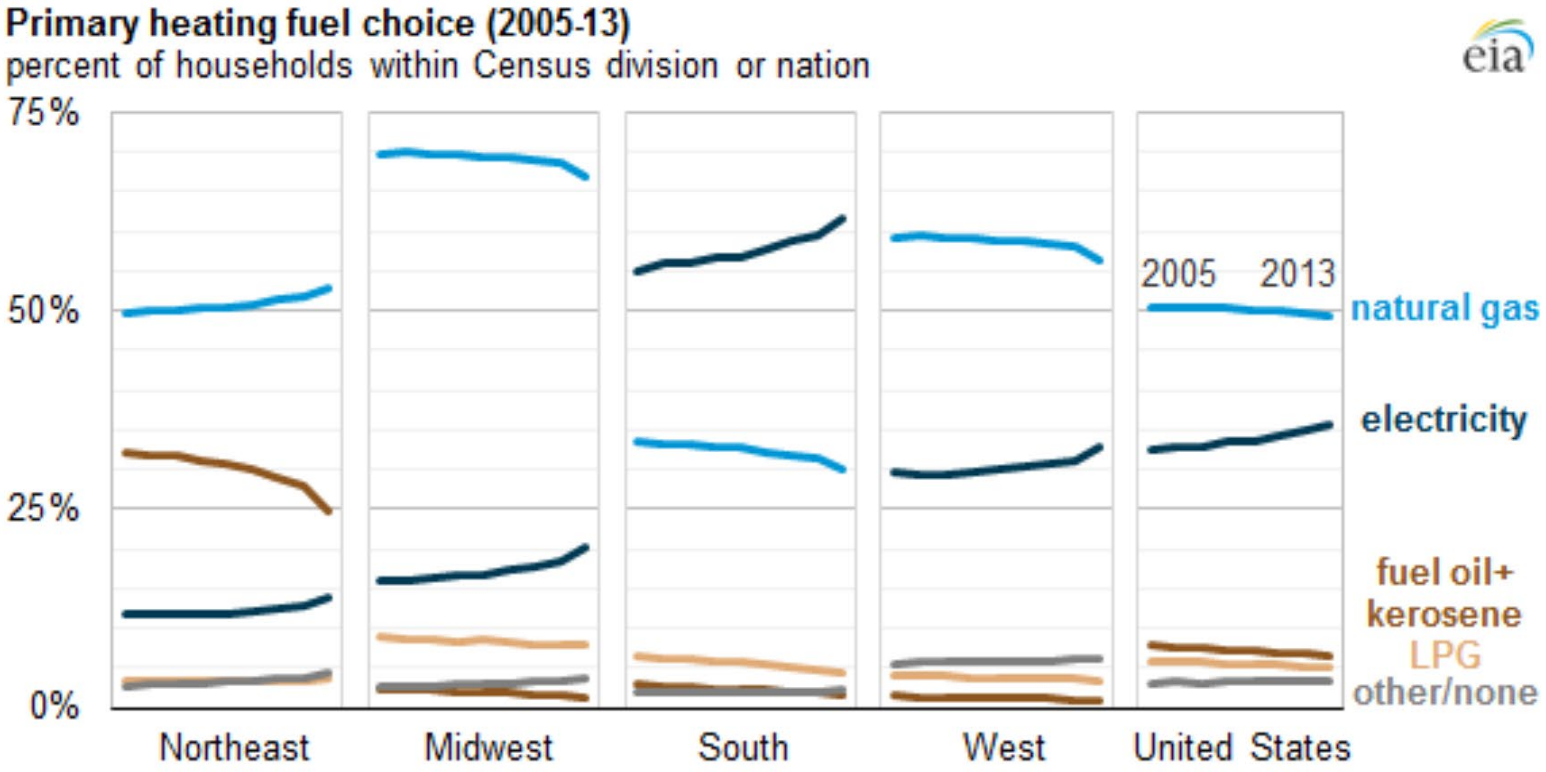
2005 – 2013 data by region

SEPTEMBER 25, 2014

Everywhere but Northeast, fewer homes choose natural gas heating fuel

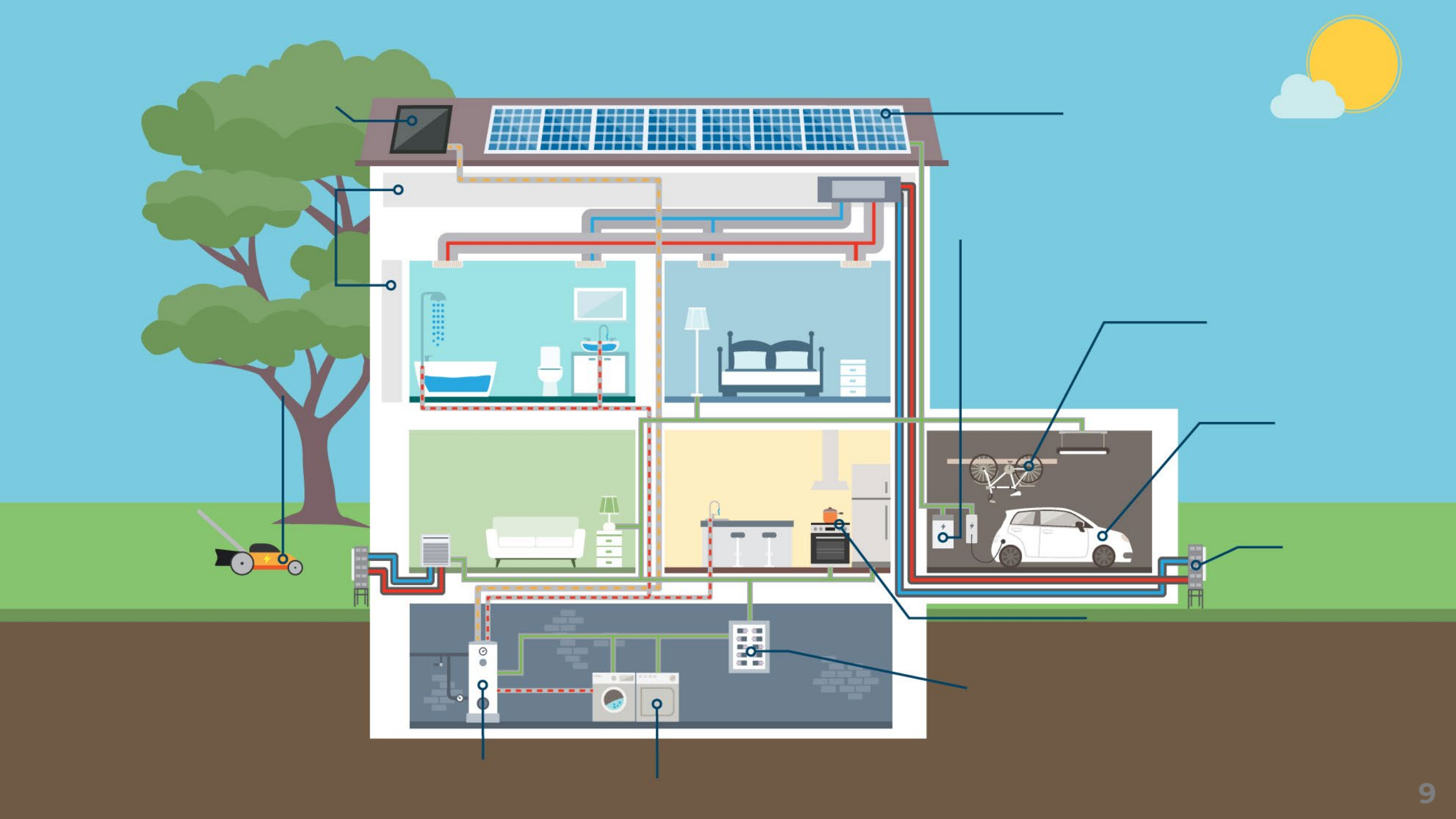


Source: U.S. Energy Information Administration, based on Census Bureau American Community Survey

Note: Geographic areas based on Census regions. LPG is liquefied petroleum gas.

Why Passive Buildings?

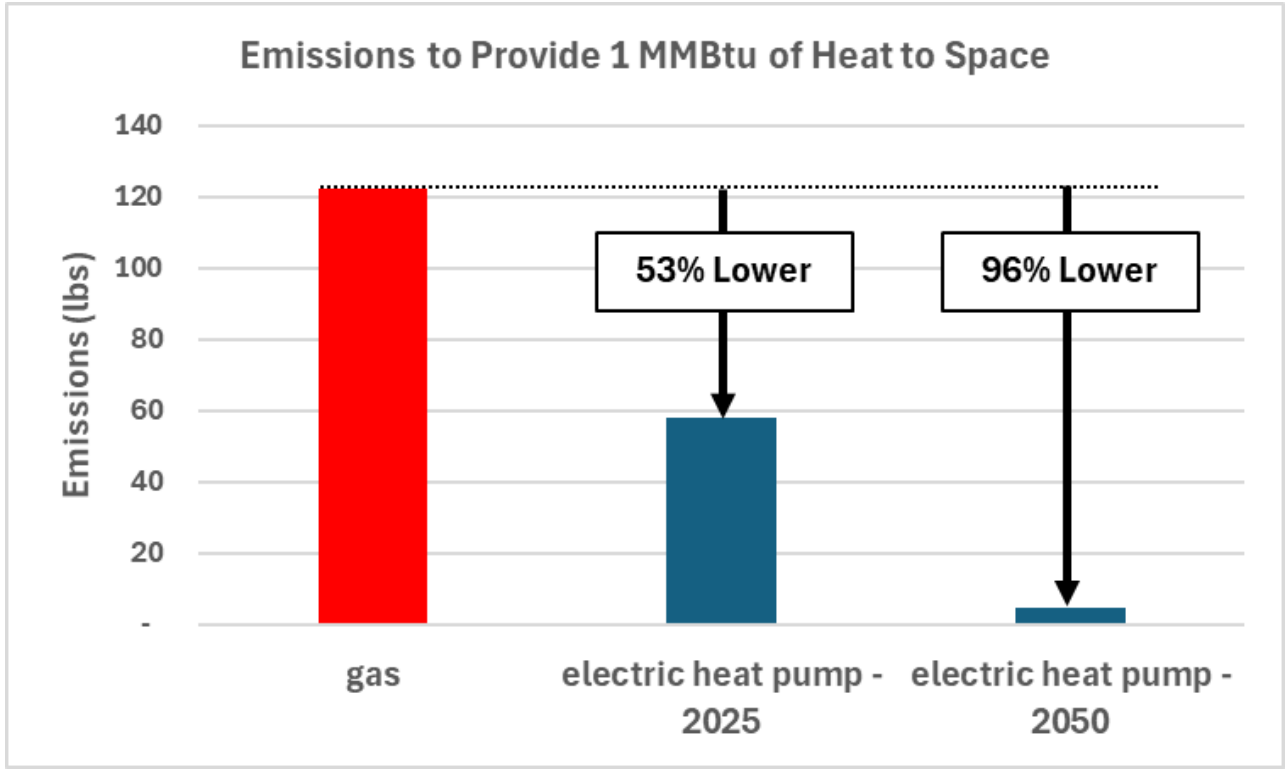
Why not “Net – Zero” or “All-Electric”



Key Consideration: Electrification of New Construction

- Electric vs gas heating in MA
  - 53% lower GHG in 2025
  - 96% lower GHG in 2050

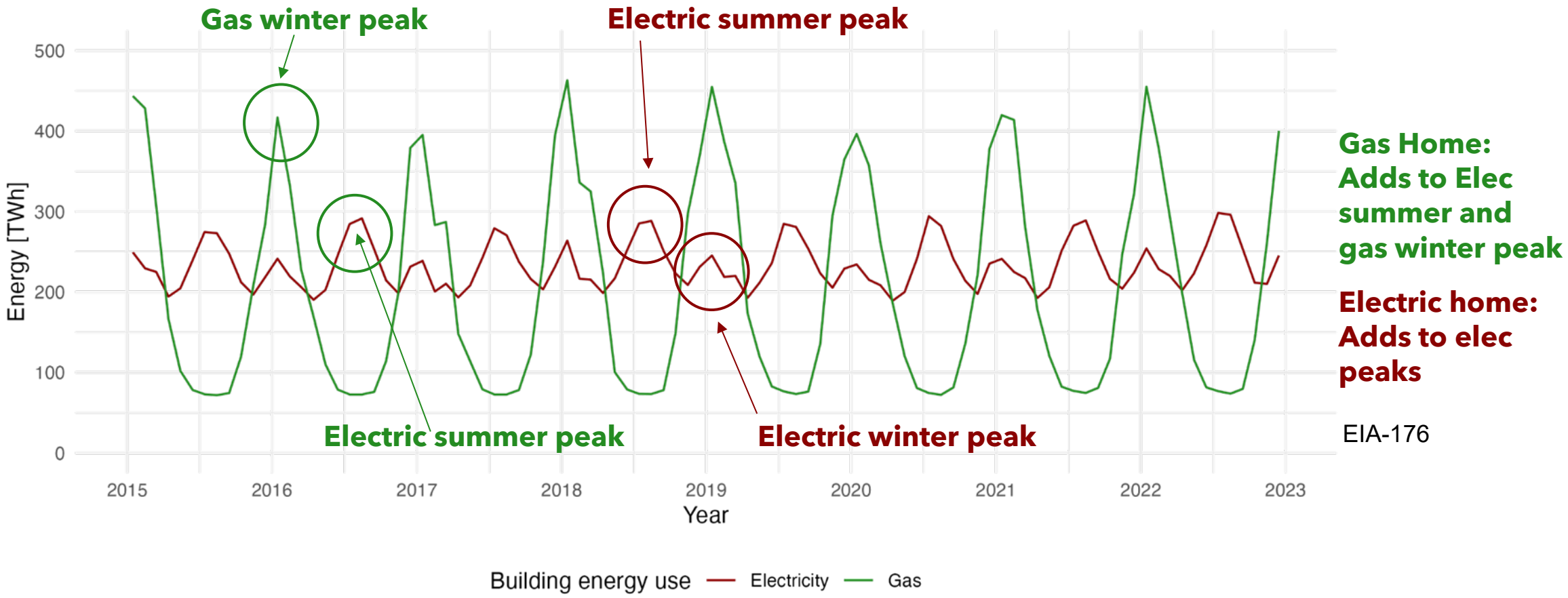
- Critical that new buildings embrace electrification, to pave the way for more expensive existing building conversions



Based on 95% efficient natural gas boiler vs. 320% efficient air source heat pump, 2023 emission rate of 633 lbs/MWh, 2050 emission rate of 50 lbs/MWh

Cost driver: Peaking capacity of electricity & gas networks

New gas buildings add to both network peaks,
New electric buildings concern is around future winter peaks

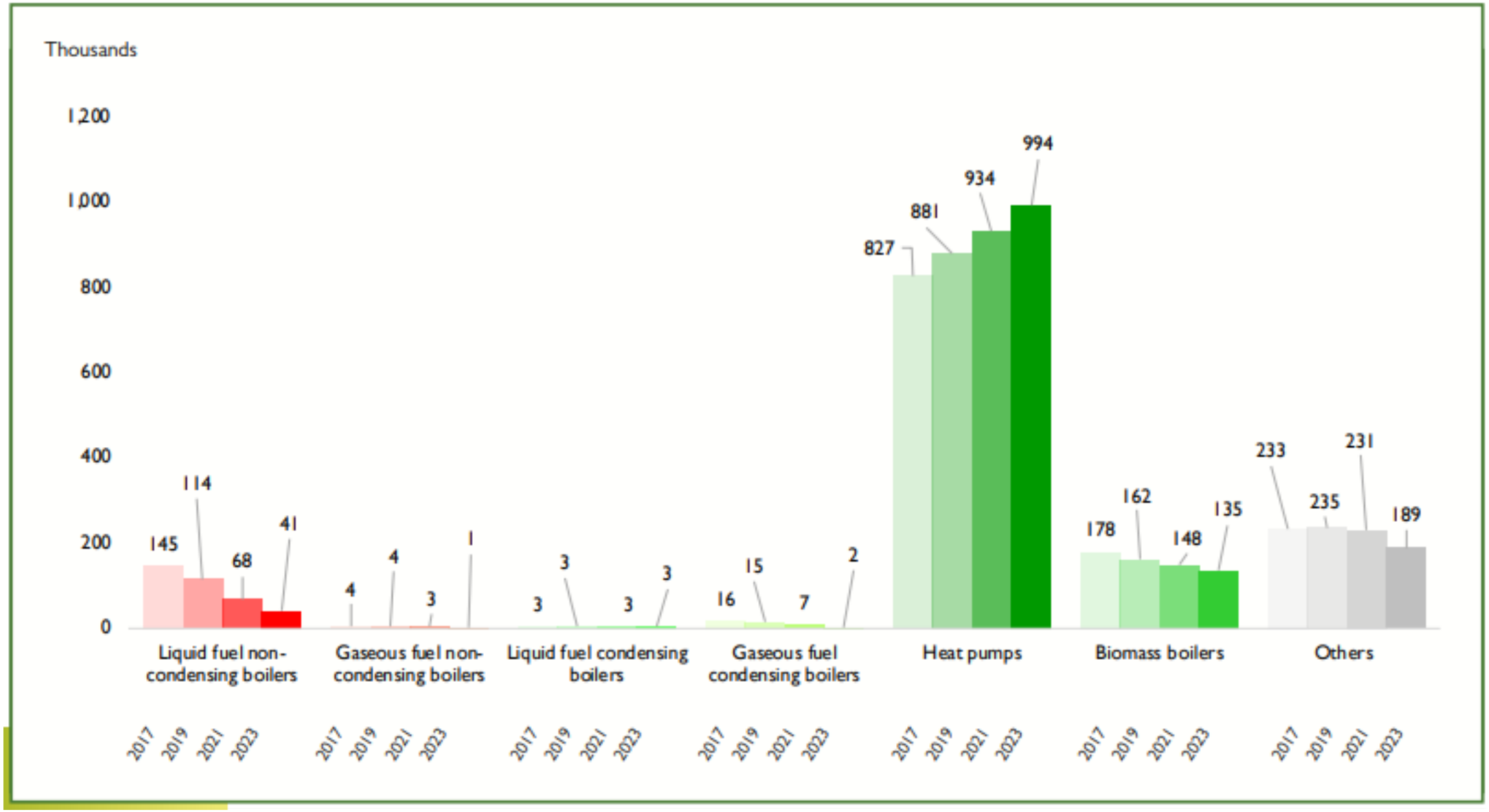


Gas Home: Adds to Elec summer and gas winter peak

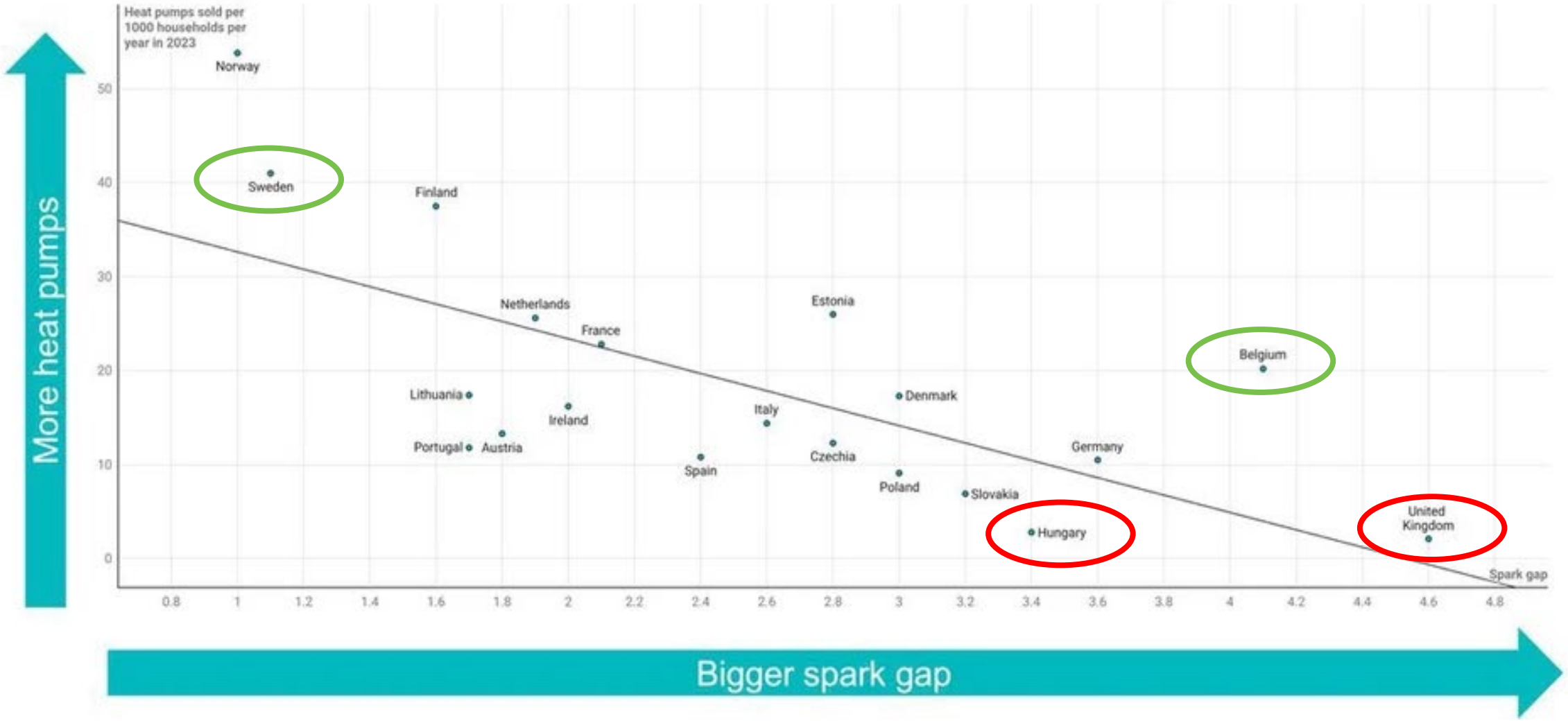
Electric home: Adds to elec peaks

EIA-176

Quiz: Which country is this?



Bigger spark gap means fewer heat pumps



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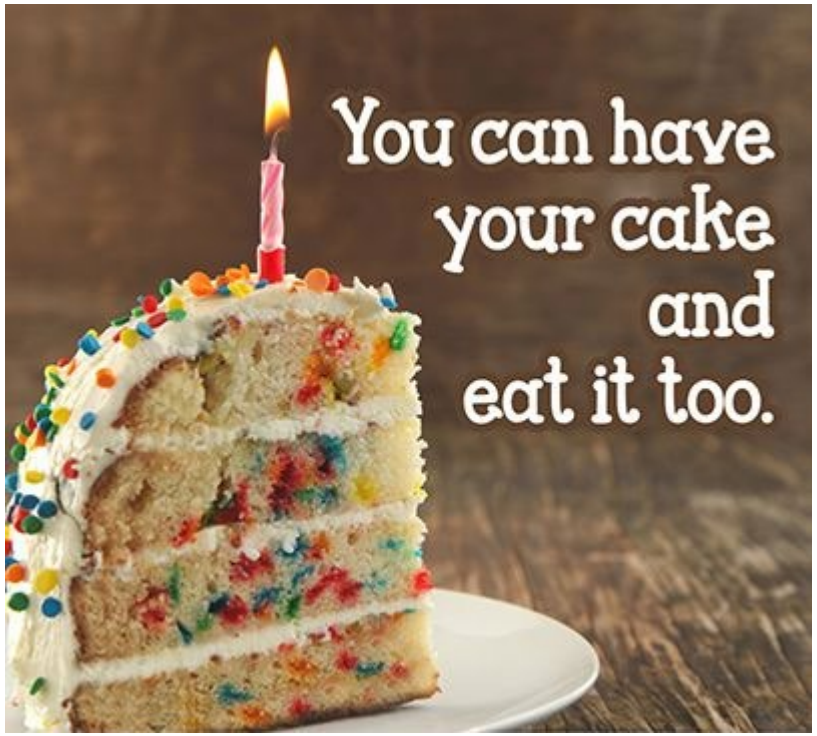
(Spoiler alert....) MA & Belgian Recipe for Success

High in electric calories



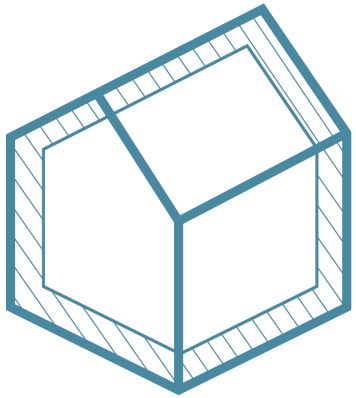
Low in electric peak loads

RECIPE:

1. Start with an IECC base
2. add 4 cups – Thermal Code
3. add Heat Pumps to taste
4. season with EV & Solar ready
5. leave to prove for 5 years

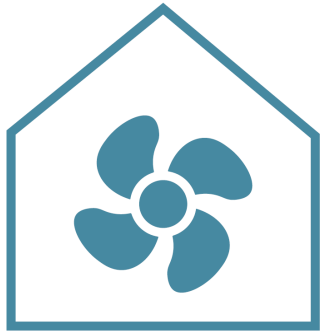
Potential side-effects: may reduce electric rates for all ratepayers

Thermal Code – 4 ~~Pillars~~ Cups



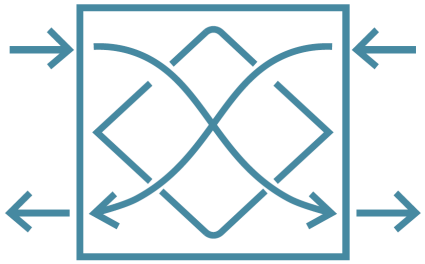
Envelope U-Value

+



Low Air Infiltration

+



Ventilation Energy Recovery

+

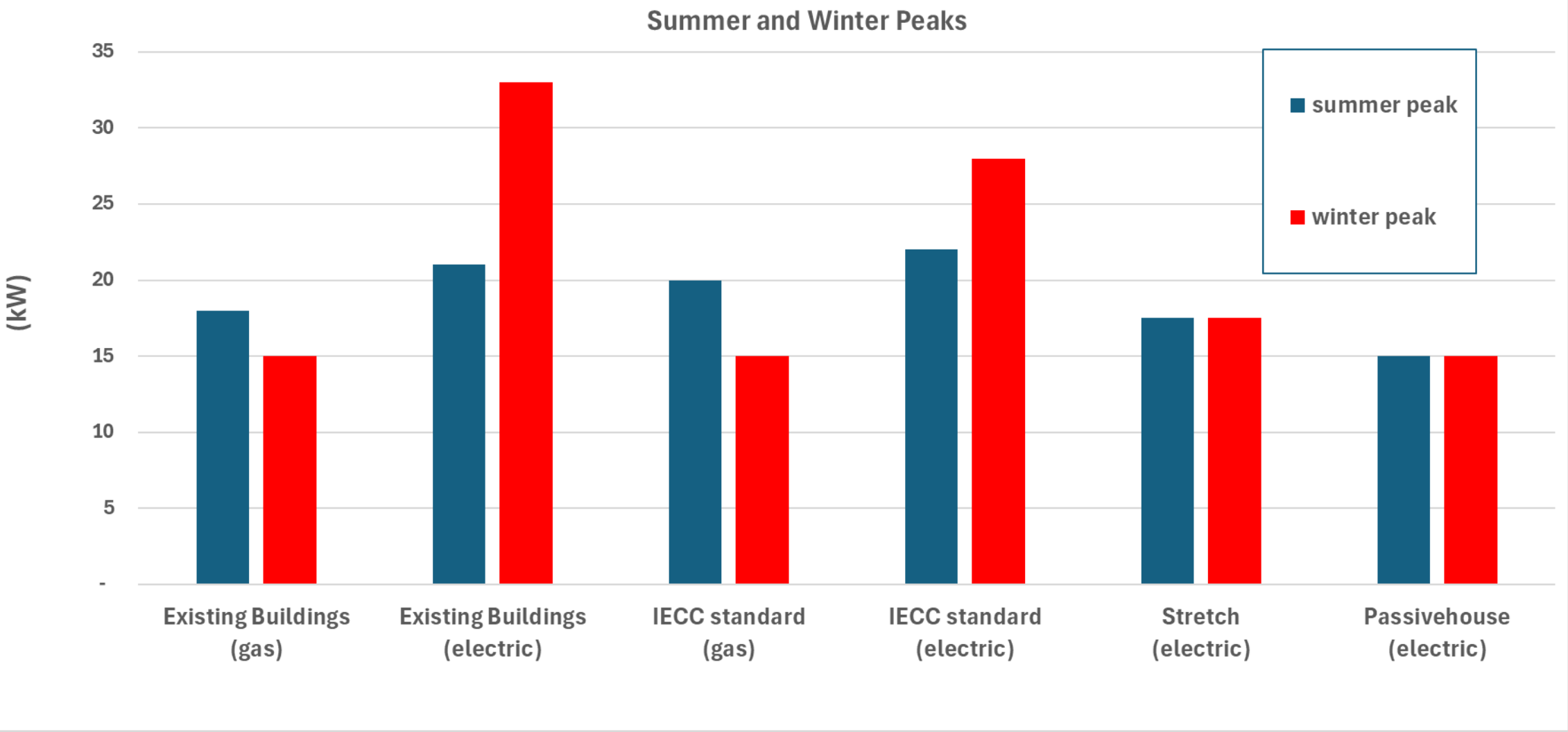
Thermal Bridge Mitigation

This Cake looks a lot like…

All Electric
Passive Building
(especially Multi-family)

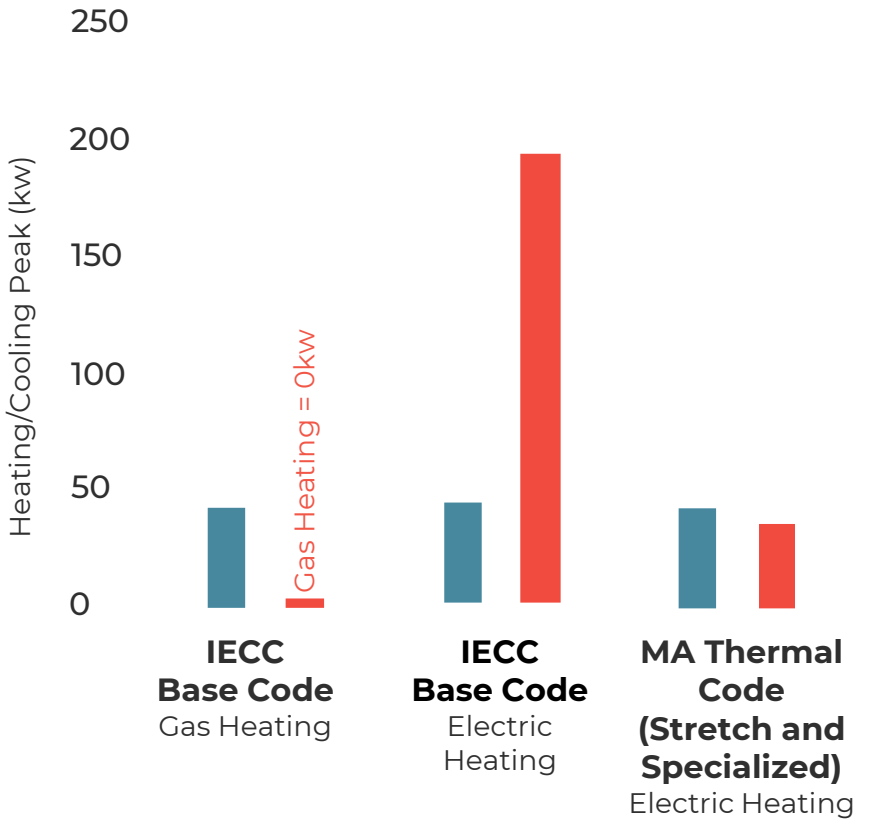
<u>Lower</u> in electric calories
&
Lower in peak loads

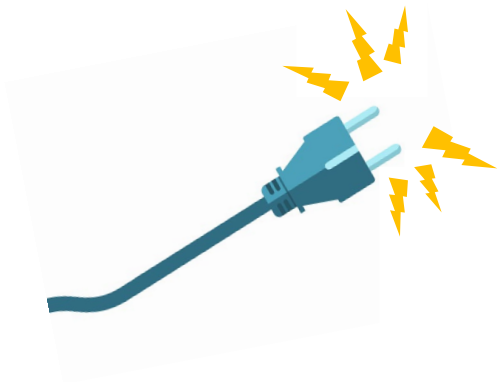
Energy Code goal: manage peak electric loads



How about “grid-friendly” Schools?

Example Load on Electric Grid due to Heating/Cooling in a new school





If Passive buildings via ‘thermal code’ is the destination…

How do we get there?

Do you really need a stretch code?

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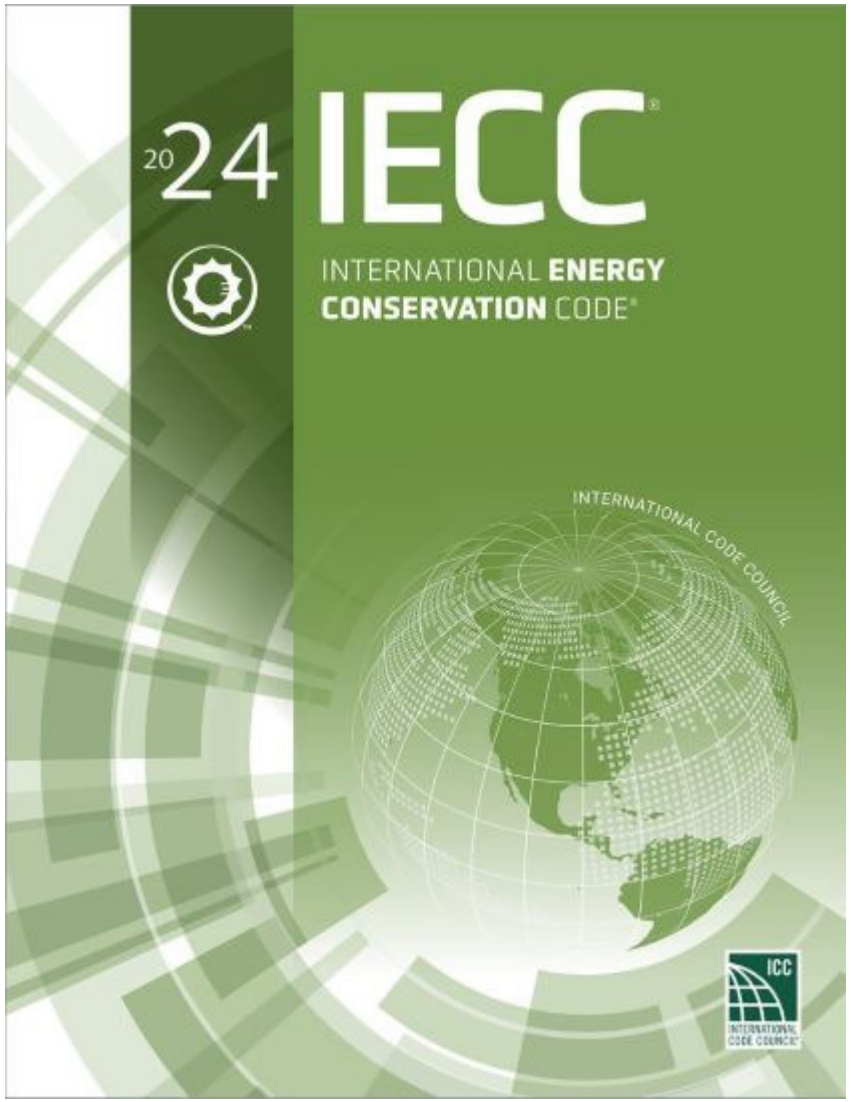
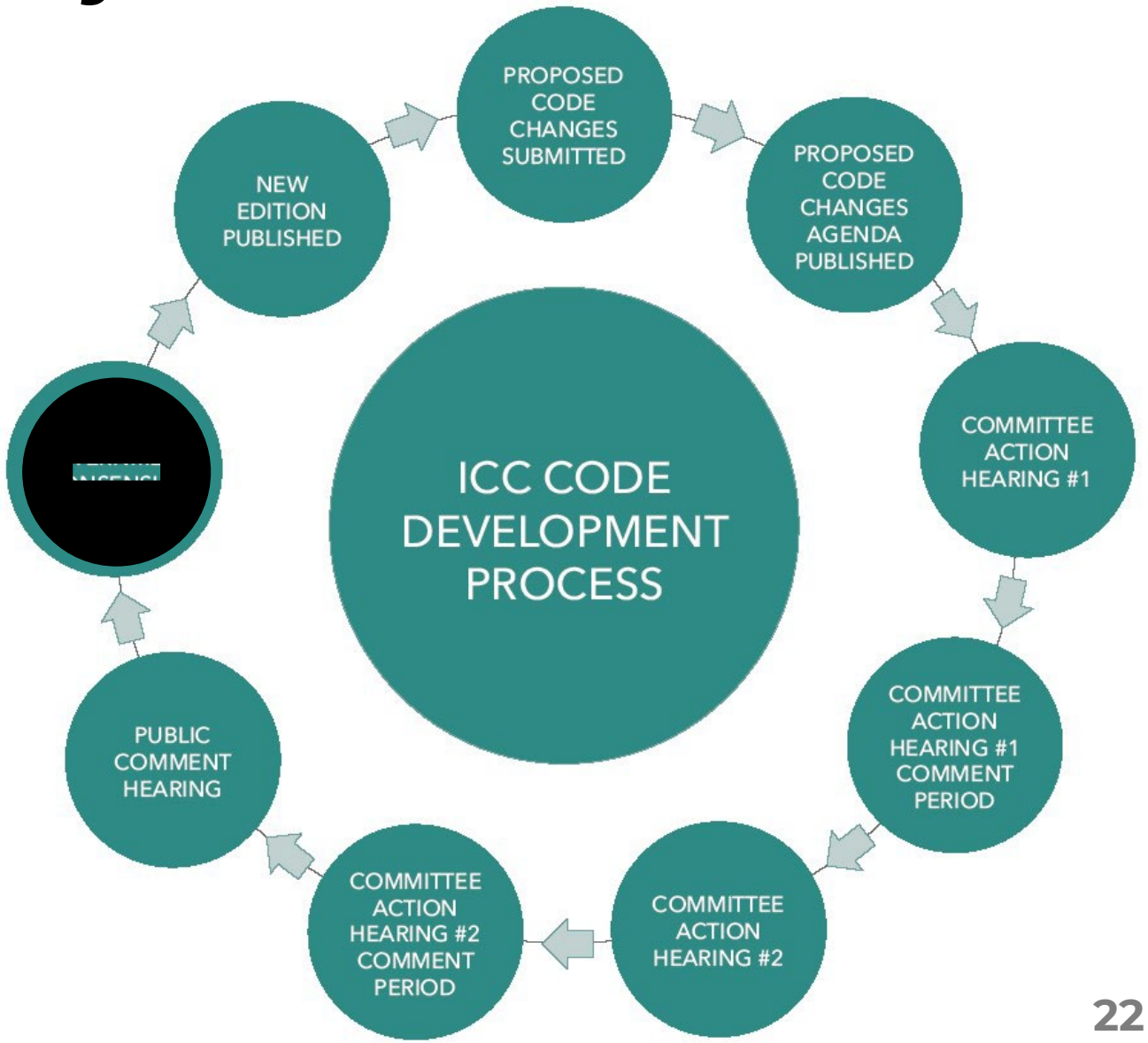
How does the base energy code deal with thermal bridges and peak loads?



How about we electrify the IECC?

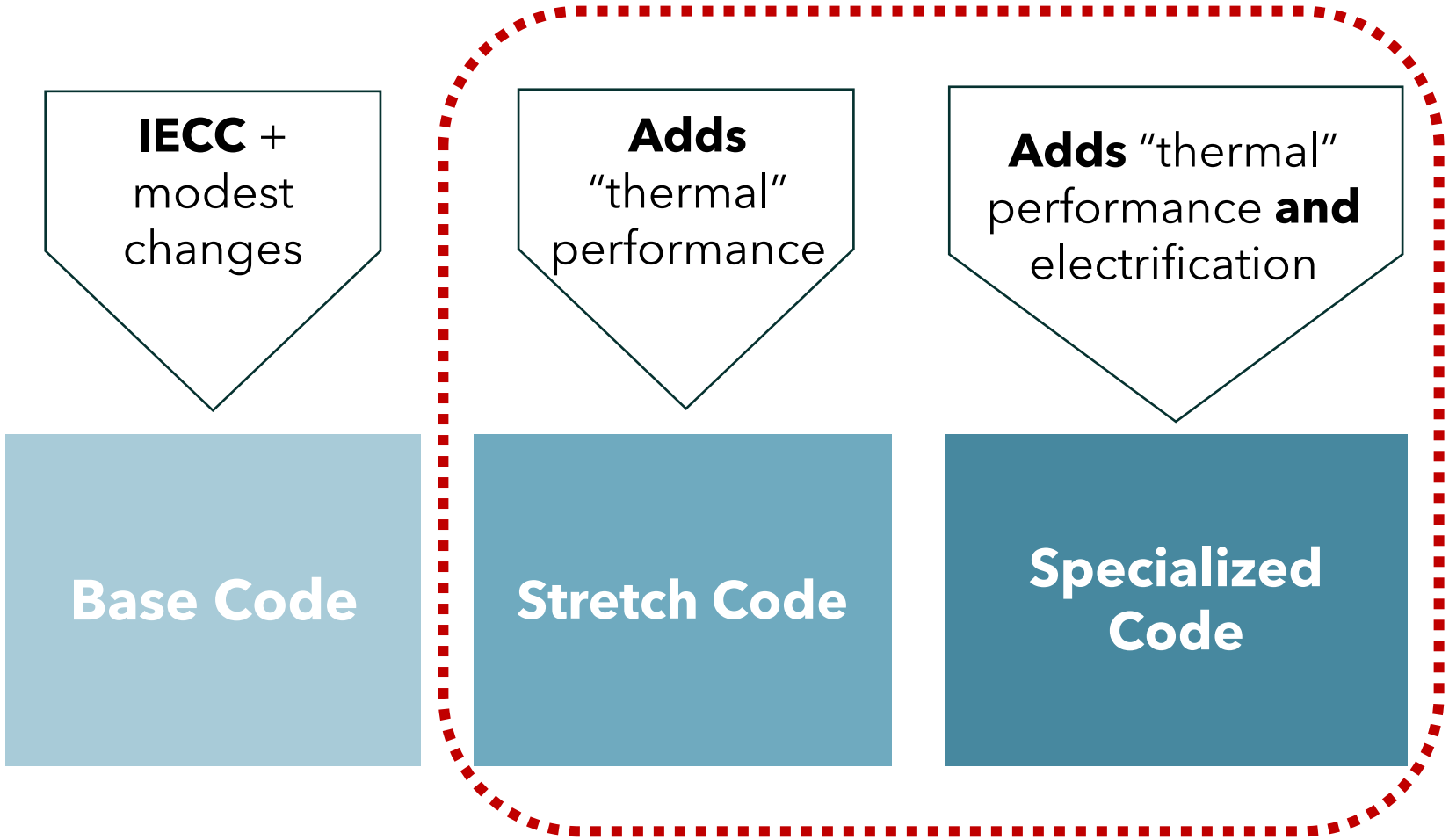
- **IECC 2024 & 2027** – Electrification explicitly excluded (by ICC board) from the main body of the code
  - Allowed only in optional appendices
  - No Governmental voting round

- **IECC 2030** - Process requires **67%** vote by the consensus committee



Luckily in Mass, it’s not ‘all about that base’

Stretch and Specialized "Thermal" Code



phius

Passive House Institute

Roger Federer – ‘tennis lessons’

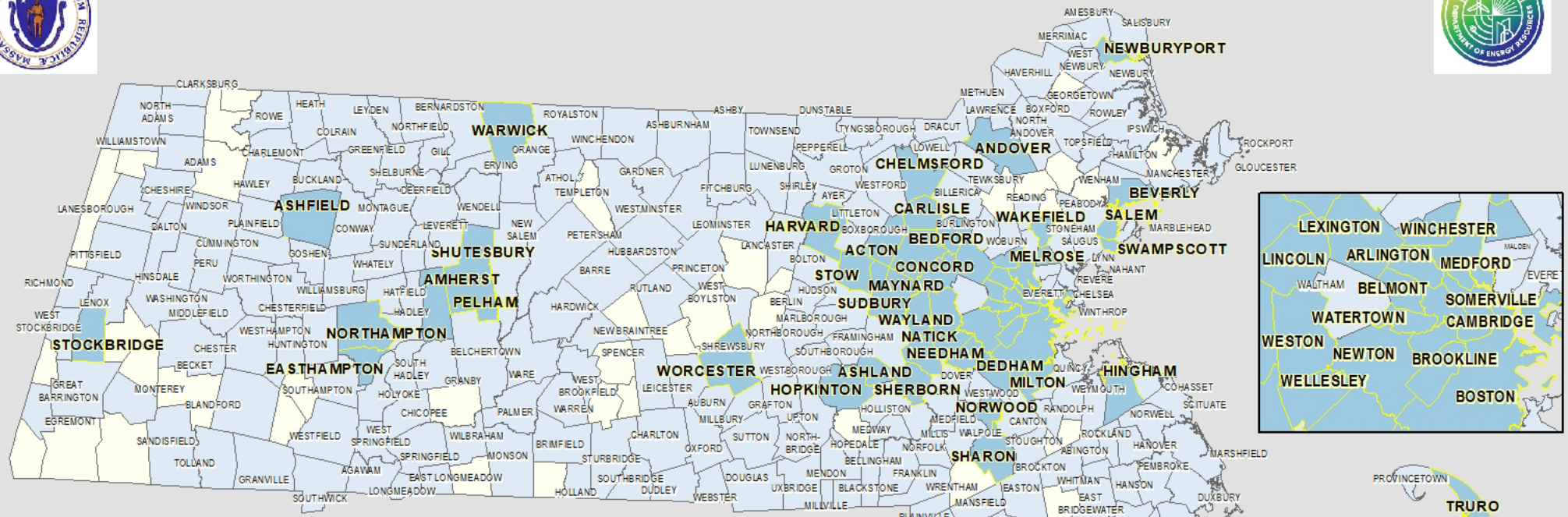
1. Effortless… is a Myth

- Lots of preparation makes it look easy

2. It’s only a point

- Played: 1,526 singles matches
- Wins: almost 80% of matches
- Points won: **Only 54%**

Massachusetts Building Energy Code Adoption by Municipality



Massachusetts Energy Codes

- Base Energy Code (50 city/town)
- Stretch Energy Code - 225 CMR 22.00 and 225 CMR 23.00 (246 c/t)
- Specialized Energy Code - 225 CMR 22.00 (appx. RC) and 225 CMR 23.00 (appx. CC) (*55 c/t)

* Acton, Amherst, Andover, Aquinnah, Arlington, Ashfield, Ashland, Bedford, Belmont, Beverly, Boston, Brookline, Cambridge, Carlisle, Chelmsford, Concord, Dedham, Eastham, Easthampton, Harvard, Hingham, Hopkinton, Lexington, Lincoln, Maynard, Medford, Melrose, Milton, Natick, Needham, Newburyport, Newton, Northampton, Norwood, Pelham, Salem, Sharon, Sherborn, Shutesbury, Somerville, Stockbridge, Stow, Sudbury, Swampscott, Truro, Wakefield, Warwick, Watertown, Wayland, Wellesley, Wellfleet, West Tisbury, Weston, Winchester, Worcester

--2023: Effective 7-1-23-Brookline,Cambridge,Somerville,Watertown--2024: Effective 1-1-24-Acton,Aquinnah,Arlington,Boston,Concord, Lexington,Lincoln,Maynard,Newton,Northampton,Sherborn,Stow,Truro,Wellesley,Wellfleet -Effective 7-1-24-Amherst,Bedford,Carlisle,Chelmsford, Medford,Melrose,Needham,Norwood,Salem,Swampscott,Wakefield,Weston,Worcester--2025: Effective 1-1-25-Ashfield,Ashland,Belmont,Dedham, Eastham,Easthampton,Harvard,Hopkinton,Milton,Sharon,Wayland,West Tisbury -5-31-2025-Shutesbury; 7-1-25- Natick,Newburyport,Winchester; -9-1-25-Pelham,Sudbury--2026: Effective 1-1-26- Beverly,Hingham,Stockbridge,Warwick -Effective 7-1-26, Andover

MA DOER, 8-18-2025, jpfister

3 tiers of Energy Code
available to MA towns & cities:

Massachusetts "Opt-In" Thermal Codes

Base Code

IECC 2021 (10th edition*)
w/ MA amendments:

9% population

50 municipalities

Stretch Code

IECC 2021
w/ key MA amendments:
225 CMR Chapter 22 (residential)
225 CMR Chapter 23 (commercial)

61% population
New Construction, Major Alterations & Additions

251 municipalities

Specialized Code

IECC 2021
w/ key MA amendments:
225 CMR Chapter 22 + Appendix RC (residential)
225 CMR Chapter 23 + Appendix CC (commercial)

30% population
New Construction Only
Reference Stretch Code for existing buildings

55 municipalities

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Stretch code is a marathon – don't forget 'effortless' is a myth

- If you invest in developing a Stretch code (with Phius buildings)
- Don't forget a real support program for municipal adoption
  - Municipal grant $$$s
  - Technical assistance
  - Recognition Awards

GREEN COMMUNITY
Massachusetts
DEPARTMENT OF ENERGY RESOURCES
Commonwealth of Massachusetts
Deval L. Patrick Governor | Timothy P. Murray Lieutenant Governor | Ian A. Bowles EOEEA Secretary | Philip Giudice DOER Commissioner
DESIGNATED 2010

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What else is in the policy toolbox?

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Policy tools: Carrots, Sticks and Tambourines

Carrots:

- Recognition: Green Community status, Design awards
- Financial direct: Utility incentives, Federal Tax credits, QAP for low-income tax credits
- Financial in-direct: Green Communities Grants
- Administrative: Passive house compliance pathway

Sticks:

- Building Code minimums
- Affordable housing QAP pre-requisites

Tambourines:

- Study Tours
- Code training
- Demonstration Projects
- Technical assistance
- Municipal meetings / conferences / webinars

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Study Tours: what exists… must be possible

Identify & support local passive building champions

- 2009 & 2010 MA hosted building delegations from Upper Austria and Saxony, Germany
- 2011: 4 NESEA leaders reported back from a study tour of Upper Austria and Saxony
  - Chris Benedict, Paul Eldrencamp, Tom Hartman, Andy Shapiro
- 2014: NESEA follow-up Study Tour to Denmark & Sweden with Heather Nolan added
- Today: you can visit NYC, Phili, Boston, Vancouver or Toronto

April 2011: Western MA AIA newsletter

Germany and Austria Green Building Tour

Thomas RC Hartman, AIA, a partner at Coldham & Hartman Architects in Amherst recently joined a cohort of colleagues on a tour of Germany and Upper Austria. Tom, (along with Chris Benedict, an architect in New York City who focuses her firm on multifamily buildings, Paul Eldrenkamp, president of Byggmeister, a design-build remodeling firm based near Boston and Andy

Upon returning home, the group presented their findings at the NESEA Building Energy conference in Boston on March 9. The presentation was rather raw and a wonderful outpouring with a spirited cross-engagement between the travelers and their audience. The presentations included three 90 minute sessions and included a total of 16 building descriptions, nearly all of which were either designed to the PassivHaus standard or similar low energy standard required in this part of the world, and a summary of the conference as well as the trip.

ere may be an opportunity imilar presentation for presentations and more formation will be made y on the NESEA website, .

Solar City in Linz Austria
to by Thomas RC Hartman AIA

Demonstration projects

MASSACHUSETTS CLEAN ENERGY CENTER®

PASSIVE HOUSE DESIGN CHALLENGE

North Commons at Village Hill, Northampton, MA

The Challenge: Dispel Misperceptions about Passive House Construction Costs

Passive House standards provide a framework for the construction of exceptionally low-energy, resilient, healthy, and comfortable buildings. However, as of 2017, there was only one certified Passive House multifamily building in Massachusetts and little data was available on the costs associated with building to Passive House standards.

Average +2.2%

Closed

Program Area

High Performance Buildings

Program Duration

2017 - 2022

Activities Supported

- Design & Construction
- Pilot Projects

Utility energy efficiency programs

Incentives | How to Participate | Eligibility

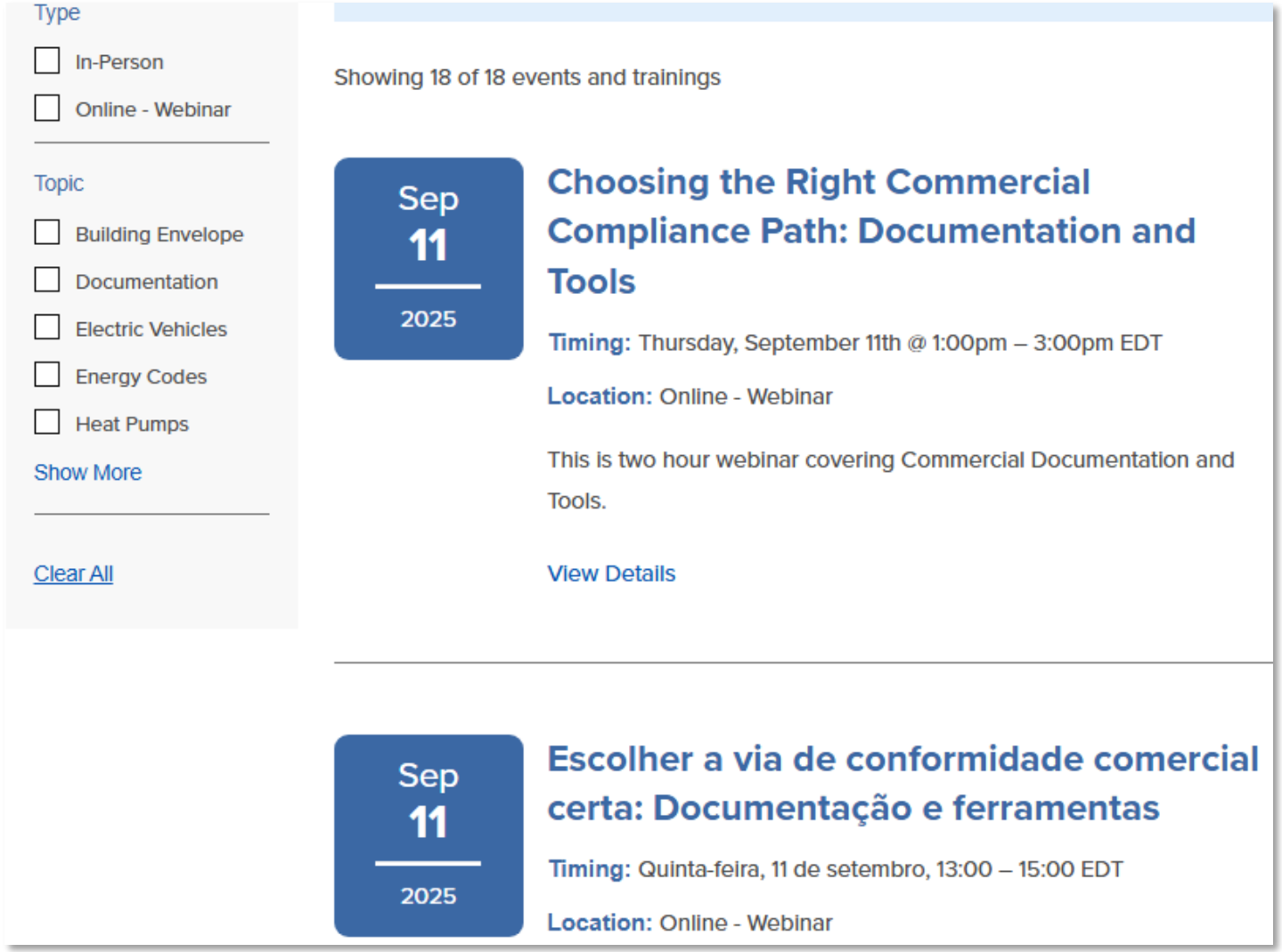
Multi-Family (5+ units)			
Tier	**Base**	**ENERGY STAR**	**Passive House**
Overview	All-electric heating, cooking, and clothes drying	ENERGY STAR Multi-Family New Construction (MFNC) v1.2	Passive House
Performance Specification	Low-rise: ≥15% savings above baseline or HERS: ≤45 High-rise: Exceed baseline	ENERGY STAR MFNC v1.2	Passive House certification (Phius or PHI)
Incentives	Low-rise: $1,500/Unit High-rise: $1,000/Unit	Low-rise: $2,500/Unit High-rise: $1,750/Unit	Both: $3,750/Unit ($750 Pre-Cert, $3,000 Final Cert)
Passive House adders	$5,000 Feasibility Study Incentive Up to 75% Energy Modeling Costs ($500/Unit or $20,000/Project max)		

Single-Family (1-4 units)			
Tier	**Base**	**ENERGY STAR**	**Passive House**
Overview	All-electric heating, water heating, cooking, and clothes drying	ENERGY STAR NextGen	Passive House
Performance Specification	≥15% savings above baseline	≥30% savings or HERS: ≤45 Infiltration: ≤1.5 ACH50 ENERGY STAR SF NH v3.2 + NextGen	Passive House certification (Phius or PHI)
Incentives	Single Fam: $7,500 2-unit: $8,750 3-unit: $10,000 4-unit: $11,250	Single Fam: $15,000 2-unit: $17,500 3-unit: $20,000 4-unit: $22,500	Single Fam: $25,000 2-unit: $30,000 3-unit: $35,000 4-unit: $40,000
Market Transformation adders*	Wi-Fi Connected Thermostat (Base tier only): $100/unit Induction Cooktop: $250/unit Split-System Heat Pump Water Heater: $750/unit ENERGY STAR v3.2 certification (Base tier only): $250/unit DOE Zero Ready certification (Base and ENERGY STAR tier): $500/unit ENERGY STAR Certified Ground-Source Heat Pump: $9,000/unit		

No-cost Training & Support

in partnership with Passivehouse MA

Mass Save: Codes and Standards training calendar



How’s it going in MA?

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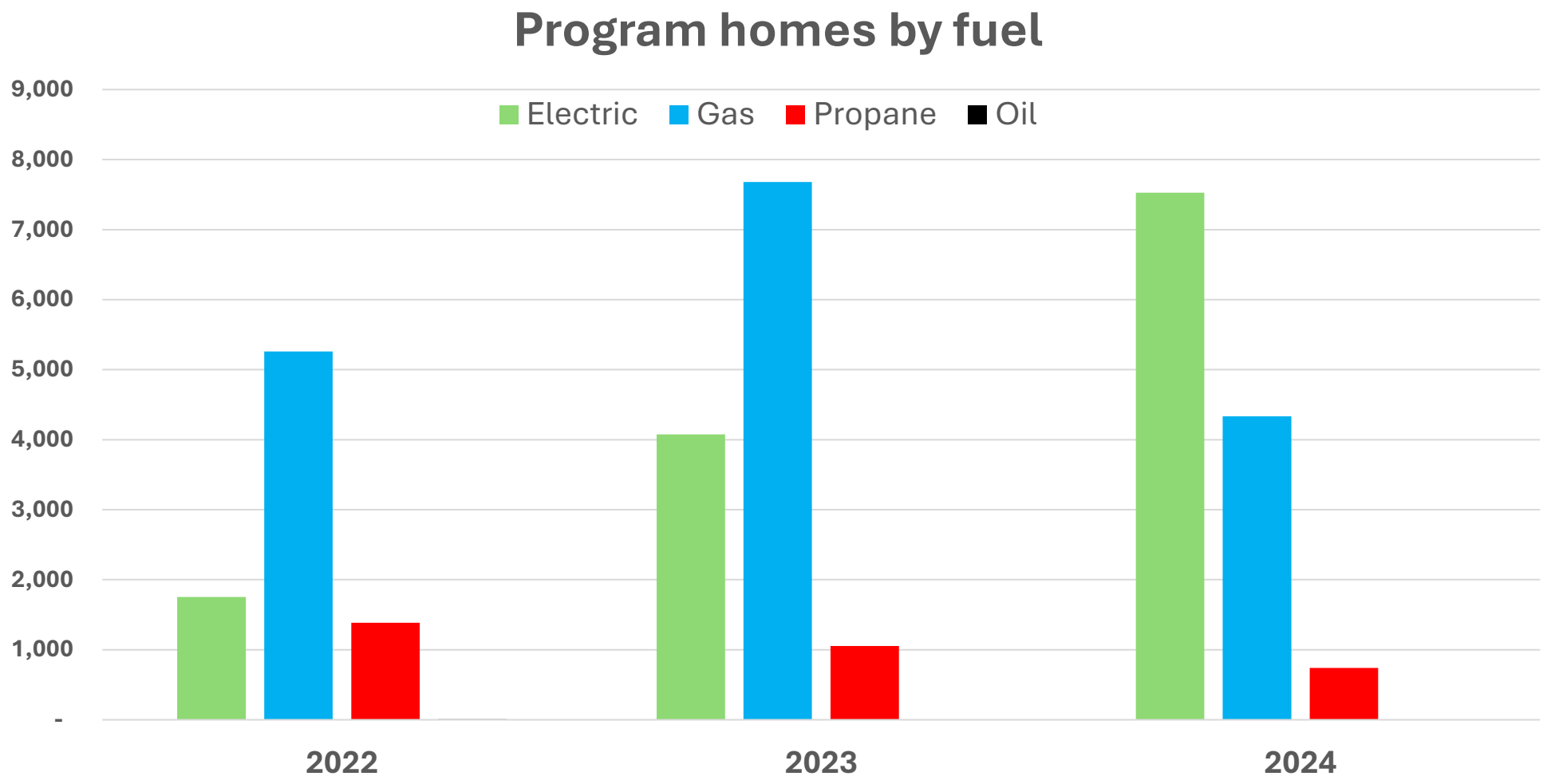
Mass Save® program – new construction 2022-2024



Mass Save **Passive House** Incentive Program

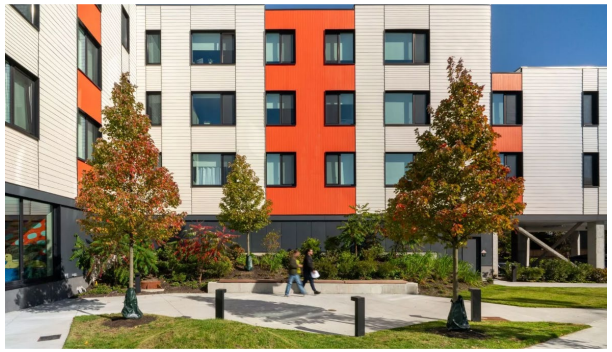
Leyland Community
Dorchester MA
Davis Square Architects

Glen Brook Way
Medway MA
Meander Studio Collaborative

McElwain Apartments
Bridgewater MA
Prellwitz Chilinski Associates

11 E. Lenox Street
Boston MA
Haycon Construction

Walnut Street Building 2
Foxborough MA



1005 Broadway
Chelsea MA
Utile, Inc

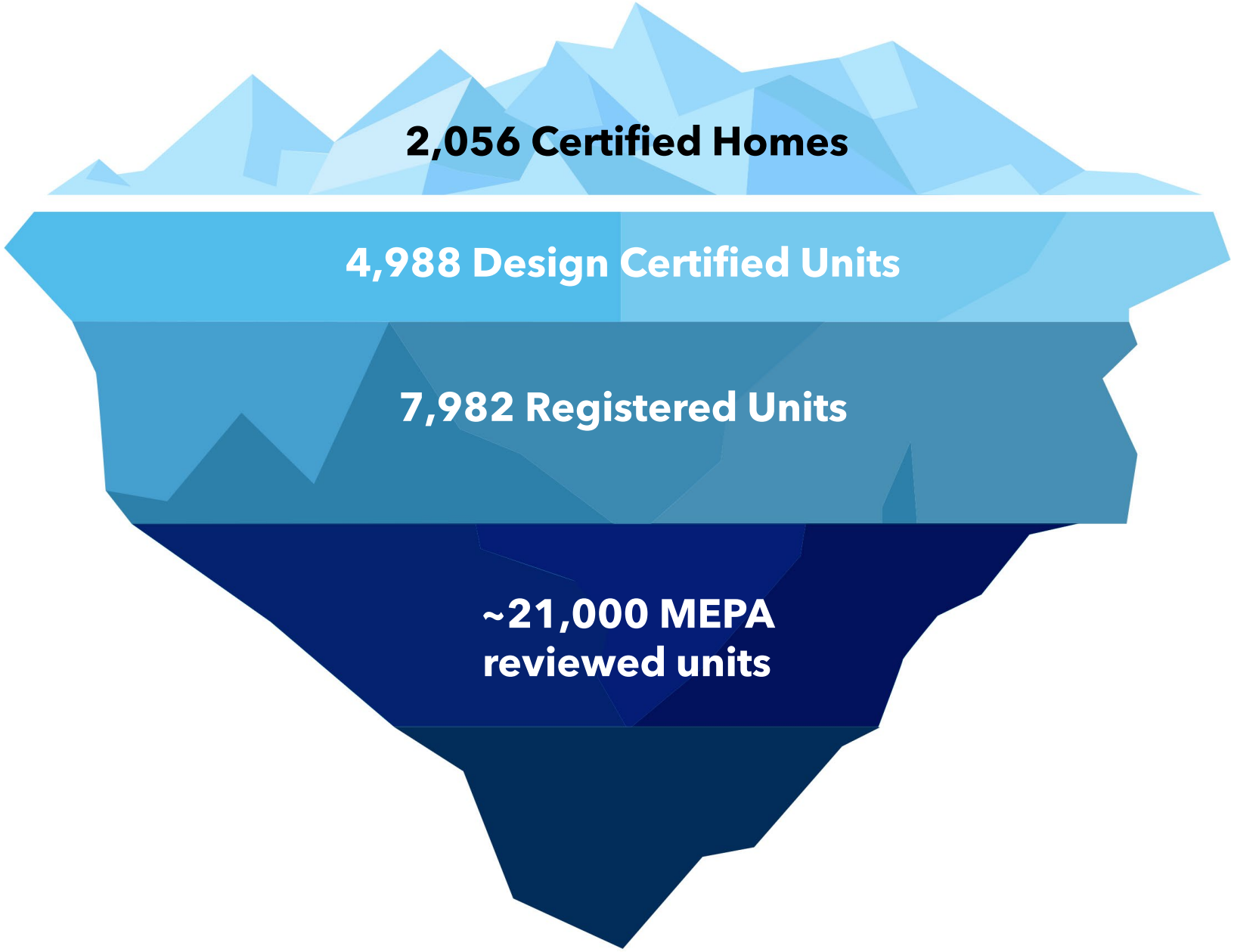
The Loop at Mattapan Station
Boston MA
The Architectural Team

Hillside Center for Sustainability
Newburyport MA
Hall & Moskow

JJ Carroll Redevelopment
Boston MA
MASS Design Group

to date **>16,000** housing units
have pursued **PH** through **Mass Save**

MAssive Passive iceberg : Over 35,000 multi-family units



Lessons Learned

1. Passive buildings build community:
    - Design professionals
    - Affordable housing community
    - Municipal ‘YIMBYs’
2. Concise performance-based stretch code works
3. Increase your odds of adoption:
    - Have a plan with Carrots, Sticks and Tamborines
    - Target Multi-family and Schools
    - Use a stretch code / municipal option
4. Have a delivery mechanism – Scale up by enabling local adoption

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Thank You!

Bonus Quiz: What is the common link?

Cameroon

Canada

Italy

Nepal

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