



# Scaling Up Passive House Multifamily: The Massachusetts Story

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**Together, we make good happen for Massachusetts.**

Your local electric and natural gas utilities and energy efficiency service provider are taking strides in energy efficiency: Berkshire Gas, Cape Light Compact, Eversource, Liberty Utilities, National Grid and Unitil.

As one, we form Mass Save<sup>®</sup>, with the common goal of helping residents and businesses across Massachusetts save money and energy, leading our state to a clean and energy efficient future.



**We Are Mass Save<sup>®</sup>**

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# Agenda

Multifamily Market Transformation Results

How Did We Get Here? Overcoming Barriers

Mass CEC Passive House Design Challenge

Mass Save Passive House Multifamily Offer

Finch Cambridge Case Study

# Transformation: Massachusetts in context

- # 2 state per ACEEE Score Card
- Robust policy framework under the state's 2008 Green Communities Act
- Highly engaged policy makers and stakeholders
- Historically high market penetration for multifamily new construction incentive offers
- Standard incentives determined by whole building energy modeling, accommodating multiple meter and fuel types



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# Transformation: Targeting Passive House for Multifamily

- Roadmap to 2030 specifically references "high performance, Passive House level of envelope efficiency" for new construction
- Whole building focused, fuel and meter neutral
- 40%-60% better than MA stretch code
- Passive House maximum allowable source energy: 38.0 kBtu/sf/year
  - BERDO New Construction average: 56 kBtu/sf/year
  - EnergyStar Portfolio Manager average: 118.1 kBtu/sf/year

**2017** Mass CEC Passive House Design Challenge

**2019** Passive House projects eligible for QAP bonus points

**Fall 2019** Mass Save Passive House Multifamily Offer

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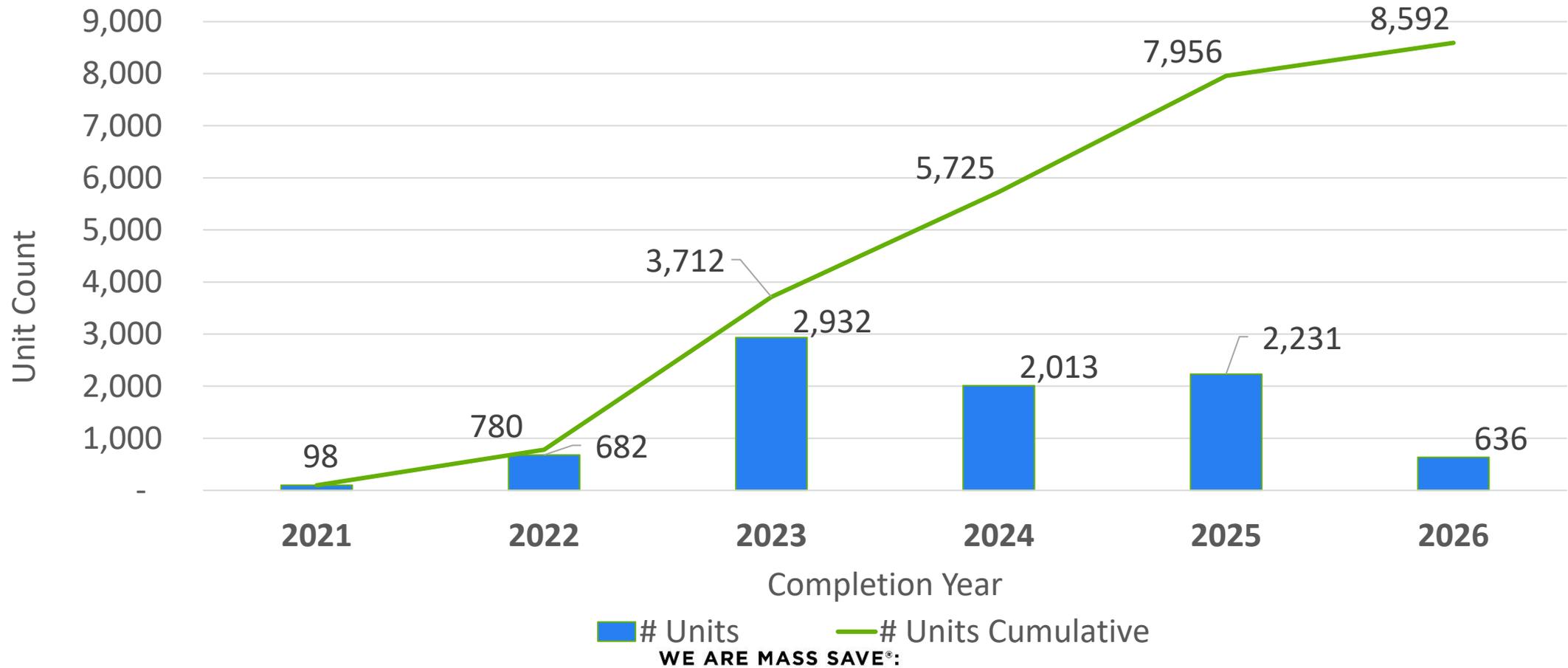
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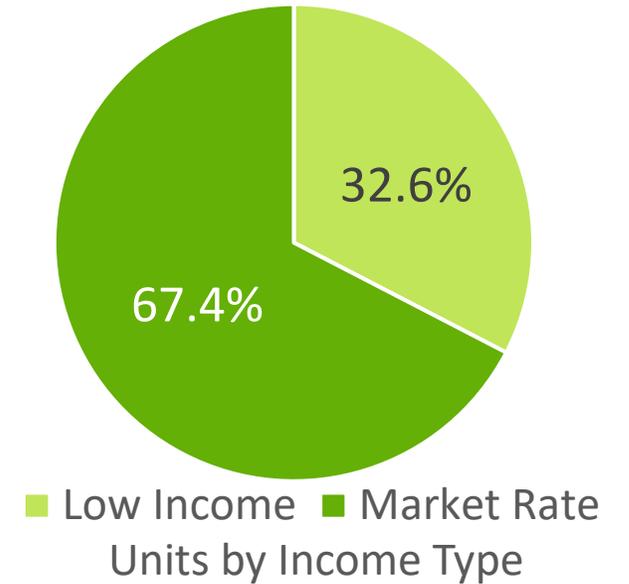
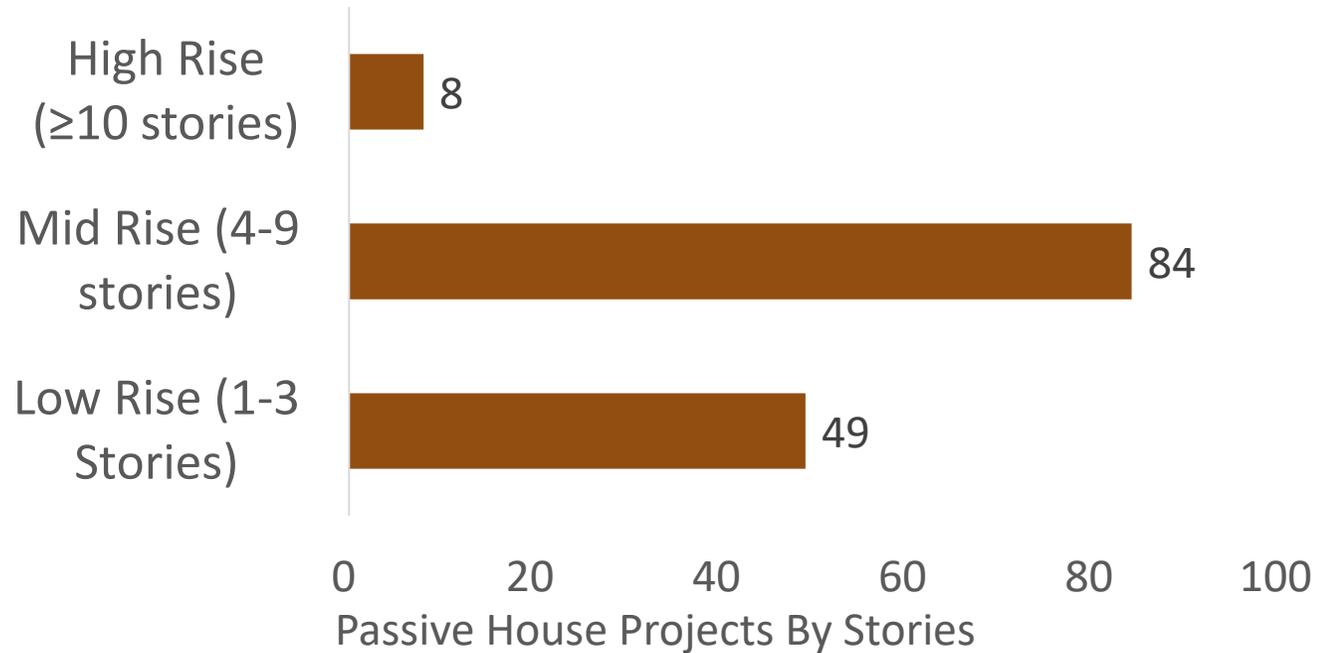
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# Transformation: Market Response



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# How did we get here?

## Overcoming Barriers

- **Risk & uncertainty:** Developers perceived significant financial risk to pursue a Passive House project
- **Incremental Cost:** Market actors were uncertain but suggested the incremental cost for constructing multifamily Passive House projects ranged from 2-10%.
- **Training:** Market actors of all types stressed the importance for training to overcome limited industry knowledge and experience with Passive House design and construction.
- **Lack of public awareness:** Lack of public awareness and demand for more efficient building hinders the decision-making process of developers to pursue a Passive House project.

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# Mass CEC Passive House Design Challenge Overview

- Goal: to track incremental construction costs and validate modeled energy performance for eight buildings.
- Selected 8 low-income projects, with 540 units
  - 5 occupied
  - 3 under construction
- Up to \$4,000 per unit, paid in three milestone payments during design, construction, and completion.
- Projects are required to share construction cost data, both hard and soft, and post-occupancy energy data.

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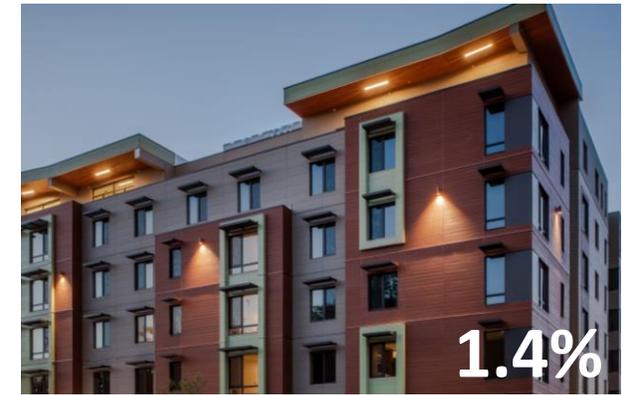
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# Design Challenge: Project Incremental Cost



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# Design Challenge: 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.

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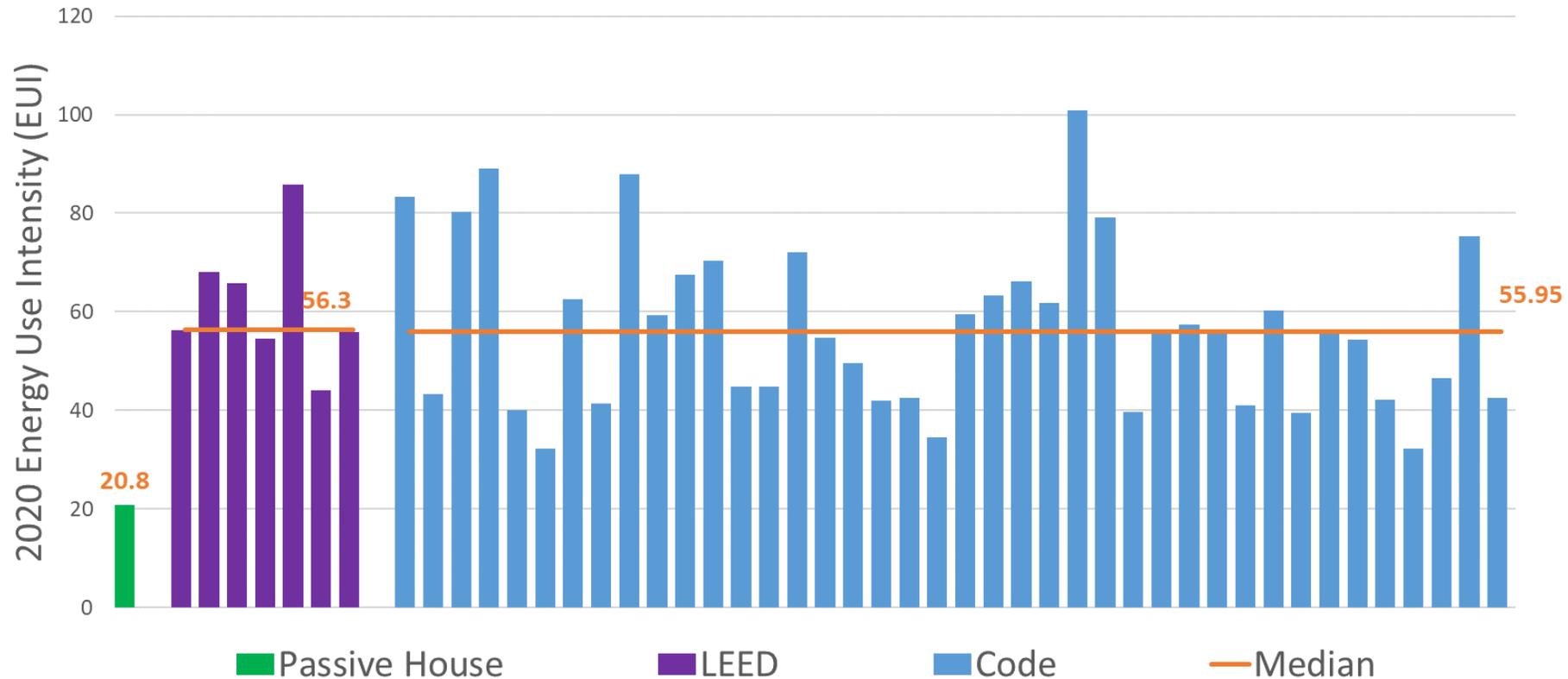
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# Design Challenge: Performance Benchmarking using BERDO 2020



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# Mass Save Passive House Multifamily Incentives Overview

- Workforce Training
  - No cost training, including both live content and recorded webinars available anytime on the Energy Efficiency Learning Center
  - Architects, builders, developers, engineers, financing agencies, realtors, municipal officials
  - Topics include Passive House basics, project delivery, building science best practices, quality assurance, and more
  - Passive House certification training cost share
- Technical Assistance
  - Dedicated Account Managers who are architects, energy engineers, and Certified Passive House Consultants

Multi-family buildings with five units or more

**Take energy efficiency to a new level.**

The Sponsors of Mass Save® have launched a new way to drive market transformation in the energy efficiency industry to meet and exceed energy-savings targets across Massachusetts.

We are offering incentives and assistance to support the construction of multi-family buildings (five units or more) with deep energy savings. Certification and performance incentives are available to assist builders and developers in achieving Passive House certification or similar levels of efficiency.

**What is Passive House?**

Passive House refers to the ultimate goal in high-efficiency design: buildings that minimize energy consumption and have added comfort and durability features. The Passive House Institute US (PHIUS) and the Passive House Institute (PHI) have established two independent standards and provide certifications for such buildings: the PHIUS+ Passive Building Standard and the international Passive House Standard.

**High-efficiency incentives available**

The Sponsors of Mass Save support Passive House and related high-efficiency construction in Massachusetts through enhanced incentives. We offer incentives for multi-family buildings that achieve certification through PHIUS or PHI and those that pre-certify and build to high efficiency without obtaining certification.

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# Mass Save Passive House Multifamily Offer Incentives

Passive House Incentive Structure for Multi-Family (5 units or more)			
Incentive Timing	Activity	Incentive Amount	Max. Incentive
Pre-Construction	Feasibility Study	Up to 100% of Feasibility costs	\$5,000
	Energy Modeling	75% of Energy Model cost	\$500/unit, max. \$20,000
	Pre-Certification	\$500/unit	N/A
Post-Construction	Certification	\$2,500/unit	
	Net Performance Bonus	\$0.75/kWh	
		\$7.50/therm	

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# Mass Save Passive House Multifamily Incentives Details

- Eligibility
  - Multifamily PH projects of 5+ units
  - New Construction
- Enrollment process
  - Enroll during schematic design
- Verification completed utilizing architect and/or engineer approved submittals
- Requirements
  - Pursue PHIUS or PHI certification
  - Work with a certified Passive House professional

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# Mass Save Passive House Multifamily Offer Best Practices

- Keep the incentive program design simple:
  - Design phase incentives such encourage the exploration
  - Flat rate incentives are easily understood and predictable
- Plan for soft landings:
  - Projects can withdraw without penalty.
  - Projects that do not certify (after pre-certifying) remain eligible for pay-for-savings incentives at the Passive House rates.
- Education, training, and workforce development is critical
  - This knowledge will also spill over into design of other high-performance buildings that do not seek PH certification.

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# Passive House Case Study: Finch Cambridge

- Details
  - 6 Story New Construction
  - 96 Units
  - Low Income
- Certifications
  - PHIUS+ 2015
  - Enterprise Green Communities
- Equipment
  - Air source heat pumps (VRF)
  - Central Gas DHW
  - Balanced ventilation with an ERV
  - 105 kW PV system



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# Project Highlight: Finch Cambridge

- Air-Tight Assemblies
  - 0.073 cfm/sq ft @75 Pa envelope (whole building testing)
- Exterior Envelope
  - Walls: R-29 5.5" Cellulose + 1" Continuous Mineral Wool
  - Roof: R-54.5
  - Windows: U-0.22, SHGC-0.32
  - Slab: R-20



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# Thanks for listening.

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