The Carbon Trifecta

New Horizons for RESNET

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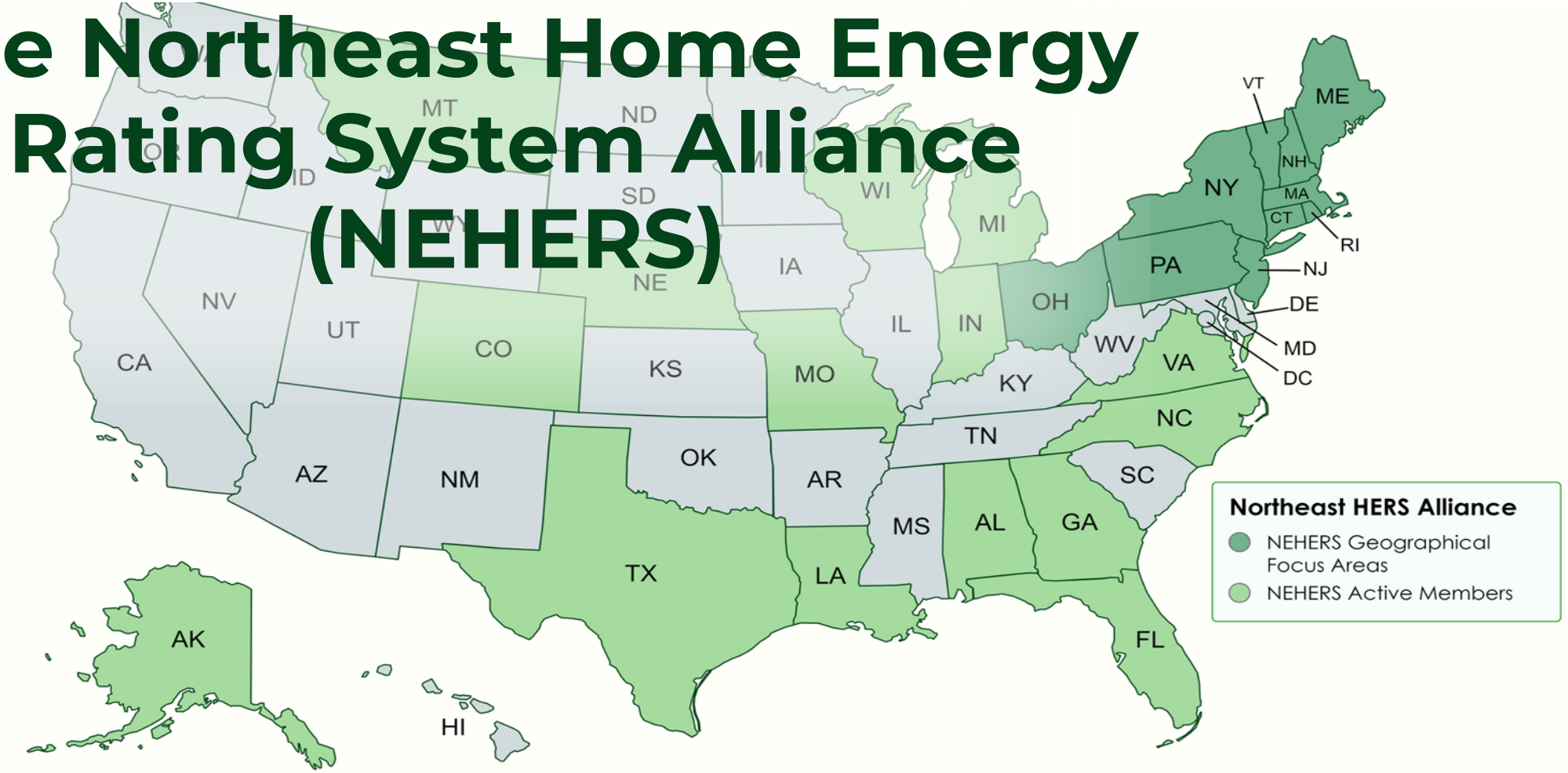
The Northeast Home Energy Rating System Alliance (NEHERS)



www.nehers.org

Giants of Energy Efficiency

Dr. David Goldstein

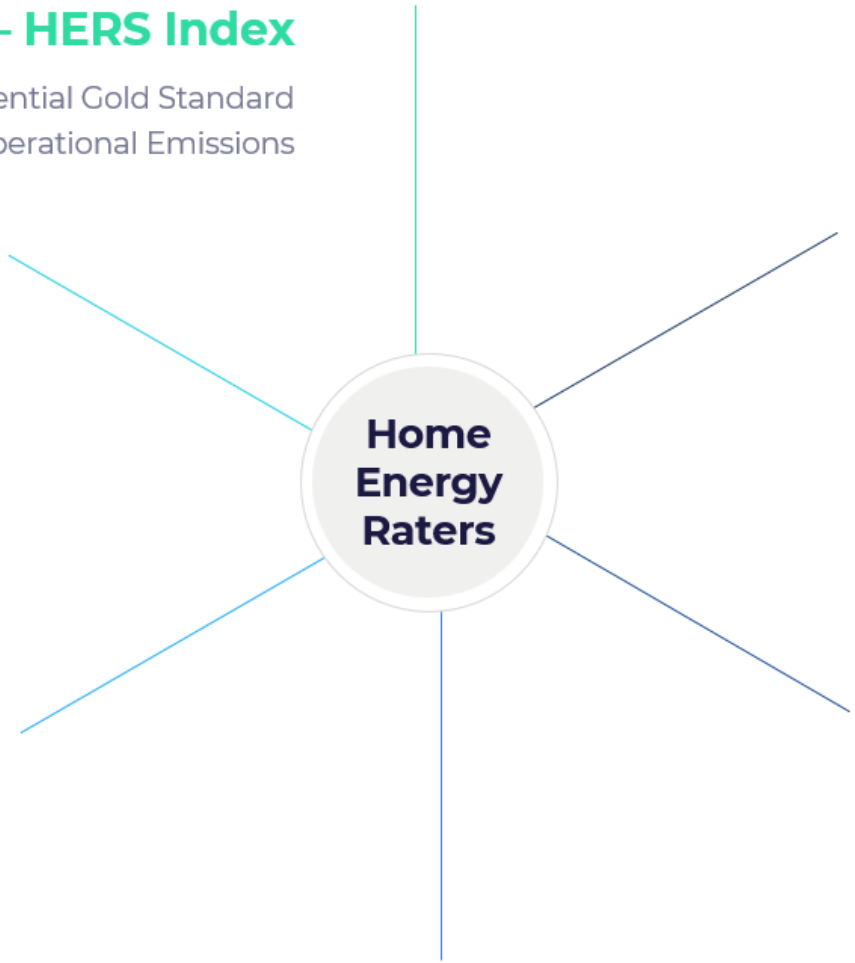
President Jimmy Carter

The RESNET Ecosystem

Q1 - 2018

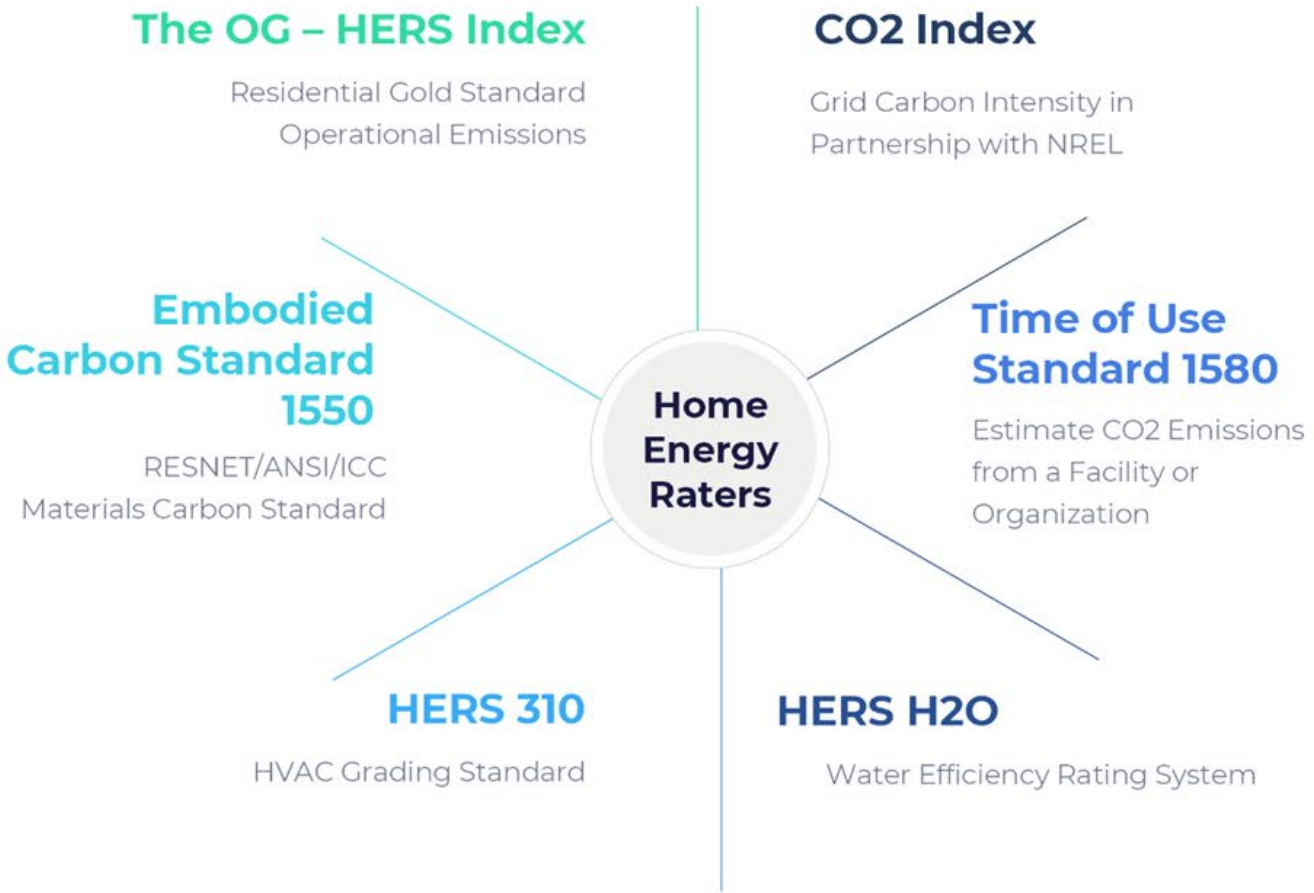
The OG – HERS Index

Residential Gold Standard
Operational Emissions



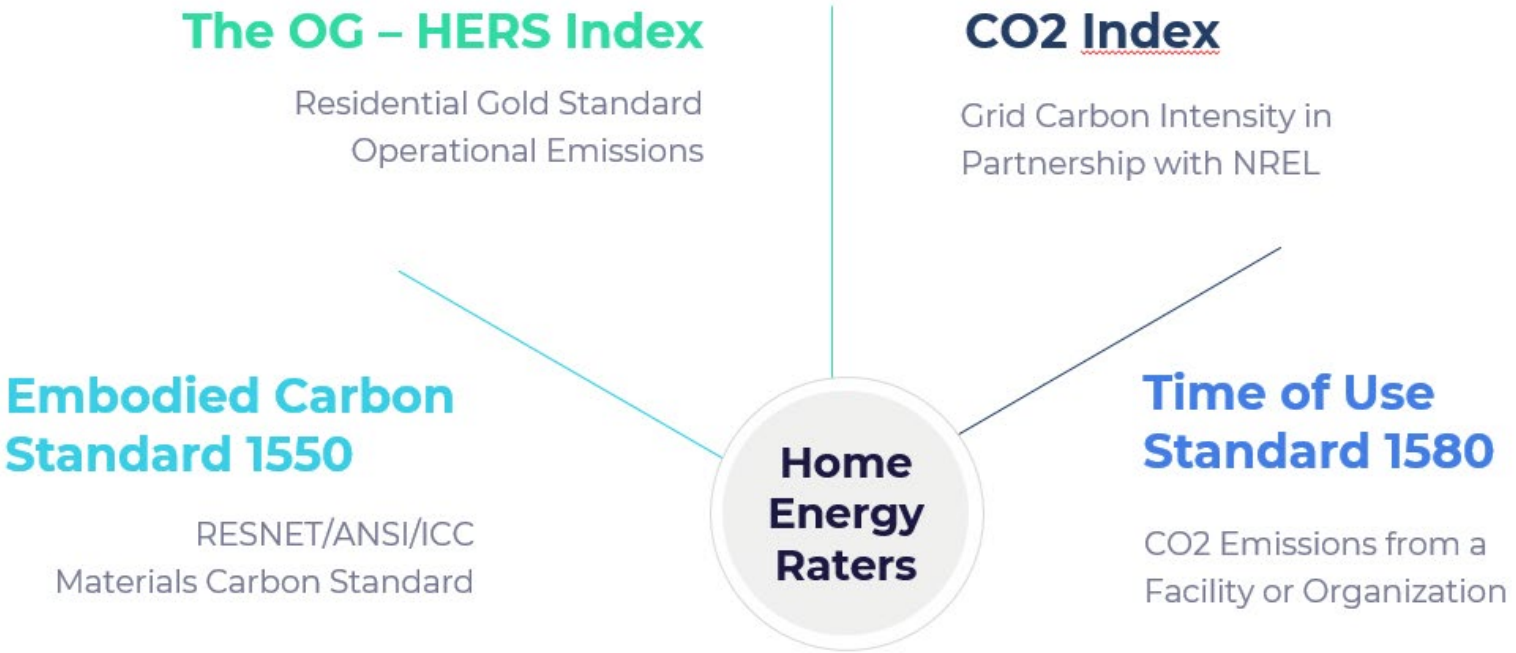
The RESNET Ecosystem

30 Years of Leadership



The RESNET Ecosystem

The Trifecta + 1



What does the next decade hold for the Rating Industry?

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Massachusetts Carbon Matrix

Synergy across the State

Government Leadership

From the Governor's office to the Building Officials

DOER

Actionable Policy across Residential, Commercial & industrial

Utilities

3-year plans in tight alignment with state policy -

MASS Save

Performance Based Incentives

Workforce Development

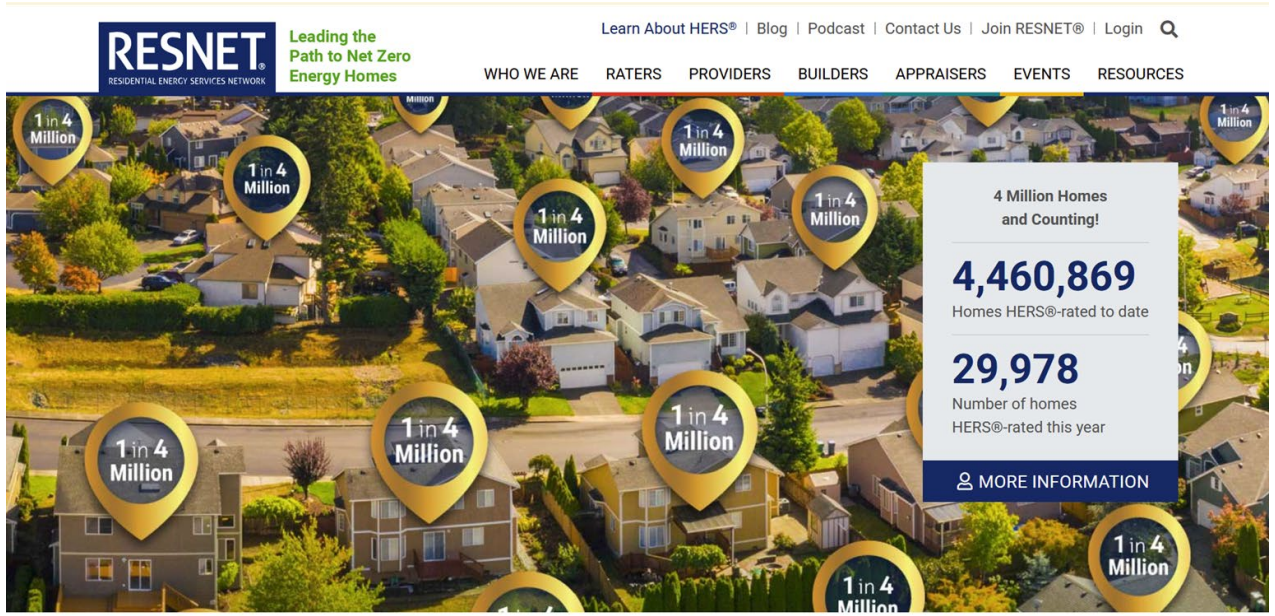
Weatherization, Energy Consultants, Builder Training

HERS Raters

MASS Clean Energy Center

Innovation through investment

Raters Registered 436,798 Homes in 2024



https://www.resnet.us/

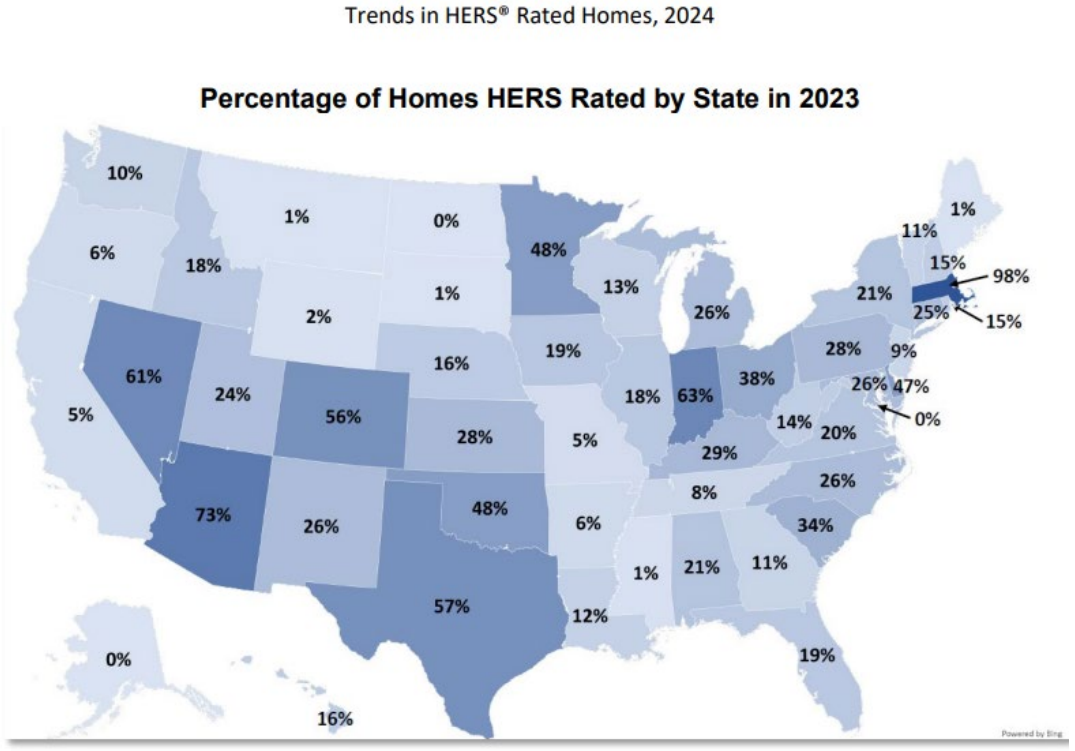
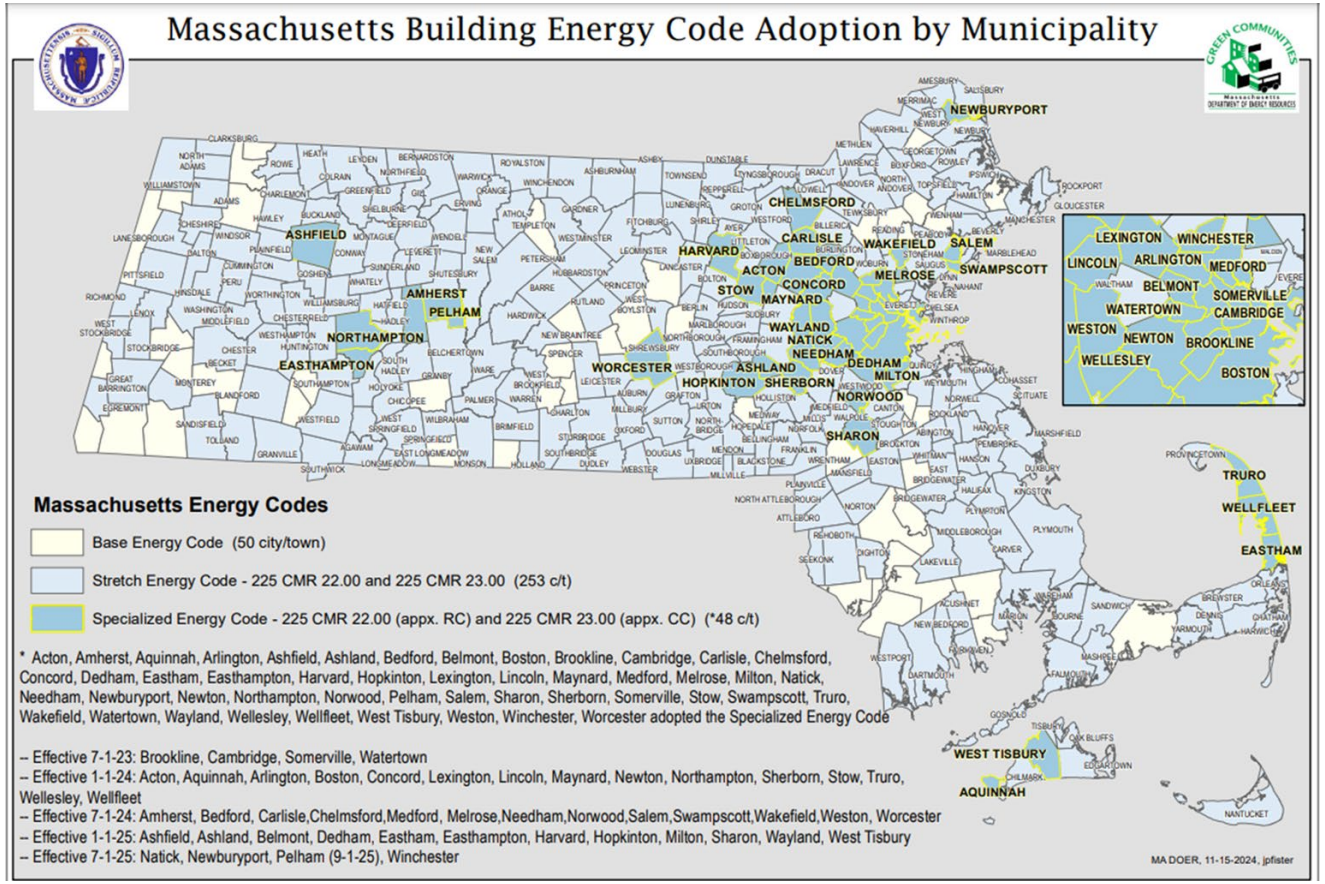
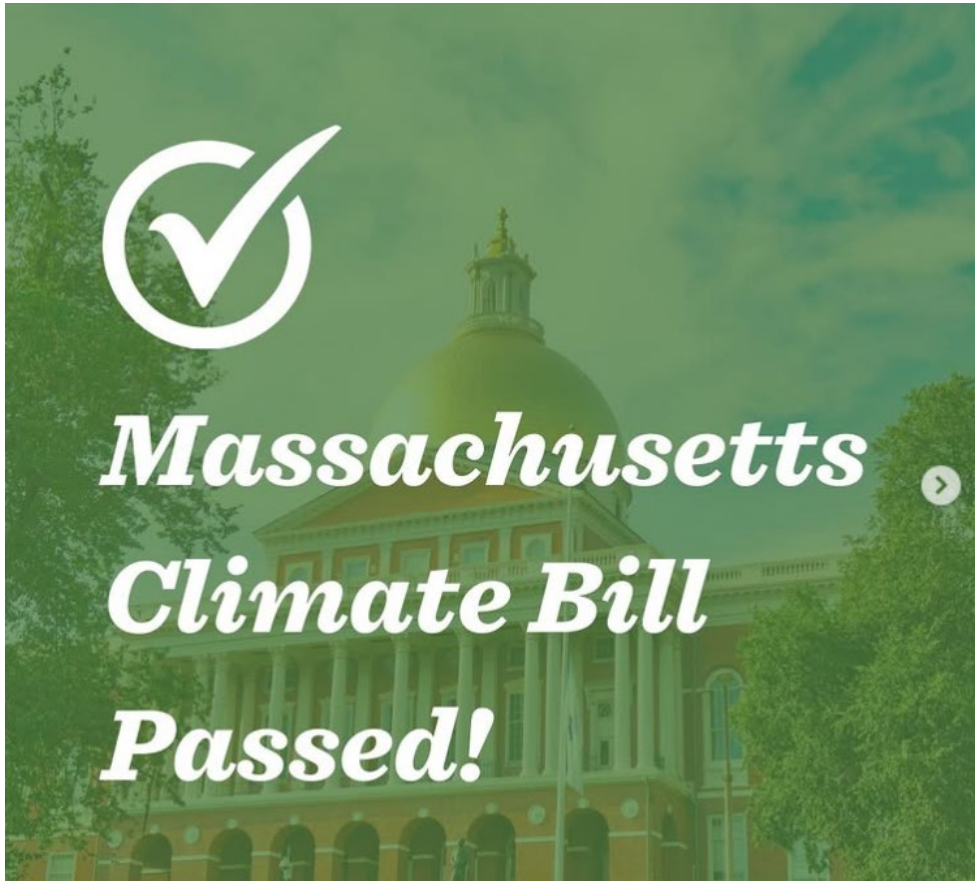


Figure 1. Percent of New Homes HERS Rated by State, 2023

https://www.resnet.us/wp-content/uploads/RESNET_2024_HERSTrendsDataReport_FINAL.pdf

Massachusetts: The Test Kitchen





https://www.mass.gov/doc/building-energy-code-adoption-by-municipality/download

https://www.instagram.com/officialmasssierraclub/p/DCXT6jayBO-/?img_index=1

Embodied Carbon Credit

R406.5.2 Add Subsection R406.5.2

1. Insulation embodied carbon credit:

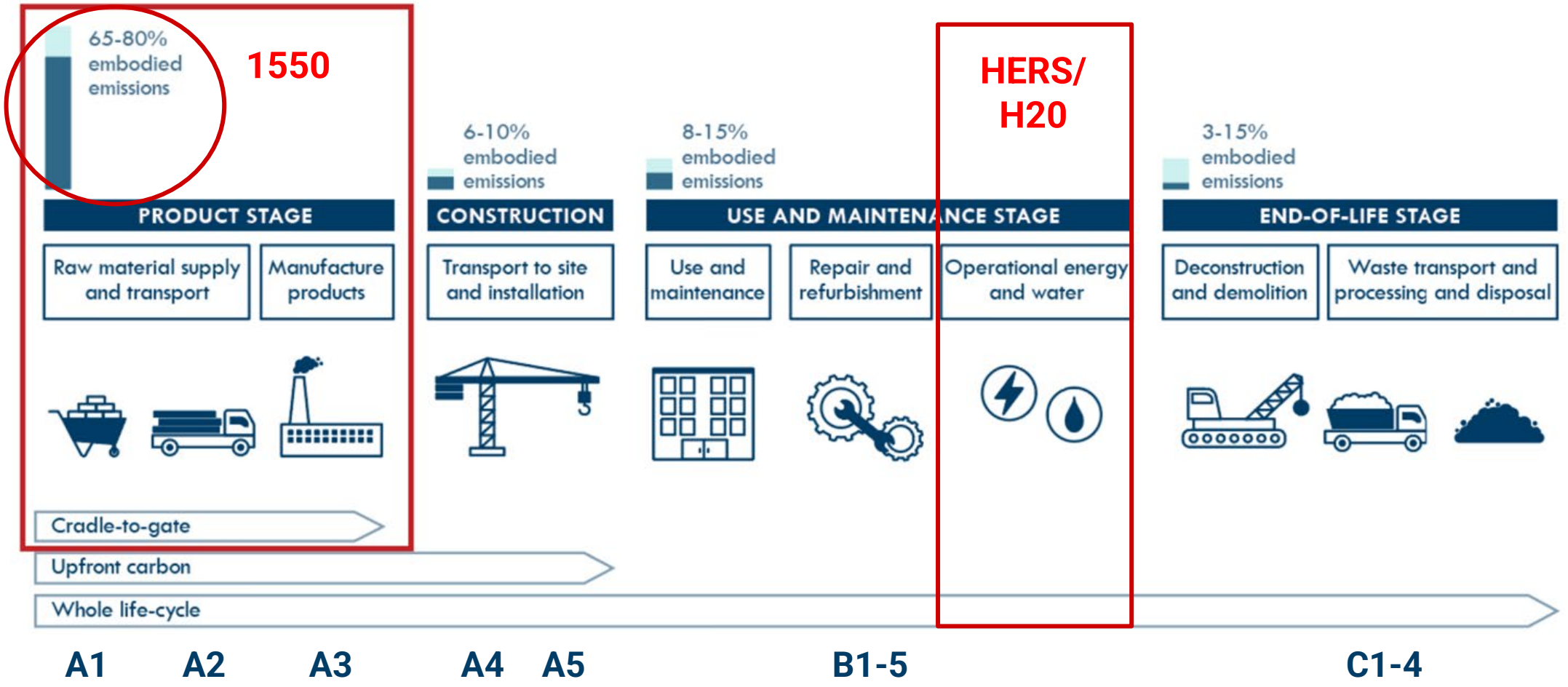
- Up to 3 HERS points off for low carbon insulation
- Northeast HERS worksheet for DOER from NEHERS

2. Low GWP concrete mix credit:

- Up to 3 HERS points off for GWP reduction from regional baseline

https://www.mass.gov/doc/fall-2024-stretch-specialized-code-residential-redlines-full/download

Life cycle stages A1-A3:



RMI – Energy. Transformed.

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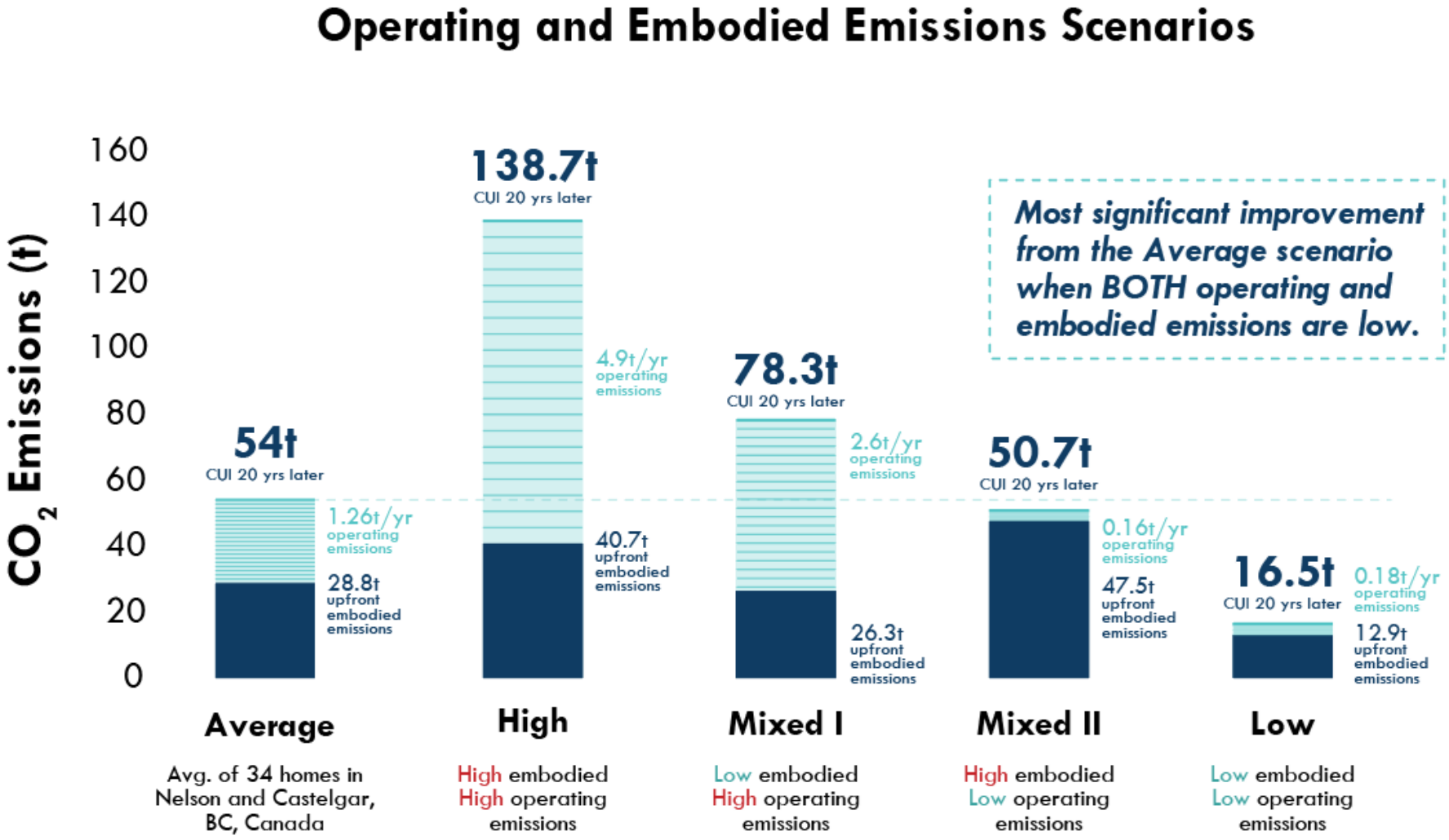
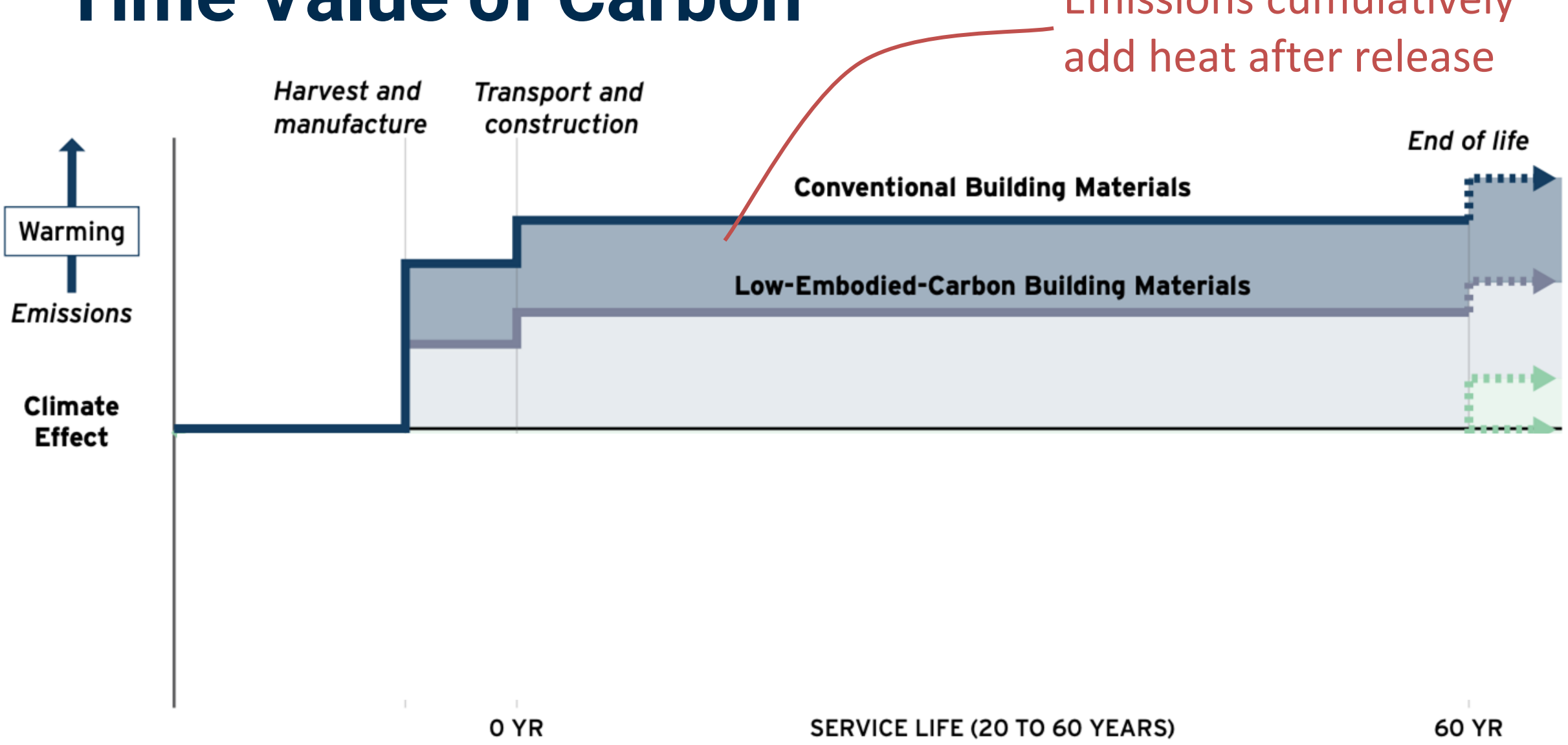
Carbon Use Intensity - Nelson, B.C.

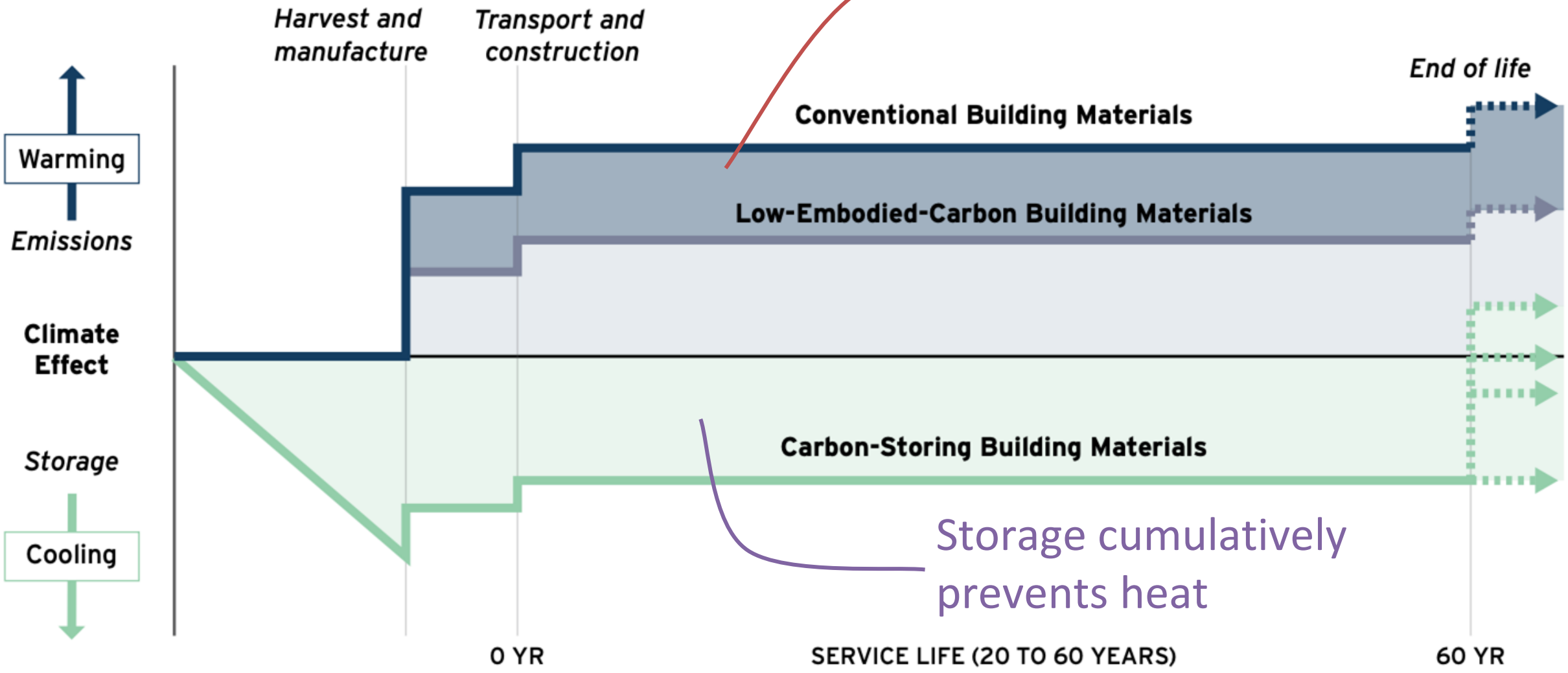


Time Value of Carbon



https://rmi.org/insight/hidden-climate-impact-of-residential-construction/

Time Value of Carbon



https://rmi.org/insight/hidden-climate-impact-of-residential-construction/

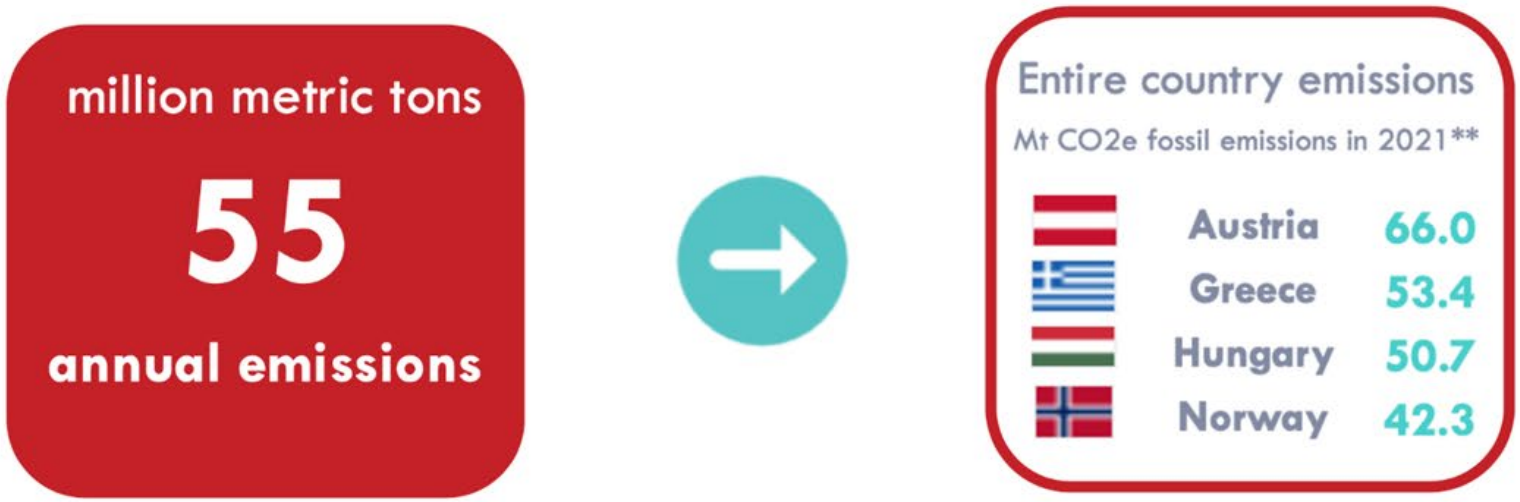
Why should we care about embodied carbon?

Initial studies of ~1,000 new homes

* US Census Bureau, American Housing Survey, 2021.

Why should we care about embodied carbon?

Extent of emissions from annual new home construction:



This will increase significantly if new home construction ramps up.

** https://data.jrc.ec.europa.eu

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Material Carbon Emission Analysis

EXTERIOR WALLS

SECTION COMPLETE? ☐

SUBTOTAL (kg CO_2e): -5,576

CATEGORY	MATERIAL	QUANTITY	UNITS	%	SELECT	NET EMISSIONS (kg CO_2e)	EMISSIONS (kg CO_2e)	STORAGE (kg CO_2e)	FOOTNOTE
	Fiberglass batt / Owens Corning / EcoTouch Pink batt and roll / R 3.6/inch	4,101.0	ft²	100%	☐	374	374	0	
HEMP FIBER WOOL INSULATION									
	Hemp fiber batt / NaturFibre / Hemp Wool / R 3.7/inch	4,101.0	ft²	100%	☐	-438	1,398	1,836	
CELLULOSE INSULATION									
	Cellulose / loose fill / R 3.7/inch / CIMA [Industry Avg | US & CA]	4,101.0	ft²	100%	☐	-856	392	1,248	
	Cellulose / batt / CMS / EcoCell / R 3.6/inch	4,101.0	ft²	100%	☐	-1,436	392	1,828	
	Cellulose / spray applied / R 3.75/inch / International Cellulose Corp. / K-13, ThermoCon	4,101.0	ft²	100%	☐	-1,692	262	1,954	
	Cellulose / dense pack / R 3.7/inch / CIMA [Industry Avg | US & CA]	4,101.0	ft²	100%	☐	-1,711	784	2,495	
WOOD FIBER INSULATION									
	Wood fiber loose fill / GUTEX / ThermoFiber / R 3.6/inch	4,101.0	ft²	100%	☐	-1,172	486	1,658	Expired 2020
	Wood fiber batt / GUTEX / ThermoFlex / R 4/inch [EU]	4,101.0	ft²	100%	☐	-1,731	302	2,033	
	Wood fiber batt / Steico / SteicoFlex / R 3.8/inch [EU]	4,101.0	ft²	100%	☐	-1,897	352	2,249	Expired 2021
	Wood fiber batt / [BEAM Avg | EU]	4,101.0	ft²	100%	☐	-1,956	235	2,191	
	Wood fiber batt / Pavatex / Pavaflex / R 3.8/inch [EU]	4,101.0	ft²	100%	☐	-2,241	50	2,291	Expired 2019
HEMPCRETE INSULATION									
	Hempcrete / Cast in-situ / USA / R 2.1/inch, Avg. mix using NHL & PHL	4,101.0	ft²	100%	☐	-2,417	7,133	9,551	Peer-reviewed LCA, 2020
	Hempcrete / Cast in-situ / Europe / R 2.1/inch, Avg. of 9 mixes	4,101.0	ft²	100%	☐	-4,199	10,548	14,747	Peer-reviewed LCA, 2017
	Hempcrete / Cast in-situ / IsoHemp / Europe / R 2.1/inch	4,101.0	ft²	100%	☐	-4,832	4,719	9,551	LCA, 2018
STRAW BALE INSULATION									
	Straw Bale / Wheat & barley straw / SNaB (UK) / R 2.8/inch	4,101.0	ft²	100%	☐	-4,319	542	4,861	
	Straw Bale / Wheat & rye straw / (Germany) / R 2.8/inch	4,101.0	ft²	100%	☑	-6,162	326	6,488	Expired 2019

Embodied Carbon Incentives in MA

Massachusetts 2025-2027 Energy Efficiency and Decarbonization Plan

Hybrid Approach

Materials- Based Approach- focuses on selecting low GWP alternatives to standard materials on a like for like basis

Commercial Whole Building Approach- Requires Whole Building LCA and compares design with a baseline level of EC performance

https://www.swinter.com/embodied-carbon-reduction-incentives-in-massachusetts/

DOER MA Stretch Code Feb 2025 - informed by climate bill

TABLE R406.5 MAXIMUM ENERGY RATING INDEX

Clean Energy Application	Maximum HERS Index score [a,b]				
	~~New construction until June 30, 2024~~	New construction permits after July 1, 2024	New Construction with R406.5.2 embodied carbon credit	Accessory Dwelling Units	Major alterations, additions, or change of use[c]
Mixed-Fuel Building	~~52~~	42	45	52	~~52~~ 65
Solar Electric Generation	~~55~~	42	45	55	~~55~~ 70
All-Electric Building	~~55~~	45	48	55	~~55~~ 70
Solar Electric & ~~All-Electric Building~~ *All-Electric Building*	~~58~~	45	48	58	~~58~~ 75

[a] Maximum HERS rating prior to onsite renewable electric generation in accordance with Section R406.5

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Performance Based Incentives

Workforce Development

Weatherization, Energy Consultants, Builder Training

HERS Raters

MASS CEC

Innovation through investment

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100-Home Study

A **$200,000 grant** to the Northeast Home Energy Rating System Alliance (NEHERS). **Utilities added another $30k** to include **MEP to be in alignment with 1550**

Build an **integration sheet linking Ekotrope to the Building Emissions Accounting for Materials (BEAM)** software system that calculates embodied emissions, to allow the calculation of both metrics simultaneously.

Gathers data on the **upfront carbon of 100 homes** in Massachusetts to act as a baseline for future codes and Utility incentives

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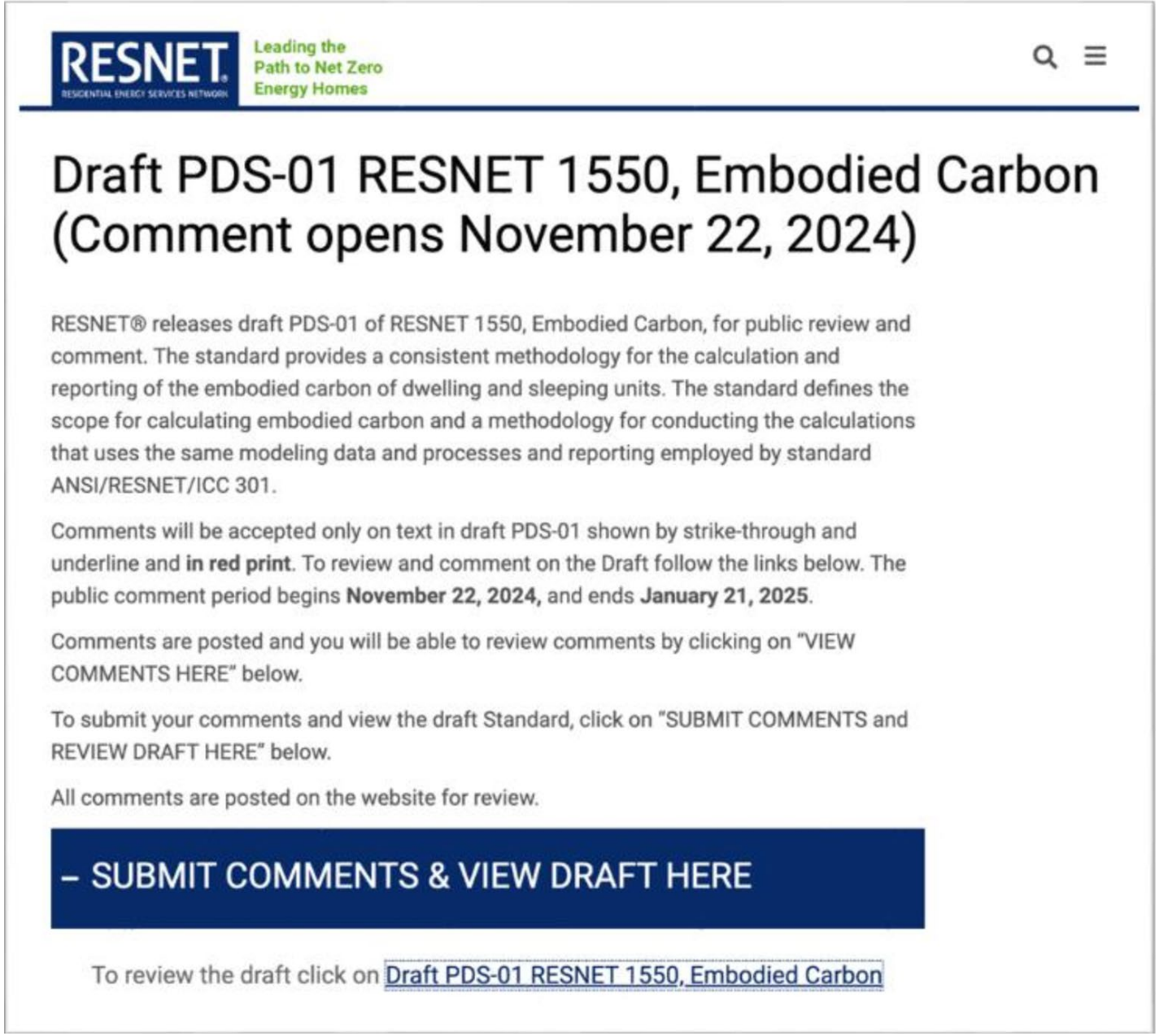

RESNET
RESIDENTIAL ENERGY SERVICES NETWORK
Leading the Path to Net Zero Energy Homes

Draft PDS-01 RESNET 1550, Embodied Carbon (Comment opens November 22, 2024)

RESNET® releases draft PDS-01 of RESNET 1550, Embodied Carbon, for public review and comment. The standard provides a consistent methodology for the calculation and reporting of the embodied carbon of dwelling and sleeping units. The standard defines the scope for calculating embodied carbon and a methodology for conducting the calculations that uses the same modeling data and processes and reporting employed by standard ANSI/RESNET/ICC 301.

Comments will be accepted only on text in draft PDS-01 shown by strike-through and underline and **in red print**. To review and comment on the Draft follow the links below. The public comment period begins **November 22, 2024,** and ends **January 21, 2025**.

Comments are posted and you will be able to review comments by clicking on "VIEW COMMENTS HERE" below.

To submit your comments and view the draft Standard, click on "SUBMIT COMMENTS and REVIEW DRAFT HERE" below.

All comments are posted on the website for review.

– SUBMIT COMMENTS & VIEW DRAFT HERE

To review the draft click on Draft PDS-01 RESNET 1550, Embodied Carbon

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RESNET Standard 1550

Purpose & Scope:

“

1. Purpose

The provisions of this document establish a methodology for **quantifying and reporting embodied greenhouse gas emissions** associated with building products using data commonly gathered by energy raters and according to the system boundary and data sources defined in Section 5.

2. Scope

This standard is applicable to **buildings with Dwelling Units and Sleeping Units** in Residential or Commercial Buildings, excepting hotels and motels .

This standard **does not set benchmarks or establish levels of building performance**.

This standard shall not be used to circumvent any safety, health, or environmental requirements.

”

BUILDINGENERGY BOSTON

MARCH 14–15, 2019 • WESTIN BOSTON WATERFRONT • NESEA.ORG/BE19

Conference + Trade Show of the Northeast Sustainable Energy Association (NESEA)

NEHERS

NORTHEAST HOME ENERGY RATING SYSTEM ALLIANCE

RMI

STEPHENS & COMPANY, INC.

innova BUILDING ADVISORS

BUILDERS FOR CLIMATE ACTION

RESNET®

RESIDENTIAL ENERGY SERVICES NETWORK

RESNET 1550

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Software

Following HERS software verification method

BEAM
BUILDING EMISSIONS ACCOUNTING FOR MATERIALS

ekotrope

Software connectivity

- Prototype of connectivity between HERS and embodied carbon software in MA

https://www.masscec.com/resources/assessing-upfront-carbon-building-materials-homes

RESNET's New Carbon Rating Index

RESNET CARBON INDEX

The US energy system is changing

First-of-its-kind carbon rating index addresses critical issue of greenhouse gas emissions.

The Standard:

Based on ANSI/RESNET/ICC 301 Standard "CO_2e Rating Index"

Provides a more accurate metric to measure emissions: addresses when energy is used, as well as how much of it is used

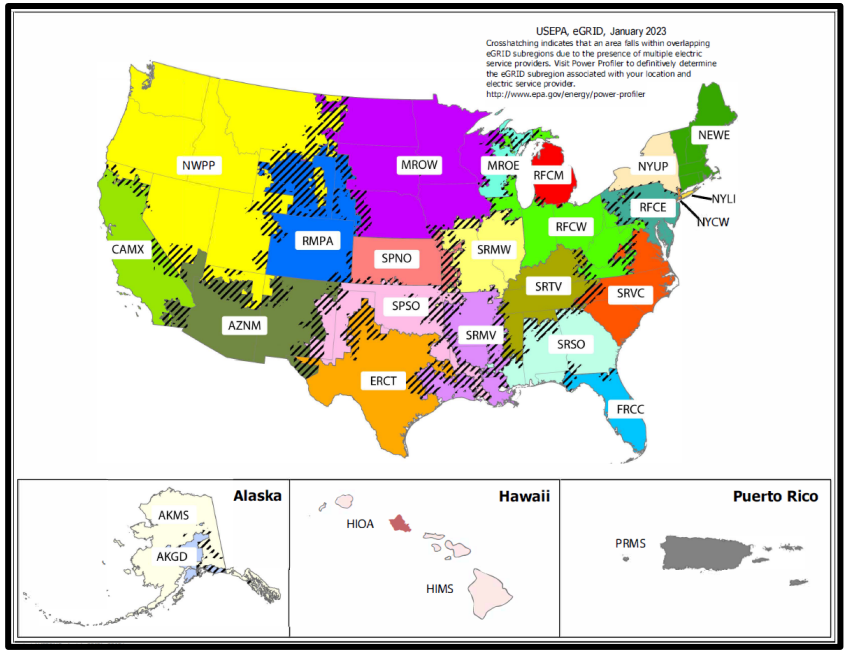
Uses hourly CO_2e emission rates and electricity generation emission projections as published by the National Renewable Energy Laboratory (NREL).

Combines these values with the hourly energy consumption given by the calculation of the HERS Index to provide a new metric valuing the carbon emissions when energy is used.

How can it be used?

- ✓ Usable for local climate change initiatives
- ✓ Utility incentive programs
- ✓ Consumer awareness
- ✓ Can be used in Environmental, Social and Governance (ESG) reporting
- ✓ Can be a basis for green bonds

NREL Transforming ENERGY



Cambium Database

Grid Forecasting Tool Released in 2020

First of its kind

Forecasts Renewable Grid Penetration

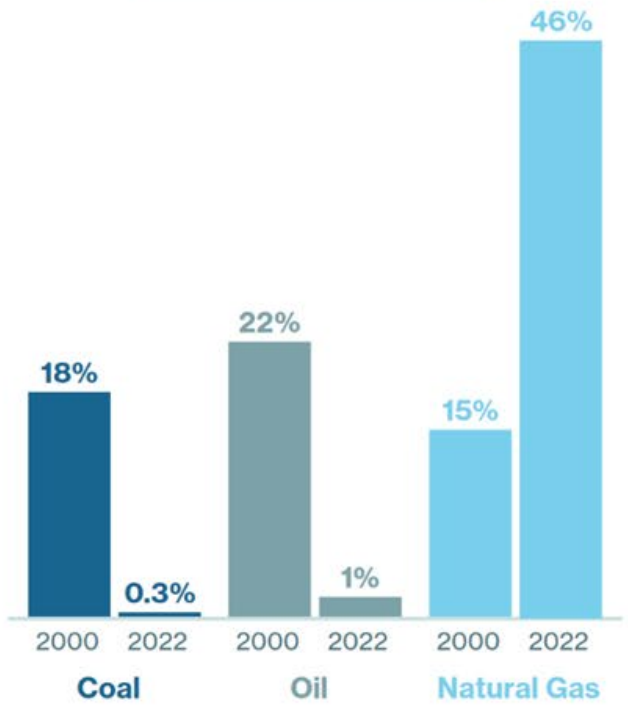
A Major Energy Transformation Is Underway

New England has shifted away from older coal- and oil-fired generation to cleaner burning natural gas.

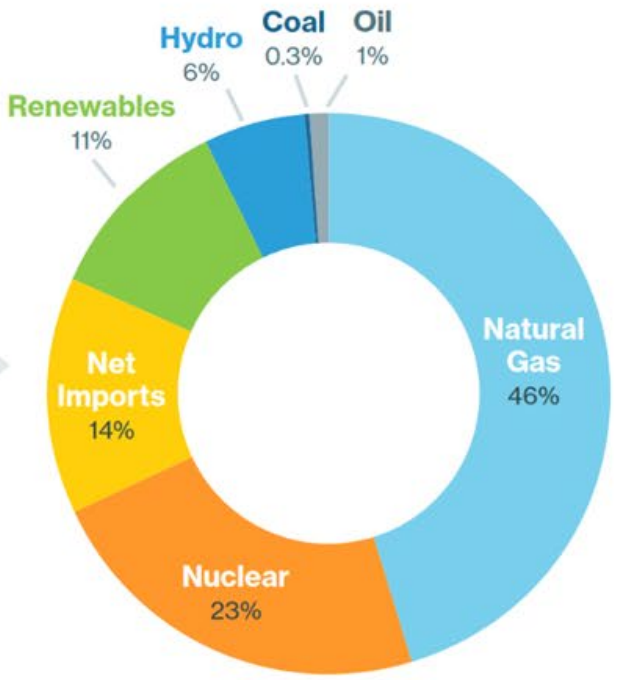
Most of today's electricity comes from lower-emitting energy resources.

The region is transitioning to large-scale clean and renewable energy.

YESTERDAY VS. TODAY



2022 ENERGY RESOURCES



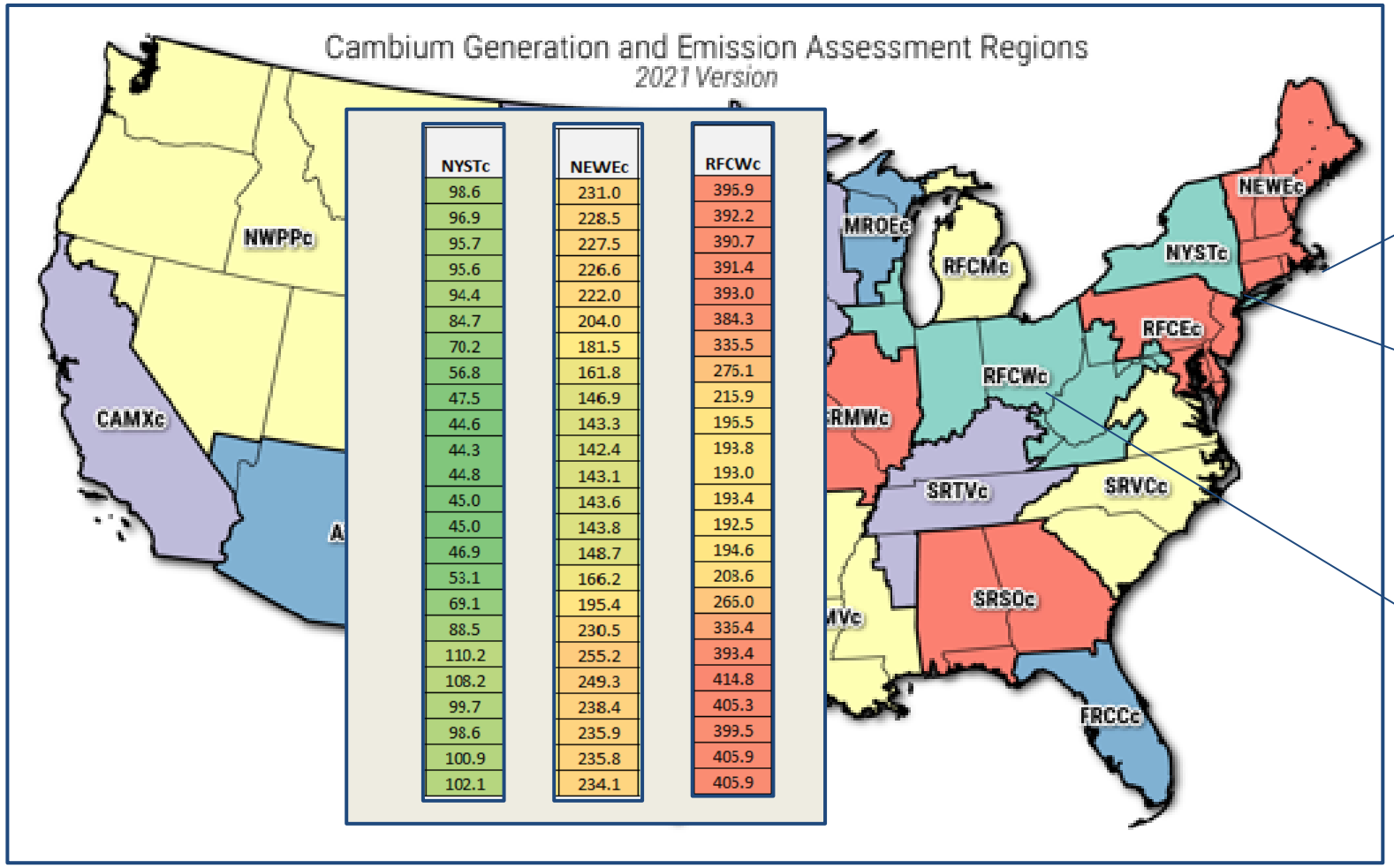
LOOKING TO THE FUTURE

- Wind power dominates new resource proposals: nearly 16,000 MW
- Solar power is growing rapidly: ISO-NE forecasts nearly 12,000 MW within a decade
- Battery storage technologies are emerging at the customer and grid level: more than 11,000 MW proposed
- New transmission proposals would provide access to additional clean or renewable energy in New England or Eastern Canada

The amount of electricity produced by generators in New England and imported from other regions to satisfy all residential, commercial, and industrial customer demand in New England. This is called Net Energy for Load (NEL).

Courtesy ISO-ne.com

Comparing the Same Development Across Three Grids



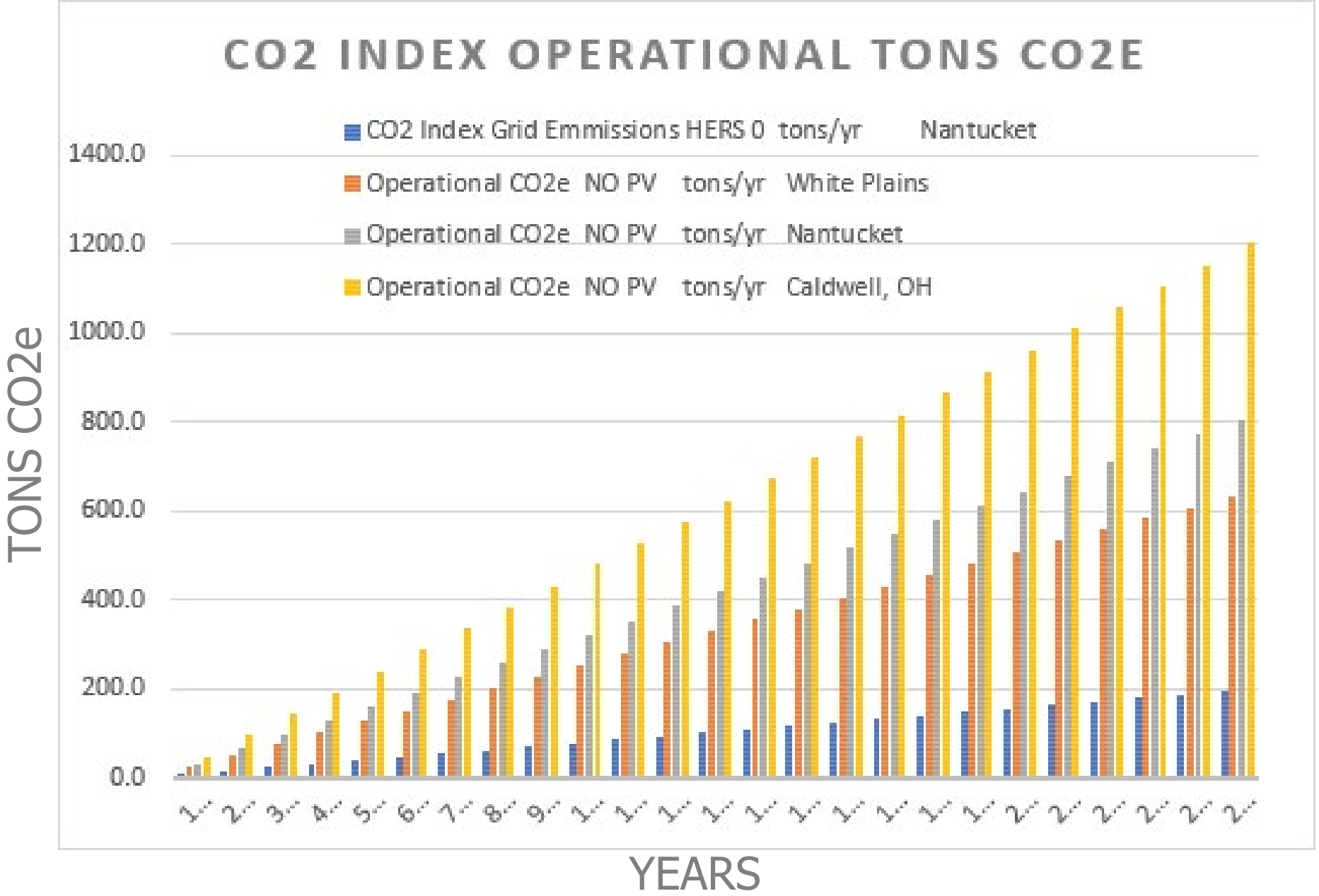
NYSTc	NEWEc	RFCWc
98.6	231.0	395.9
96.9	228.5	392.2
95.7	227.5	390.7
95.6	226.6	391.4
94.4	222.0	393.0
84.7	204.0	384.3
70.2	181.5	335.5
56.8	161.8	275.1
47.5	146.9	215.9
44.6	143.3	195.5
44.3	142.4	193.8
44.8	143.1	193.0
45.0	143.6	193.4
45.0	143.8	192.5
46.9	148.7	194.6
53.1	166.2	208.6
69.1	195.4	265.0
88.5	230.5	335.4
110.2	255.2	393.4
108.2	249.3	414.8
99.7	238.4	405.3
98.6	235.9	399.5
100.9	235.8	405.9
102.1	234.1	405.9

3 Cambium GEA Scenarios

Nantucket, MA 02554
NEWEc - NPCC New England

White Plains, NY 10601
NYSTc - NPCC NYC/Westchester/Long Island/ Upstate

Caldwell, OH 43724
RFCWc - RFC West


CO2 INDEX OPERATIONAL TONS CO2E
CO2 Index Grid Emmissions HERS 0 tons/yr Nantucket
Operational CO2e NO PV tons/yr White Plains
Operational CO2e NO PV tons/yr Nantucket
Operational CO2e NO PV tons/yr Caldwell, OH
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
TONS CO2e
YEARS

Workforce Development

Goal of complete electrification of one million homes across the state by 2030

Embodied Carbon:
A Competitive Advantage for HERS Raters

“Nicole, when we last spoke you talked a bit about Embodied carbon and decarbonizing building materials on projects that you’ve done in Massachusetts. I clearly started geeking out on the concept and its been on my mind. I’m looking at potential concept for one of our PHFA applications upcoming and wondering if there is a play around innovative construction technology we can think upon here.

I wanted to see if we could talk about this further together to see if it could be a viable option for one of our clients that we could bring Innova to the table with.

Let me know if you available to chat further next week Thursday at 10:00.”

Equity and Business Opportunity

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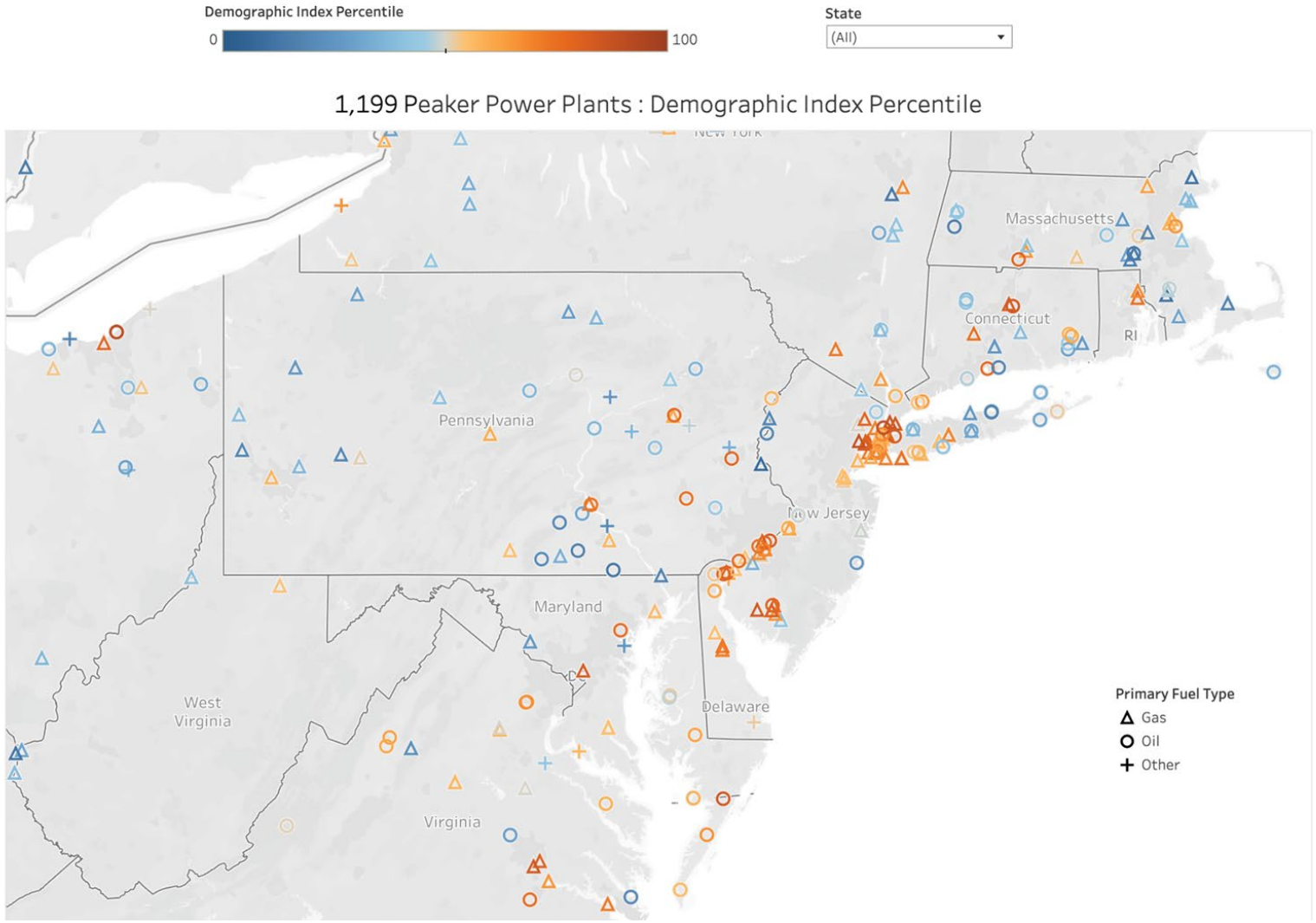
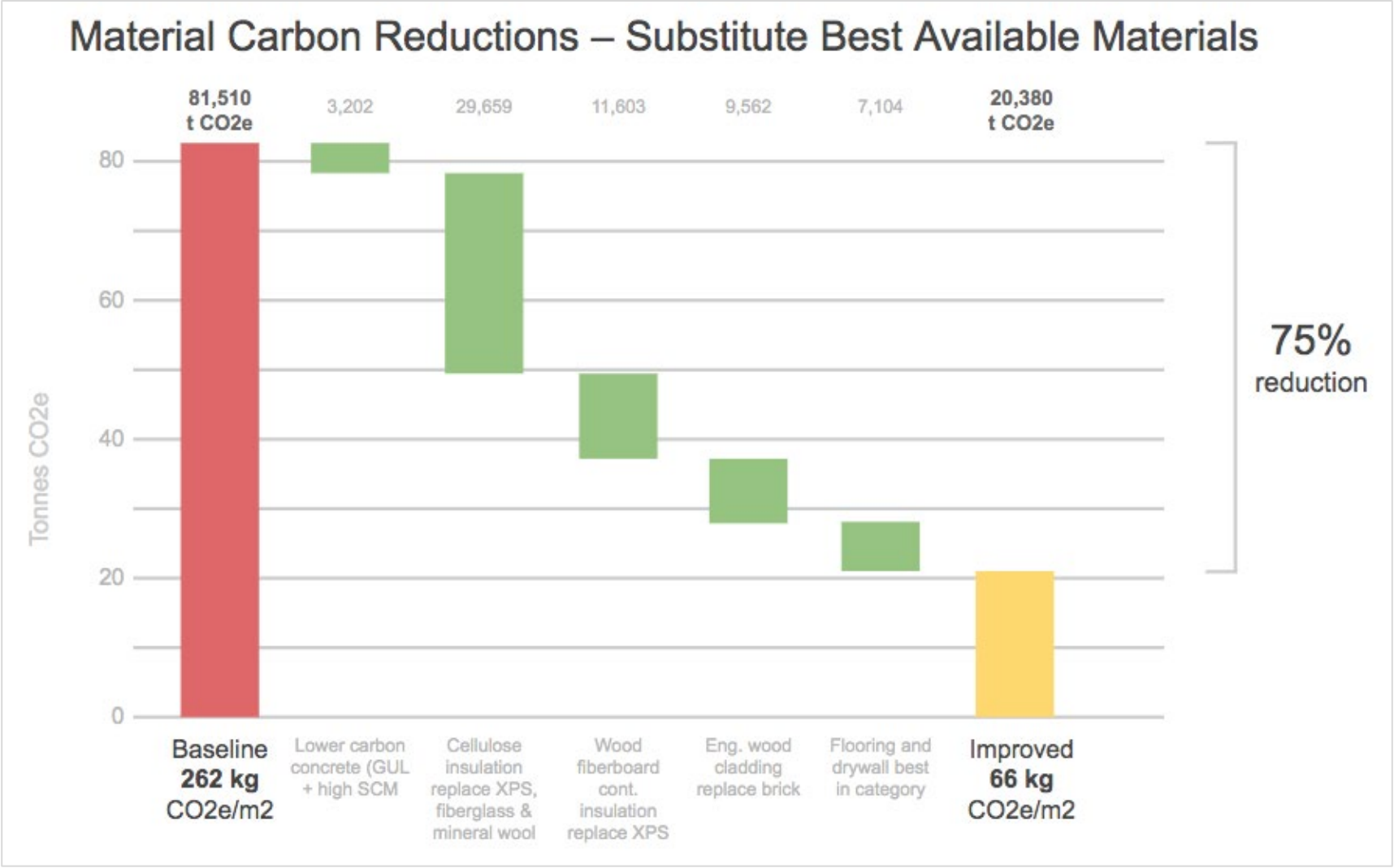
Environmental Justice and CO2

Large numbers of “peaker” plants in New England are located in areas with densely populated EJ Communities



Source: US EPA data visualized at https://www.cleanegroup.org/initiatives/phase-out-peakers/maps/

Simple Substitution Strategy: Immediate Action



What's your next step?

1. Learn more about embodied carbon and operational carbon
2. Ask your Rater for embodied carbon analysis
3. Evaluate and choose/recommend low carbon materials
4. Use 1550 (as soon as it's out); develop market for EC value
5. Use CO2 Index and develop a project strategy to manage operational carbon
6. Advocate for policies requiring HERS standards for energy code compliance, embodied carbon in codes
7. Reach out to us and the Northeast HERS Alliance

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Questions:

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Thank You!