# Nonantum Village Place

## Pathway to Zero Carbon Emissions

**A case study of decisions made and the Zero over Time Process**

December 8, 2022 presentation
to Energy Cohort Group
Prepared by Cascap/HRI
New Ecology Inc. (NEI)

HRI CASCAP inc

NEW ECOLOGY
Community-Based Sustainable Development

# Nonantum Village Place

**Built in 2004**
**241 Watertown St.**
**Newton MA**

**35 one- bedroom apartments**
**20,000 sq. ft. building**

**HUD 202 Supportive Housing for the Elderly**
**100% affordable** 50% of AMI maximum

# Nonantum Village Place

**GOALS**

**Owner:**

- At end of building components useful life, improve energy efficiency
- Decarbonize building
- Maintain comfort and indoor air quality for Seniors
- Incorporate maintenance and operation awareness

**City of Newton Climate Action Plan:**

- Carbon Neutral by 2050

**Zero Over Time Plan:**

- Energy Use and Carbon Reduction
- Improved Resilience
- Address Embodied Carbon

# Nonantum Village Place

## Key Partners

Funders:

| | |
|---|---|
| City of Newton CPA | $500K |
| LEAN | $207K |
| NVP replacement reserves | $144K |
| City of Newton CDBG | $100K |
| Charlesbank Foundation | $ 50K |

Technical Assistance

- LISC
- New Ecology Inc. (NEI)- ZOT
- Resonant Energy- Solar studies
- BC Stewart-CNA
- Wegowise- data on energy/water use

Property Management Company:

- Wingate Companies

Contractors

- J&S Building Exteriors
- K J Miller Mechanical Inc.
- Smartbuild LLC

# Nonantum Village Place

## Challenges/concerns

- Insufficient replacement reserve funds to complete energy, capital goals
- Construction during Covid
  - what could/should wait
  - Impact on tenants.
- Air Source Heat Pumps (ASHP) in elderly building
  - tenant's comfort
  - equipment performance in winter
- Fuel shifting: Changing from gas to electricity. Uncertain operating cost savings
- LEAN/Mass Save- setting new policies on how decarbonization evaluated

# Process and Timeline

**Identified**

- 2016-2021
- How is the building performing?
- Failing building components
- High Energy Consumption areas energy and water
- Potential funding sources

**Initial funding applications**

- Jan-April 2021
- Initial construction scope and bids
- Charlesbank Foundation
- LEAN
- City of Newton

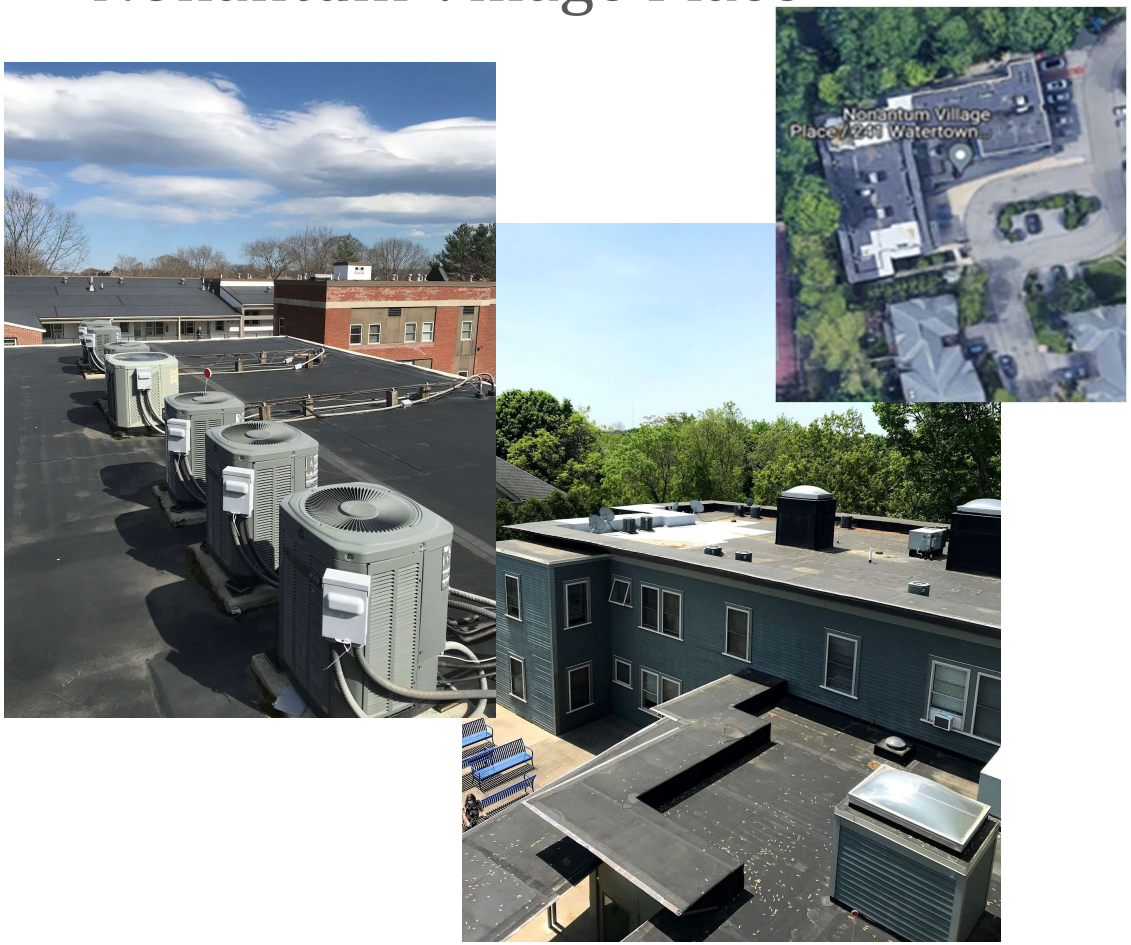
**Zero Over Time**

- May 2021- August 2021
- Energy Audit
- Design Charrette
- Short Term and Long- Term Projects identified

**Funding and Retrofit scope**

- June 2022  all funding committed
- HUD approval
- Refined construction scope
- Roofing, HVAC work started Fall 2022

# Nonantum Village Place




**Tools**

**Capital Needs Assessment 2021**

**Zero over Time Process May 2021**
Energy Audit
Design Charette
Zero over Time Report

**City of Newton Climate Action Goals**
willingness to fund decarbonization.

**NEI engineers** working with contractors and property management to define scope and equipment

# Nonantum Village Place

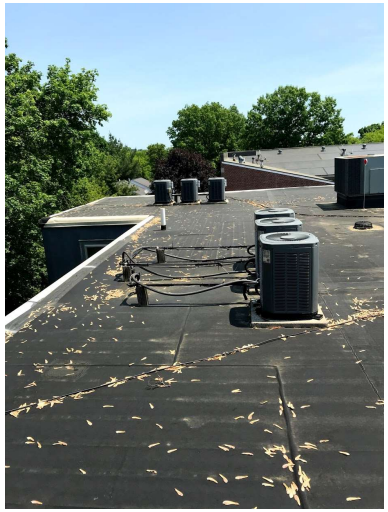

Domestic Hot Water
2 80 gallon gas fired tanks.

Building orientation excellent for solar array

**Existing components**

Building is master metered. All utilities are paid by the owner.
National Grid gas
Eversource electricity

# Nonantum Village Place

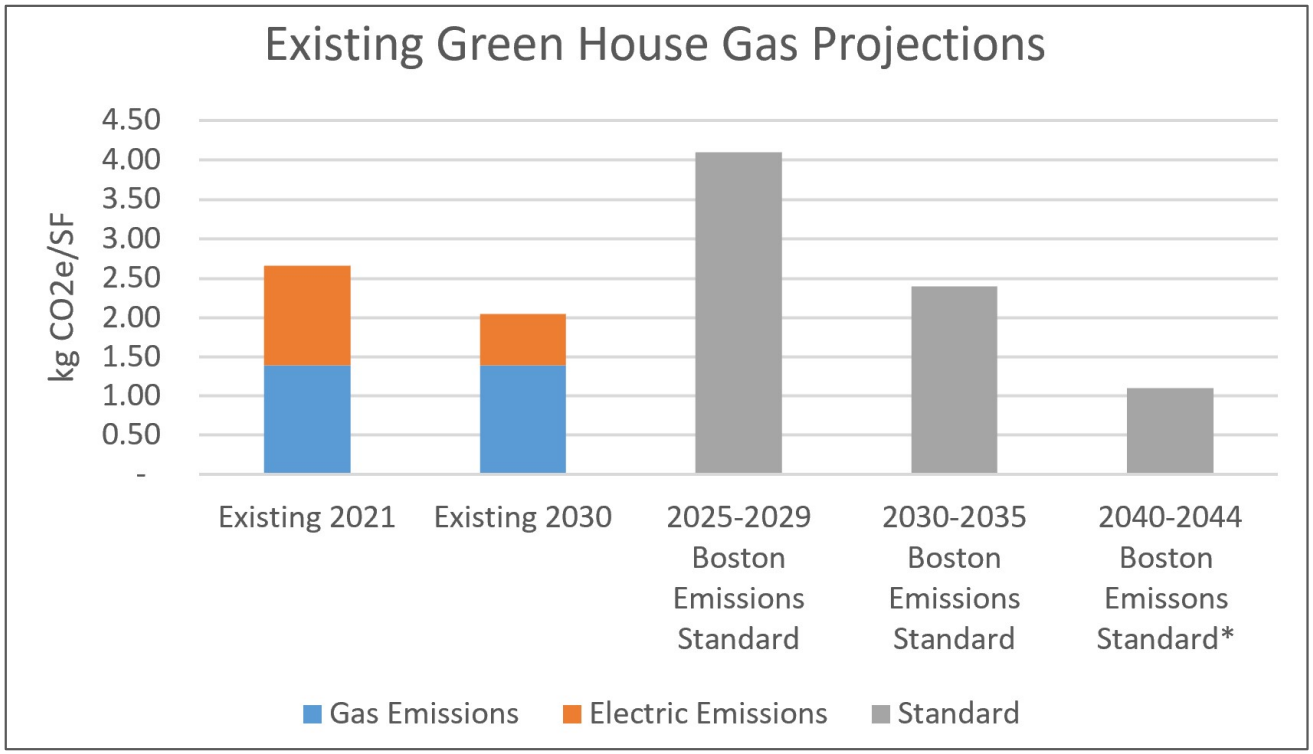
**Existing Heating Apartments** heated through 2 HTP high efficiency Condensing Boilers- to fan coil unit/air handler in the apartment

**Existing cooling Apartments** Cooled by individual fan coil unit connected to rooftop condenser (35 total)

**Existing common area**

3 Roof Top Units with gas fired heating and electric supplied cooling coil.

# Current Performance Overview




EUI (energy use intensity)

Existing: 47kBtu/SF

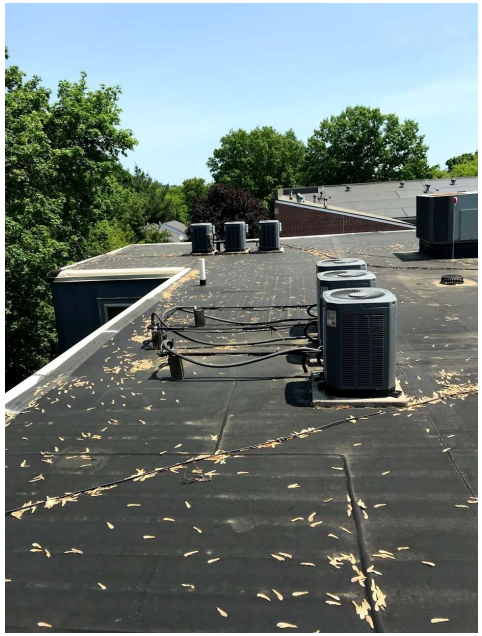
After proposed capital project:
30 kBtu/SF

Passive House standard:
30 kBtu/SF

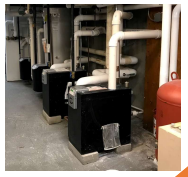
CO2e/kWh based on NREL and Cambrium's energy grid "Standard Scenarios" viewer for electric energy in Massachusetts: https://cambium.nrel.gov/?project=c3fec8d8-6243-4a8a-9bff-66af71889958

# Proposed Capital Project- $1MM

- Replace roof add R-50 insulation
- Replace apartment condensing units/ fan coils with hybrid system:
  - *heat pump/ hot water coil feeding new fan coils*
  - *controlled by 2-stage thermostat*
  - *switches to existing high efficiency gas boilers when temperature drops below 30F (~27% of heating)*
- Replace gas fired RTU's w/ heat pump RTU's

# Apartment Heating and Cooling Timeline



**2021: Current System**

- Central Gas-Fired Condensing Boiler
- Hot Water Coil in Fan Coil Unit
- 80% Efficient Heating, 11 SEER cooling

**2022: Hybrid Heat Pump**

- Central Gas-Fired Condensing Boiler (Below 30F)
- Apartment Heat Pumps (Above 30F)
- Hot Water Coil and Heat Pump in Fan Coil Unit
- 80% Efficient Gas HW, 3.1 COP Heat Pump, 20 SEER Cooling

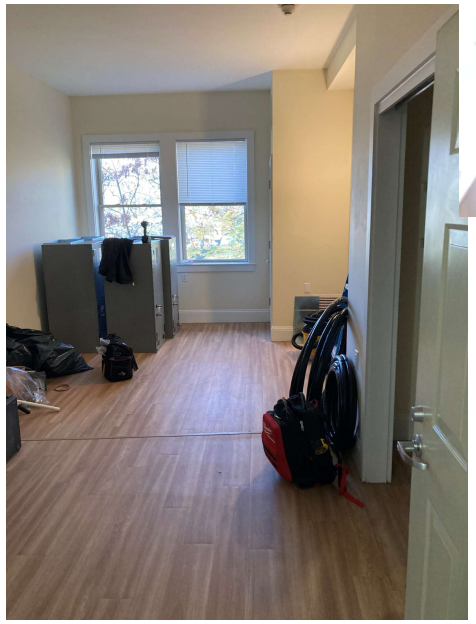
**2033: Full Electrification**

- Apartment Heat Pumps (All Temperatures)
- Heat Pump in Fan Coil Unit
- Above 30F: 3.1 COP, Below 30F: 2.4 COP, 20 SEER Cooling

# Nonantum Village Place

New TPO Roof being installed

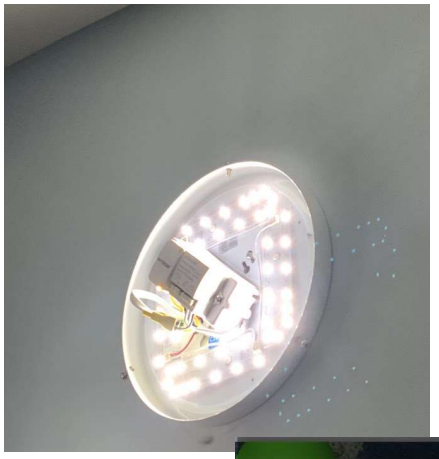
# Nonantum Village Place



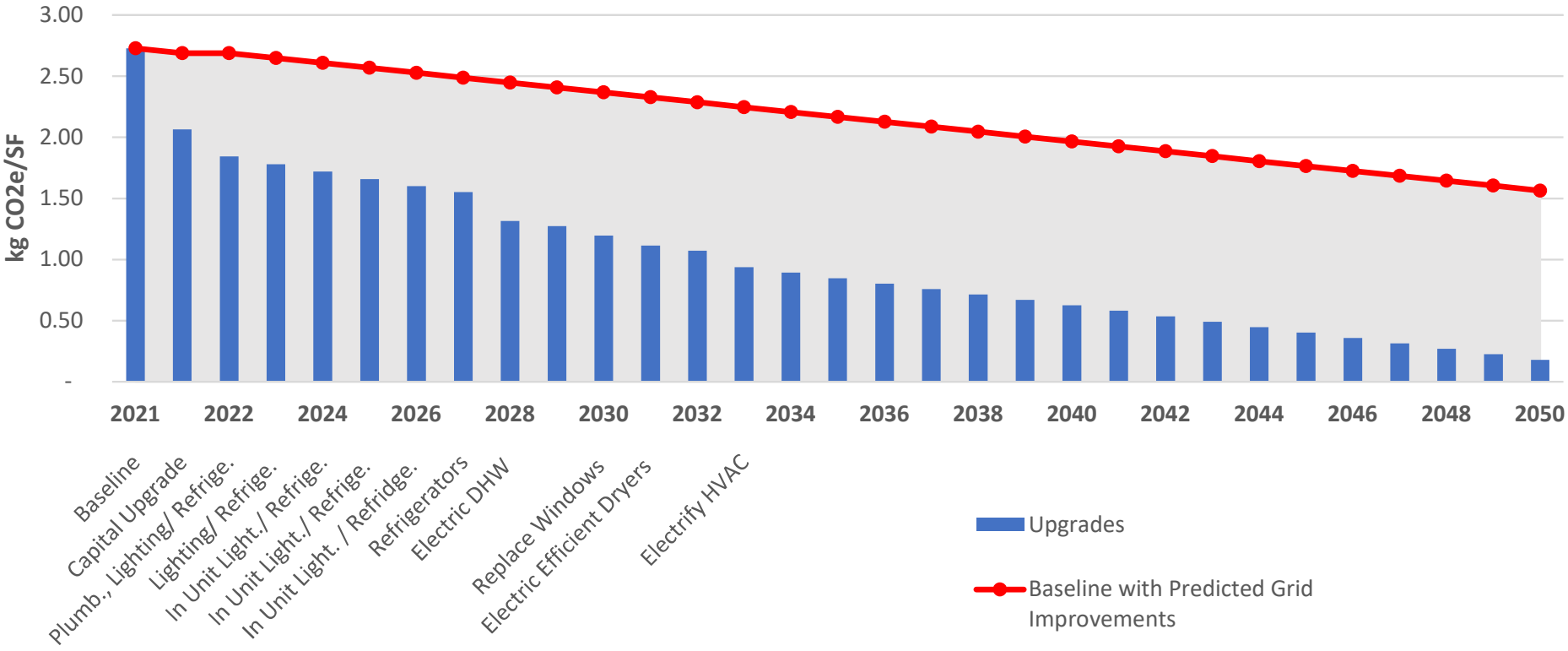
In Unit work: New Air Handler with Fan coil unit

# Over Time Measures

- In-Unit LED Lighting
- Low-Flow Plumbing Fixtures
- Energy Star Refrigerators and Dryers
- Window Replacement
- Solar PV
- Electrify HVAC (remove boilers)
- Heat Pump Domestic Hot Water Heater

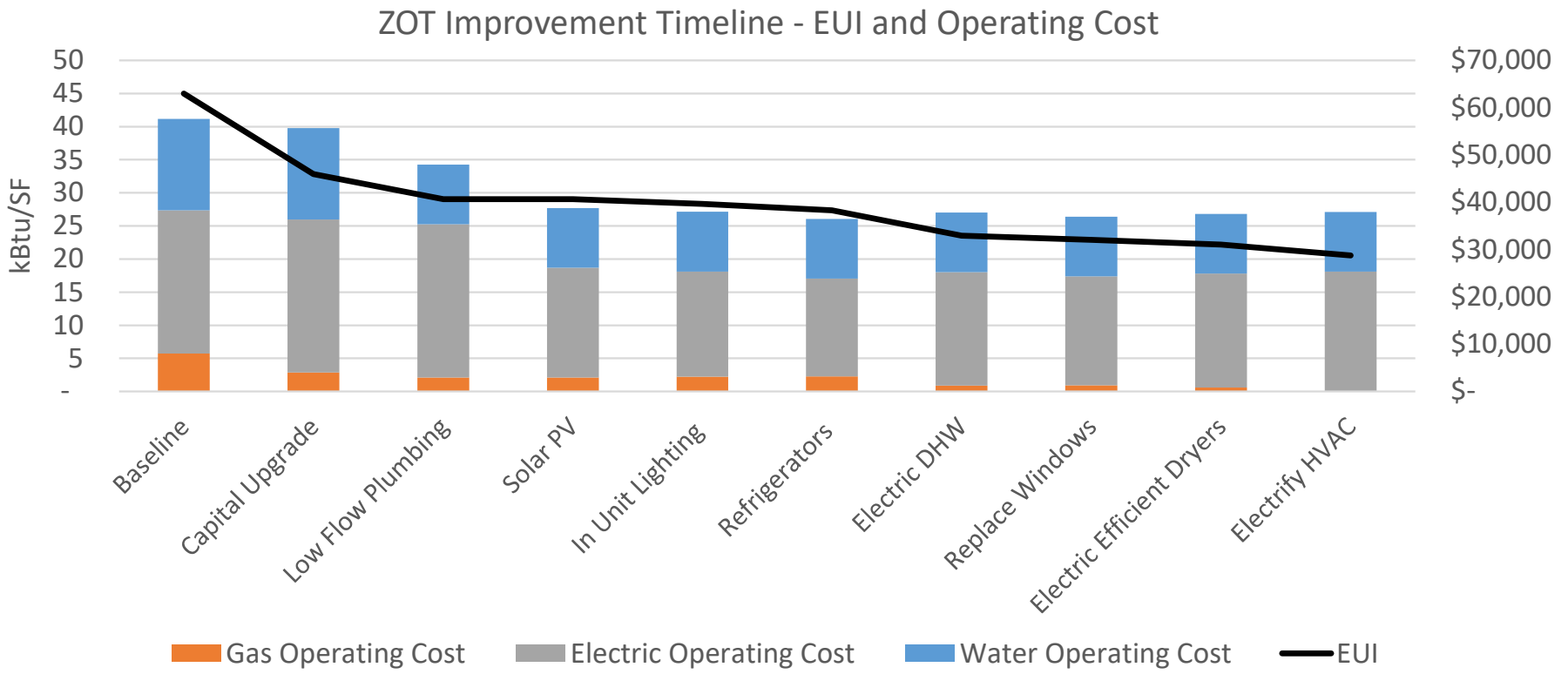



## Carbon Emissions for Baseline Model and Model with Upgrades Over Time




Using NREL's Massachusetts electric grid carbon emissions projections between now and 2050, the graph above shows the passive carbon savings from the greening of the energy grid if no upgrades are performed (red line) and the savings if the upgrades noted are performed in tandem with the greening of the electric grid (blue bars).

# Economic and Energy Overview




The graph above shows the cumulative impact on cost and Energy Use Index (EUI) impact with each progressive upgrade.

# Key Take Away Points

- Review portfolio for properties with high energy usage or needed capital retrofits
- LISC funding Energy Audit/ZOT was an important first step
- Zero Over Time (ZOT) process established priorities and sensible next steps, timeline
  - *Melded CNA and Sustainability/decarbonization goals.*
  - *Energy Audit Data- resource for funding application/discussion with funders.*
  - *Design Charrette gets everyone on the same page, identifies areas where need more information*
- NEI technical staff worked with contractors to provide informed decisions on scope and specific equipment.
- City of Newton Climate Action Goals were central to City funding priorities.

LISC BOSTON

NEWTON CLIMATE ACTION

Lean Multifamily

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT