

# Codes for Climate Webinar II: Mass Save Electrification Incentives

**March 1, 2023**

MAPC
METROPOLITAN AREA PLANNING COUNCIL

# Notification of Recording

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# Zoom Housekeeping

- Please keep yourself on mute when not talking
- Use the chat feature to ask questions
- Rename yourself in zoom- Name and Organization

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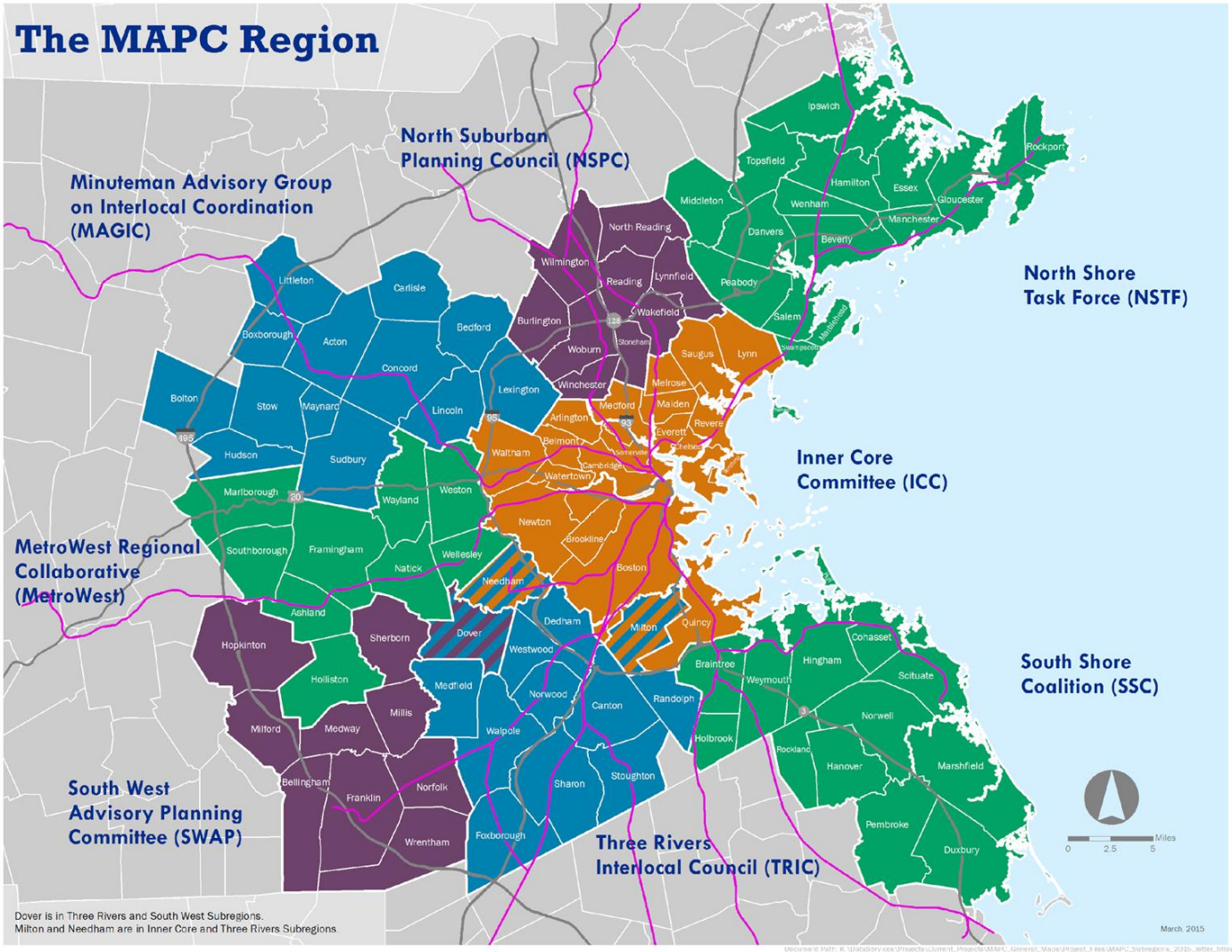
# Introductory Polls




101 municipalities

1,440 square miles

Nearly 3.2 million residents

# Today's Agenda

- 12:00-12:10: Introductions and Housekeeping
- 12:10-12:25: Commercial New Construction Programs
- 12:25-12:35: Electric Vehicle (EV) Infrastructure Program
- 12:35-12:43: Acton-Boxborough Regional School District Project
- 12:43-12:58: Residential New Construction Programs
- 12:58-1:05: POAH Brewster Woods Affordable Housing Project
- 1:05-1:25: Q&A from the Zoom Chat
- 1:25-1:30: Closing

# Mass Save Commercial Electrification Programs for New Construction

# Question and Answer

# Closing Question

What additional information would be helpful to know about Mass Save for your community?

# Upcoming MAPC Webinars

- **How Healthy Homes are Tackling the Housing and Climate Crises-** Tuesday March 7th at 1:00 p.m.

- **Energy Efficiency and Conservation Block Grant (EECBG) Funding for Massachusetts Municipalities-** Thursday, March 16 at 11:00 a.m.

# Contact Us

- MAPC: cleanenergy@mapc.org

mass save

# Commercial New Construction/Major Renovation

## Supporting Electrification and Ultra Low EUIs with Enhanced Incentives

WE ARE MASS SAVE®:

BERKSHIRE GAS
An AVANGRID Company

Cape Light Compact

EVERSOURCE

Liberty

nationalgrid

Unitil

# Agenda

LEGISLATIVE/REGULATORY/POLICY CONTEXT

OUR MAIN FOCUS: HEAT PUMPS AND EUI

PARTICIPATION PATHWAYS

THE VALUE MASS SAVE PROGRAMMING ADDS

# Legislative/Regulatory/Policy Context

## New Building Codes

DOER
Massachusetts Department of Energy Resources

## Local Ordinances/Policies

boston planning & development agency

Zero Net Carbon Building Zoning Initiative

## State Legislation

AN ACT CREATING A NEXT-GENERATION ROADMAP FOR MASSACHUSETTS CLIMATE POLICY.

## Federal Policy

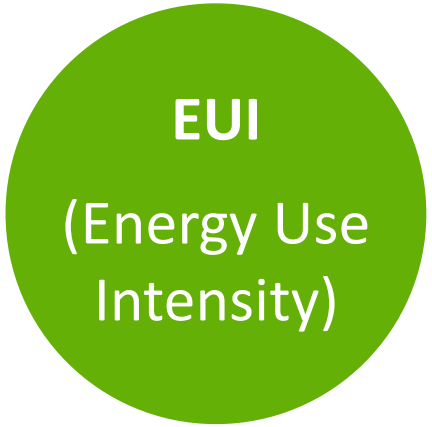
INFLATION REDUCTION ACT OF 2022

Biden's Goal: Net zero emissions economy by no later than 2050

# Definitions


**Buildings that produce as much energy as they consume over a year**

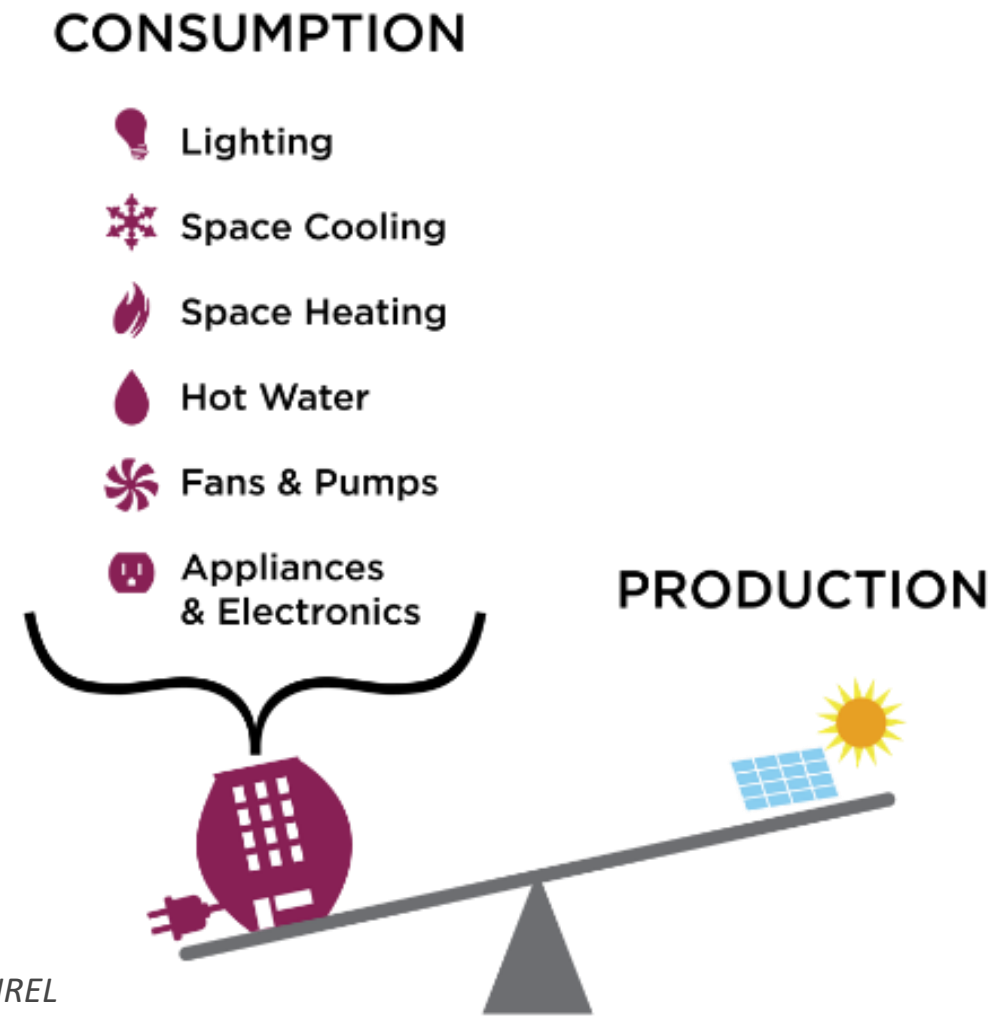
Heat pumps, LED lighting, improved insulation – lead to lower building energy needs that can be offset by solar energy production




**A measure of a building's total annual energy use divided by its square footage (Annual kBtu/sf)**

Similar to a miles per gallon metric, but for buildings

# Understanding Zero Net Energy Buildings:
## Finding the Right Balance & Optimization



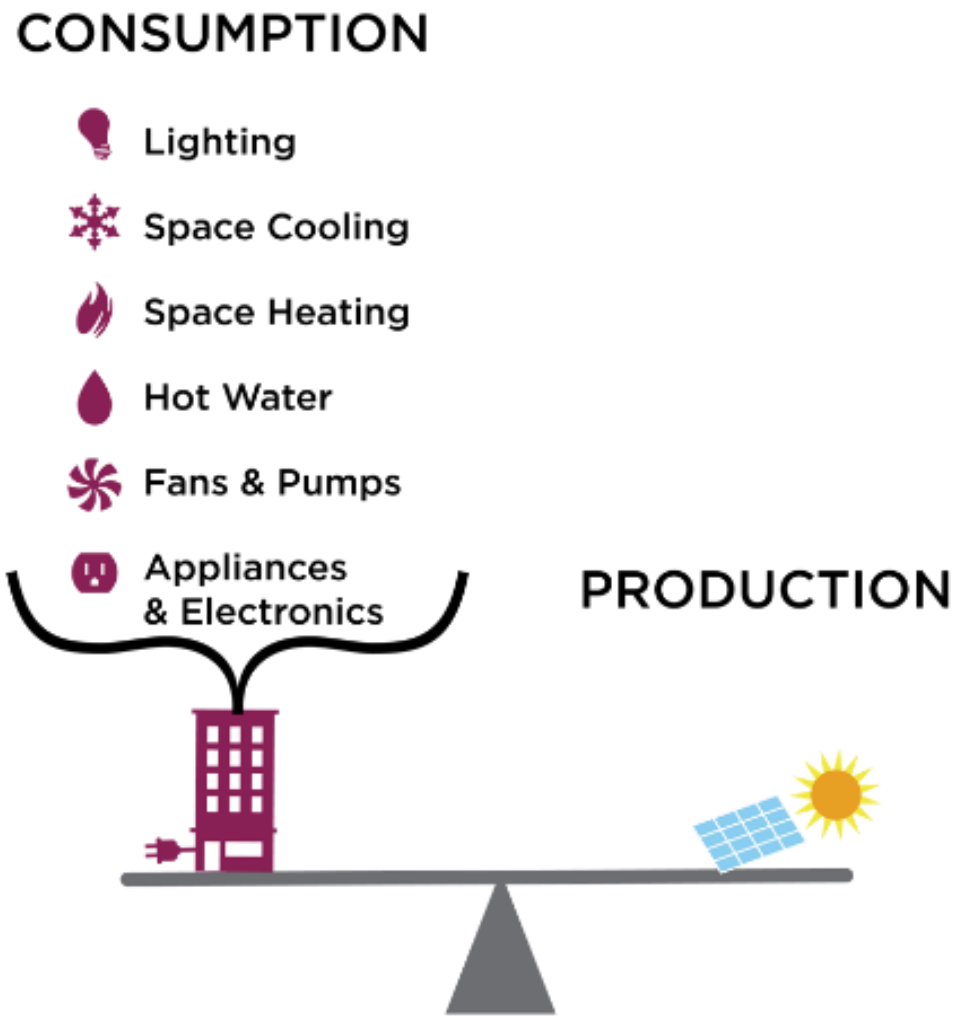
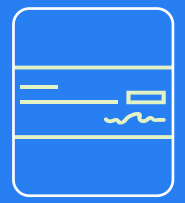




*Photo Credit: P. Torcellini, NREL*

# Mass Save Commercial New Construction & Major Renovation Program Overview

**Building Electrification/Decarbonization** (Heat pumps)

**Low Energy Use Intensity (EUI) and Net Zero**



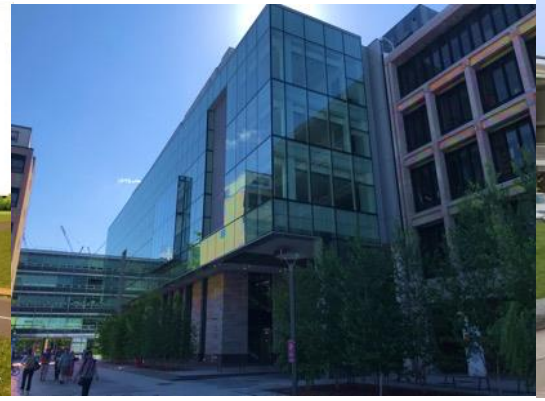
**Three paths to accommodate project types and customers**

## Heat Pump Support Levels are Significant

| **Heat Pump Incentives for Commercial New Construction/Major Renovation Projects** | |
|---|---|
| Air source heat pumps: | $800/ton |
| Variable refrigerant flow (VRF): | $1,200/ton |
| Ground source heat pumps: | $4,500/ton |

# New Building/Major Renovation Participation Pathways

| Path 1 | Path 2 | Path 3 |
| --- | --- | --- |
| Net Zero & Low EUI Buildings | Whole Building EUI Reduction | High Performance Buildings |

Low EUI Pathways

# Path 1: Net Zero & Low EUI Buildings

## INTENT: For buildings 10,000 sf and greater

Drive projects toward net zero, low carbon and low EUI in operation - focus on performance

## KEY PROGRAM DRIVER:

- Achieve a target site EUI in design, construction and operation
- Electrified systems

## NET ZERO TECHNICAL SUPPORT

- Net zero design support
- Mass Save Sponsors will pay 50% up to $10,000
- Mass Save Sponsors will pay for optional Verification Incentive - 50% of fee up to $10,000

**ACTON-BOXBOROUGH DOUGLAS-GATES ELEMENTARY SCHOOL**

Opened Fall 2022 | All electric

# Path 1 Incentive Rates

| Target Site EUI | Incentives | | | |
|---|---|---|---|---|
| | Payable at End of Construction | | Payable at End of 1 yr. Post Occupancy Period | |
| | Construction Incentive | Heat Pump Adder | Post Occ. Incentive | Optional Incentive for Certification |
| **Varies based on building type** | Tier 1: $2.00/SF<br>Tier 2: $1.50/SF | Air source heat pumps: $800/ton<br>Variable refrigerant : $1,200/ton<br>Ground source heat pumps: $4,500/ton | $1.50/SF | $3,000 |

# Example – New Elementary School

**172,000 SF new building**

**Solar PV**:  $2 million

**Geothermal**: 340 tons, 110 wells at 600' depth:  $20 million

**Target site EUI**: 25

| Path 1 Incentives with 25 EUI Target | |
|---|---|
| $2.00 /SF Construction Incentive | $344,000 |
| Electrification incentive for ground source heat pumps at $4,500/ton | $1,530,000 |
| $1.50/SF Post Occupancy Incentive | $258,000 |
| Total | $2,132,000 |

# Path 2: Whole Building EUI Reduction

## INTENT: For buildings 50,000 sf and greater

Large or complex projects, interested in setting an EUI reduction target, but not good candidates for Path 1

## KEY PROGRAM DRIVER:

- Lowest possible site EUI
- Building electrification

## TECHNICAL ASSISTANCE

- Provide energy savings and decarbonization advice
- Sponsors of Mass Save will pay for energy modeling, charrette support, and mid design review - up to 75% of the cost/Customer pays 25%
- Sponsors of Mass Save will pay for optional Verification Incentive - 50% of fee up to $10,000

**Note:** This design-focused pathway does not have a post occupancy performance component, which is the hallmark of Path 1

# Path 2 Incentive Rates

| Path 2: EUI Reduction Incentive Tiers | | | | | |
|---|---|---|---|---|---|
| % Reduction Required to Participate | | | | | |
| | **Incentive Rate** | **Heat Pump Adder** | **All sectors other than office/labs** | **Office** | **Lab/office** |
| **Tier 4** | $0.35/sf | Air Source Heat Pump: $800/ton<br>Variable Refrigerant Flow: $1200/ton<br>Ground Source Heat Pump: $4,500/ton | 10%-15% | 5%-10% | 15%-20% |
| **Tier 3** | $0.50/sf | | 15%-20% | 10%-15% | 20%-25% |
| **Tier 2** | $0.75/sf | | 20%-25% | 15%-20% | 25-30% |
| **Tier 1** | $1.25/sf | | 25% and above | 20% and above | 30% and above |

# Verification Incentive – Available for Path 1 & 2 Projects

Review control strategies at end of design



Multiple trend data reviews at post occupancy

Multiple EUI data pulls at post occupancy

**Sponsors of Mass Save offers 50% cost share up to $10,000 to cover this scope**

# Path 3: High Performance Buildings

## INTENT:

Reduce building energy and decarbonize

Offer includes same per-ton Heat Pump incentives offered in other paths plus incentives for other measures offered on a $/annual kWh or $/annual therm saved

## TECHNICAL ASSISTANCE:

Expert support in identifying energy conservation and decarbonization strategies

## TYPICAL PROJECTS

Customers with small and fast paced projects where customers do not wish to set and pursue an EUI target

Projects that are not whole buildings (e.g., tenant fit outs, open air parking garages).

Projects where heavy process loads are the major energy savings focus (e.g., cannabis, industrial).

Projects where customers have interest in discrete measures only

Projects engaging too late in design to participate in Path 1

# What Can You Do?

1. Encourage project teams to set energy or carbon budgets (e.g., EUI targets) for new construction/major renovation projects

2. Suggest they include language in their RFS for design services
   - EUI target or target range
   - Net zero aspirations
   - Reference Mass Save program participation as an objective

3. Advise project teams to contact their Mass Save Sponsor in early feasibility/conceptual design


Bring Mass Save Sponsors in here or before architect is hired.

# How Can Our Support Help Your City/Town?

1. We can help projects in your town meet the Stretch Code
2. If you are considering adopting the Specialized Opt In Code (Net Zero Code), our programs will help each project meet this high bar.
3. Mass Save Sponsors make low carbon/low EUI projects more affordable
4. Mass Save Sponsors provide technical support that drives low carbon/low EUI building solutions


**More at MassSave.com**
masssave.com/cincmr

**Kim Cullinane**
**Eversource**
kim.cullinane@eversource.com

**Caitlin Cantella**
**Cape Light Compact**
Caitlin.cantella@capelightcompact.org

**Denise Rouleau**
**National Grid**
Denise.rouleau@nationalgrid.com

**Brad Hunter**
**Unitil**
hunterb@unitil.com

**Matt Caffrey**
**Liberty Utilities**
matthew.caffrey@libertyutilities.com

**Brandon Mark**
**Berkshire Gas**
bmark@uinet.com

mass save

# Thanks for listening.

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nationalgrid

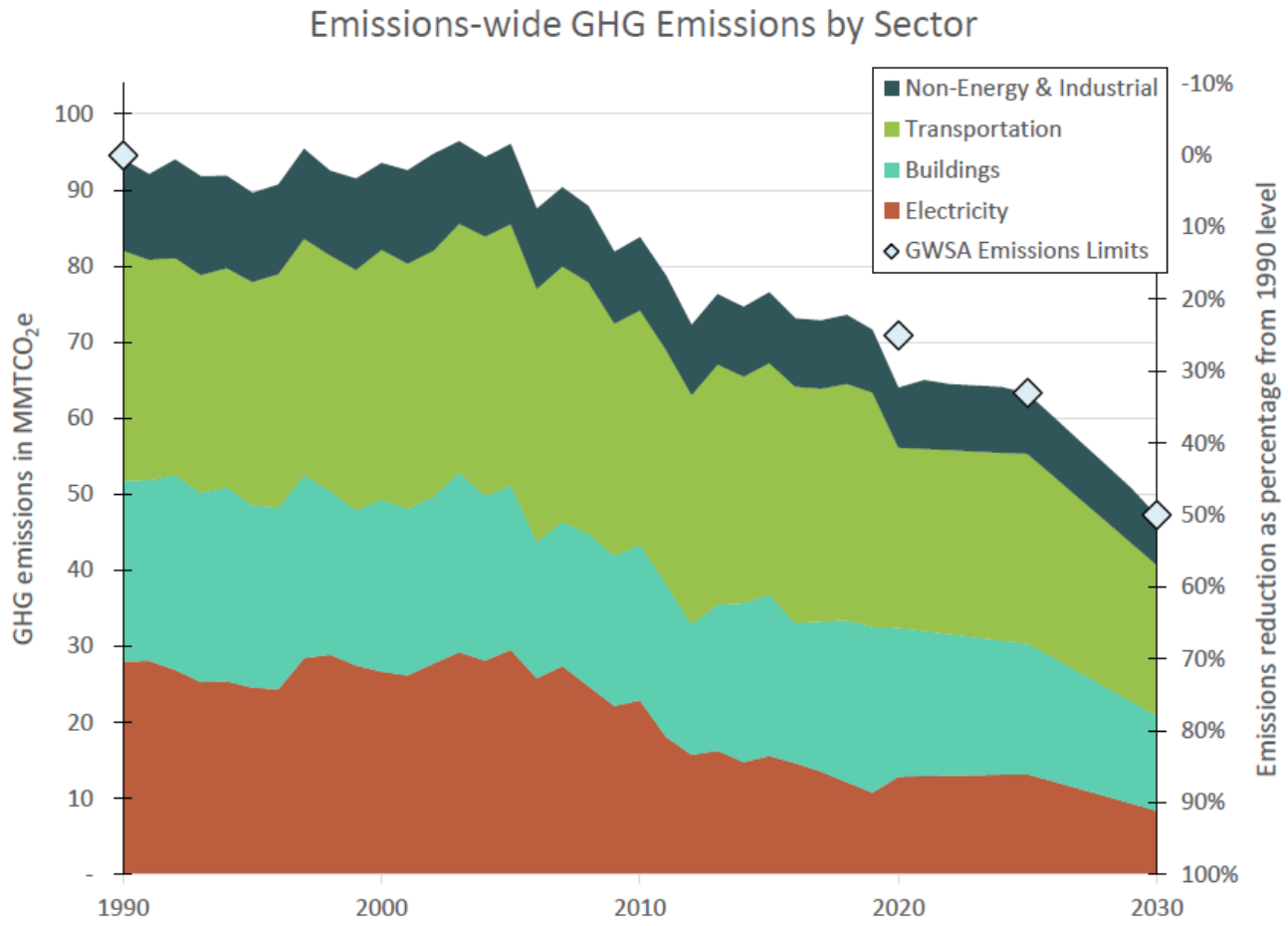
Unitil

3/1/23

EVERSOURCE

# MA EV Phase 2 Programs

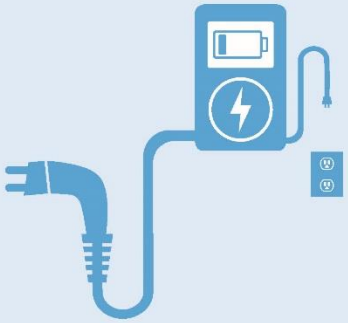
# Why Clean Transportation?




*Source: MassDEP (2022). Massachusetts Clean Energy and Climate Plan for 2025 and 2030*

# TYPES OF EV CHARGING

## Level 1
*Residential*

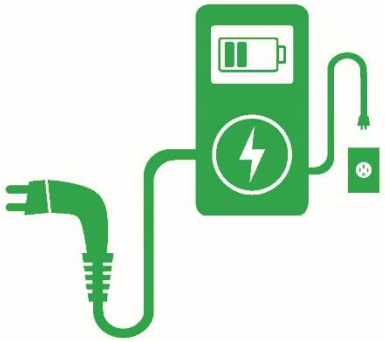


**120V**

Uses a standard outlet

Adds 5 miles per hour of charge

## Level 2
*Residential & Commercial*



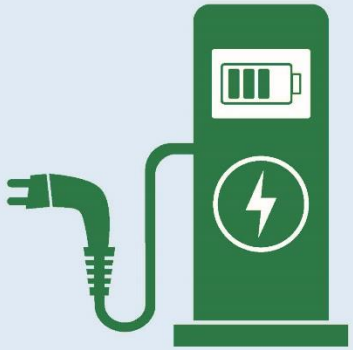
**240V**

Uses a 240V outlet

Can also be hardwired

Adds 20-60 miles per hour of charge

## Level 3
*Commercial*



**480V**

**DC Fast Charger**

Hardwired

Adds 60-100 miles per 20 minutes of charge

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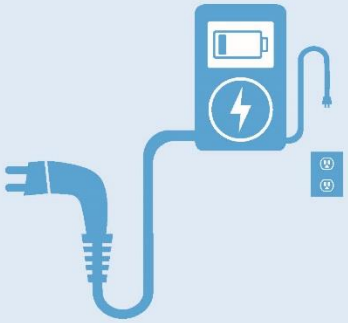

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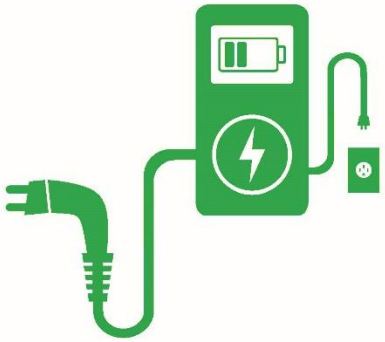

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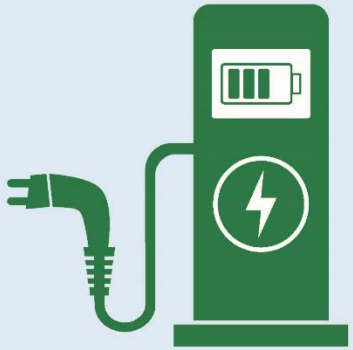

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Hardwired

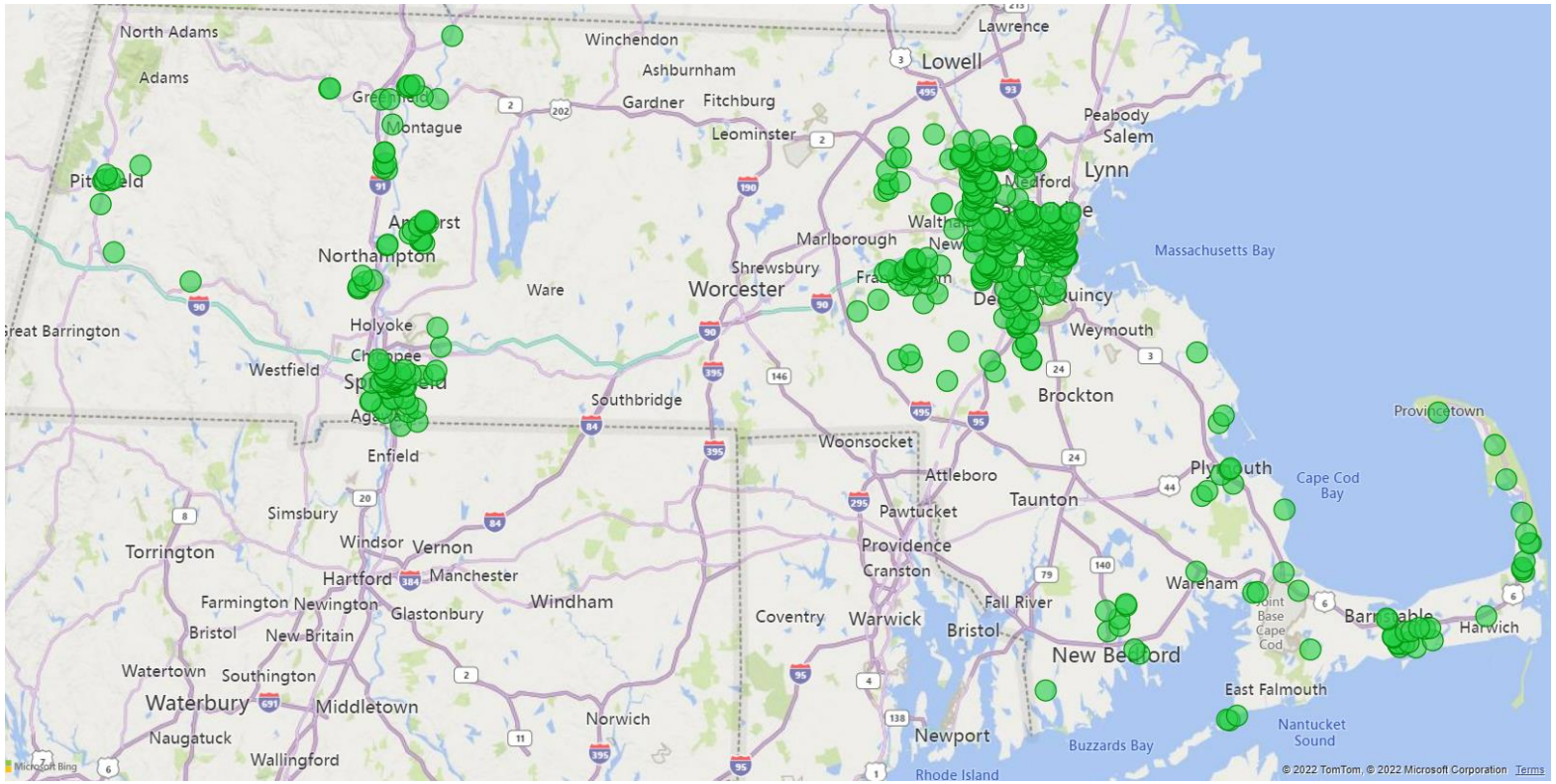
Adds 60-100 miles per 20 minutes of charge

# Phase 1 Program Success

**$55 million spent** in Eversource's MA Electric Service Territory over 4 years

100% of infrastructure costs covered **– 50-90% of project costs**
100% of EVSE cost in Environmental Justice Communities

**430 unique charging sites**
**2100 charge ports installed**



# Phase 2 Program Approved

**$188** million approved on 12/30/22 – Four-year program from 2023-2026

## Commercial Program

- Public, Workplace, Multi-Unit Dwellings
- Make Ready & EVSE Rebates

## Residential Program

- Single Family Homes, 2-4 Unit Dwellings
- Make Ready & EVSE Rebates

## Fleet Program

- Make Ready & EVSE Rebates
- Fleet Advisory Services

## Other

- Medium/Heavy-Duty Public Fleets
- EJC Community Charging Hub

# MA EV Commercial Program

# Commercial Offerings by Segment

| Commercial Program | | | | | | |
|---|---|---|---|---|---|---|
| **Audience** | **Property Type** | **EJC Criteria** | **EVSE Rebate** | **EVSE Eligibility** | **Make-Ready Rebate** | **Make-Ready Eligibility** |
| Municipal | Town Halls, Police Stations, etc. | N/A | 50% ports 3-10 | Must be Publicly Accessible | Up to 100% Not to exceed actual costs | Must apply for available State/Federal Funding (MassEVIP) when if eligible and when available |
| Public/ Workspace | Commercial Property Owners and long-term renters- Gas Stations, Banks, Grocery Stores, Restaurants, etc. | Non EJC | 50 % ports 5-10 | | | |
| | | EJC- Income | 100% | | | |
| | | EJC -Other | 75% | | | |
| Fleets | Groups of vehicles owned by one entity | Contact Eversource to discuss options | | Public fleets only | | |
| MUDS | Multiple Unit Property Owners- 5+ Units | Non EJC | 50% | Non-Deeded Spots | | |
| | | EJC- Income | 100% | | | |
| | | EJC -Other | 75% | | | |

****Publicly Accessible in this space defined as: must allow the general public practical access to, and use of, the parking space and charging station for seven days per week, 24 hours per day. The participant is permitted to charge a parking fee and, if the location has access restrictions, may reduce the hours of public access to no less than twelve hours per day, seven days per week.*

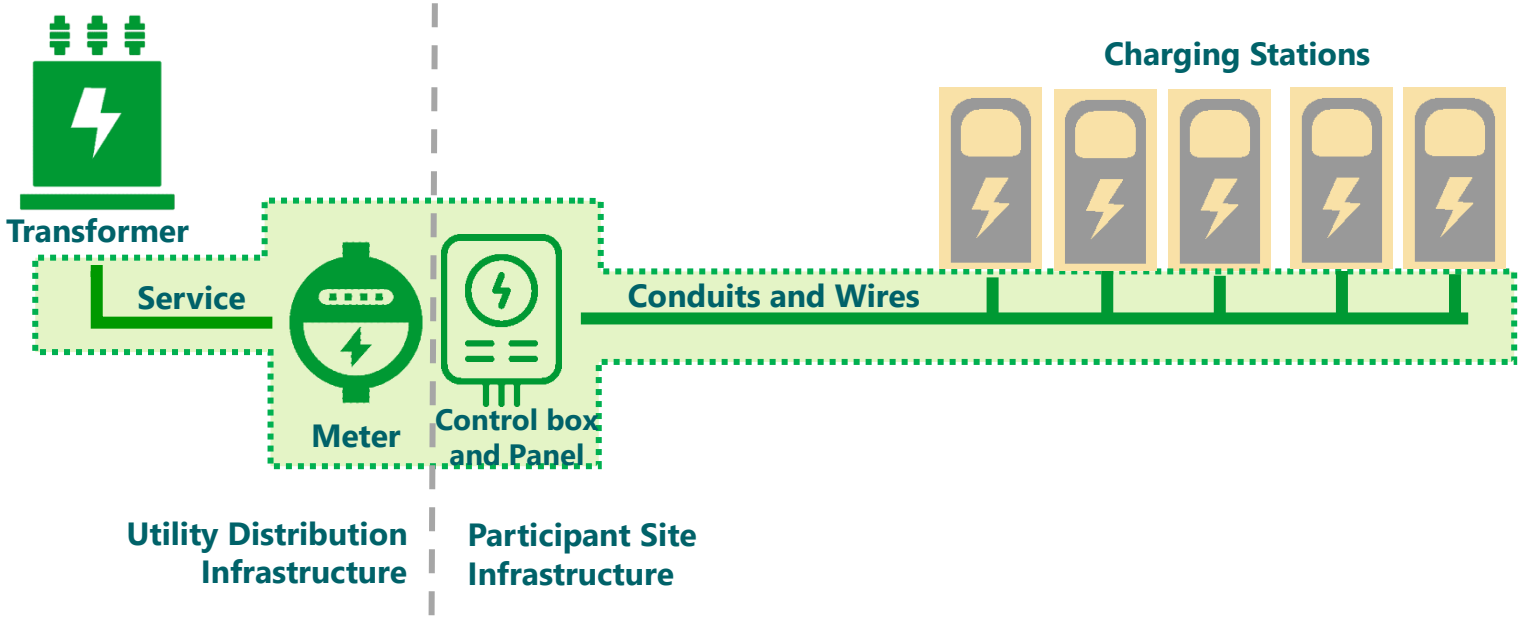
# Ownership Model

**Make Ready:** Up to 100% total cost

- Infrastructure before the meter is owned by **Eversource**
- Infrastructure after the meter owned by **Customer**

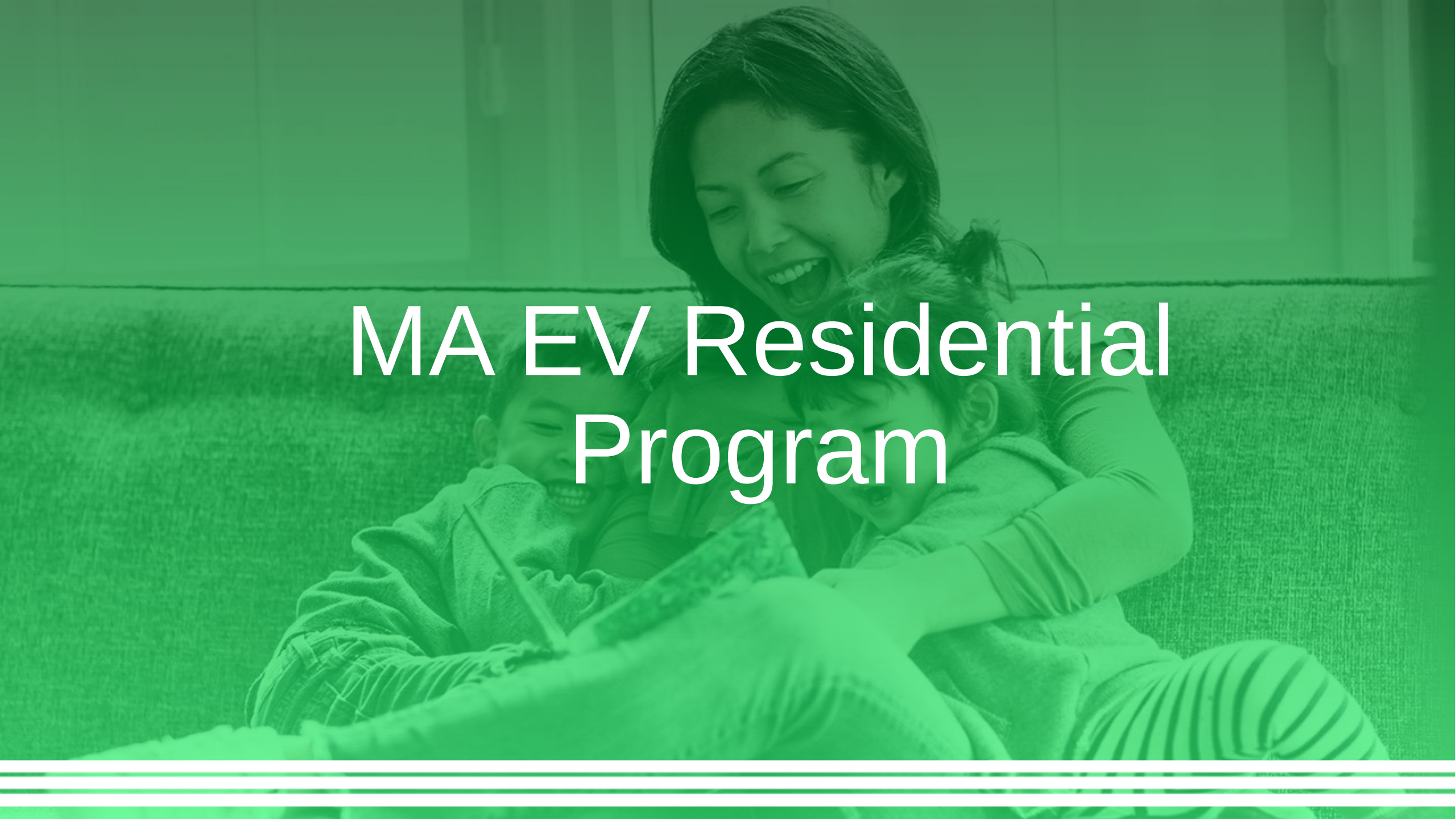
**EVSE:** Rebates available

- **Customer** owns and maintains charging stations



# New Construction

- Site Hosts may use their own contractor
- Eversource can assist with design
- Incentives
  - Make Ready: $$ per port installed
  - EVSE Rebate: same tiered rebate structure as Retrofit



# MA EV Residential Program

# Residential Offerings by Segment

| Residential: Eversource Customers enrolled in Standard Rate | | | | | |
|---|---|---|---|---|---|
| **Audience** | **Property Type** | **Make-Ready Rebate** | **EVSE Rebate** | **Total Cap** | **Eligibility** |
| Single Family Homeowner | 1 Unit | Up to 100% | None | $700 | Must be enrolled in managed charging program. Rebate can-not exceed actual costs. |
| Multi Family Property Owner | 2-4 Units | Up to 100% | None | $1400 | |
| **Residential: Customers enrolled in Eversource low-income discount rate program** | | | | | |
| Single Family Homeowner | 1 Unit | Up to 100% | 100% | $1700 | Must be enrolled in managed charging program. Rebate can-not exceed actual costs. |
| Multi Family Property Owner | 2-4 Units | Up to 100% | 100% | $2700 | |

****Condo Owners may be eligible to participate if the owner has the ability for the EV Charger to be fed off of their own residential electric service***Renters should contact their Personal Property Management to discuss options*

# Residential Eligibility

## EV Charger Qualified Product List (QPL)

- Eligible Smart Chargers must be on this list to receive Smart Charger rebate

## Eligible Costs

- Smart charger
- Wiring upgrade (labor, materials)

## Required Documentation

- Receipts and invoices for purchase and installation
- Charger and EV make and model information

## Managed Charging

- Participate in Managed Charging as condition for receiving rebates

# Program Contacts

MA Commercial Program

- Steve Conte: steven.conte@eversource.com or MAEVCharging@Eversource.com
- Call (855) 463-6438

MA Residential Program

- EversourceMAEVSupport@clearesult.com
- Call (888) 281-5224

EVERSOURCE

# Thanks for listening.

# Residential New Construction

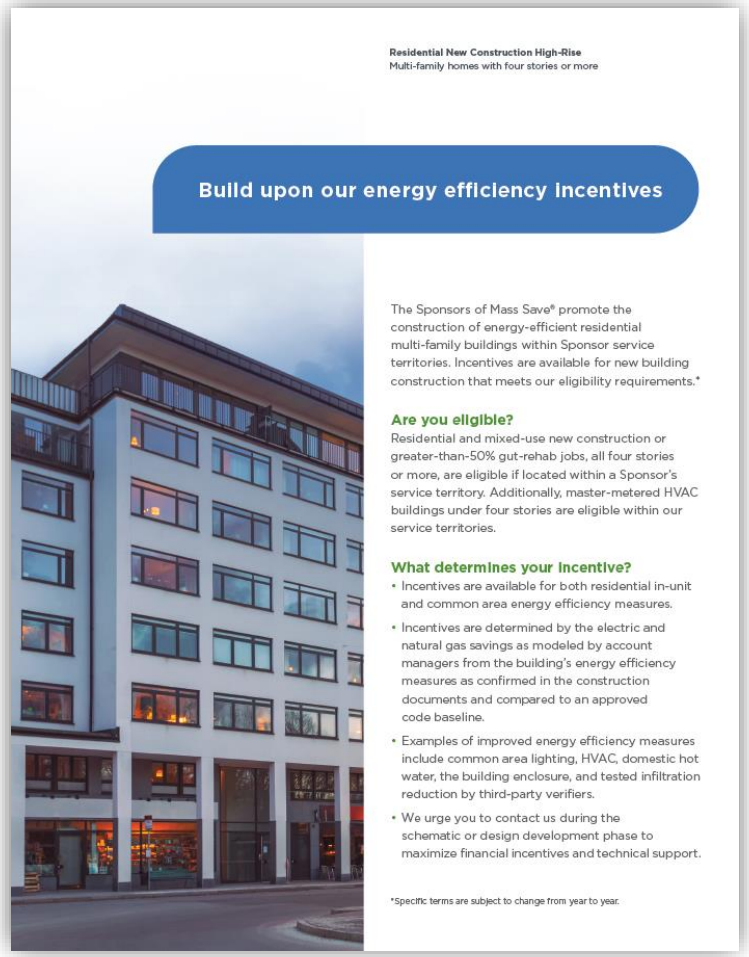
## Single Family and Multifamily Incentives

WE ARE MASS SAVE®:

# Residential New Construction

## Standard Incentive Paths

- **Low Rise New Construction**
  - Buildings w/ ≤3 Stories and residential-metered heat
  - Enrollment via program-approved HERS rater
- **High Rise New Construction**
  - Buildings w/ ≥4 stories and 5+ units with residential-metered heat [or] all multi-family buildings with master-metered heat
  - Enrollment via program Account Manager
- **Renovations & Additions**
  - Buildings w/ ≤3 Stories and residential-metered heat
  - Major renovations & large additions
  - Enrollment via program-approved HERS rater



# Residential New Construction

## Enhanced Incentive Path

- **All-Electric Homes**
  - Single family and 2-4 unit dwellings
  - new construction and major renovations
  - All-Electric heating, cooling, water heating and cooking
  - Enrollment via program-approved HERS rater
  - Incentives range $15k - $40k per building
  - Officially launched in April 2022

| All-Electric Homes | | | |
|---|---|---|---|
| | **Enrolled Units** | **Completed Units – Level 1** | **Completed Units – Level 2** |
| **Total** | **287** | **114** | **17** |

| Component | Level 1 | Level 2 |
|---|---|---|
| Energy savings percentage or HERS Index Score | Savings ≥ 30% or HERS Index Score ≤ 45* | Savings ≥ 50% or HERS Index Score ≤ 35* |
| Heat pump for space heating† | Required | Required |
| Heat pump for water heating | Optional | Required |
| All-electric cookware | Required | Required |
| Infiltration rate (ACH) | ACH50 ≤ 1.5 | ACH50 ≤ 1.0 |
| Balanced ventilation systems (HRVs & ERVs) | Required | Required |
| Continuous envelope insulation‡ | Optional | Required |
| Electric vehicle-ready checklist | Required | Required |

*The HERS Index Score is calculated without factoring in on-site generation.
†Installed air-source heat pumps must be on the Mass Save Heat Pump Qualified Product List.
‡Level 2 requirement applies to whole home (i.e., slab, slab edge, foundation, exterior walls, and roof assemblies).

# Residential New Construction

## Enhanced Incentive Path

- **Multi-Family Passive House**
  - New Construction multi-family buildings w/ 5+ units
  - Passive House Certification (PHI or PHIUS)
  - Enrollment via program Account Manager
  - Pre-construction and post-construction incentives

| Passive House Multifamily Enrollment | | | |
|---|---|---|---|
| **Projected Completion** | **# Projects** | **# Units** | **Project Area (sq.ft.)** |
| **Completed** | 3 | 199 | 222,898 |
| **2023** | 30 | 994 | 1,089,353 |
| **2024** | 54 | 3,231 | 3,193,254 |
| **2025** | 57 | 3,619 | 3,936,863 |
| **2026** | 16 | 1,632 | 1,902,943 |
| **2027** | 3 | 342 | 580,988 |
| **2028** | 3 | 1,110 | 1,003,594 |
| **Grand Total** | **165** | **11,029** | **11,818,460** |

| 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 | |

*The Net Performance Bonus is calculated by determining the final pay for savings incentives and subtracting the pre- and final certification incentives. The result is the Net Performance Bonus.*

*Projects that pre-certify but do not achieve certification are eligible for the pre-certification incentive and Net Performance Bonus.*

*Projects over 100 units must be pre-approved by the applicable Sponsors of Mass Save.*

# Opportunities:
# Electrification, Net Zero, Battery Storage


Kate Crosby, Energy Manager
Acton-Boxborough Regional School District
March 1, 2023

# ABRSD Douglas & Gates School Building Project

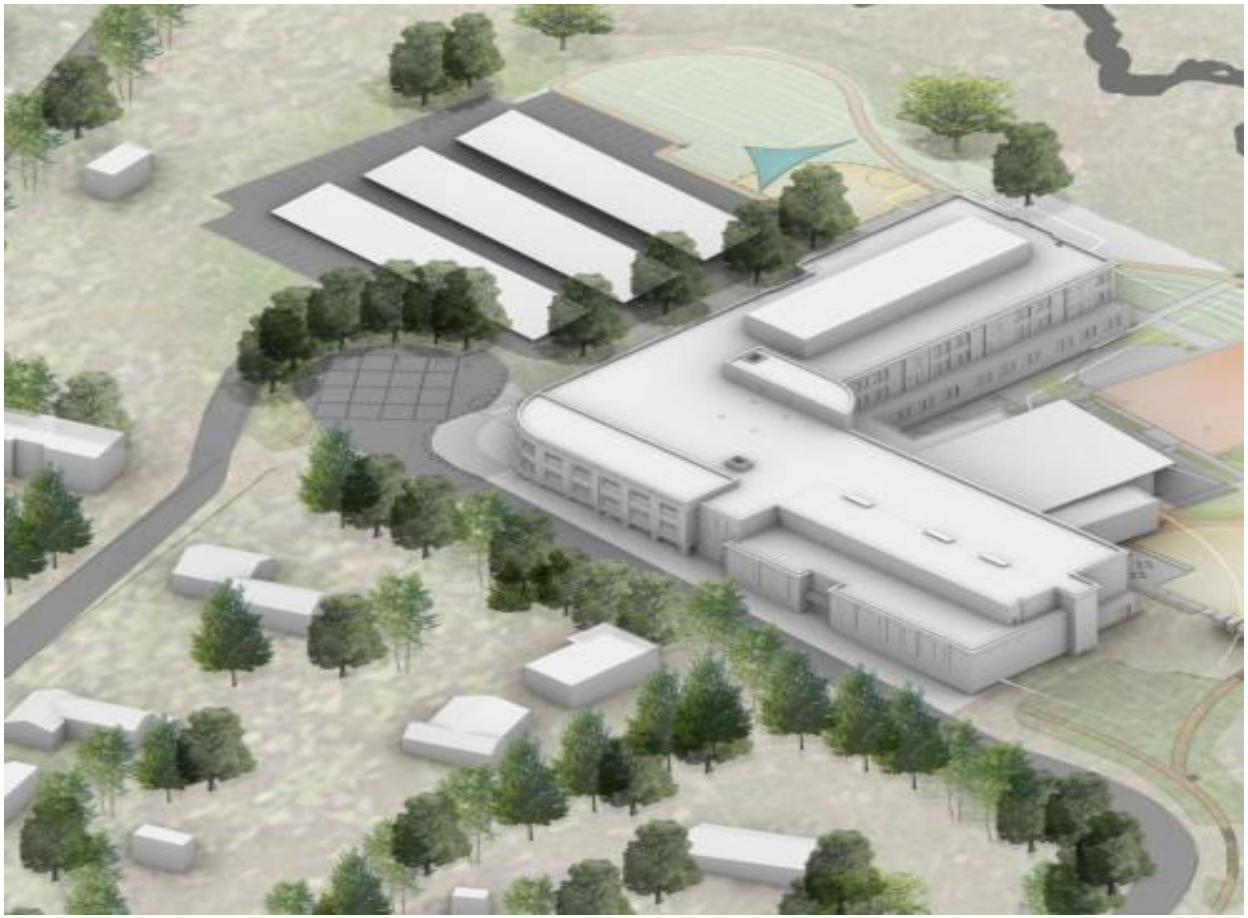
## Douglas & Gates Elementary Schools

**Acton-Boxborough Regional School District**
Acton, Massachusetts


**ARROWSTREET**
10 POST OFFICE SQUARE
SUITE 700N
BOSTON MA 02109
617.623.5555
www.arrowstreet.com

**SKANSKA**
101 SEAPORT BOULEVARD
SUITE 200
BOSTON, MA 02210
617.574.1400
www.skanska.com

CONSIGLI
*Est. 1905*

# ABRSD Douglas & Gates School Building Project

- 175,000 s.f.
- EUI target 28 kBtu/sf  (*EUI = Energy Use Intensity*)
- Zero Net Energy
- Geothermal heating/cooling + backup electric boiler
- All-electric (emergency generator = diesel)
- Solar+Storage
- EV chargers (EV Make Ready program)
- Rainwater collection to grey water system

# Support: Mass Save, NGRID, Eversource

**Essential early support from Mass Save**:

- "Start early!" >> set EUI target early in the process
- Credibility
- Momentum
- Technical help
- Substantial incentives confirmed ahead of time

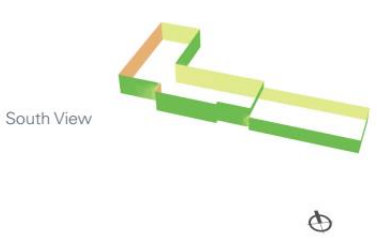

EVERSOURCE ENERGY

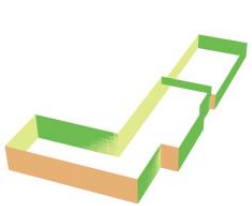
nationalgrid

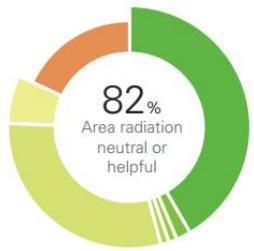
# Solar radiation benefit study

## IMPACT OF BUILDING MASSING ON SOLAR RADIATION BENEFIT

### #1 DOUGLAS/DOUGLAS SITE

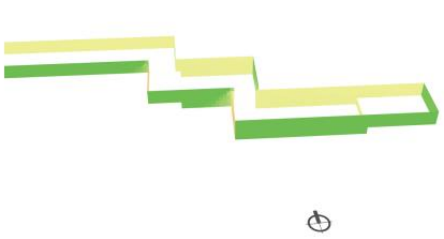


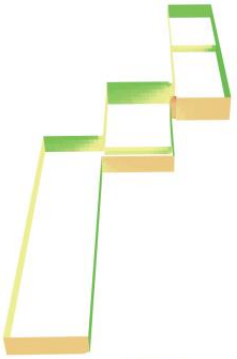


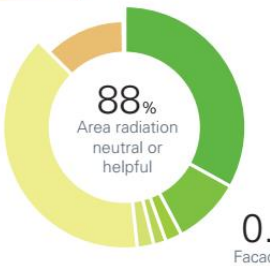



0.39
Facade/Floor Ratio

### #2 DOUGLAS GATES/ELM SITE

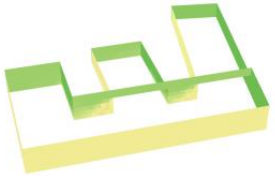


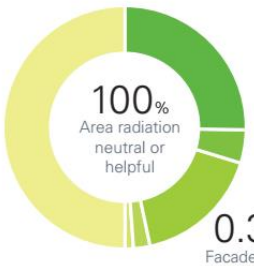





0.39
Facade/Floor Ratio

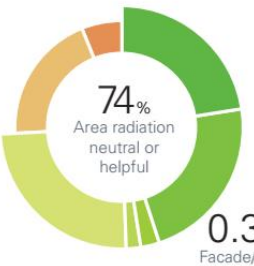
### #3 DOUGLAS GATES/GATES SITE






0.35
Facade/Floor Ratio

### #4 DOUGLAS CONANT/CONANT SITE




0.34
Facade/Floor Ratio

South View

West View

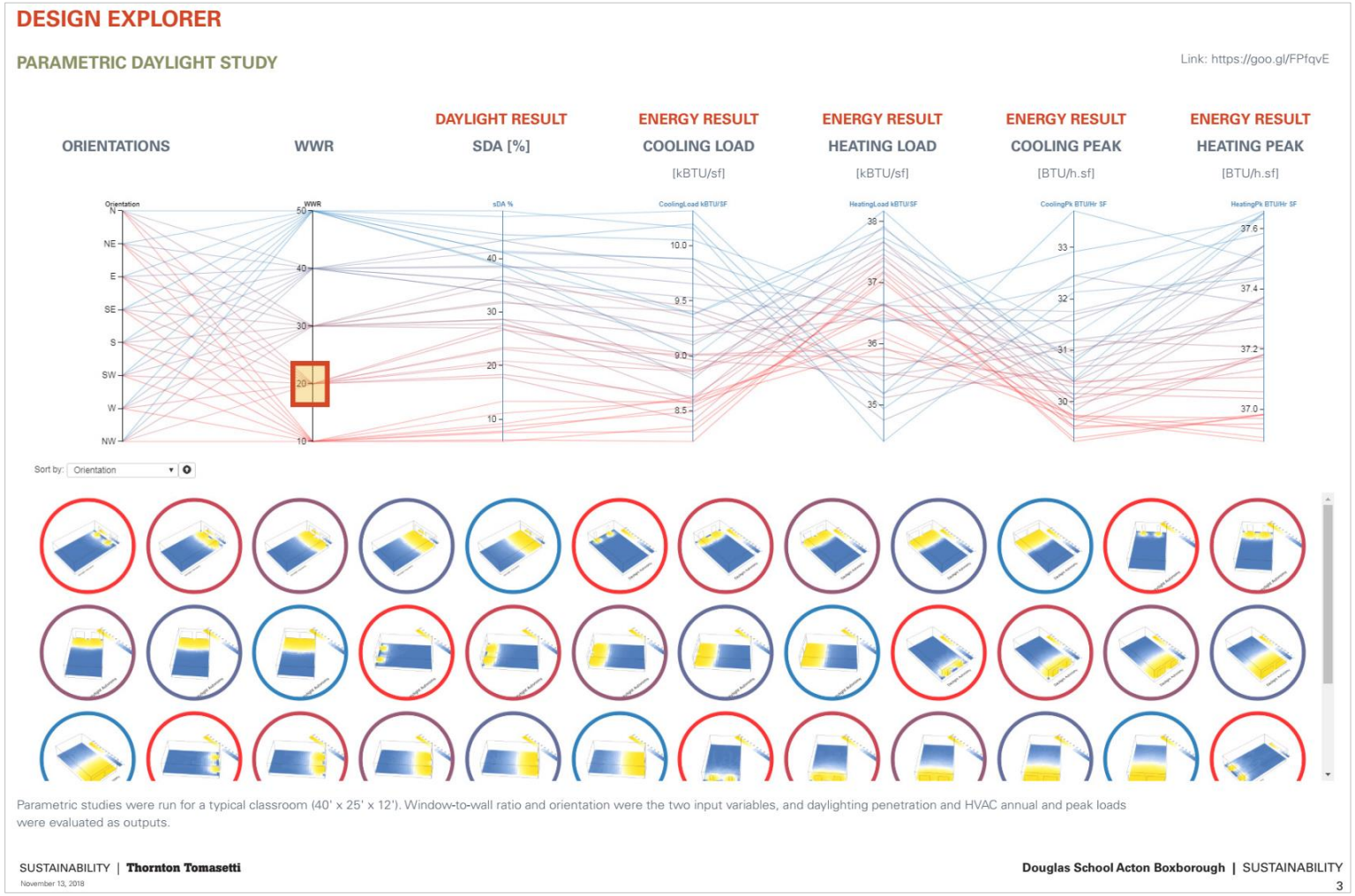
The purpose of this radiation benefit study to understand how different building massings differ in the amount of beneficial / harmful solar radiation on their facades. "Helpful radiation" is colored in green, and corresponds to any solar incidence that occurs when the outdoor air temperature is below 64 F (heating season). "Harmful radiation" is colored in red, and corresponds to any solar incidence during the cooling season (outdoor air temperature higher than 64F). Any facades with predominantly harmful radiation would require exterior shading to maintain a low energy consumption. Results indicate that massings1 and 4 receive more harmful radiation than massing 2 and 3.

Note: Balance point used in this study is 64 F.




Thornton Tomasetti

# Daylight study




"Using the parametric studies highlighted in the previous page, we here have narrowed down the results to a box model with 20% window wall ratio in 8 orientations. "

Thornton Tomasetti

# Douglas Gates Engineering Economic Analysis (LCCA)

**LCCA** = engineering study looking at costs over time

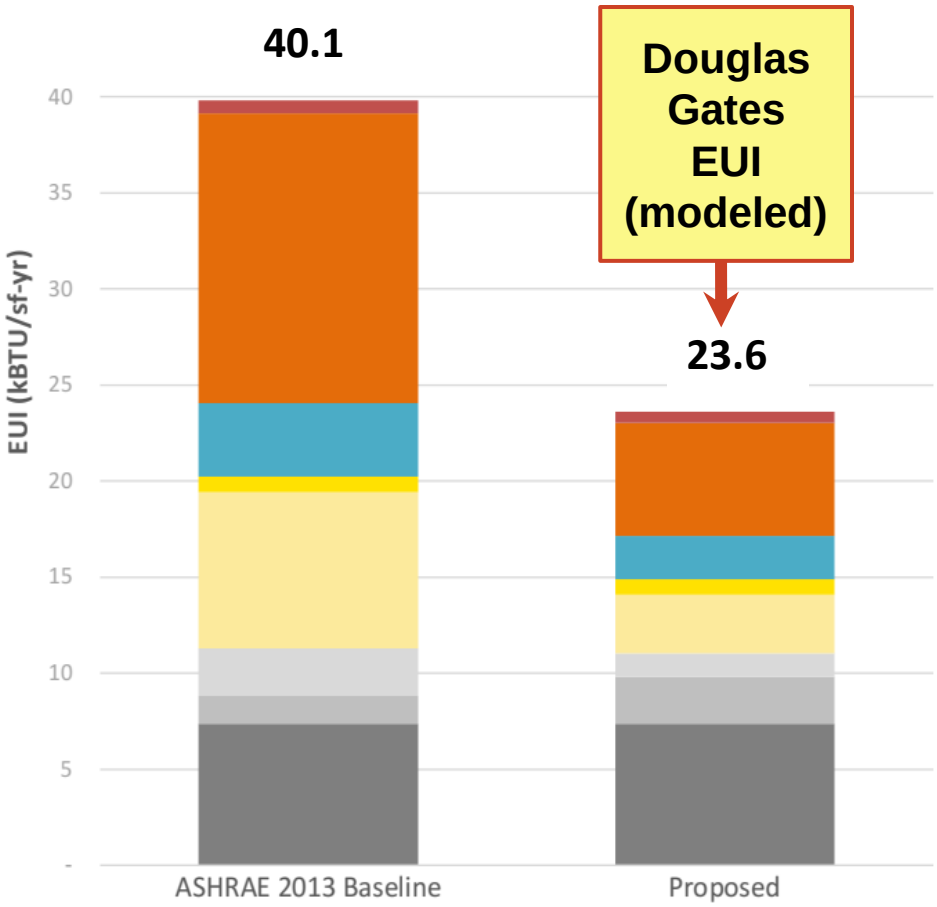
**High efficiency gas**
&
**Geothermal**
very close in cost over time
(…*before* IRA legislation)

New IRA legislation provides 30% tax credit for geothermal that municipalities can access!

Study:
https://drive.google.com/file/d/1y41_8ctZkAh9psoJJ9Es-CkeXyCItgW3/view?usp=share_link

| Option | System |
|---|---|
| 1 | 1. Displacement ventilation diffusers with passive chilled beam cooling/heating radiation<br>2. Hot water coil heating/chilled water cooling VAV ventilating units with energy recovery with terminal VAV boxes with CO2 controls<br>3. Geothermal wells with high-efficiency water-to-water source heat pump chillers |
| 2 | 1. Displacement ventilation diffusers with passive chilled beam cooling/heating radiation<br>2. Gas-fired heating/dx cooling VAV ventilating units with energy recovery with terminal VAV boxes with CO2 controls<br>3. High efficiency gas-fired condensing boiler plant<br>4. High efficiency air-cooled chiller plant |
| 3 | 1. Variable refrigerant flow (VRF) terminal evaporator units with air-cooled condensing units<br>2. Air-cooled dx heat pump heating/cooling 100% O.A. ventilating units with energy recovery with terminal VAV boxes with CO2 controls serving VRF units<br>3. Air-cooled dx heat pump heating/cooling VAV AHU systems with energy recovery with terminal VAV boxes with CO2 controls serving the cafetorium |
| 4 | 1. Displacement ventilation diffusers with passive chilled beam cooling/heating radiation<br>2. Hot water coil heating/chilled water cooling VAV ventilating units with energy recovery with terminal VAV boxes with CO2 controls<br>3. Geothermal wells with high-efficiency water-to-water source heat pump chillers<br>4. Supplemental electric boiler plant |

GGD Consulting Engineers, Inc.




| | ASHRAE 2013 Baseline | Proposed |
|---|---|---|
| DHW | 0.7 | 0.6 |
| Heating | 15.1 | 5.9 |
| Cooling | 3.8 | 2.3 |
| Ext. Lights | 0.8 | 0.8 |
| Int. Lights | 8.2 | 3.1 |
| Fans | 2.5 | 1.2 |
| Pumps | 1.5 | 2.4 |
| Equipment | 7.4 | 7.4 |
| Total | 40.1 | 23.6 |

Thornton Tomasetti

# DOUGLAS-GATES ELEMENTARY SCHOOL

## ENERGY ANALYSIS

September 4th, 2020

**Geothermal well fields x 2**

65 wells x 600’ depth

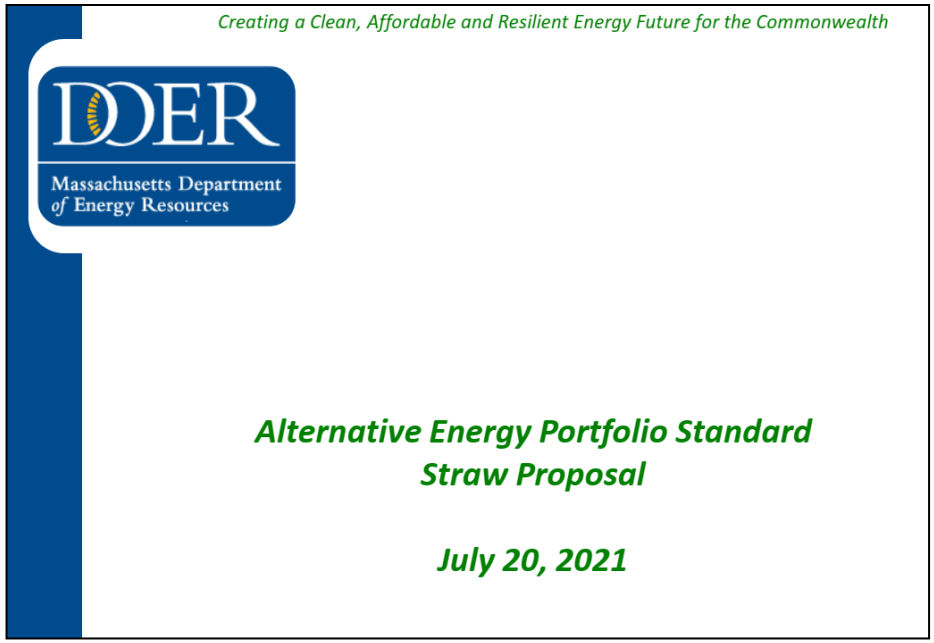
**Geothermal lines entering mechanical room**


480 VOLTS
OFF
WaterFurnace
Commercial Solutions


CHILLED WATER RETURN
COMP WATER RETURN
HOT WATER RETURN
SPRINKLER WATER

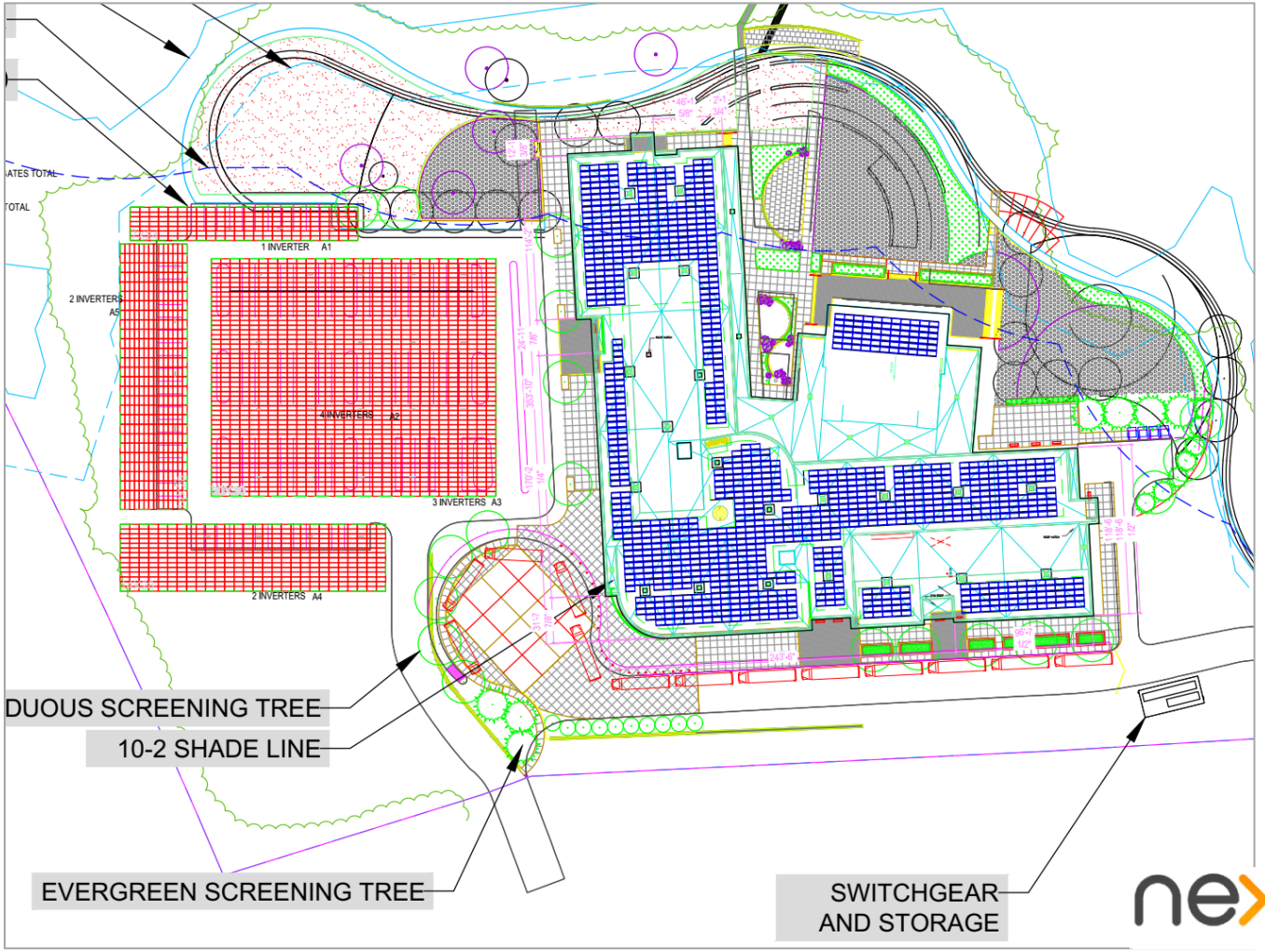
# AEC's = Alternative Energy Credits

- Update to Alternative Energy Portfolio Standard (APS)
- Goal: incentivize clean heat (e.g., GSHP, ASHP) & reduce emissions
- "Useful thermal energy" >> mint AEC's >> revenue
- **Heating** only (cooling does not qualify)
- Douglas Gates building projected:
  - **$43,000 yearly revenue** at price of $15/AEC (price may climb)



# Solar + Storage

- PV solar: 1447 kW DC *(2,700 panels)*
- Battery storage system (BESS): 1MW/2MWh



# Strategic Electrification – Existing Buildings – HS RTU's

- Replacing RTU's x 11 at ABRHS
- "Renewable Thermal Technical Study" = **LCCA**
- $15,000 grant (MA DOER META grant)

DOER
Massachusetts Department of Energy Resources

| System | Gross Capital Investment* | Annual kBTU/s.f. (EUI) | Annual Elec. Cons. (kWh) | Annual Gas Cons. (Therms) |
|---|---|---|---|---|
| Air-Source DX Cooling/Gas-Fired Heating Multizone RTU's w/ Terminal Hot Water Re-Heat Coils (Replacement in Kind) | $3,293,049 | 71.0 | 1,438,164 | 67,378 |
| Air-Source DX Heat Pump Cooling/Heating Multizone RTU's w/ Energy Recovery & Terminal Hot Water Re-Heat Coils | $3,381,441 | 36.9 | 1,773,935 | 0 |

GGD Consulting Engineers, Inc.

**$900,000 estimated NGRID incentive!!! (not included in study calc's)**

# Strategic Electrification – Existing Buildings – HS RTU's

(continued)

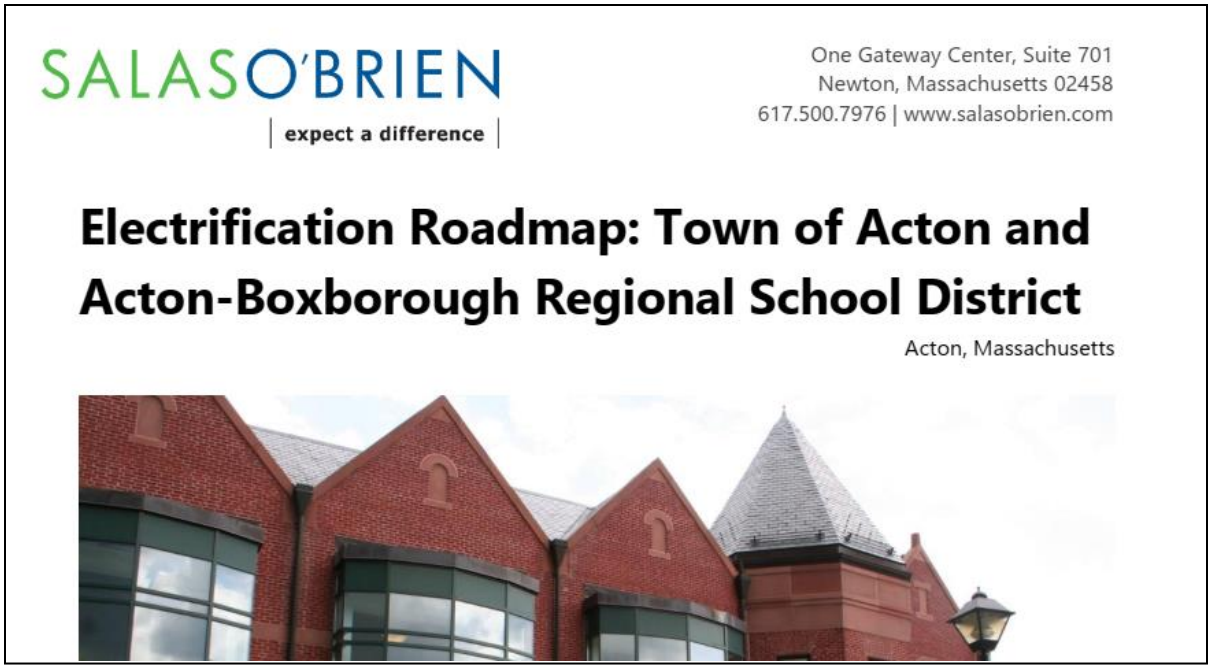
| System | Combined Utility Cost | Total Life-Cycle Savings*** | Discounted Payback (Years)**** |
|---|---|---|---|
| Air-Source DX Cooling/Gas-Fired Heating Multizone RTU's w/ Terminal Hot Water Re-Heat Coils (Replacement in Kind) | $322,735 | - | - |
| Air-Source DX Heat Pump Cooling/Heating Multizone RTU's w/ Energy Recovery & Terminal Hot Water Re-Heat Coils | $276,757 | $2,803,756 | 2 |

Study: https://drive.google.com/file/d/1dhLzWj0ZGoJdg11T6qD99i_Gt3TzvY9W/view?usp=share_link

# Strategic Electrification – Existing Buildings – Portfolio

"Electrification Roadmap"

- Collaboration with Town of Acton (funding lead)
- $70,000 grant funding (MA MVP)
- Assessing electrification timeline of 7 key school/muni buildings
  - Acton: Town Hall, library, PSF
  - ABRSD: HS, JH, 2 additional school bldngs

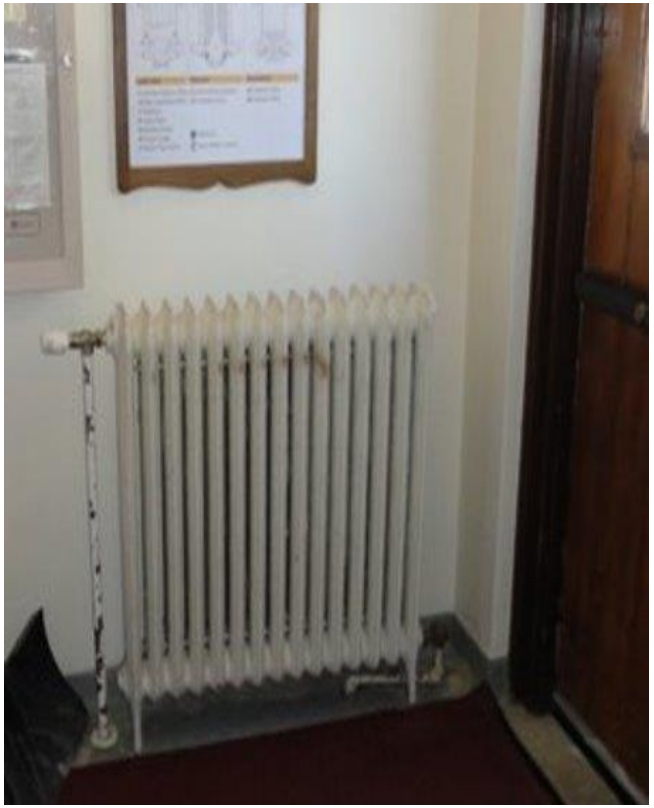



MVP
Municipal Vulnerability Preparedness

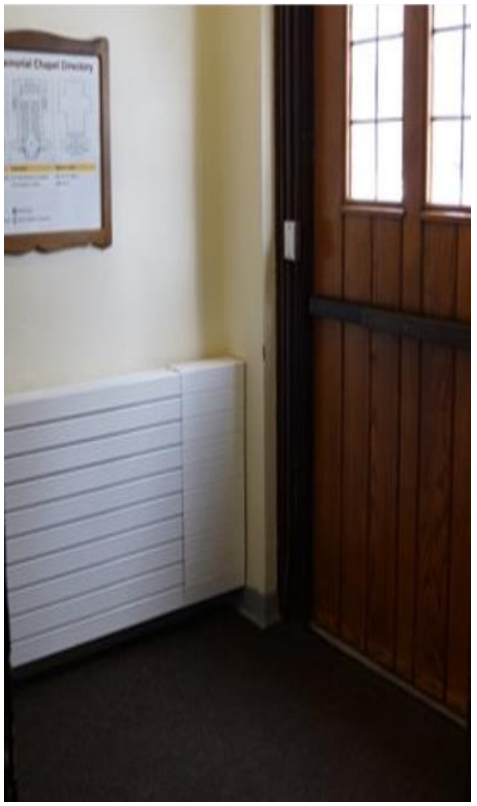
Study report: https://www.acton-ma.gov/DocumentCenter/View/8048/Acton-Electrification-Roadmap-Final-Report
Master slide deck: https://drive.google.com/file/d/1ACBPMBwddqNX5Gr71-SUpEsnkgtK14Ve/view?usp=share_link

# Low Temperature Hot Water Building Conversion

- Replace steam heating equipment with hydronic



Before

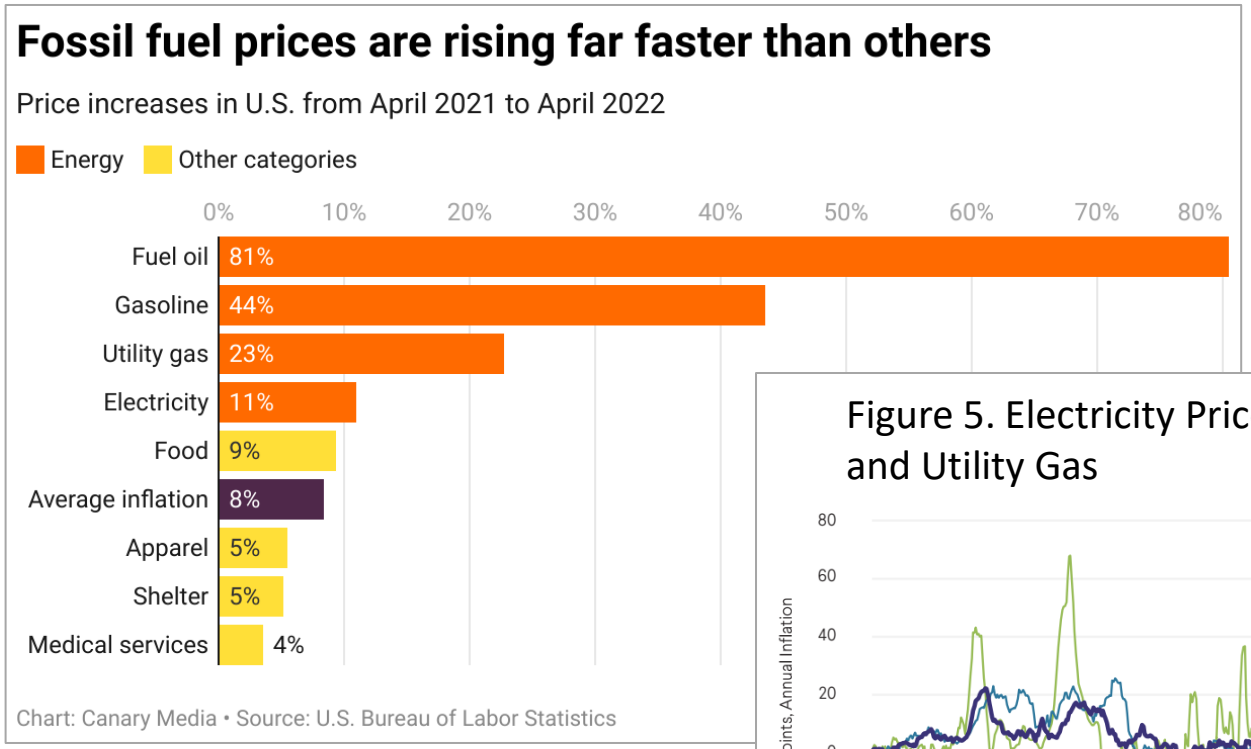


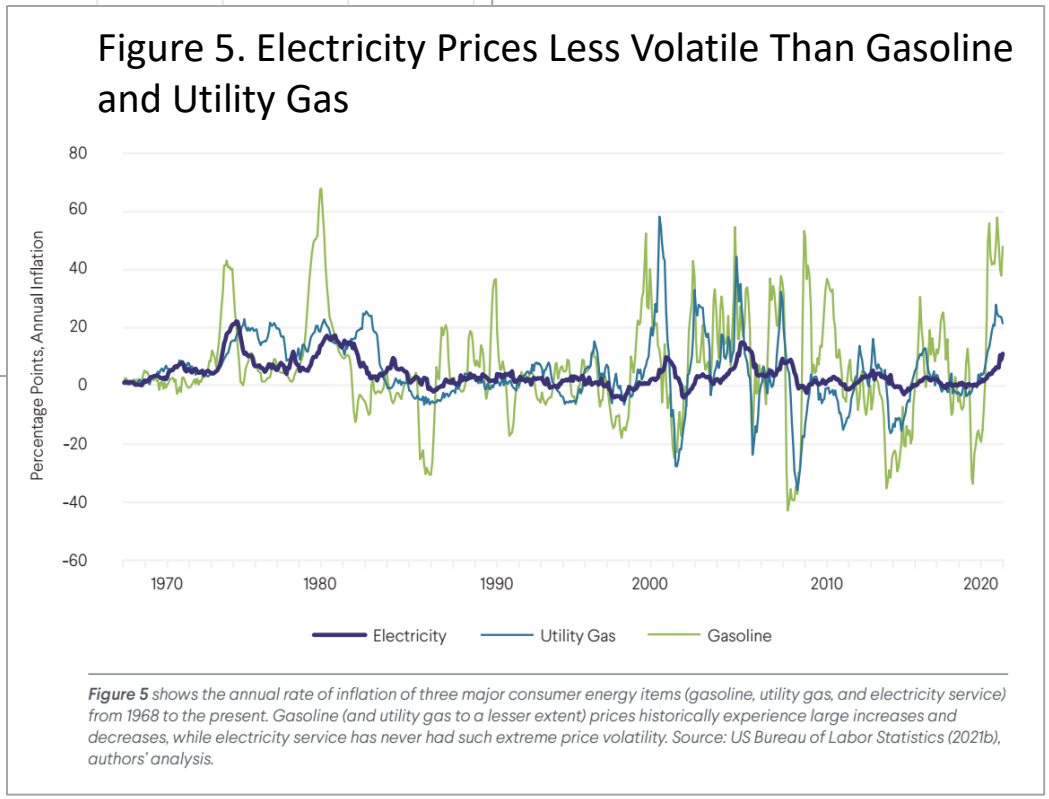
After

*Pictures from Carleton College Chapel

SALASO'BRIEN
expect a difference

# Electricity prices >> more stable, less inflation over time




https://www.canarymedia.com/articles/fossil-fuels/chart-fossil-fuels-are-a-big-driver-of-inflation
https://rooseveltinstitute.org/publications/energy-price-stability/

# Battery storage system (BESS) – Charter Road campus

MASSACHUSETTS CLEAN ENERGY CENTER

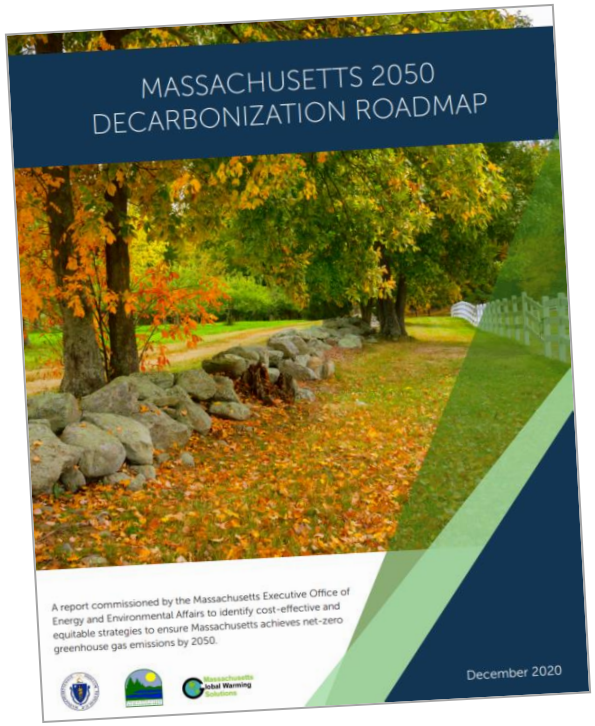
enel x

MA ACES (Advancing Commonwealth Energy Storage)

- 2MW/4MWh battery storage array
- **~$70K annual revenue to ABRSD**
- Dec. 2017 = grant award
- Dec. 2020 = interconnected

# Landmark MA climate legislation >> low carbon economy

- 2030 emissions: 50% below 1990 baseline
- 2040 emissions: 75% below 1990 baseline
- **2050 emissions: net zero GHG emissions**





Thank you!

# Brewster Woods

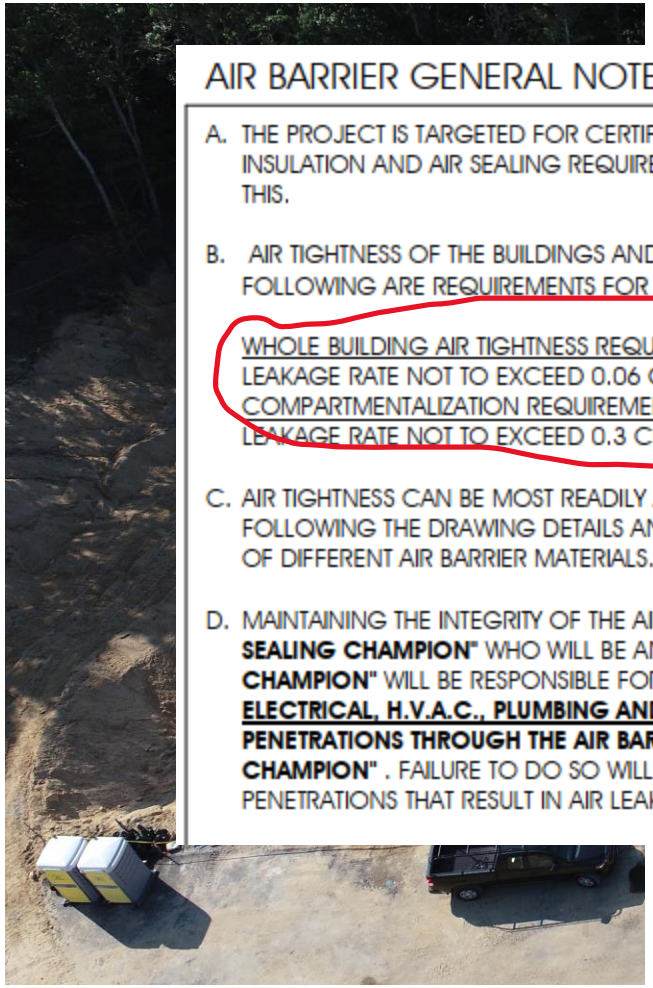
- First POAH project completed targeting Passive House certification (PHIUS)
- (30) units of affordable housing:
  - including (7) project-based vouchers for households below 30% Area Median Income (AMI)
  - including (3) Section 811 supportive housing units for persons with disabilities
- Total Development Costs - $13,580,266 ($452,676/unit)
- Total Construction Costs – $9,104,875 ($303,495/unit or $238.19/sq ft)
- All Electric heating/cooling/hot water plus energy recovery and solar PV, all owner paid utilities
- Mass Save PH Incentives - $3,500/unit; $105,000 total (1.15% of Total Construction Costs)

  *Does not include $5,000/building feasibility funds

HOME funds provided by the Barnstable County HOME Consortium

DESIGN+ BUILDING PERFORMANCE
Preservation of Affordable Housing

# Con

## AIR BARRIER GENERAL NOTES:

A. THE PROJECT IS TARGETED FOR CERTIFICATION UNDER THE PASSIVE HOUSE STANDARD ADMINISTERED BY PHIUS. THE INSULATION AND AIR SEALING REQUIREMENTS INDICATED ON THE DRAWINGS ARE MANDATORY IN ORDER TO ACHIEVE THIS.

B. AIR TIGHTNESS OF THE BUILDINGS AND UNITS WITHIN THE BUILDINGS ARE REQUIREMENTS OF THIS PROJECT. THE FOLLOWING ARE REQUIREMENTS FOR THIS PROJECT:

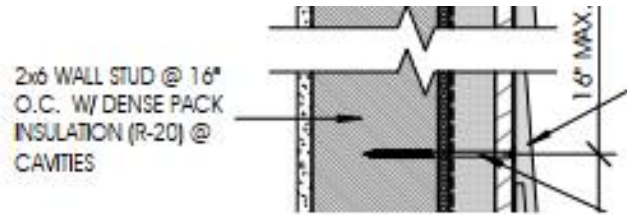
WHOLE BUILDING AIR TIGHTNESS REQUIREMENT: EACH FULL BUILDING SHALL BE TESTED AND VERIFIED AS HAVING AN AIR LEAKAGE RATE NOT TO EXCEED 0.06 CFM50 PER SQUARE FOOT OF BUILDING ENCLOSURE.
COMPARTMENTALIZATION REQUIREMENT: EACH DWELLING UNIT SHALL ALSO BE TESTED AND VERIFIED AS HAVING AN AIR LEAKAGE RATE NOT TO EXCEED 0.3 CFM50 PER SQUARE FOOT OF TOTAL ENCLOSURE AREA OF THE DWELLING UNIT.

C. AIR TIGHTNESS CAN BE MOST READILY ACHIEVED IN THE CONSTRUCTION OF THE BUILDING ENVELOPE BY CAREFULLY FOLLOWING THE DRAWING DETAILS AND SPECIFICATIONS. PARTICULAR CARE MUST BE TAKEN WITH THE CONNECTIONS OF DIFFERENT AIR BARRIER MATERIALS.

D. MAINTAINING THE INTEGRITY OF THE AIR BARRIER IS SHARED AMONG VARIOUS TRADES, BUT WILL COORDINATED BY AN **"AIR SEALING CHAMPION"** WHO WILL BE AN EMPLOYEE DESIGNATED BY THE GENERAL CONTRACTOR. THE **"AIR SEALING CHAMPION"** WILL BE RESPONSIBLE FOR COORDINATING AIR SEALING APPROACHES OF ALL SUB-CONTRACTORS. **ELECTRICAL, H.V.A.C., PLUMBING AND TELECOMMUNICATION SUB-CONTRACTORS ARE RESPONSIBLE FOR SEALING ALL PENETRATIONS THROUGH THE AIR BARRIER THAT THEY MAKE, IN A MANNER ACCEPTABLE TO THE "AIR BARRIER CHAMPION"** . FAILURE TO DO SO WILL RESULT IN THE SUB-CONTRACTOR BEING CHARGED FOR THE COSTS OF REPAIR OF PENETRATIONS THAT RESULT IN AIR LEAKAGE, AS REVEALED BY THE BLOWER DOOR TESTING.

MINERAL WOOL
4" MIN. ABOVE

INSULATION
CKWOOL) OR




**BASE BID:** PREFINISHED FIBER CEMENT SIDING
**ALT #1:** PREPRIMED FIBER CEMENT SIDING, FIELD PAINTED. FASTENED TO FURRING STRIPS PER W/ STAINLESS STEEL NAILS

1 X 4 P.T. FURRING STRIPS AT 16" O.C., CENTERED OVER AND FASTENED TO

DESIGN+ BUILDING PERFORMANCE
Preservation of Affordable Housing

POAH

POAH is committed to Passive House on all new construction:

- Long term investment for durability and performance
- Resiliency benefit for community
- Energy security benefit for community or organization
- Increased health and comfort benefits for occupants