

Project Overview & Objectives

Boston’s Building Emission Problem:

- Approximately half of Boston’s GHG emissions come from commercial, industrial, and large residential buildings.
- BERDO requires large buildings to report energy use and reduce emissions to reach net-zero by 2050

What is BDAP?

- Boston's Building Decarbonization Assistance Program (BDAP) connects lower-income and mixed-use building owners with technical consultants.
- Consultants develop Zero-Over-Time (ZOT) plans to support phased building decarbonization.

My Work:

- Analyzed outcomes of ZOT plans across 50 buildings in Cohorts 1 and 2
- Assessed who has benefited from BDAP, projected climate and financial impacts, and trends to inform future program improvements

Approach and Methods

1) DATA COLLECTION & STANDARDIZATION

→Compiled 38 building decarbonization plans covering 50 buildings across Cohorts 1 and 2 from four City-hired vendors

→ Developed a standardized methodology to convert vendor data into consistent annual metrics (estimated change in electricity and natural gas usage by 2050, emissions reductions, and utility cost changes)

2) ESTIMATED MISSING VALUES

→Used baseline energy consumption, vendor- reported savings ranges, and current Eversource/National Grid rates to fill gaps.

3) ECM EXTRACTION

→Categorized all recommended energy conservation measures (heat pumps, insulation, solar, lighting, etc.) into a standardized data key across six BERDO compliance periods (2025-2050).

4) DASHBOARD DEVELOPMENT

→Compiled all verified figures into a central database with methodology notes documenting assumptions and calculation sources

5) ANALYSIS

Deliverables and Findings

The final dataset supports analysis at multiple levels: program-wide totals, and breakdowns by vendor, cohort, building use type, ownership type, and neighborhood. These findings are visualized in a dynamic dashboard built in Google Sheets, using charts, pivot tables, and filters designed for use by City staff.

A. Program-Wide Impacts

Projected Climate and Financial Impacts by 2050

Shows cumulative program impacts across 50 buildings if ZOT plans are implemented.

Estimated Carbon Emission Reductions (kgCO2e/yr)

Estimated Annual Change in Utility Cost (\$/yr)

5,747,123

-312,614

6,208,333

-265,616

Projected Shift in Energy Consumption by 2050

Shows cumulative program impacts across 50 buildings if ZOT plans are implemented.

Increase in Electricity Usage (kWh/yr)

Reduction in Natural Gas Usage (therms/yr)

1,350,944

-1,059,842

3,369,261

-1,240,835

B. ECM Recommendations

ECM Recommendations by Compliance Period

Like-for-Like Equipment Replacement

DHW Electrification

Heating and Cooling Electrification

Solar PV

HVAC / Ventilation Controls

Envelope

Lighting and loads

2025-2029

2030-2034

2035-2039

2040-2044

2045-2049

2050-

Main Takeaways

Analysis of ZOT plans across 50 buildings reveals clear patterns in how Boston's lower-income and mixed-use buildings are projected to decarbonize in order to remain BERDO compliant.

Key Takeaways:

1. ZOT plans project significant cumulative emissions reductions by 2050, though some building owners can expect a **modest increase in utility costs** as they transition away from fossil fuels.

2. As buildings move toward full decarbonization, **electricity consumption increases while natural gas use declines significantly**. The increase in electricity consumption prior to adding controls like solar panels or energy efficiency measures can be attributed to the increase in utility costs.

3. Buildings are recommended **to start with lower-cost upgrades** like lighting, envelope improvements (insulation, windows, and weatherization), and HVAC controls in the near term, then shift toward heating and cooling electrification in the 2030-2044 window as buildings take on larger, more complex retrofits.

Impact:

Boston can't hit its climate goals without decarbonizing its buildings, and a lot of those buildings don't have the resources to figure it out alone. BDAP meets them where they are by connecting them with technical experts and breaking decarbonization into manageable steps over time.

This analysis helps the City see what's working, who's being reached, and where to focus next. Phased, targeted decarbonization support can drive meaningful emissions reductions in Boston's most underserved buildings while keeping implementation manageable for owners over time. This work provides the City with a data infrastructure to track program progress, identify gaps, and strengthen future cohorts.

Acknowledgements

- Dima Moujahed, Building Decarbonization Advisor, dima.moujahed@boston.gov
- Claudia Diezmartinez, Deputy Director of Policies and Programs, claudia.diezmartinezperegrina@boston.gov

CELT Fellowship Celebration

June 16th | Boston University