

Building Decarbonization Guide Series

Large Multifamily Housing - Post-2000 Construction with District Steam



Steven
Winter
Associates

SWA



Agenda



- **Introductions**
- **BERDO 101**
- **Building Decarbonization Guides**
 - *What are the BERDO Building Decarbonization Guides?*
 - *How to use these guides?*
- **Sample Large Multi-family Building**
- **Key Building Upgrades**
- **Key Considerations and Resources**
 - *Timing your upgrades*
 - *Electrical Service*
 - *Resources*
- **Q&A**

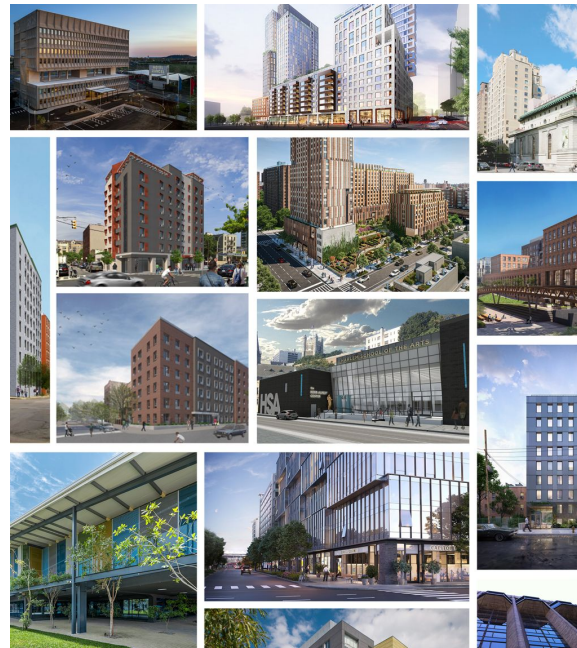
Steven Winters Associates



For over five decades, Steven Winter Associates has been at the forefront of transforming the built environment to be more **energy efficient**, **accessible**, **healthy**, and **resilient**.

Our services:

- Sustainable Design & Construction
- Energy Efficiency & Decarbonization
- Accessibility



BERDO 101



What is BERDO?

Building Emissions Reduction and Disclosure Ordinance



BERDO is a local law that aims to reduce air pollution and greenhouse gas emissions from Boston's largest buildings.

BERDO covers the following buildings:

- **Residential buildings** with 15 or more units
- **Non-residential buildings** that are 20,000 square feet or larger
- Any **tax parcel with multiple buildings** that collectively sum to 20,000 square feet or 15 residential units

What is Required from Building Owners Under BERDO?



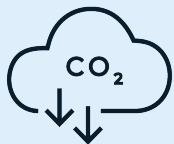
ANNUAL REPORTING

Report your building's annual energy and water use every year by **May 15**



THIRD-PARTY VERIFICATION

Verify reported data with a third-party qualified energy professional every verification year



EMISSIONS REDUCTION

Reduce emissions produced by your building to comply with annual emissions standards



REDUCE BUILDING ENERGY USE

Implement building improvements to reduce energy use.



GET RENEWABLE ENERGY

Enroll into BCCE, use local solar power, or buy renewable energy in the market.



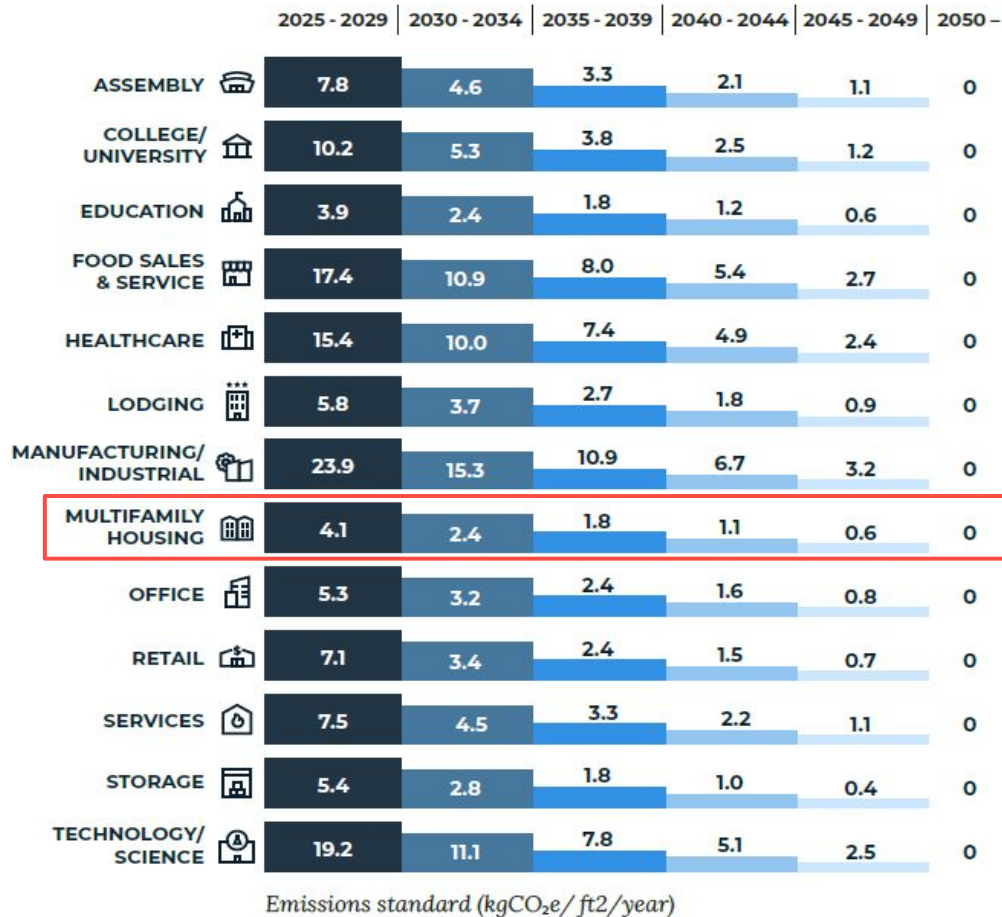
INVEST IN THE COMMUNITY

Make Alternative Compliance Payments, which are collected into the Equitable Emissions Investment Fund to support local building decarbonization projects.

What are BERDO Emissions Standards?

Emissions standards refer to the regulated amount of emissions a BERDO building is allowed to produce during a year.

Emissions standards in BERDO vary by building use types.



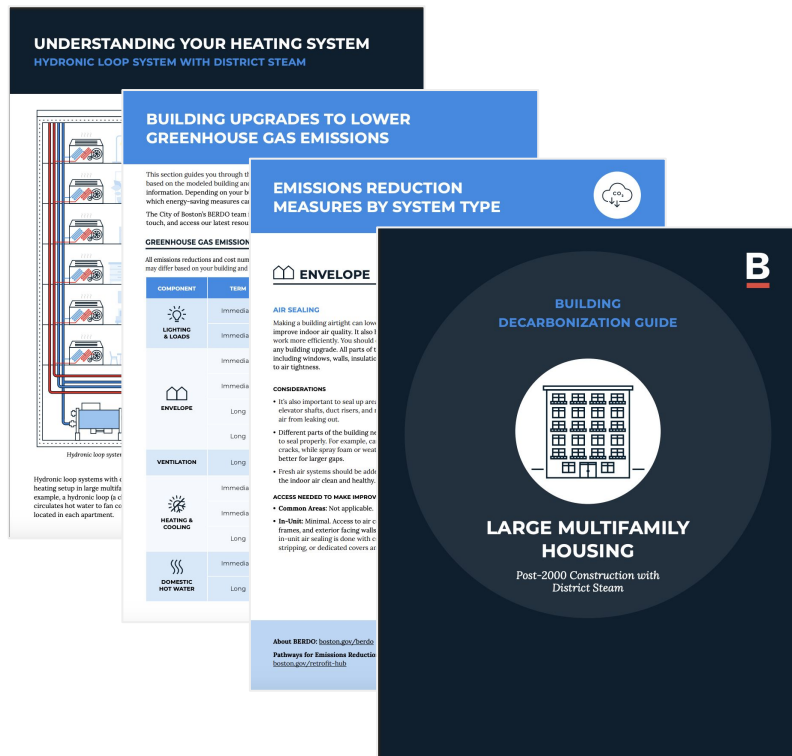
KEY RESOURCES

[EMISSIONS COMPLIANCE QUICK GUIDE](#)



Building Decarbonization Guides

What are the Building Decarbonization Guides?



The City of Boston's Building Decarbonization Guides are a new accessible technical resource for BERDO building owners and property managers.

These guides will help you:

- Get to know your building and the key characteristics that impact its performance
- Understand how your building uses energy
- Identify the most impactful building upgrades that can improve energy efficiency, reduce emissions, and help with BERDO compliance.
- Identify technical and financial resources for building upgrades

How to Use the Building Decarbonization Guides?

TIMING YOUR BUILDING UPGRADES

Building systems impact each other. For example, better insulation can reduce heating and cooling loads. The timing of construction projects can impact installation costs and disruptions. Using incentives or rebates that may be available in the short term gives you capital to invest in incremental improvements further into the future.

Proper sequencing can lead to mixed chances to combine work or to retrofit building systems that work with each other and improve your building's performance in the long run. A long-term plan helps organize building upgrades so that a deep energy retrofit can be done more efficiently.

TIMING CONSIDERATIONS

EXISTING BUILDING SYSTEM OPTIMIZATION



Proactive carrying out measures that reduce heating and cooling loads, such as air sealing, heating system controls, and distribution repairs, lighting and appliance upgrades as well as building. These measures reduce heating and cooling needs, allowing for purchase of smaller and less expensive equipment when the time comes for future system upgrades. These measures also tend to improve comfort and health for occupants through improved air quality, temperature control, and safety.

The energy cost savings from reduced heating and cooling loads in the short term can also be applied toward capital expenses for future, larger-scale measures.

TENANT TURNOVER



Building owners and staff have the opportunity to make energy efficiency improvements in addition to repairs or aesthetic upgrades when tenants vacate spaces. This includes air sealing in places that may be hard to reach when spaces are occupied, standardizing equipment, and replacing or upgrading equipment such as air conditioners or packaged terminal units.

EXISTING BUILDING SYSTEM END OF LIFE



Upgrades to building systems are often most cost-effective at the time when major equipment is at the end of its useful life and due for replacement. Capitalize on these times when investments are already required to upgrade key systems, or choose additional systems that can easily be completed at the same time. While the exact time for replacement may not be known, it is good practice to plan around the equipment's expected useful life. This also helps minimize the risk of expensive emergency repairs or replacements.

Between now and 2050, there may be only one chance to replace major systems like heating and cooling. It's important to plan ahead so you can make upgrades that save the most energy and money.

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Use **Dark Blue** sections to learn about your building and key considerations for building decarbonization

EMISSIONS SAVINGS MEASURES BY SYSTEM TYPE



LONG TERM

VENTILATION

ENERGY RECOVERY VENTILATION (ERV) SYSTEM

An Energy Recovery Ventilator (ERV) is a type of ventilation system that brings fresh air into a building while using less energy. It helps improve indoor air quality and keeps people healthy.

An ERV works by using the air that's leaving the building to warm or cool the fresh air coming in. This means your heating and cooling systems don't have to work as hard, which saves energy and reduces pollution.

CONSIDERATIONS

• **Mechanical Exhaust System:** If there is space available, ERVs can work with existing mechanical exhaust systems.

• **Ductwork Modifications:** Some buildings may need added or modified ductwork to distribute fresh air effectively.

• **Exhaust Blower Condition:** Cleaning and sealing of exhaust fans is important for the best performance. Exhaust fans help remove stale, or contaminated air from different parts of the building and push it up to the roof or an upper level where it's released outside.

• **Fan Replacement:** Existing exhaust fans in common areas, bathrooms, and other spaces may need to be replaced.

• **Electrical Capacity:** Installing an ERV may require increased electrical capacity both at the unit level and in the building's main electrical panel.

ACCESS NEEDED TO MAKE IMPROVEMENTS

- **Common Areas:** Access to exhaust chases and rooftop access.
- **Top-Down:** Access needed to make improvements to chases and ductwork, some through all access may be necessary to repair damaged ducts.

ADDITIONAL REVENUES

Additional revenues with Energy Recovery Ventilators (ERVs)

RECOMMENDED SPECIFICATIONS

- Suitable Static Pressure (SP)
- Max fan power: 0.75 W/cfm

ENERGY SAVINGS

4% of heating usage

CAPITAL COST

Costs vary depending on the type of mechanical ventilation system currently installed in the building, as well as the materials and labor used to install new ERV equipment. There are additional costs for cleaning, sealing, and balancing fans.

About REEDS | <https://www.reeds.com>
Partners for Emissions Reductions
info@reeds.com

REEDS Help Desk
info@reeds.com
877-435-3600 x5



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Use **Bright Blue** sections as “tear sheets” to approach service providers for a project and as a reference to review scopes of work and bids.

The Building Decarbonization Guides are a starting point to familiarize yourself with key aspects of building decarbonization, but **all buildings will require their own assessment to select the right equipment, repairs, or electrical service that may be needed for specific upgrades.** Always consult a qualified service provider before undertaking any building upgrades.

A night-time photograph of a city street, likely in Chicago, featuring festive white string lights draped over trees and buildings. In the background, a church tower with a dome is visible against the dark sky. The street is filled with people, and a sign for 'Cafe Pulse' is visible on the left. The overall atmosphere is warm and celebratory.

Sample Large Multi-family Building

Post-2000 Construction with District Steam

Building Typology Description

Multifamily - Post-2000 Construction with District Steam

200,000

SQUARE FOOTAGE

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APARTMENTS

EXTERIOR WALLS



Steel framed window wall with code-level insulation.

Challenges:

- Air leakage
- Minimal to no insulation
- Thermal bridging/ heat loss at roofs and floorplates

WINDOWS



Double-hung aluminum or fiberglass framing, double pane glass with thermal breaks.

Challenges:

- Average insulative performance

ELECTRIC CAPACITY



In-unit electrical capacity of 110/120 volts or 220 volts may be present.

Challenges:

- A study of current capacity and future needs may be required to see if upgrades are needed
- Switchgear and feeder cables at the building level, and panel and wiring upgrades likely needed within apartments to provide 220/240 volt service – dependent on the electrification upgrade

HVAC System Detail

200,000

SQUARE FOOTAGE

210

APARTMENTS

HEATING



Hydronic loop heating system with district steam, serving fan-coil units.

Challenges:

- Minimal temperature control

COOLING



Chilled water loop provided by air-cooled chillers, serving fan-coil units. A dual temperature loop is switched over to cooling in the summer.

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VENTILATION



Kitchen and bath mechanical exhaust with vertical risers. Corridors are supplied with conditioned air.

Challenges:

- Both low and high ventilation in the building can cause poor indoor air quality and unnecessary energy use

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DOMESTIC HOT WATER

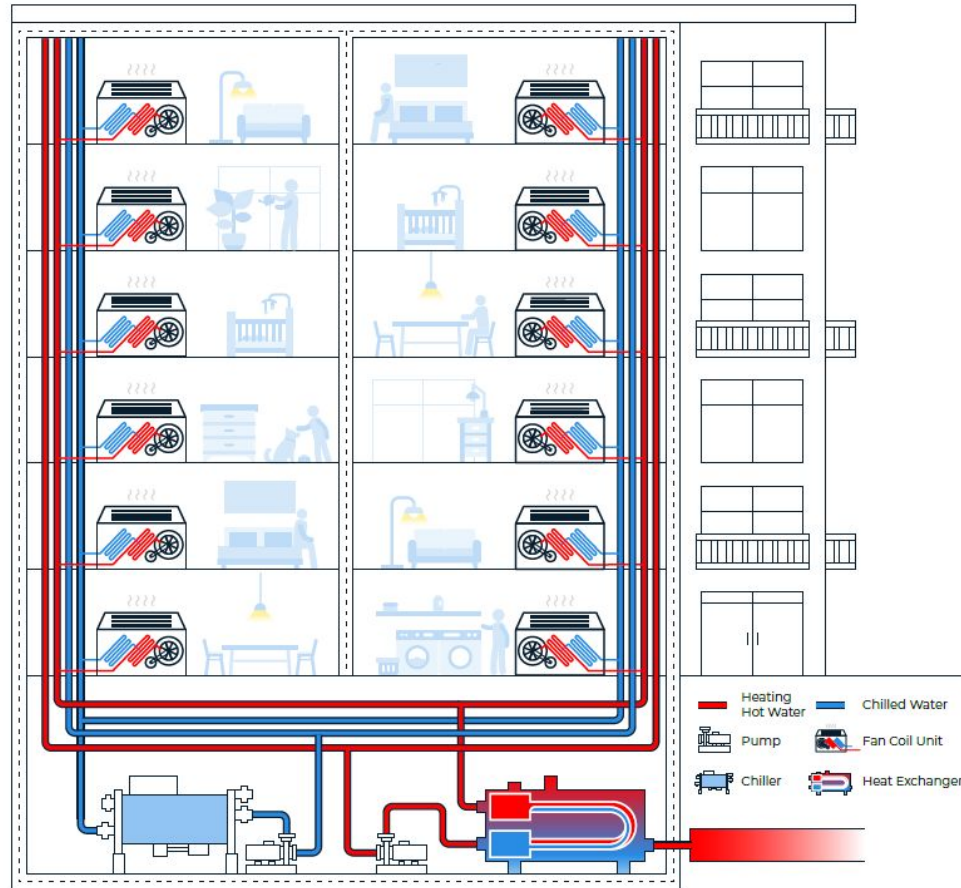


District steam heat exchanger.

Challenges:

- Requires use of district steam during summer and periods with mild outdoor temperatures
- High water flow rates at plumbing fixtures

Building Systems Summary

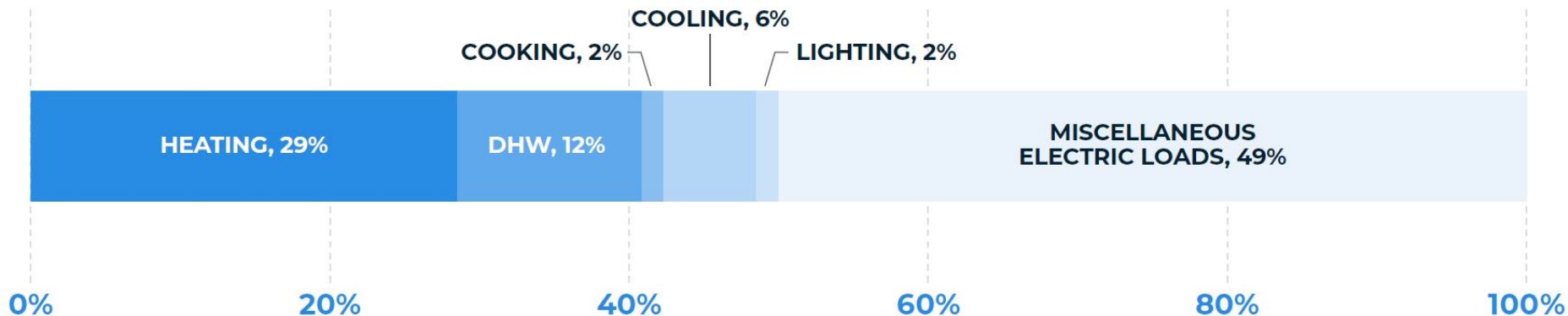


GHG Emissions

End Use Breakdown



END USE BREAKDOWN (kgCO₂e/sf)



GHG Emissions

BERDO Compliance

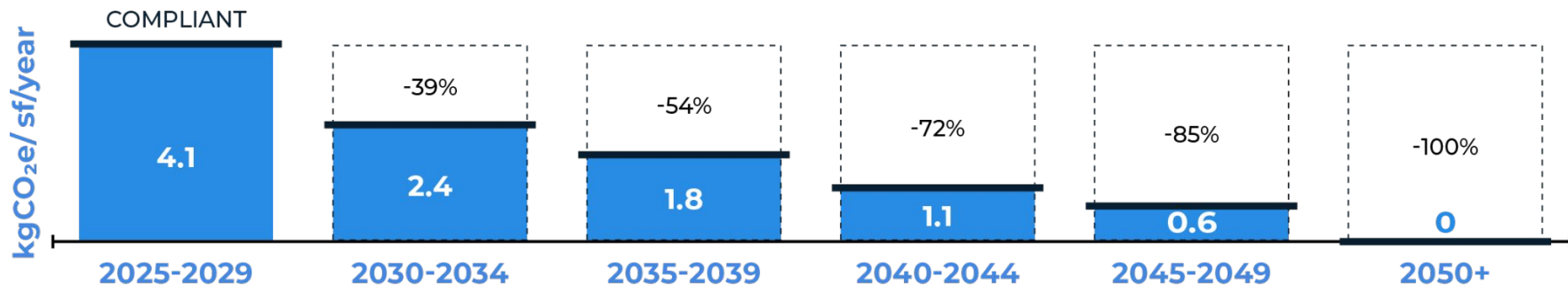


BERDO EMISSIONS STANDARDS (LIMITS) IN kgCO₂e/sf/yr

■ kgCO₂e/sf/year

□ % emissions reduction needed to comply with each period

— Emissions limit



Building Upgrades

Building Upgrades

Lighting & Plug Loads



COMPONENT	TERM	MEASURE
 LIGHTING & LOADS	Immediate	LED Upgrades + Controls
	Immediate	Appliance Upgrades



Building Upgrades

Envelope

COMPONENT	TERM	MEASURE
 ENVELOPE	Immediate	Air Sealing
	Immediate	Roof Insulation
	Long	Recladding/Wall Insulation
	Long	Window Replacement

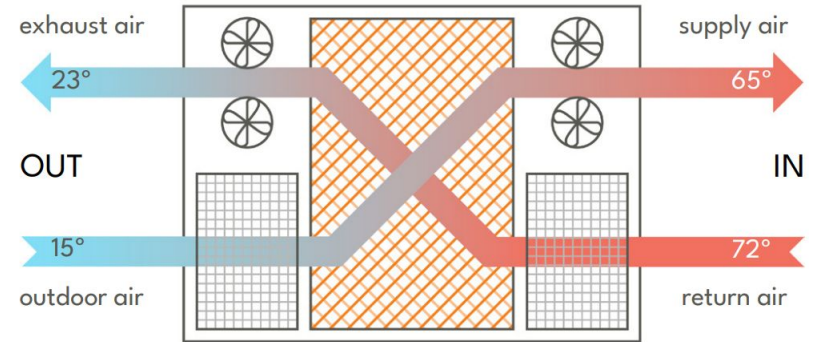


Building Upgrades

Ventilation



COMPONENT	TERM	MEASURE
VENTILATION	Long	Energy Recovery Ventilation (ERV) system



Energy Recovery Ventilator

Building Upgrades

Heating & Cooling



COMPONENT	TERM	MEASURE
 HEATING & COOLING	Immediate	Retro-commissioning
	Immediate	Controls + Distribution Improvements
	Long	Heating Electrification



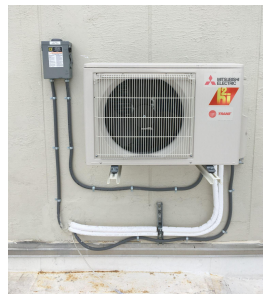
Building Upgrades

Heating Electrification



Mini-Split Heat Pumps

These are small systems with one outdoor unit (compressor) connected to the indoor unit (mini split) that condition the air in the room. They don't use ducts and are good for heating and cooling single rooms.



Package Terminal Heat Pumps (PTHPs)

These are single units usually found under windows in through-wall penetrations in bedrooms or living rooms. They heat and cool one room at a time and can be plugged in or hard wired.



Central Air to Water Heat Pump (AWHP) Plant

A bank of AWHPs can replace district steam service and heat the hot water loop for the building.



Building Upgrades

Domestic Hot Water



COMPONENT	TERM	MEASURE
 DOMESTIC HOT WATER	Immediate	Low-flow Water Fixtures/Aerators
	Long	Central/Partial/Full Heat Pump





Key Considerations and Resources

Timing Building Upgrades



**EXISTING BUILDING
SYSTEM OPTIMIZATION**

Timing Building Upgrades



**EXISTING BUILDING
SYSTEM OPTIMIZATION**



**TENANT
TURNOVER**

Timing Building Upgrades



**EXISTING BUILDING
SYSTEM OPTIMIZATION**



**TENANT
TURNOVER**

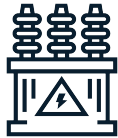


**EXISTING BUILDING
SYSTEM END OF LIFE**

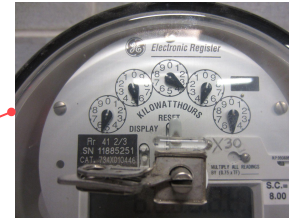
Electric Service Capacity



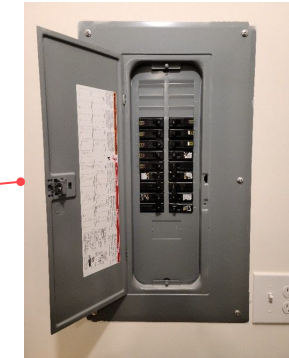
**ELECTRIC SERVICE
FROM THE LOCAL GRID**



**BUILDING CENTRAL
INFRASTRUCTURE**



DISTRIBUTION AND METERS



INDIVIDUAL UNIT SERVICE

Key Resources: Mass Save

For all multi-Family housing with 5 units or more



➤ MASS SAVE FOR MULTI-FAMILY RESIDENTIAL

- Start with a **no-cost home energy assessment**.
- Based on your energy assessment, you may qualify for **instant incentives and rebates** on energy-saving improvements, including:
 - No-cost air sealing
 - Up to 100% off insulation
 - Rebates on high efficiency heating, cooling and water heating equipment (including heat pumps and controls)
 - Programmable and Wi-Fi thermostats
 - Water-saving devices, including low-flow showerheads, faucet aerators and pipe wrap
 - Occupancy sensors
 - 0% HEAT Loan financing for condos and owner-occupied units on residential rates
- If 50%+ of the tenants are at the designated income levels, you may also be eligible for the [Income Eligible Multi-Family Retrofit Program](#).

Key Resources: Mass Save & Boston Energy Saver

For Residential Condos



CITY of BOSTON



WE'RE HERE TO HELP

Schedule a 30-minute 1-on-1 video or telephone call with our Help Desk so we can help you save big on your energy bill.

 **SCHEDULE A CHECK-IN WITH
BOSTON ENERGY SAVER**

MASS SAVE FOR RESIDENTIAL CONDOS

Do you have authority to make improvements to your:	Yes	No
Exterior walls, attic, and/or basement of your condo/townhome? This could also include minor modifications to your façade and roofline.	Schedule a Home Energy Assessment by calling 866-527-7283	Connect with your condo board/HOA about getting an Energy Assessment.
Heating and cooling system(s)?	Consider heat pump rebates	
Hot water system?	Consider a heat pump water heater	
Appliances (i.e., clothes washer/dryer, room AC, electric stoves, lawn equipment)?	Consider appliance rebates	
Off street parking?	Consider electric vehicle chargers	
Smart thermostat?	Consider enrolling in ConnectedSolutions	

How the City of Boston is Helping Building Owners



**BERDO
HELP DESK**



**↗ ONE-ON-ONE
CONSULTATIONS
WITH CITY STAFF**



**↗ MA CLASS I REC
CONNECTOR
PROGRAM**



**↗ BUILDING
DECARBONIZATION
ADVISOR PROGRAM**



**↗ FREE ENGINEERING
SERVICES FOR
BUILDINGS
TAKING ACTION**



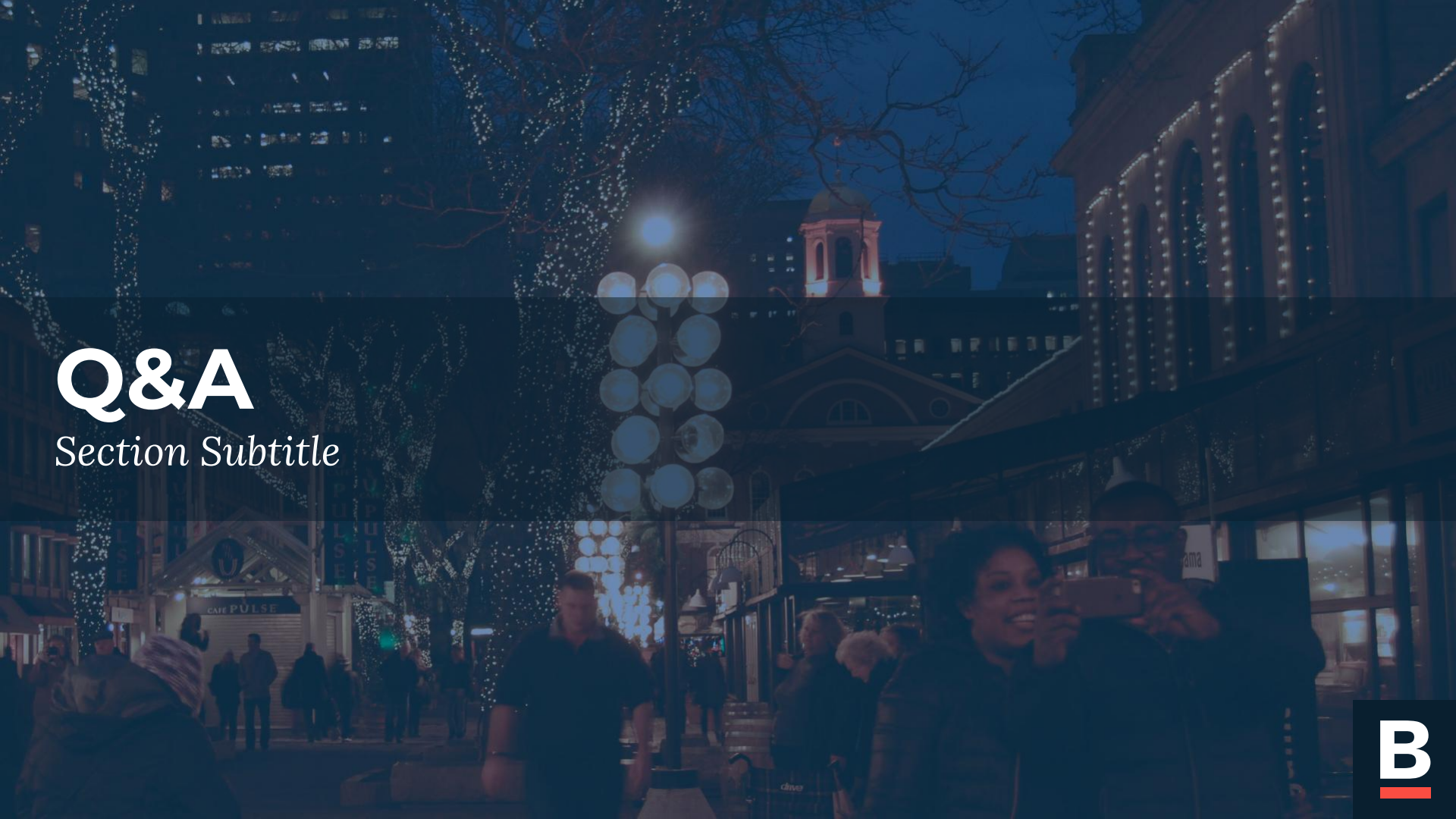
**↗ EQUITABLE
EMISSIONS
INVESTMENT FUND**



**IN-PERSON
WORKSHOPS AND
EVENTS**



**CONDO
TOOLKIT
(COMING SOON)**



Q&A

Section Subtitle

Thank You!

A recording and slide deck for this meeting will be available at boston.gov/berdo.

