

BUILDINGENERGY BOSTON

Watt It Will Take to Decarbonize: Boston's New Emissions Reduction and Disclosure Ordinance

**Brenda Pike (City of Boston)
Hannah Payne (City of Boston)
Amy Barad (MassCEC)**

Curated by Shari Rauls (SWA) and Bryan Evans (NEEP)

**Northeast Sustainable Energy Association (NESEA)
March 1, 2022**



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WHY BERDO 2.0?

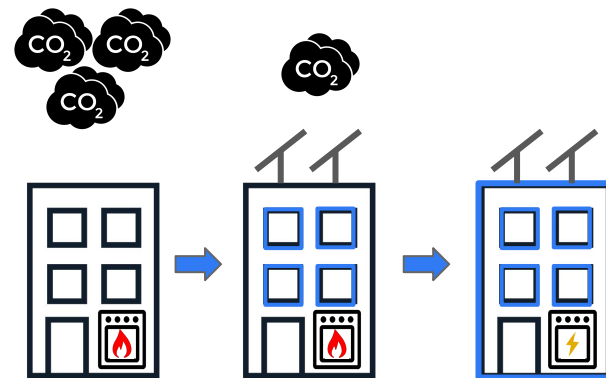


**MAYOR JANEY SIGNED THE
BUILDING EMISSIONS
REDUCTION AND DISCLOSURE
ORDINANCE ON OCT. 5, 2021
AFTER UNANIMOUS APPROVAL
BY THE CITY COUNCIL.**

WHAT AND WHY

A building performance standard sets carbon targets for existing large buildings that decrease over time. A performance standard:

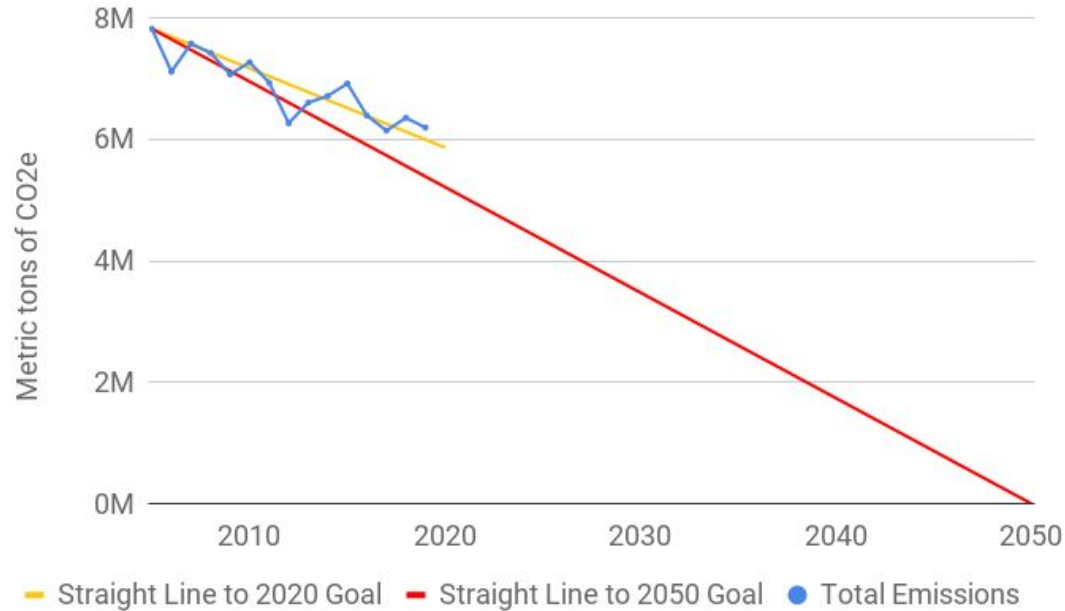
- Directly targets our largest source of emissions
- Sets long planning horizons
- Provides flexibility in how buildings meet targets and when they make investments.



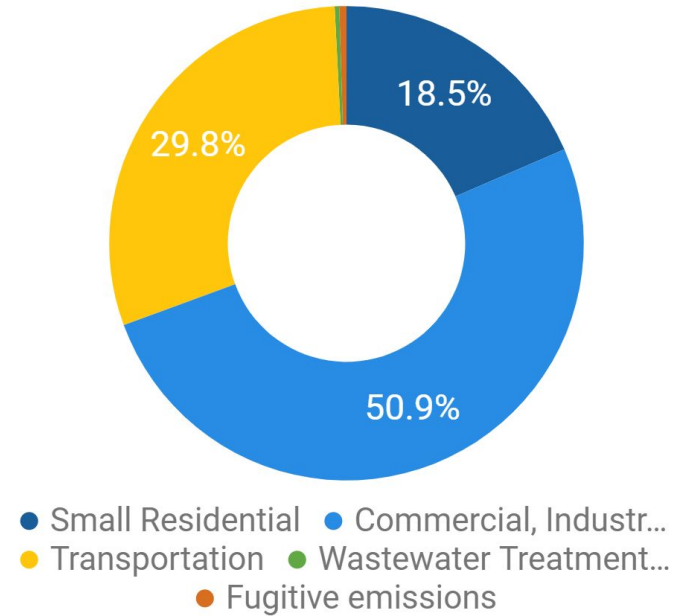
BOSTON'S CARBON FOOTPRINT



BOSTON COMMUNITY GREENHOUSE GAS EMISSIONS



2019 EMISSIONS BY SECTOR



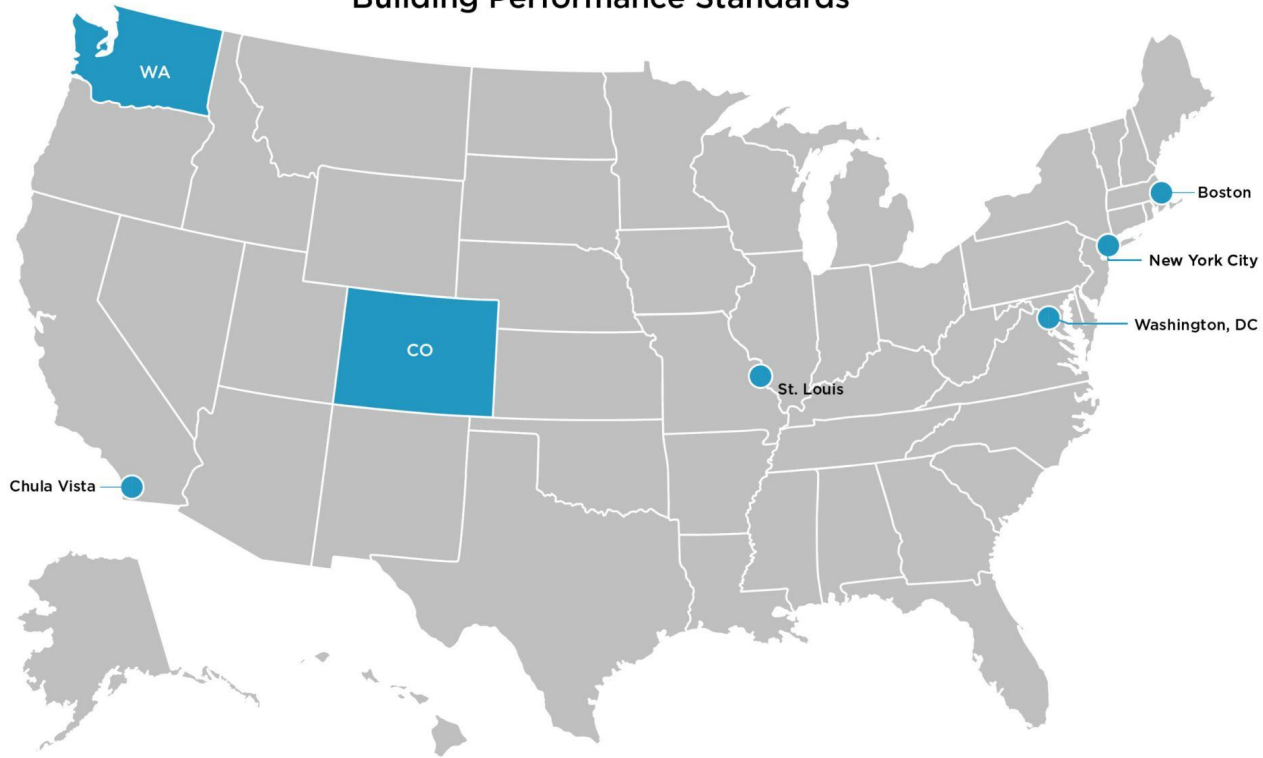
BUILDING ON EXISTING POLICY

Boston's Building Energy Reporting and Disclosure Ordinance (BERDO 1.0) was in effect since 2013.

- Required buildings over 35,000 square feet or 35 units to report their annual energy and water usage to the City each year. The City then publishes energy, water and emissions data.
- After five years of being covered under the policy, buildings were required to complete an energy action or assessment.

The updated ordinance maintains the annual reporting requirement, and shifts from energy action or assessment to an emissions performance standard.

U.S. City and State Policies for Existing Buildings: Building Performance Standards



U.S. CITY & STATE PERFORMANCE STANDARDS

Jurisdiction	Metric	Compliance Starts	Exemptions
New York City	Emissions intensity	2024	Affordable housing, city-owned, houses of worship
Denver	Energy use intensity	2024	
Boston	Emissions intensity	2025	
St Louis	Energy use intensity	2025	Industrial, communications
Washington, DC	Energy Star score or energy use intensity	2026	
Washington State	Energy use intensity	2026	Industrial, agricultural, historic
Colorado	TBD	2026	Manufacturing, industrial, or agricultural

<https://www.imt.org/resources/comparison-of-u-s-building-performance-standards>



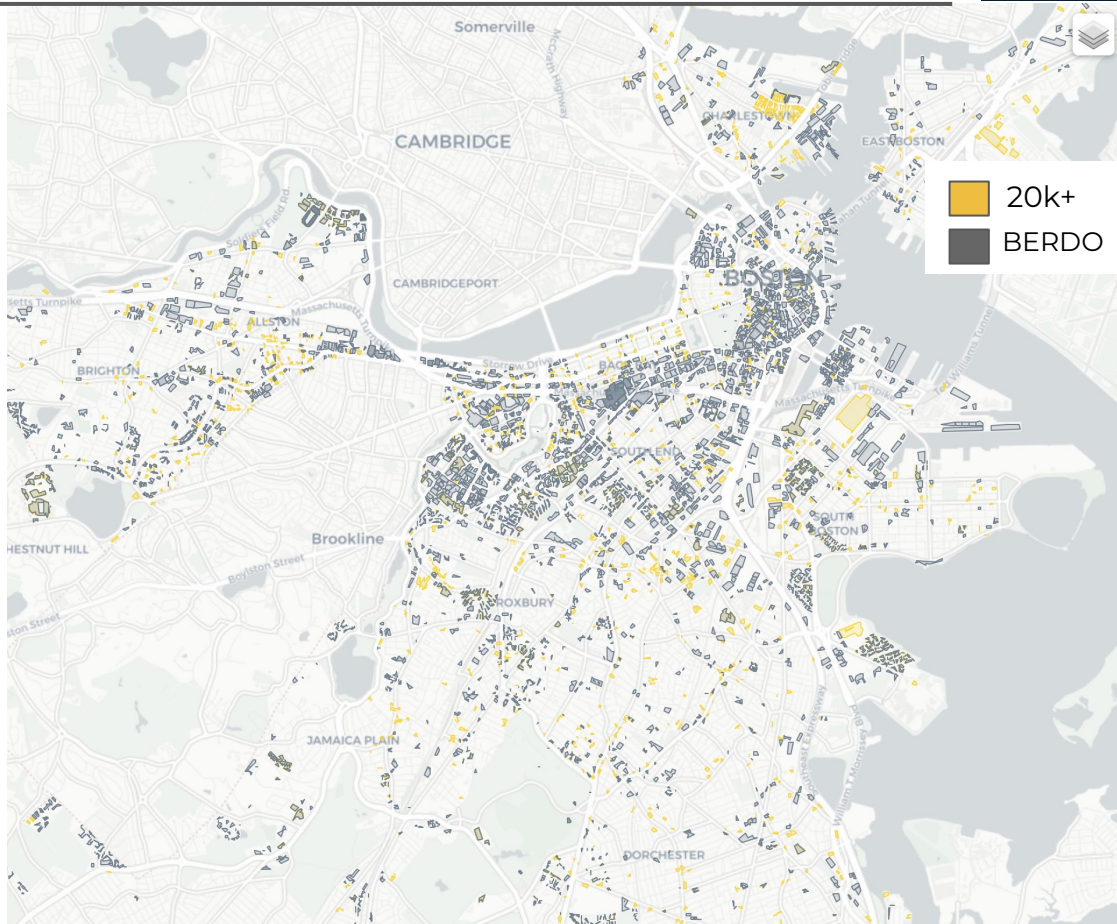
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WHAT IS BERDO 2.0?

SIZE THRESHOLD

- **Previously:** 35,000+ square feet or 35+ units
 - These buildings are subject to emissions targets starting in 2025, and reported in 2026
- **Now:** 20,000+ square feet or 15+ units
 - First annual report due in 2022
 - Subject to emissions targets starting in 2030, and reported in 2031



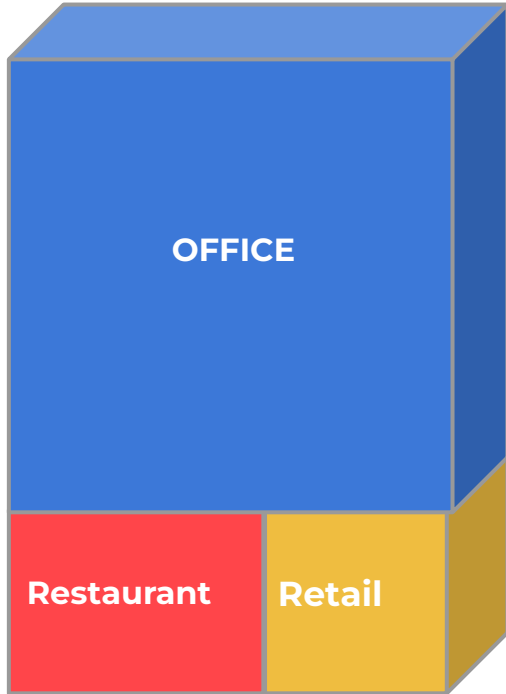
EMISSIONS STANDARDS

- Developed through the technical analysis process
- Aligned with citywide goals
- Buildings with multiple use-types can adopt a blended target

Building use	Emissions standard (kgCO ₂ e/SF/yr.)					
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-
Assembly	7.8	4.6	3.3	2.1	1.1	0
College/ University	10.2	5.3	3.8	2.5	1.2	0
Education	3.9	2.4	1.8	1.2	0.6	0
Food Sales & Service	17.4	10.9	8.0	5.4	2.7	0
Healthcare	15.4	10.0	7.4	4.9	2.4	0
Lodging	5.8	3.7	2.7	1.8	0.9	0
Manufacturing/ Industrial	23.9	15.3	10.9	6.7	3.2	0
Multifamily housing	4.1	2.4	1.8	1.1	0.6	0
Office	5.3	3.2	2.4	1.6	0.8	0
Retail	7.1	3.4	2.4	1.5	0.7	0
Services	7.5	4.5	3.3	2.2	1.1	0
Storage	5.4	2.8	1.8	1.0	0.4	0
Technology/Science	19.2	11.1	7.8	5.1	2.5	0

Developed by Synapse Energy Economics for the City of Boston.

BLENDING TARGETS FOR MIXED USE BUILDINGS



$$\begin{array}{c} \text{Office} \\ \text{Square Feet} \\ \times \\ \text{Office} \\ \text{Emissions Standard} \end{array}$$

+

$$\begin{array}{c} \text{Food Sales \& Services} \\ \text{Square Feet} \\ \times \\ \text{Food Sales \& Services} \\ \text{Emissions Standard} \end{array}$$

+

$$\begin{array}{c} \text{Retail} \\ \text{Square Feet} \\ \times \\ \text{Retail Emissions} \\ \text{Standard} \end{array}$$

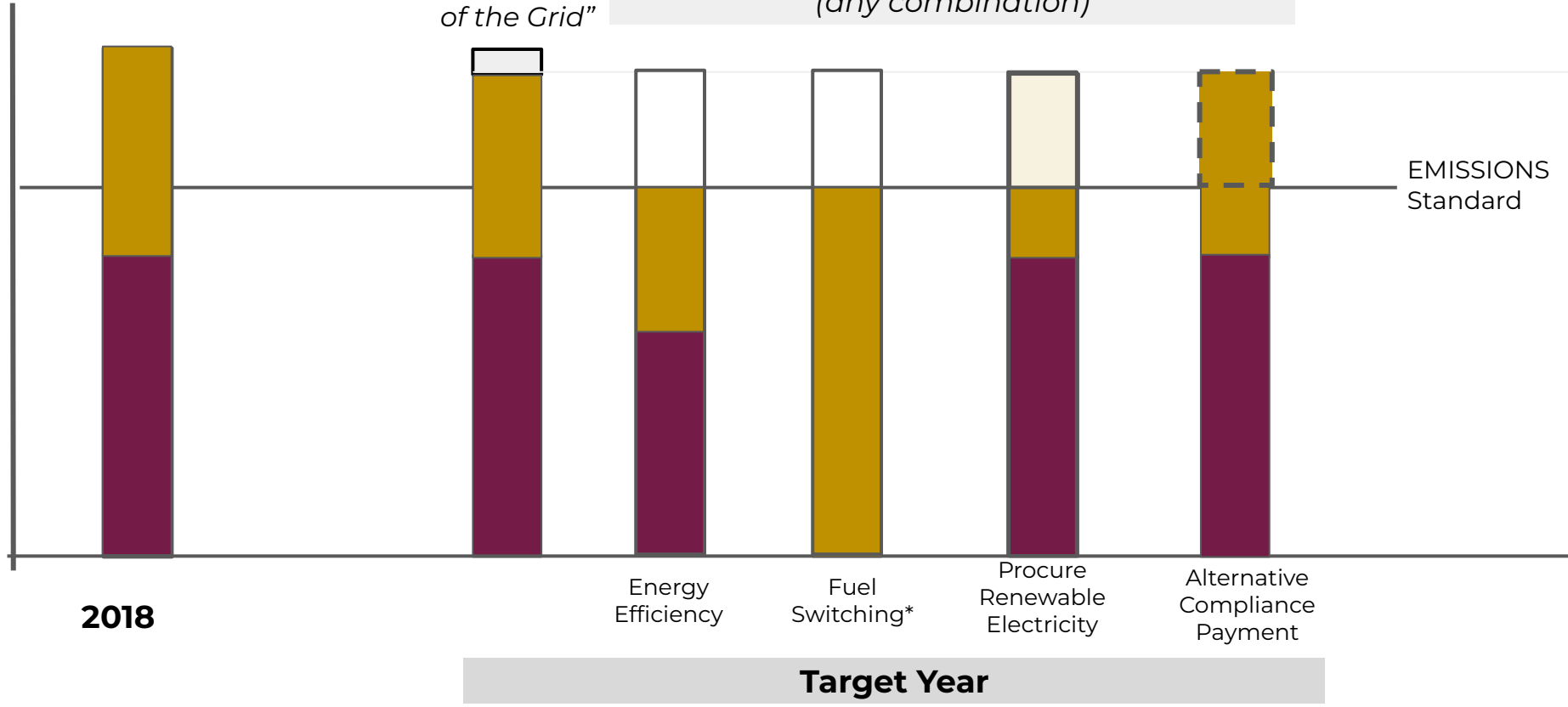
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Blended Building Emissions Standard

INDIVIDUAL BUILDING

"Greening of the Grid"

Options
(any combination)



EMISSIONS Standard

2018

Energy Efficiency

Fuel Switching*

Procure Renewable Electricity

Alternative Compliance Payment

Target Year

Electricity Natural Gas

* Fuel switching often best when combined with efficiency **For illustrative purposes only

ALTERNATIVE COMPLIANCE PAYMENT

- Additional option to meet carbon targets
- Tied to average retrofit cost per metric ton of CO₂e, estimated at \$234/mtCO₂e
 - *To be reviewed every 5 years and updated as needed*
- Paid into a new Equitable Emissions Investment Fund



FLEXIBILITY MEASURES

- **Portfolios** - owners with more than one covered building may apply to comply across their portfolio.
- **Individual compliance schedules** - buildings or portfolios may apply for their own individual compliance plan, which must be aligned with citywide emissions goals for 2030 and 2050.
- **Hardship compliance plans** - buildings or portfolios with unique characteristics or circumstances that present a hardship (e.g., affordable housing refinancing timelines, historic designation, financial hardship) may apply for a hardship compliance plan.

RENEWABLE ENERGY PURCHASES

- Off-site renewable energy purchases, including RECs, used only to offset electricity consumption
- RECs retired in the year they were generated
 - Some flexibility for an accounting true-up period (e.g., 6 months)
- Accounts participating in the City's Community Choice Electricity program will have the appropriate emissions factor applied.
- **Options**
 - **Option 1:** Unbundled RECs that meet Massachusetts Class I eligibility
 - **Option 2:** Virtual Power Purchasing Agreements and directly owned off-site renewables
 - Must be traceable to a specific project and the RECs must be retired

REVIEW BOARD

Responsibilities:

- Oversight and enforcement
- Program review & regulation update recommendations
- Review of alternative pathways
- Allocation of grants from the investment fund
 - Prioritizes emissions reduction projects that benefit environmental justice populations

Note: The Air Pollution Control Commission will continue to oversee the ordinance and approve regulations changes, with the addition of the Commissioner of the Environment (ex officio) and a member with expertise in building design and energy systems.

REVIEW BOARD

- Two-thirds of board members will be nominated by community-based organizations.
- Members will be appointed by the Mayor and approved by the City Council, with expertise in:
 - Environmental justice
 - Affordable housing
 - Labor and workforce development
 - Building engineering and energy
 - Public health
- Stipends will be available.

COMPLIANCE

Data quality:

- Self-certification with annual data submission
- Third-party verification every 5 years, including in first year of reporting to set the baseline

Non-compliance:

- Penalty for failure to comply with reporting requirements (\$150-\$300 per day depending on building size)
- Penalty for failure to comply with emissions standards (\$300-\$1,000 per day depending on building size)



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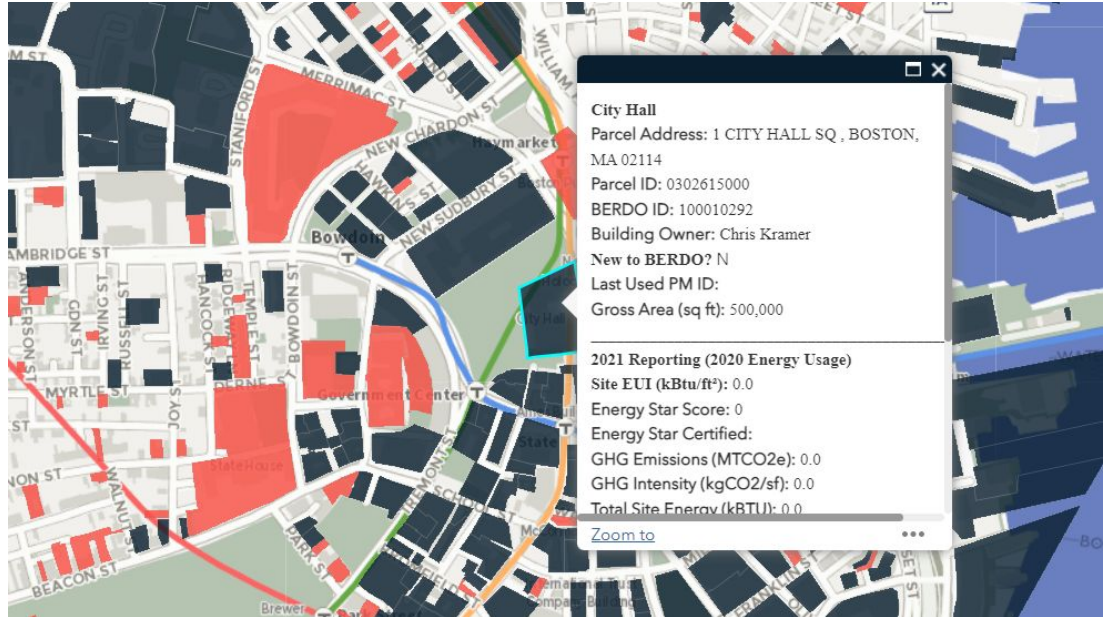


**HOW IS YOUR BUILDING
PERFORMING?**

FIND YOUR BUILDING



[This online tool](#) will be available through boston.gov/BERDO.



BUILDING USES



Assembly

- Aquarium
- Bar/Nightclub
- Bowling Alley
- Casino
- Fitness Center/Health Club/Gym
- Ice/Curling Rink
- Indoor Arena
- Movie Theater
- Museum
- Other - Entertainment/Public Assembly
- Other - Recreation
- Other - Stadium
- Performing Arts
- Racetrack
- Roller Rink
- Social/Meeting Hall
- Stadium (Closed)
- Stadium (Open)
- Swimming Pool
- Worship Facility
- Zoo



College/University



Education

- Adult Education
- Convention Center
- K-12 School
- Other - Education
- Pre-school/Daycare
- Vocational School



Food Sales & Service

- Convenience Store with Gas Station
- Convenience Store without Gas Station
- Fast Food Restaurant
- Food Service
- Other - Restaurant/Bar
- Restaurant
- Supermarket/Grocery Store
- Wholesale Club/Supercenter



Healthcare

- Ambulatory Surgical Center
- Hospital (General Medical & Surgical)
- Medical Office
- Other - Specialty Hospital
- Outpatient Rehabilitation/Physical Therapy
- Urgent Care/Clinic/Other Outpatient
- Veterinary Office

BUILDING USES



Lodging

- Barracks
- Hotel
- Other - Lodging/Residential
- Prison/Incarceration
- Residence Hall/Dormitory
- Residential Care Facility
- Senior Care Community



Manufacturing/Industrial



Services

- Courthouse
- Drinking Water Treatment & Distribution
- Energy/Power Station
- Fire Station
- Library
- Mailing Center/Post Office
- Other - Public Services
- Other - Services
- Other - Utility
- Personal Services (Health/Beauty, Dry Cleaning...)
- Police Station
- Repair Services (Vehicle, Shoe, Locksmith...)
- Transportation Terminal/Station
- Wastewater Treatment Plant



Multifamily housing



Office

- Bank Branch
- Financial Office
- Office



Retail

- Automobile Dealership
- Enclosed Mall
- Lifestyle Center
- Other - Mall
- Retail Store
- Strip Mall



Storage

- Distribution Center
- Non-Refrigerated Warehouse
- Parking
- Refrigerated Warehouse
- Self-Storage Facility



Technology/Science

- Data Center
- Laboratory
- Other - Technology/Science

EMISSIONS FACTORS

Fuel Type	Emissions Factor (kgCO ₂ e/MMBtu)
Natural Gas	53.11
Fuel Oil (no. 1)	73.50
Fuel Oil (no. 2)	74.21
Fuel Oil (no. 4)	75.29
Diesel Oil	74.21
District Steam	66.40
District Hot Water	66.40
Electric Driven Chiller	52.70
Absorption Chiller using Natural Gas	73.89
Engine-Driven Chiller Natural Gas	49.31
Grid electricity, 2018	87.50

- Multiply annual energy use for each fuel type by its emissions factor
- Add the results together
- Divide by square footage
- Compare the result with the emissions standards

EMISSIONS STANDARDS



Building use	Emissions standard (kgCO ₂ e/SF/yr.)					
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Technology/Science	19.2	11.1	7.8	5.1	2.5	0

Developed by Synapse Energy Economics for the City of Boston.



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HOW TO REPORT?

2022 REPORTING REQUIREMENTS

- **Energy Star Portfolio Manager:** The Environmental Protection Agency's (EPA) Energy Star Portfolio Manager (ESPM) is used for reporting key building characteristics and energy and water usage.
- **BERDO Reporting Form:** A new requirement in 2022, this form captures data required for BERDO 2.0 that isn't included in ESPM.
- **Third Party Data Verification:** Third-party data verification is a new requirement of BERDO 2.0 and must be completed by a qualified energy professional.

WHAT YOU WILL NEED TO REPORT

To prepare for reporting to BERDO you will need the following:

- Property address for each property required to report.
- A list of all energy utilities that served the building in 2021.
- Fuel delivery bills for the entire calendar year 2021.
- Basic property information including number of units and accurate square footage of the total property and of all building uses (e.g., square footage of ground floor retail and square footage of residential area).
- Number of meters serving the building.
- A third-party data verifier.

THIRD PARTY VERIFICATION

Required in 2022

- Confirm square footage and allocation to appropriate building use is correct in Portfolio Manager.
- Confirm unit count is accurate in Portfolio Manager. *(residential only)*
- Confirm all energy usage is accounted for in Portfolio Manager.
 - *All meters are reported and all delivered fuels are accounted for*
- Verify all energy use is accurately reported

Optional for 2022*

- Confirm eligibility of any RECs.
- Confirm eligibility of any PPAs.
- Confirm use of any backup generation to be exempt from emissions standards.
- Confirm any EV charging station usage to station usage to be exempt from emissions standard.

**Note: Future regulations will specify what needs to be verified for compliance with emissions standards. We anticipate that at a minimum the four steps above will be required if they are used by a building.*

QUALIFIED ENERGY PROFESSIONALS



Profession	Credential
Engineer	Professional Engineer (PE)
Architect	Licensed Architect
Architect	Registered Architect (RA)
Energy Modeler	Passive House
Energy Auditor	Building Energy Assessment Professional (BEAP)
Energy Auditor	Certified Energy Auditor (CEA)
Energy Auditor	Building Energy Modeling Professional (BEMP)
Energy Auditor	RPA/FMA High Performance Designation (RPA/FMA-HP)
Energy Auditor	Certified Measurement and Verification Professional (CMVP)
Energy Auditor	LEED Advanced Professional (AP) Building Operations & Maintenance
Commissioning Professional	Commissioning Process Management Professional Certification (CPMP)

Profession	Credential
Commissioning Professional	Certified Commissioning Professional (CCP)
Commissioning Professional	Associate Commissioning Professional (ACP)
Commissioning Professional	Certified Building Commissioning Professional (CBCP)
Commissioning Professional	Existing Building Commissioning Professional (EBCP)
Commissioning Professional	Certified Commissioning Authority (CxA)
Energy Manager	Operations and Performance Management Professional (OPMP)
Energy Manager	Certified Energy Manager (CEM)
Energy Manager	Energy Management Professional (EMP)
Building Operator	Building Operator Certification (BOC) Level 2



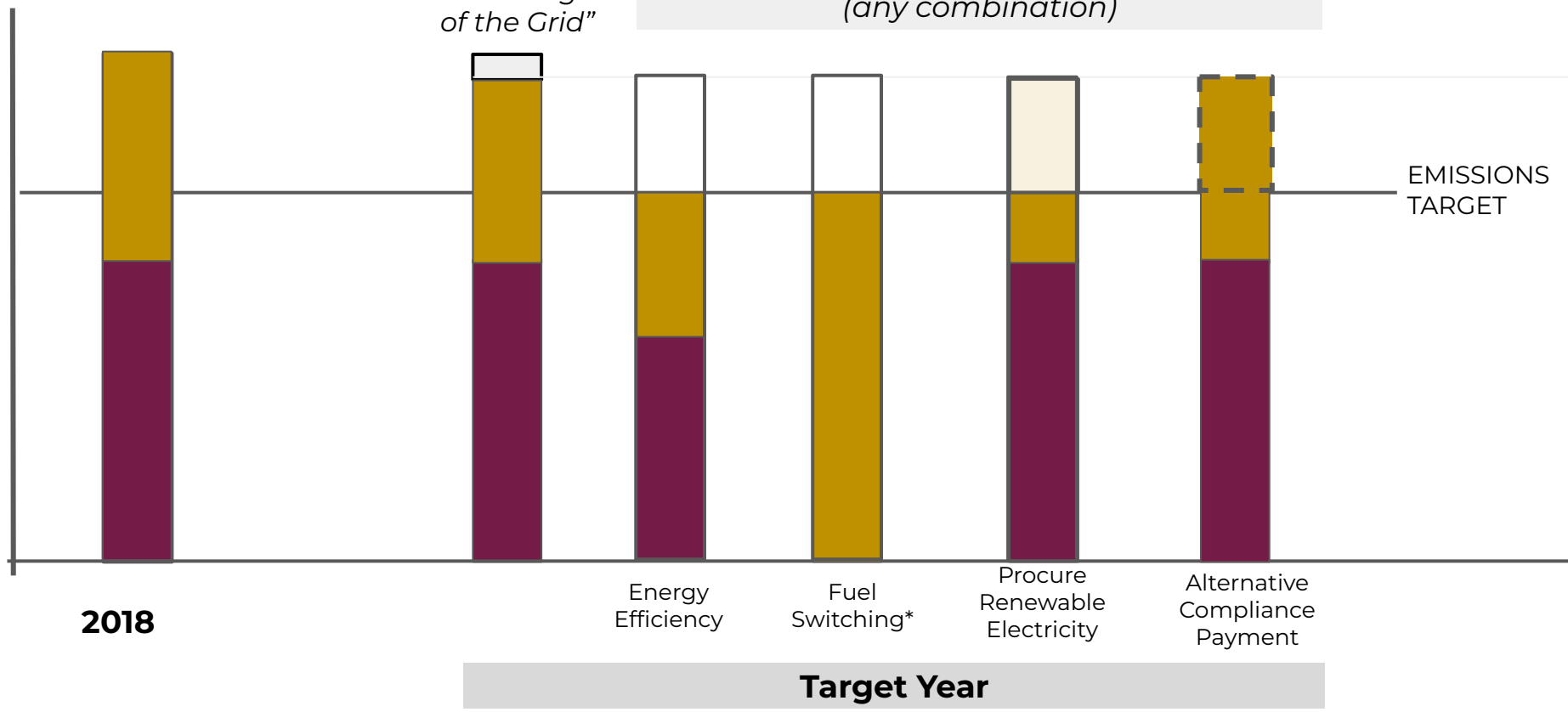
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HOW TO COMPLY WITH EMISSIONS TARGETS?

INDIVIDUAL BUILDING

“Greening of the Grid”

Options
(any combination)



EMISSIONS TARGET

2018

Target Year

Electricity Natural Gas

* Fuel switching often best when combined with efficiency **For illustrative purposes only

CASE STUDY: MULTIFAMILY (HIGH EMISSIONS)

Multifamily housing

- Low-rise, multi-building property
- 280-300 housing units

Envelope insulation

- Walls: R-12
- Roof: R-2.5 (uninsulated).
- Roof expected end of life 2025-2030.

Heating, cooling, HVAC:

- 14,000 MBH hot water boilers. Boilers expected end of life: 2035.
- Split system condensers on rooftop.
- 40 HP hot water circulation pumps without VFD.
- Heating radiators in residences and common areas. Split system indoor units for cooling in residences and common areas.

Other: Electricity and natural gas are master metered.

Gross Floor Area: 140,000-160,000 SF

Year Built: 1970-1990

Emission Percentile: 97%

Windows: Double pane, vinyl-framed

Lighting: LEDs

Domestic hot water:

- 3,000 MBH condensing firetube water heaters.
- Water heater expected end of life: 2035-2040
- Fixtures: 2.5 GPM showerheads, 1.5 GPM sinks

Process equipment: On-site laundry

Cooking: Electric ranges

Refrigeration: 18 cu., mostly in poor to fair condition, in need of replacement

Condensing gas water heater



A/C indoor unit

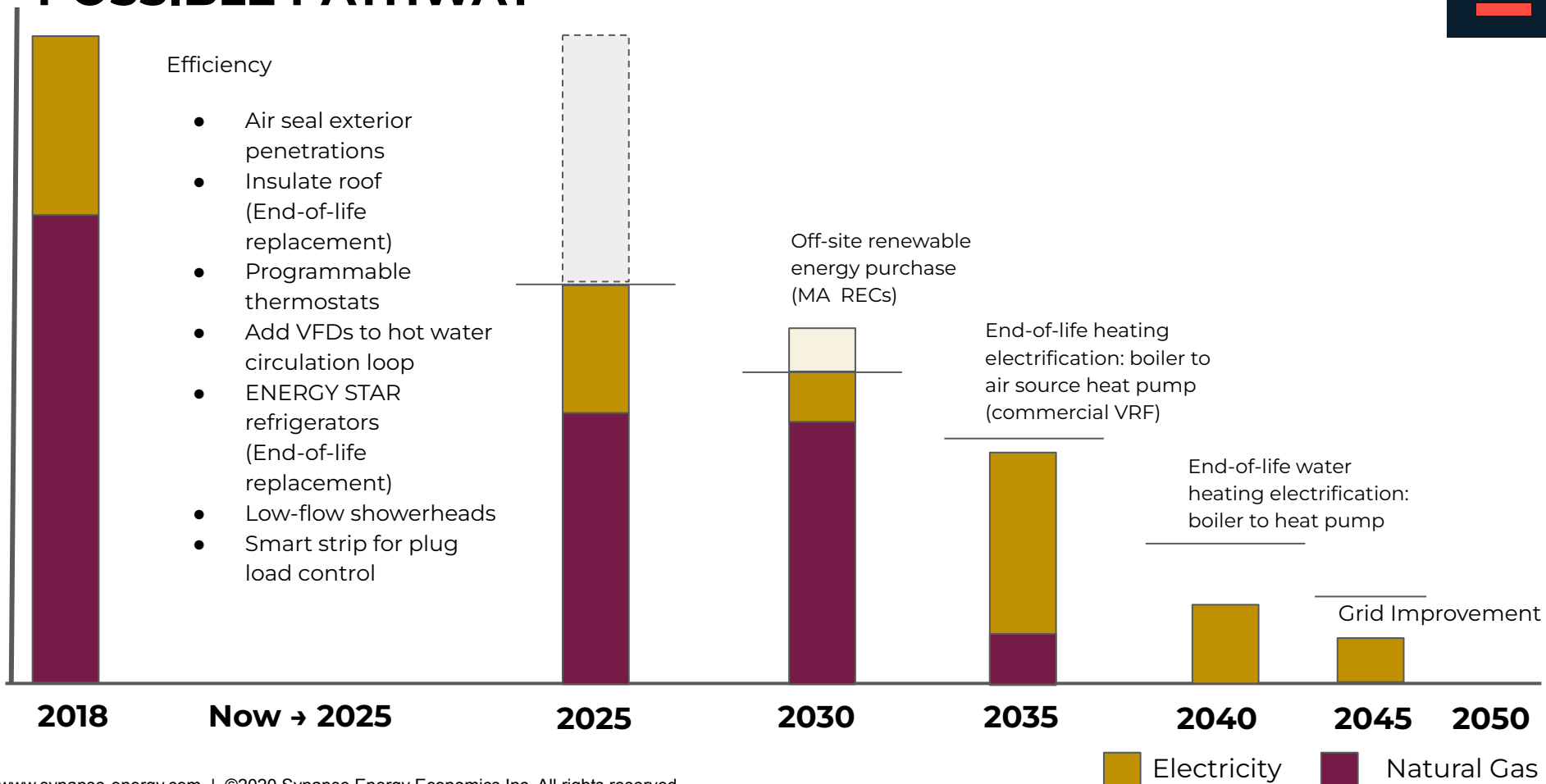


Central hot water boilers



Photo credits: Conquest, PVHVAC, Patterson-Kelley

CASE STUDY: MULTIFAMILY (HIGH EMISSIONS) POSSIBLE PATHWAY





CASE STUDY: MULTIFAMILY (HIGH EMISSIONS)

Strategy	Approach	Timeline	Total Cost	Incremental Cost	Energy Savings				Avoided Emissions		Net Incremental Abatement Cost \$/ton
					kBtu/yr	%	\$/yr	Lifetime \$ total	ton/yr	%	
Air seal exterior penetrations	Retrofit	2025	\$82,317	\$82,317	1,226,146	5%	\$13,245	\$157,272	65	4%	-\$77
Insulate roof: add rigid foam panel over sheathing	End-of-life replacement	2025	\$2,489,474	\$1,032,221	6,645,976	27%	\$71,791	\$1,340,005	353	24%	-\$29
Programmable thermostats	Retrofit	2025	\$53,029	\$53,029	183,504	1%	\$8,991	\$71,175	10	1%	-\$190
Add VFDs to hot water circulation loop	Retrofit	2025	\$53,425	\$53,425	106,120	1%	\$5,200	\$53,360	6	1%	\$1
ENERGY STAR refrigerators	End-of-life replacement	2025	\$265,741	\$83,044	225,400	1%	\$11,044	\$100,859	12	1%	-\$130
Low-flow showerheads	Retrofit	2025	\$8,327	\$8,327	844,896	3%	\$41,398	\$272,196	44	3%	-\$841
Smart strip for plug load control	Retrofit	2025	\$4,828	\$4,828	55,177	0%	\$2,704	\$11,540	3	0%	-\$467
Off-site renewable energy purchase (Massachusetts RECs)	Procurement	2030	\$44,991	\$44,991	0	0%	\$0	\$0	142	10%	\$16
Heating electrification: boiler to air source heat pump (commercial VRF)	End-of-life replacement	2035	\$642,888	\$71,241	3,042,455	12%	-\$18,581	-\$148,826	163	11%	\$90
Water heating electrification: boiler to heat pump	End-of-life replacement	2040	\$1,109,988	\$470,594	5,697,490	23%	-\$52,574	-\$423,092	305	21%	\$225
Grid improvement	Policy	2050	\$0	\$0	0	0%	\$0	\$0	380	25%	\$0
Total			\$4,755,008	\$1,904,018	18,027,165	73%	\$83,218	\$1,434,490	1,481	100%	\$22

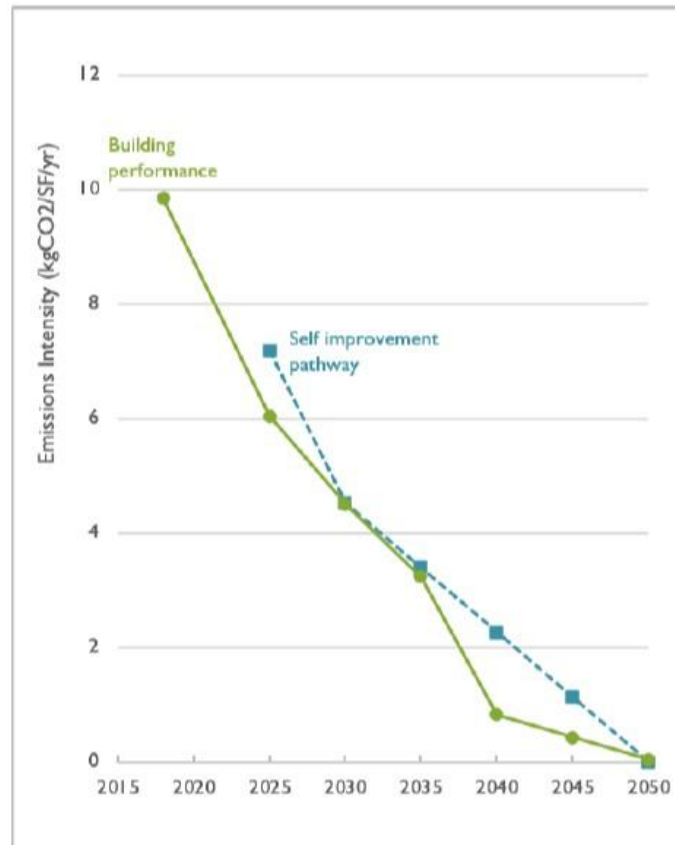
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All cost savings shown in 2020\$ present value lifecycle costs. Utility incentives are not included. Negative energy savings indicate increased costs.

CASE STUDY: MULTIFAMILY (HIGH EMISSIONS) POSSIBLE PATHWAY



- Incremental abatement cost:
 - \$1.9M over 30 years (\$0.5M over 30 years with energy savings)
 - \$89/ton (\$22/ton with energy savings)
 - 42¢/SF/yr (10¢/SF/yr with energy savings)



CASE STUDY: MULTIFAMILY (LOW EMISSIONS)

Multifamily housing

- Mid-rise, single building
- 120-140 housing units

Envelope insulation

- Walls: R-6
- Roof: R-19

Heating, cooling, HVAC:

- 8,400 MBH central steam boiler with steam to hot water heat exchanger
- 185 kW central chiller, cooling tower, two 30 HP pumps with VFDs for cooling tower and condenser loop
- 20-60 MBH fan coil units in residences; baseboard fin tube water loop in commercial
- (2) 7.5 HP circulation pumps with VFD for residences; (1) 3 HP circulation pump with VFD for commercial
- Terminal units have thermostats; boiler steam valve uncontrolled

Other: Resident gas and electricity master metered; commercial gas master metered, electricity separate

Gross Floor Area: 220,000-240,000 SF

Year Built: Pre-1900 (renovated 1970-80)

Emission Percentile: 32%

Windows: Double pane, seals in poor condition

Lighting:

- Residences: CFL, incandescent, T12 fluorescent
- Common areas: LED and T12 fluorescent

Domestic hot water:

- 620 MBH central indirect water heater with 2 tanks; 1/6 HP and 3/4 HP circulation pump
- Fixtures: 1.5 GPM showerheads and sinks

Process equipment: On-site laundry

Cooking: Electric ranges

Refrigeration: Mixture of 14 to 15 cu.

Central water heater



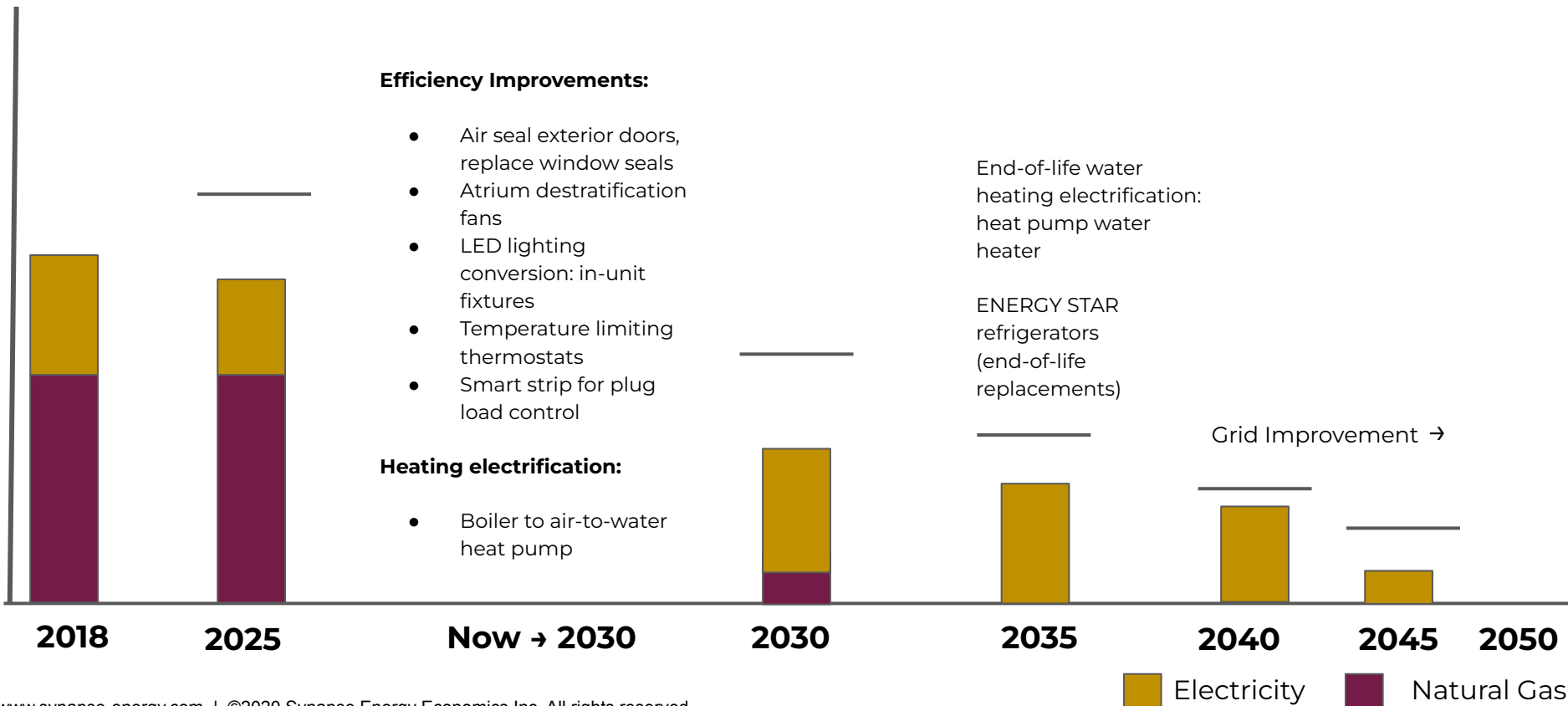
Fan coil unit



Central steam boiler



CASE STUDY: MULTIFAMILY (LOW EMISSIONS) POSSIBLE PATHWAY



CASE STUDY: MULTIFAMILY (LOW EMISSIONS)



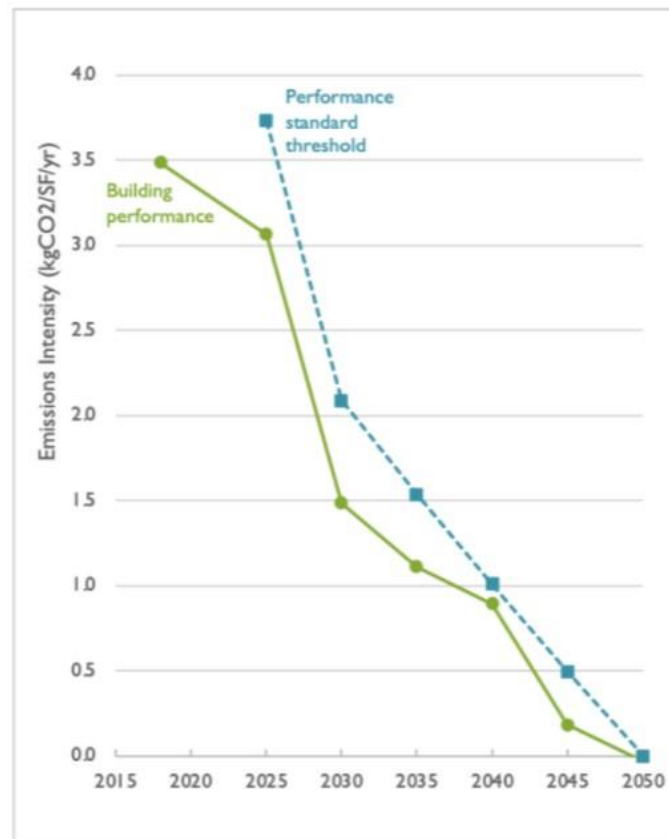
Strategy	Approach	Timeline	Total Cost	Incremental Cost	Energy Savings				Avoided Emissions		Net Incremental Abatement Cost
					kBtu/yr	%	\$/yr	Lifetime \$ total	ton/yr	%	\$/ton
Air seal exterior doors, replace window seals	Retrofit	2025	\$8,780	\$8,780	175,837	1%	\$2,127	\$24,934	9	1%	-\$114
Atrium destratification fans	Retrofit	2025	\$6,438	\$6,438	99,965	1%	\$4,898	\$44,731	6	1%	-\$527
LED lighting conversion: in-unit fixtures	Retrofit	2025	\$41,750	\$41,750	177,196	1%	\$8,682	\$84,277	11	1%	-\$298
Heating electrification: boiler to air-to-water heat pump	End-of-life replacement	2030	\$1,199,978	\$856,990	5,770,199	45%	-\$35,239	-\$282,257	286	36%	\$266
Temperature limiting thermostats	Retrofit	2030	\$65,132	\$65,132	284,580	2%	\$13,944	\$110,379	18	2%	-\$254
ENERGY STAR refrigerators	End-of-life replacement	2030	\$78,538	\$23,561	70,287	1%	\$3,444	\$31,451	4	1%	-\$154
Smart strip for plug load control	Retrofit	2030	\$4,828	\$4,828	24,181	0%	\$1,185	\$5,057	2	0%	-\$30
Water heating electrification: boiler to heat pump	End-of-life replacement	2035	\$229,397	\$97,256	729,124	6%	-\$4,831	-\$36,234	36	5%	\$285
Off-site renewable energy purchase (Massachusetts RECs)	Procurement	2045	\$8,939	\$8,939	0	0%	\$0	\$0	113	14%	\$16
Grid improvement post-electrification	Policy	2050	\$0	\$0	0	0%	\$0	\$0	315	39%	\$0
Total			\$1,643,781	\$1,113,675	7,331,369	58%	-\$5,791	-\$17,661	799	100%	\$191

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All cost savings shown in 2020\$ present value lifecycle costs. Utility incentives are not included. Negative energy savings indicate increased costs.

CASE STUDY: MULTIFAMILY (LOW EMISSIONS)

- Incremental abatement cost:
 - \$1.1M over 30 years (\$1.2M over 30 years with energy costs)
 - \$188/ton (\$191/ton with energy costs)
 - 16¢/SF/yr (17¢/SF/yr with energy costs)



CASE STUDY: TECHNOLOGY/SCIENCE (HIGH EMISSIONS)

Laboratory

Envelope insulation

- Walls: R-1.15 (visible glass)
- Roof: R-6.

Heating, cooling, HVAC:

- District steam
- Two 775 ton central chillers with VFDs on 75 HP pumps for chiller loops
- Three 663 ton cooling towers with VFDs on 40 HP fans
- 6 AHU with 100 HP fan motors (44,000 CFM each)
- Four VAV boxes with 50 HP fan motors, hot water, and chilled water coils
- Labs are humidity controlled and served by eight 7.5 exhaust fans

Other: Central building management system with daily HVAC setbacks

Gross Floor Area: 160,000-180,000 SF

Year Built: Post-2000

Emission Percentile: 83%

Windows: Double pane, metal-framed (0.87 U-value)

Lighting:

- T8 fluorescent and CFL
- Egress lighting exceeds required minimum levels

Domestic hot water:

- Steam-to-water heat exchanger.

Backup generator:

- 1,300 kW engine onsite using diesel and natural gas

Cooling tower



Ventilation system

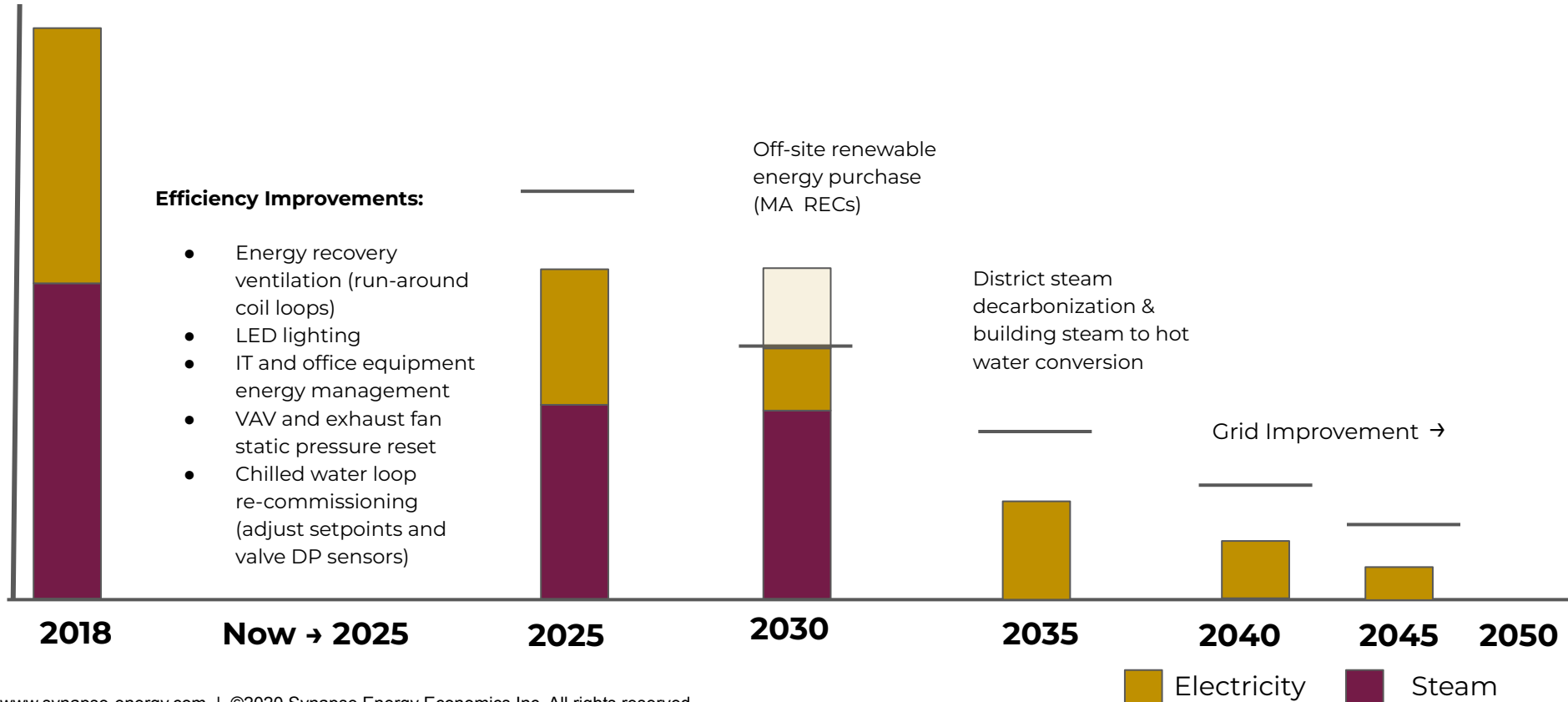


Lighting



Photo credits: MassCEC

CASE STUDY: TECHNOLOGY/SCIENCE (HIGH EMISSIONS) POSSIBLE PATHWAY



CASE STUDY: TECHNOLOGY/SCIENCE (HIGH EMISSIONS)



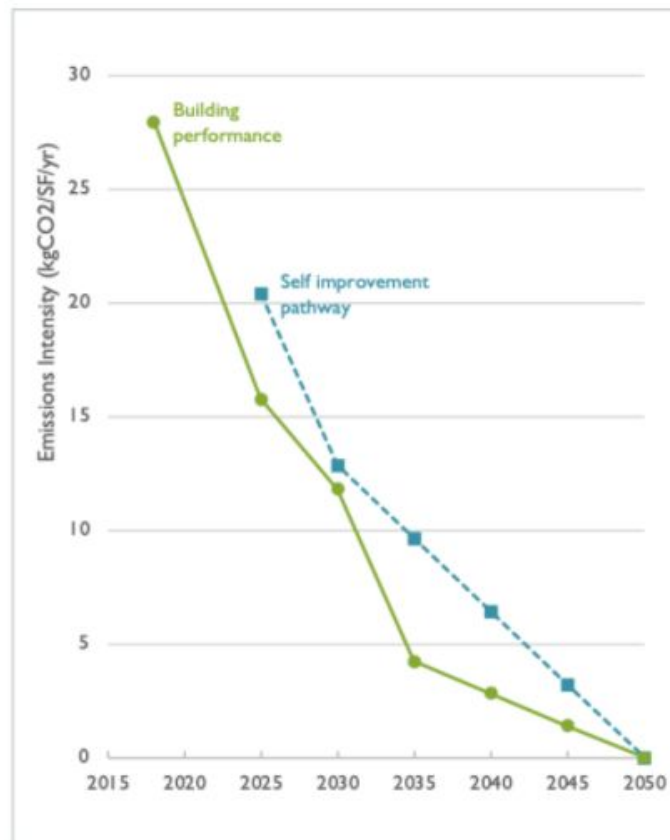
Strategy	Approach	Timeline	Total Cost	Incremental Cost	Energy Savings				Avoided Emissions		Net Incremental Abatement Cost
					kBtu/yr	%	\$/yr	Lifetime \$ total	ton/yr	%	\$/ton
Chilled water loop re-commissioning (adjust setpoints and valve DP sensors)	Retrofit	2025	\$2,262	\$2,262	201,291	0%	\$9,863	\$42,098	10	0%	-\$760
Energy recovery ventilation: run-around-coil loops	Retrofit	2025	\$1,455,560	\$1,455,560	21,111,478	33%	\$336,440	\$3,844,018	1,364	28%	-\$117
VAV and exhaust fan static pressure reset	Retrofit	2025	\$58,170	\$58,170	758,966	1%	\$16,378	\$71,638	47	1%	-\$57
LED lighting conversion: fluorescent and CFL	Retrofit	2025	\$389,321	\$389,321	5,660,398	9%	\$277,349	\$2,692,173	295	6%	-\$607
IT and office equipment energy management	Retrofit	2025	\$120,373	\$120,373	621,576	1%	\$30,456	\$278,135	32	1%	-\$406
Off-site renewable energy purchase (Massachusetts RECs)	Procurement	2030	\$138,221	\$138,221	0	0%	\$0	\$0	436	9%	\$16
District steam decarbonization + building retrofit: steam to hot water conversion	End-of-life replacement	2035	\$4,227,666	\$4,227,666	14,860,298	23%	\$20,197	\$251,921	1,059	22%	\$125
Grid improvement over time	Policy	2050	\$0	\$0	0	0%	\$0	\$0	1,546	32%	\$0
Total			\$6,391,572	\$6,391,572	43,214,006	67%	\$690,682	\$7,179,984	4,789	100%	-\$12

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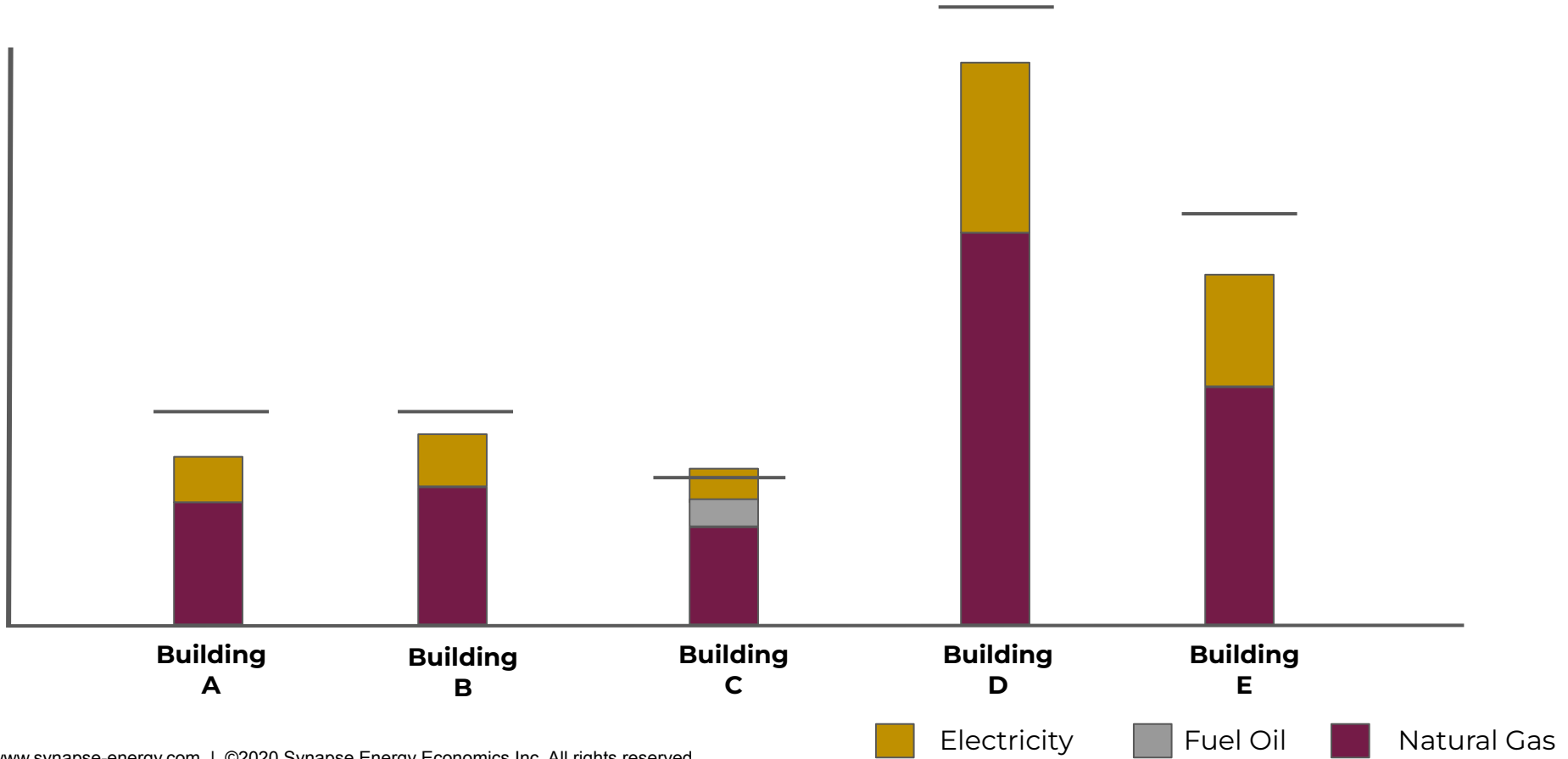
All cost savings shown in 2020\$ present value lifecycle costs. Utility incentives are not included. Negative energy savings indicate increased costs.

CASE STUDY: MULTIFAMILY (LOW EMISSIONS)

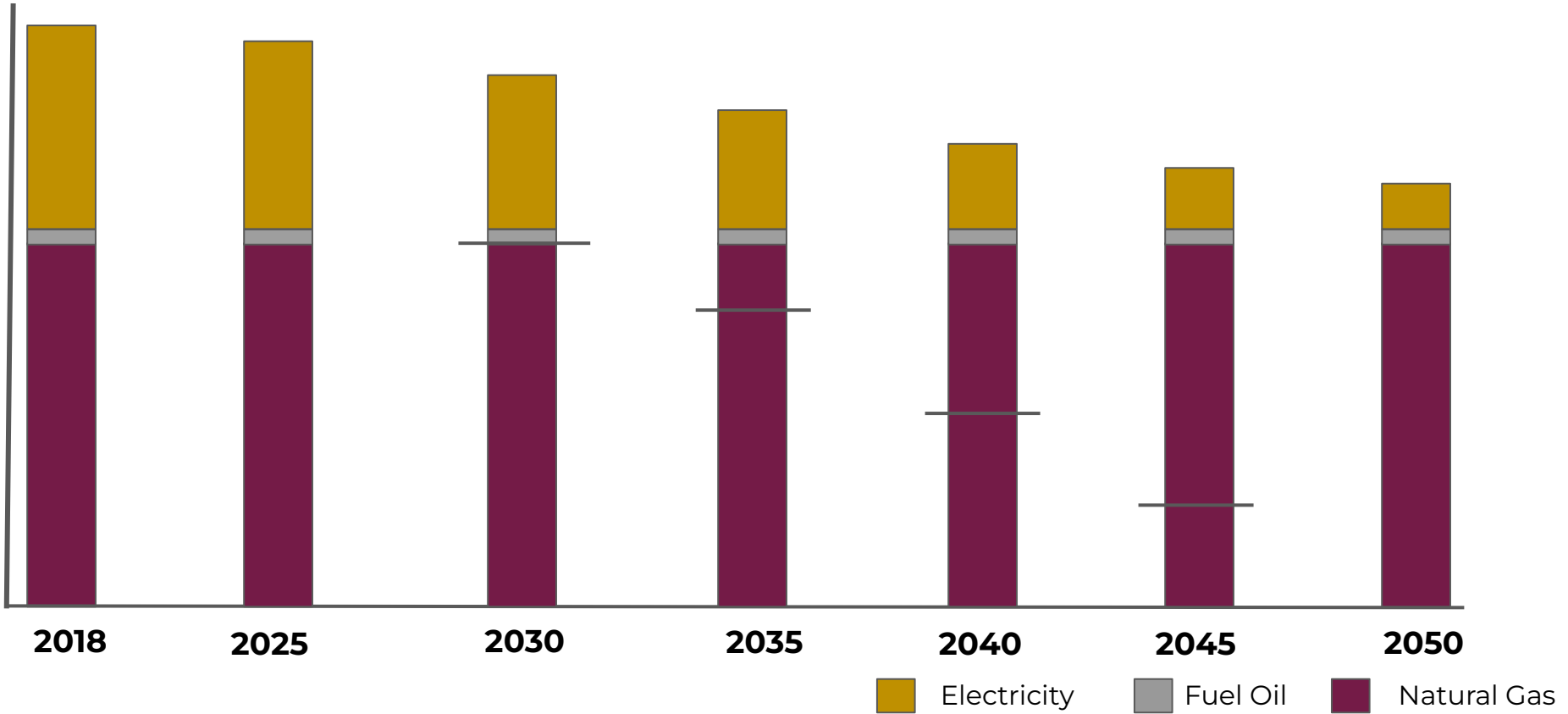
- Incremental abatement cost:
 - \$6.4M over 30 years (-\$0.8M over 30 years with energy savings)
 - \$98/ton (-\$12/ton with energy savings)
 - \$1.24/SF/yr (-15¢/SF/yr with energy savings)



CASE STUDY: PORTFOLIO



CASE STUDY: PORTFOLIO

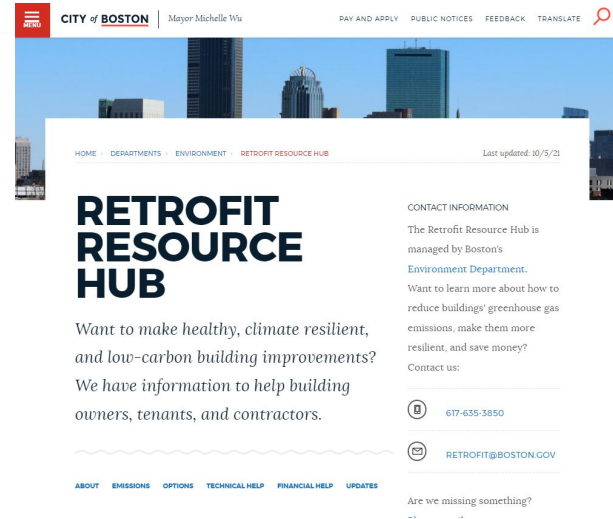


RESOURCE HUB

Acts as a single entry point for owners, contractors, and renters to access resources for building retrofits.

Phase 1 - Informational website for building owners and tenants
boston.gov/departments/environment/retrofit-resource-hub

- BERDO
- How to decarbonize a building
- Available funding options
- Tenant protections
- Green leasing
- Workforce training



Phase 2 - Technical Support

- Webinars
- Office hours
- One-on-one consultations

RESOURCES



- Ongoing incentives - Mass Save, SMART
- Grant opportunities - MassCEC
- Financing options - Tax-exempt lease, PACE
- Tax credits - Solar ITC, Low-Income Housing Tax Credit



- Green leasing
- Sustainable tenant fit-out
- Thermal electrification
- Resilient design
- Zero over time planning



B



WHAT'S NEXT?

REGULATIONS DEVELOPMENT

- Data Reporting:
 - Feb. 18 - Mar. 11 - Formal Comment Period on revised Phase 1 regulations
 - March 16 - Air Pollution Control Commission Hearing and possible vote
 - Post-March 16 - Guidance on reporting and third party verification
 - June 15th - Reporting deadline (December 15th with 6-month extension)
- Future phases of regulations:
 - Review Board
 - Compliance with emissions standards (Individual compliance schedules, hardship compliance plans, etc.)
 - Equitable Emissions Investment Fund

HOW YOU CAN HELP

- Talk to building owners now about BERDO compliance during capital planning
- Discuss options with Mass Save early in the process
- Tell us about barriers you face and what you need to make this happen

QUESTIONS?



Hannah Payne

617-635-1385

hannah.payne@boston.gov

Brenda Pike

617-635-2516

brenda.pike@boston.gov

energyreporting@boston.gov

boston.gov/berdo