Jamaica Plain Cohousing

Building Performance Exchange

MASS CLEAN ENERGY CENTER

This case study is part of the MassCEC Building Electrification and Transformation Accelerator (BETA): Project Planning program, committed to helping a representative selection of commercial building types in Massachusetts reach net zero emissions by 2050. This MassCEC funded resource and more are available via the Building Performance Exchange.

Building type	Multifamily housing
Location	Jamacia Plain
Year built	2005
Stories	3 + basement
Square footage	42,622
Energy use intensity (EUI)*	34 kBTU/sf/yr
Carbon emission intensity (CEI)*	2.0 CO2e kg/sf/yr
Decarbonization goals	Occupant comfort, lower utility costs, meet emissions regulations

The Jamacia Plain Cohousing, located in Jamaica Plain, MA, is a 30-unit condo building that was built in 2005. The building is 3 stories plus a basement. A communal kitchen and gathering space, laundry room, and administrative offices make up part of the first floor.



Existing Conditions

Enclosure	**Walls**	**Roof**	**Windows**
	Good	Good	Fair
Heating	Hydronic baseboard radiators and AHUs supplied by condensing boilers		
Cooling	Central cooling in common areas from DX AHUs and window AC in some units		
Ventilation	Constant air volume heat recovery ventilators		
Hot water	Central condensing gas-fired hot water heater with a storage tank		
Lighting	Partial LED lighting (~60%)		
Controls	None		
Other	Gas laundry dryers in common area and units (not all units have in-unit laundry) Gas stoves in common area kitchen and all but two residential units		
Renewable energy	Roof mounted solar photovoltaic (PV) system that provides about 1/3 of total energy use, direct ownership		

*EUI represents the annual energy usage of the building divided by the total area. CEI is the amount of greenhouse gas (GHG) emissions divided by the total area.

Key Challenges & Solutions

No Central AC in units

In place of window ACs, install window-mounted saddle heat pumps or mini-split heat pumps in individual units to provide sufficient cooling

Existing gas–fired boiler with perimeter heat

Reuse existing hydronic system and replace gas-fired boiler with electric boiler to provide supplemental heat on very cold days

100 A subpanels in units

Based on current usage, it is likely that electrification will require a subpanel upgrade. A licensed electrical engineer is required to make the final determination.

Core Decarbonization Strategy

- Mini-splits and saddle heat pumps provide efficient cooling while helping JPC avoid the disruptive and costly process of installing central AC in units
- New equipment installation is staged over several years to align with system end-of-life and optimize upfront costs
- Foundational efficiency measures are implemented at the beginning to reduce new equipment size

Retrofit Measures and Energy Impacts

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Measures

Energy Efficiency & Load Reduction

Foundational Efficiency and Load Reduction:

- Occupancy sensors and LEDs
- Demand controlled ventilation (DCV)
- Low flow fixtures
- Smart thermostats
- Air sealing and weather stripping
- VFD pumps
- ECM motors on HRV

Advanced Load Reduction:

- High-performance triple-pane windows

System Electrification

Electrification Enablers:
Further assessment required

System Electrification:

- Replace gas boiler with electric boiler
- Install saddle heat pumps or mini-splits in units
- DHW electrification to HPWH
- Electric laundry & kitchen appliances

Renewable Energy

Solar:

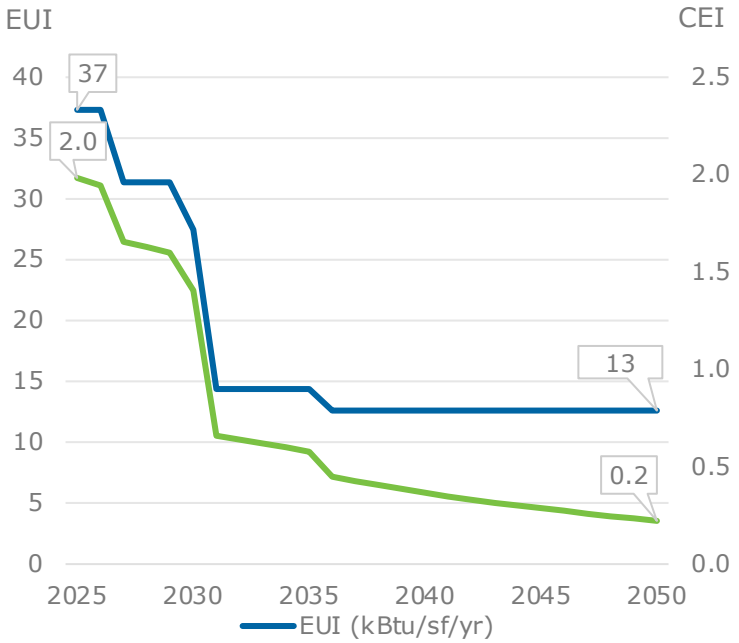
- Install additional ~ 28 kW of PV on the roof

EVSE

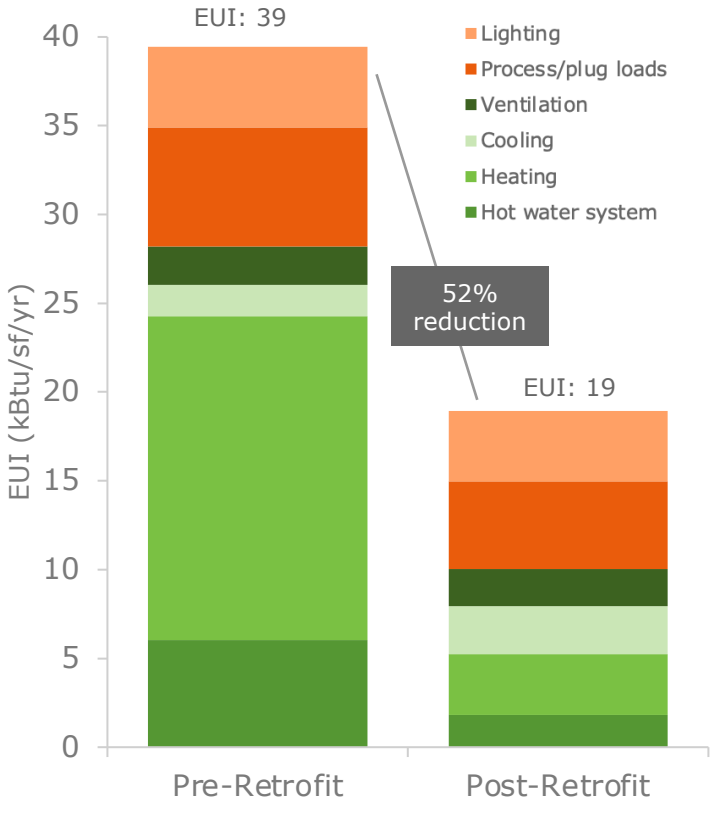
- Equipment for level 2 EV chargers

Performance Targets

The decarbonization approach prioritizes immediate energy efficiency measures and heat recovery while looking long term at heat pumps and more efficient all-electric mechanical system replacement at end-of-life. These efforts would yield the following results over time:



Annual Energy Use Impacts*

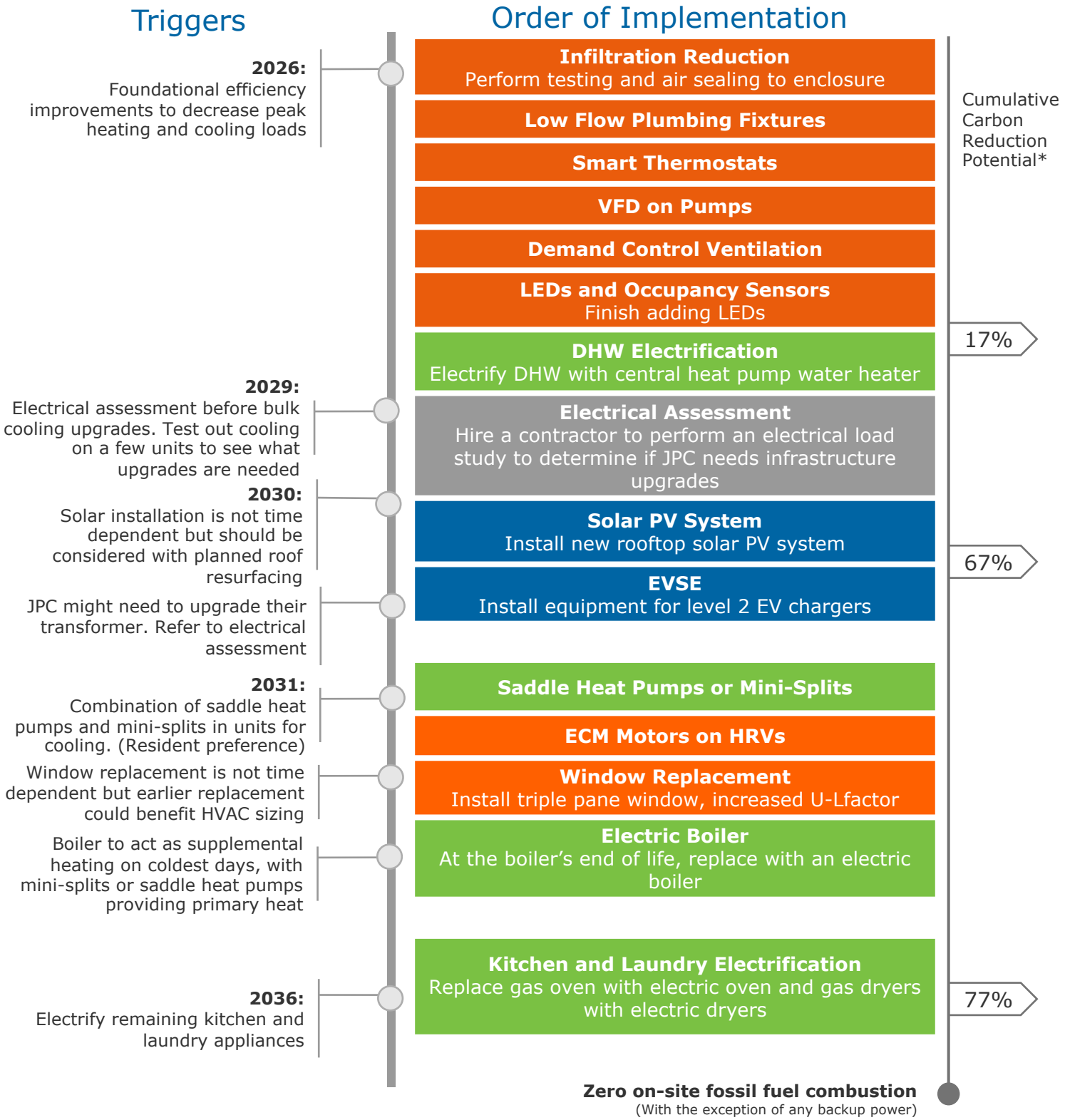


*The annual energy use impacts graphic illustrates an EUI before and after once all recommended measures are implemented, except for any renewable energy. The CEI and EUI shown in the performance targets account for the added benefits of renewable energy.

Project Planning

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The graphic below presents a decarbonization pathway, organizing measures into bundled actions that are best implemented together. The expected cumulative carbon reduction potential from each bundle is noted on the right. The strategy to reach zero GHG emissions by 2050 focuses on maximizing energy efficiency, electrifying on-site combustion systems within a cleaning grid, and cost-effective on-site renewables. Key considerations or triggers are listed along a timeline to support informed decision-making, with bolded dates indicating recommended implementation years.



*GHG calculations are based on BERDO Version 2.3 emissions factors. Full decarbonization is dependent on statewide renewable energy adoption. GHG calculations include direct onsite combustion (Scope 1) and purchased electricity (Scope 2). For any renewable energy measures included in this plan, it is assumed that the owner will retain the Renewable Energy Credits (RECs) to claim the GHG reduction for reporting.

Cost Analysis

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Annual Utility Impacts

Measure description	Changes in annual utility costs		
	Electricity	Fossil fuel	Net total changes
Lighting	($2,800)	-	($2,800)
Process/plug loads	$2,700	($2,100)	$600
Ventilation	($600)	-	($600)
Cooling	$3,000	-	$3,000
Heating	$10,900	($13,800)	($2,900)
Hot water system	$6,200	($4,600)	$1,600
Total from recommended measures	**$19,400**	**($20,500)**	**($1,100)**
Renewable energy	($12,700)	-	($12,700)

Lifecycle Costs*

Realizing the full value of decarbonization requires a long-term outlook that weighs upfront investments, operating costs, and financial incentives. BETA assessments identify the retrofit pathway that most effectively reduces emissions, maintains comfort, and improves performance relative to upgrades an owner would already make (the business-as-usual (BAU) scenario). This comparison highlights long-term avoided costs and risks, as well as opportunities—such as incentives—that support pursuing the optimized pathway.

Costs	BAU retrofit	Optimized decarbonization pathway	
Base building and envelope costs	$616,000	$125,000	Foundational efficiency and load reduction
		$665,000	Advanced load reduction
Mechanical costs	$417,000	$88,000	Electrification enablers
		$837,000	System electrification
Renewable energy costs	$0	$157,000	Renewable energy
Soft costs	$104,000	$187,000	
Total upfront costs	**$1,136,000**	**$2,059,000**	
Utility incentive opportunities	$0	($2,000)	
25-year total accrued utility costs	$2,435,000	$1,702,000	
25-year accrued total operating costs	$5,687,000	$4,876,000	
25-year LCCA	**$6,823,000**	**$6,933,000**	

BAU scope:

- Lighting replacement
- Window AC unit replacement
- Gas domestic hot water heater replacement
- Double-pane windows
- Condensing boilers replacement

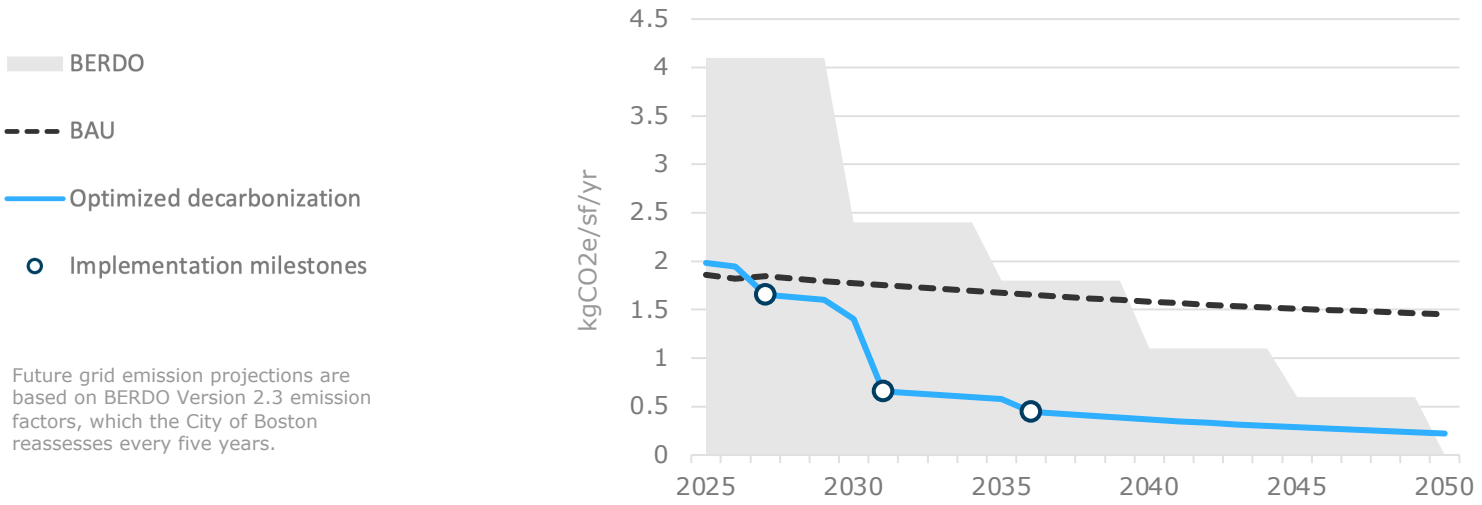
*All cost and incentive values are estimated based on industry data and rounded to the nearest $1,000. All incentives values are based on currently available programs and are subject to change over time. Forecasted operating costs include utility costs, maintenance costs, and noncompliance fees if relevant. Utility and maintenance costs reflect a 3% annual escalation rate. The BAU approach assumes necessary repairs and replacements that meet code compliance. In this case study, BAU represents the conventional gas or code-compliant versions of the decarbonization measures listed.

Decarbonization Benefits

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Emissions Goals and Benchmarking

Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO) applies to large existing buildings in the city and, outside Boston, serves as a useful benchmark for owners to proactively align upgrades with statewide goals. As Massachusetts targets net zero emissions by 2050, similar policies may be adopted statewide. Achieving "zero" depends on the pace of statewide renewable energy adoption, with any remaining gaps addressed through RECs or clean electricity aggregation programs.



Future grid emission projections are based on BERDO Version 2.3 emission factors, which the City of Boston reassesses every five years.

Resiliency Considerations

Jamacia Plain sits in an area of minimal flooding. Future weather patterns are likely to affect electricity consumption, system loads, and peak demand. As temperatures are projected to rise by 2050, analysis indicates that heating demand could decrease by approximately 28%, while cooling loads may increase by about 28%. In the event of extreme weather, building enclosure improvements and on-site solar generation are expected to help moderate energy demand during periods of extreme heat and extreme cold.



Next Steps and Best Practices

There are many potential strategies to reduce the operational GHG emissions of buildings. As a starting point, owners are encouraged to have a solid understanding of base building information, including current energy use, carbon emissions, and long-term property goals through 2050. The data and scoping developed through this assessment can be used by design teams, including architects and engineers, to begin shaping project plans and construction timelines, while also strengthening financing strategies and incentive applications. To move from assessment to action and ensure a clear, strategic path toward decarbonization, the following next steps are recommended.

- [x] Existing building conditions
- [x] Decarbonization assessment
- [ ] Supplemental assessments
  - Structural roof assessment
- [ ] Emergency protocols
- [ ] Assemble project team
- [ ] Structure financing stack