

B HOW TO DECARBONIZE YOUR BUILDING



Boston's building emissions performance standard sets requirements for large buildings to reduce their emissions gradually to net zero by 2050. For most buildings, the technology to do so is available now, and building owners should start integrating decarbonization into their short- and long-term capital plans. While every building is different, this can generally be accomplished by a combination of reducing energy use, buying renewable energy, and switching fossil fuel systems to electricity. While there is value in doing all three together, there are many reasons building owners might choose to stagger these actions over time. When making a zero-over-time plan, owners should properly sequence these actions to consider occupant comfort as well as cost-effectiveness.

REDUCING ENERGY USE



Cutting down on your electricity and fossil fuel usage is generally the least costly option, with energy savings and utility incentives that offset the upfront cost.

The most common ways to reduce energy usage include:

OPERATIONAL CHANGES

Changes to how you operate your building could include occupant behavioral changes or equipment controls, such as changing the schedule or settings for heating systems or adding occupancy sensors for lighting (especially common area lighting). These are less expensive than other measures and can often be done in-between regular capital improvement cycles.

LIGHTING UPGRADES

LEDs represent significant electricity savings compared to older bulbs, paying for themselves over a very short period of time.

ENVELOPE UPGRADES

Air sealing or adding insulation to your building not only makes it more comfortable for occupants, it also reduces the heat load, so any future heating system replacement can be smaller (and therefore less expensive).

HEATING AND HOT WATER SYSTEM REPLACEMENT

Changes to heating or hot water systems should be considered very carefully. Because these systems have such long lifespans, equipment replaced now could still be in use in 2050, so you should consider the opportunity-cost of installing a new fossil fuel system.

BUYING RENEWABLE ELECTRICITY



Installing renewable systems onsite or purchasing electricity (and Renewable Energy Credits) generated offsite after electricity usage has been reduced with energy efficiency allows you to purchase the least amount necessary.

Here are some ways to buy renewable electricity:

ONSITE RENEWABLES

Roof-mounted solar PV is the most common onsite option in urban areas. This can be done through purchasing the system yourself or entering into a power purchase agreement with a solar provider, in which they own the system and sell you electricity at reduced rates. This can be an attractive option for nonprofits or public entities, since the solar provider will be able to take advantage of existing tax credits. If your roof is nearing the end of its useful life, it should be replaced before installing solar PV.

OFFSITE RENEWABLES

If your building doesn't have sufficient roof space, or if there are other barriers to onsite renewables – such as grid constraints – there are multiple options for purchasing offsite renewables:

- Community Choice Electricity - You or your tenants can participate in the City's municipal aggregation program and opt up to 100% renewables.
- Power purchase agreements (PPAs) - You can purchase electricity from a renewable installation at another location.
- Renewable energy credits (RECs) - You can maintain your current electricity supplier and purchase the environmental attributes of offsite renewables through RECs.

SWITCH FOSSIL FUEL SYSTEMS TO ELECTRICITY



Switching from oil, propane, or natural gas to electricity will allow you to take advantage of either your own renewable electricity purchases or the renewable content of the Massachusetts electric grid, which is planned to increase over time.

At current fuel prices, switching from electric resistance, oil, and propane systems to heat pumps can often yield operational cost savings now; and switching from natural gas to heat pumps can also yield immediate savings when combined with energy efficiency and onsite solar. Any increased operational costs can be offset by additional benefits of the upgraded system. Many heat pump technologies also include efficient cooling, an amenity that increases comfort for occupants. Moving away from fossil fuels also improves indoor air quality, which is especially important for occupants with asthma.

The more common types of heat pumps include:

CENTRAL AIR-SOURCE HEAT PUMPS

A common replacement for buildings with central air conditioning or furnaces, these heat pumps use ducts to deliver hot or cold air.

DUCTLESS MINI-SPLIT HEAT PUMPS

A common replacement for buildings with hot water or steam distribution systems, mini-splits add a wall unit to blow air into each zone to be heated or cooled.

VARIABLE REFRIGERANT FLOW HEAT PUMP

Most common in large buildings, VRF systems are able to provide both heating and cooling to different zones of the building at the same time.

GEOHERMAL HEAT PUMPS

Most appropriate for buildings with outdoor space to dig wells, geothermal heat pumps (or ground-source heat pumps) pre-heat or pre-cool refrigerants using the constant temperature underground.

AIR-TO-WATER HEAT PUMPS

Currently less common in the U.S. than Europe, air-to-water heat pumps heat hot water for distribution, and can be used for both heating and hot water (and sometimes cooling).

You can choose the best ways to decarbonize your building based on your equipment lifespan, tenant turnover, refinancing cycles, or other long-term capital planning considerations. However, it's important to be prepared when these milestones happen, so start making your zero-over-time plan today. If you have any questions, email EnergyReporting@boston.gov or call **617-635-3850**.