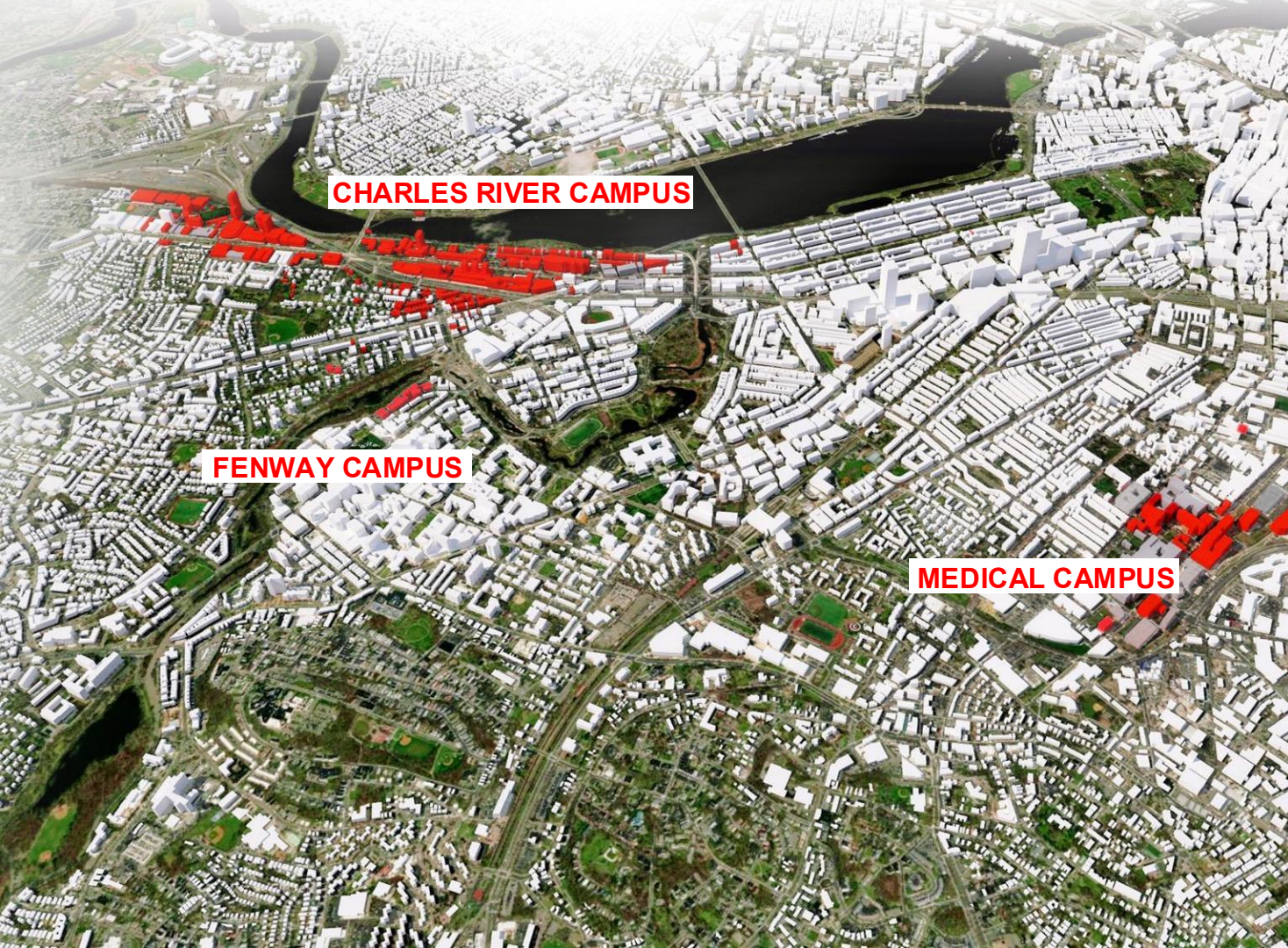


Toward a Carbon Free Future

A Case Study in Sustainable Innovation

Dennis Carlberg // Chief Sustainability Officer
Office of Energy Transformation // October 9, 2025

BOSTON
UNIVERSITY



CHARLES RIVER CAMPUS

FENWAY CAMPUS

MEDICAL CAMPUS

Stats

Students
36,000

Employees
10,000

Bldg. Area
15.6 million sf

Buildings
370

Campus Area
140 acres

Site EUI
118 kBtu/sf

Emissions
56,600 MTCO_{2e}
(66% below 2006)

Climate Action Plan - Goals

1

Prepare
for
Climate
Change

2

Net Zero
Direct
Emissions
by 2040

3

Act on
Indirect
Emissions

4

Climate
Change
Education
&
Research

5

Integrate
CAP with
BU
Strategic
Plan

Center for Computing & Data Sciences

Leading the transformation:
Top 5 reasons





Stats

Bldg. Area
345,000 sf

Stories
19

Measured Site EUI
40 kBtu/sf-yr
(26 with solar)

Emissions
Zero MTCO₂e

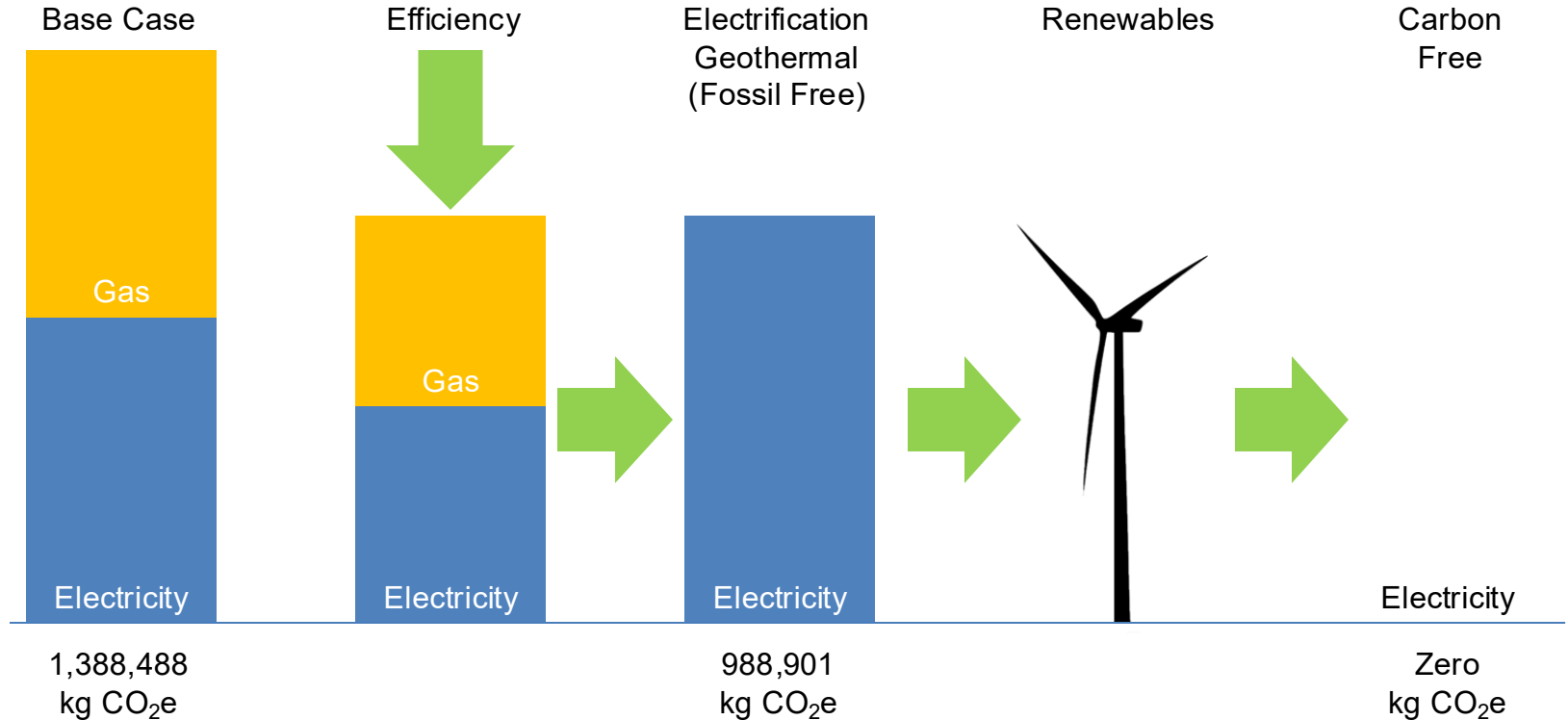
Reason #1 Resilient Design

Prepare for climate change



Reason #2 Net-zero direct emissions

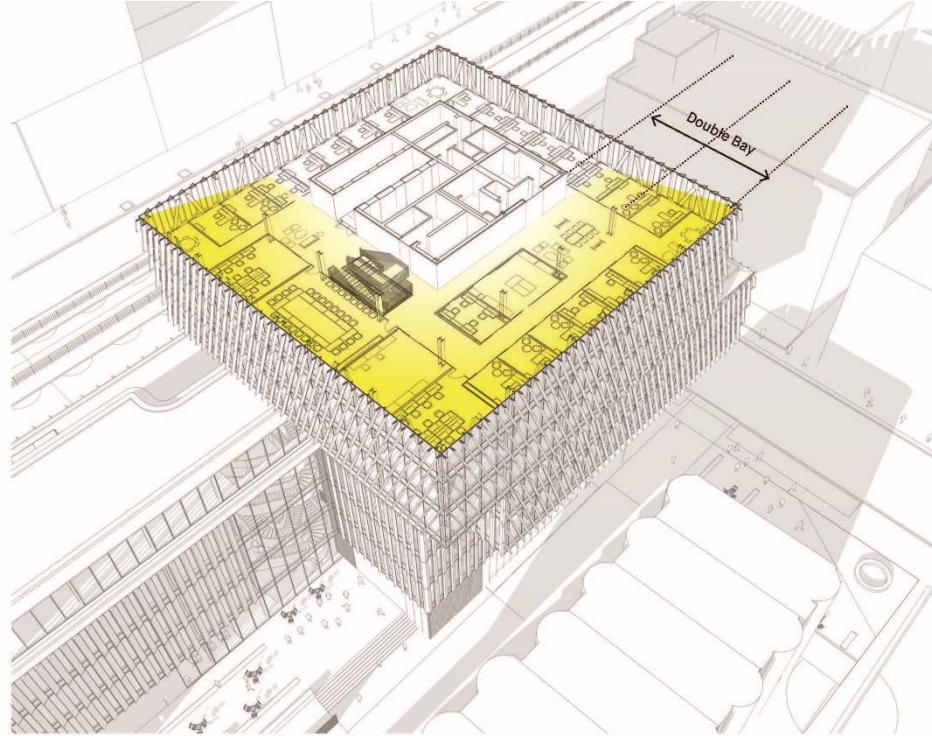
Carbon free building





Reason #2 Net-zero direct emissions

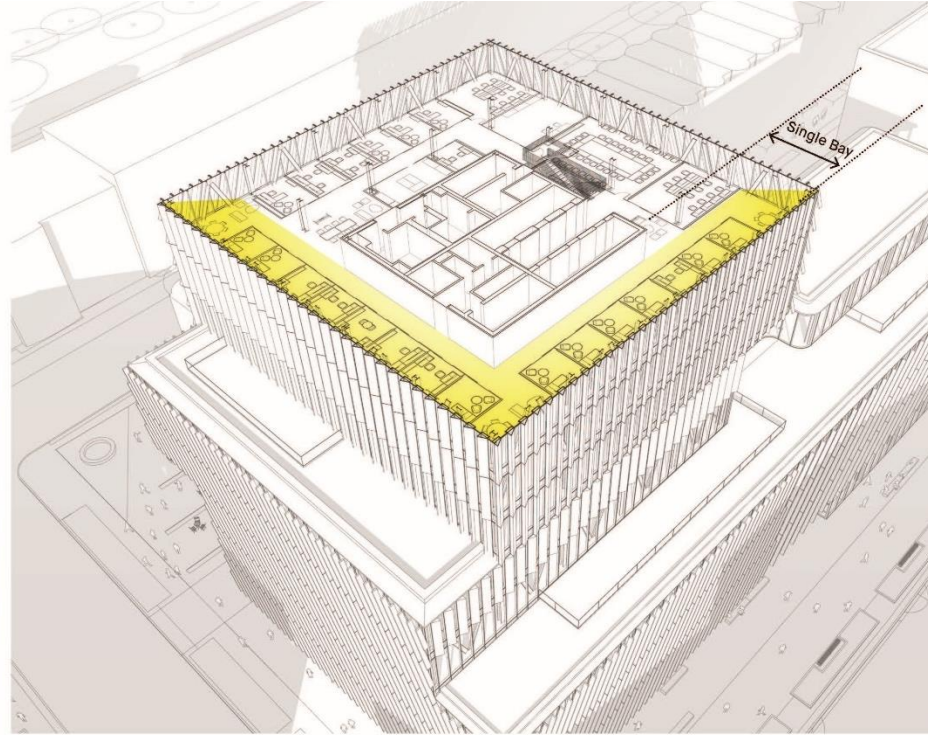
Diagonal louver façade design



Diagonal Louvers Along Double Bay Depth: A diagonal louver in front of 60% vision glazing is used in the deep floor plate zones to cut out the solar gain and drive daylight deep into the plan.

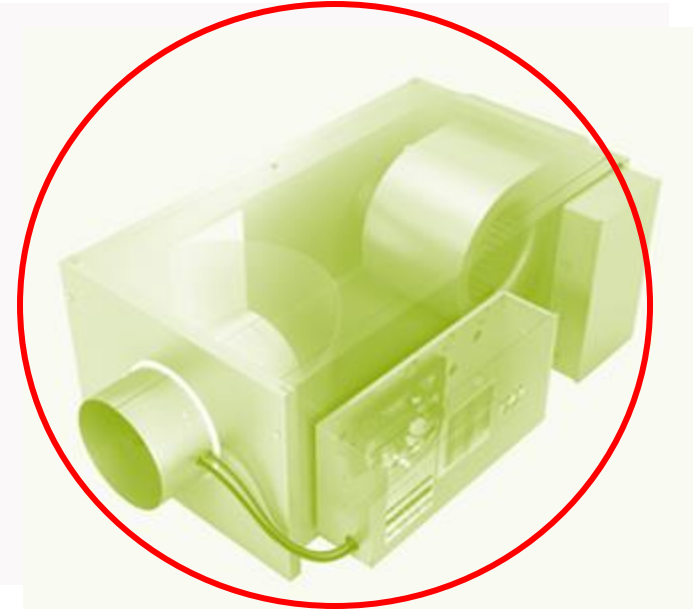
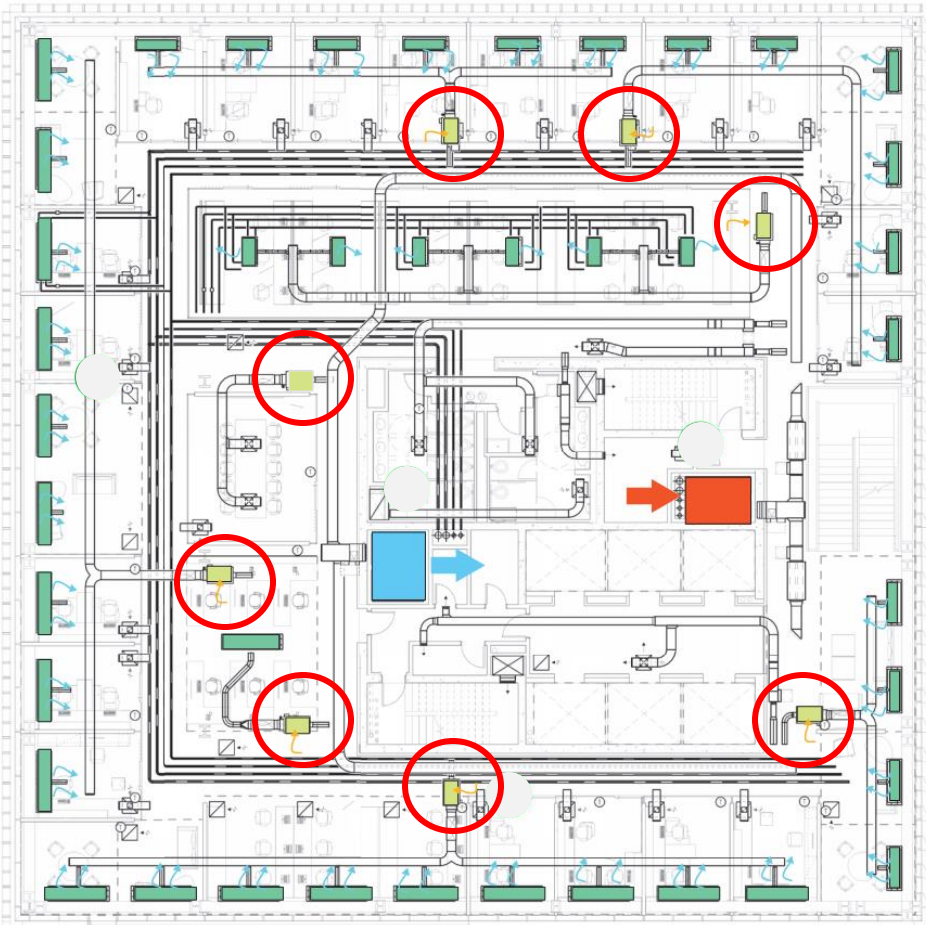
Reason #2 Net-zero direct emissions

Sawtooth façade design



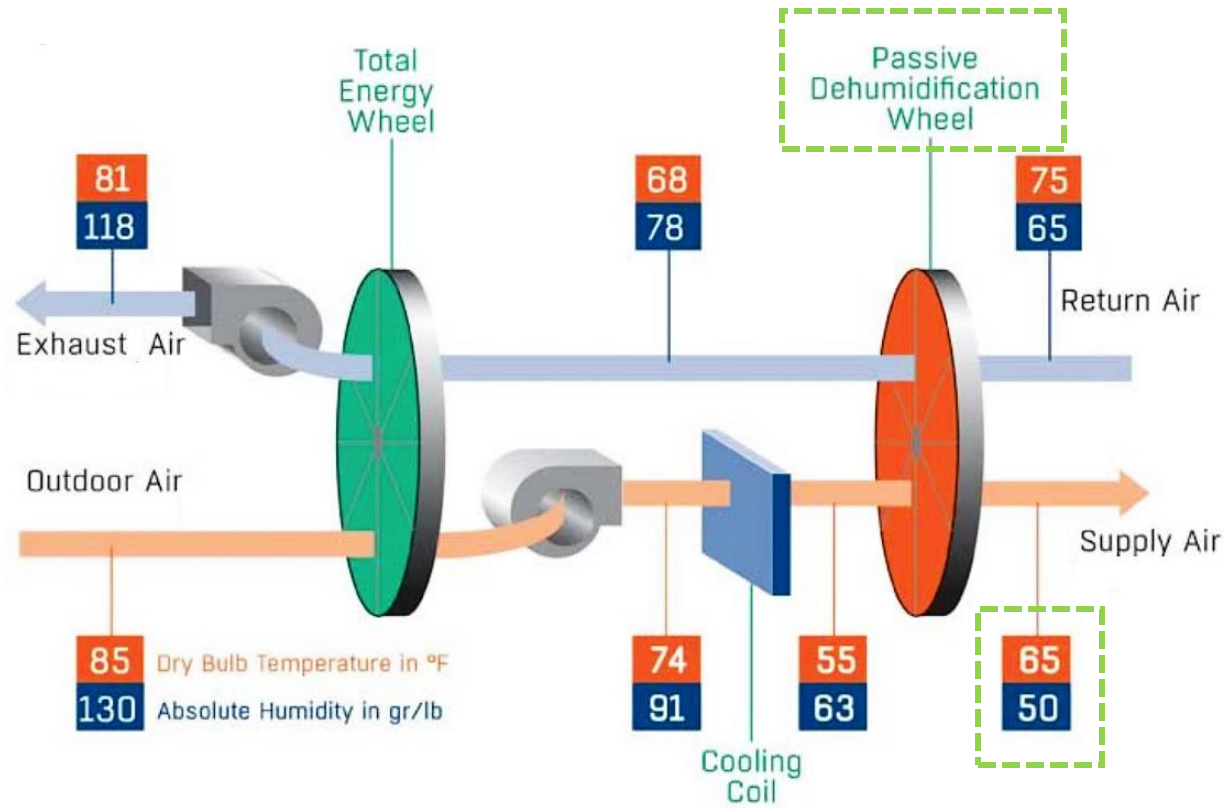
Saw Tooth Facade Along Single Bay Depth: A vertical sawtooth with 40% vision glazing is used on the shallow single bay depth floor plate zone where daylight does not need to penetrate as deep into the floorplate.

Reason #2 Net-zero direct emissions





Reason #2 Net-zero direct emissions



Reason #2 Net-zero direct emissions



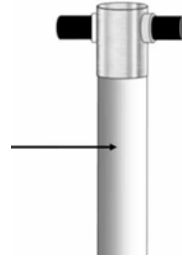
- Closed Loop
- Water
- 31 Bores
 - (3 test + 28)
- 1,500 Feet deep
- 300 Tons
- 9 Circuits

Reason #2 Net-zero direct emissions

Design considerations

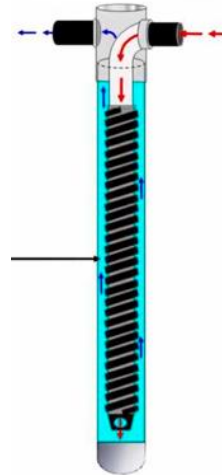
Thermal Exchange

- High-Performance GeoExchange (HPGX)
 - Larger, stronger pipe (fiberglass)
 - Concentric design
 - Improved thermal exchange
 - Enables loop depths of 1,000 – 1,500 ft



Borehole Verticality

- Holes “walk” with variations in rock hardness, fracturing
- Displacement increases with depth
- Potential for borehole collisions



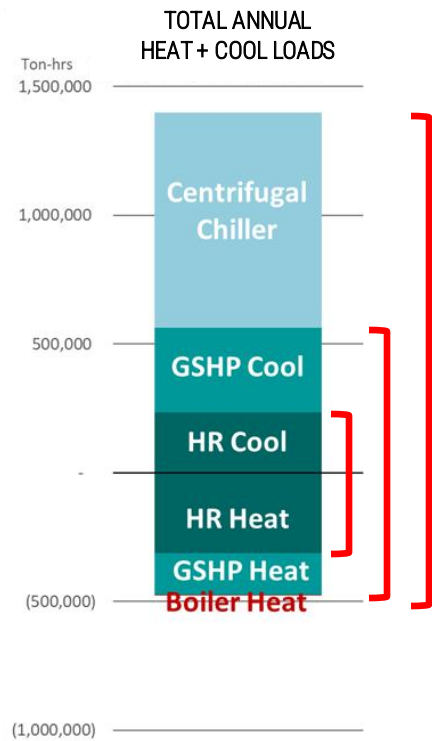
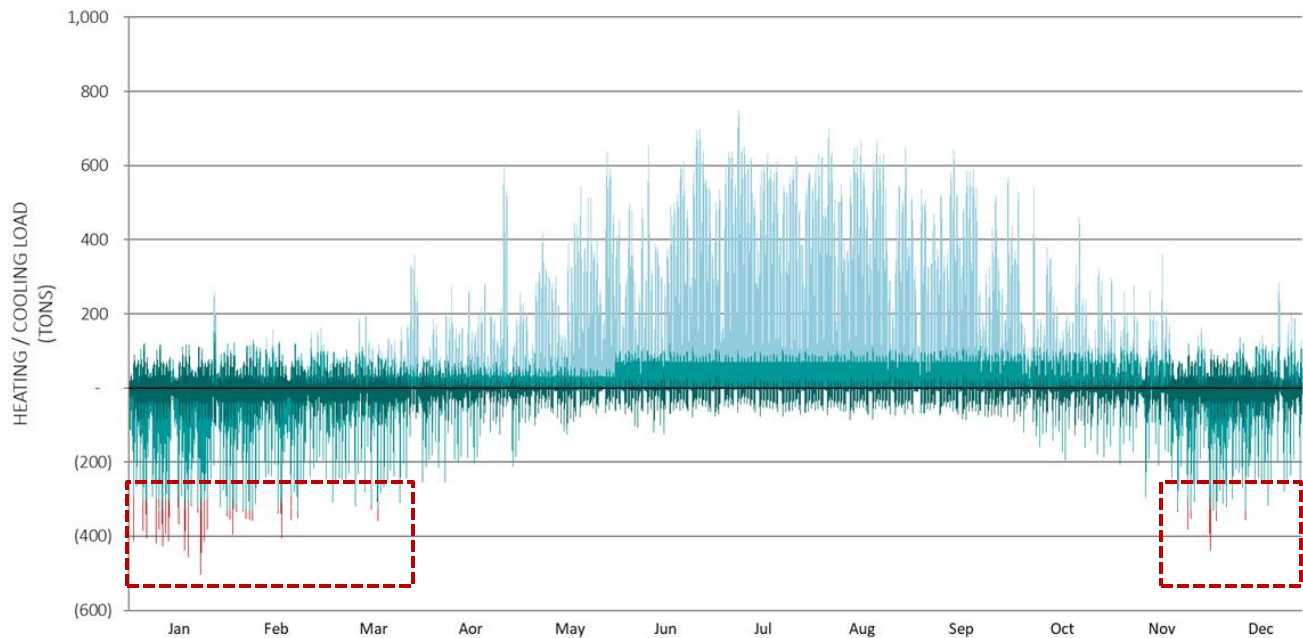






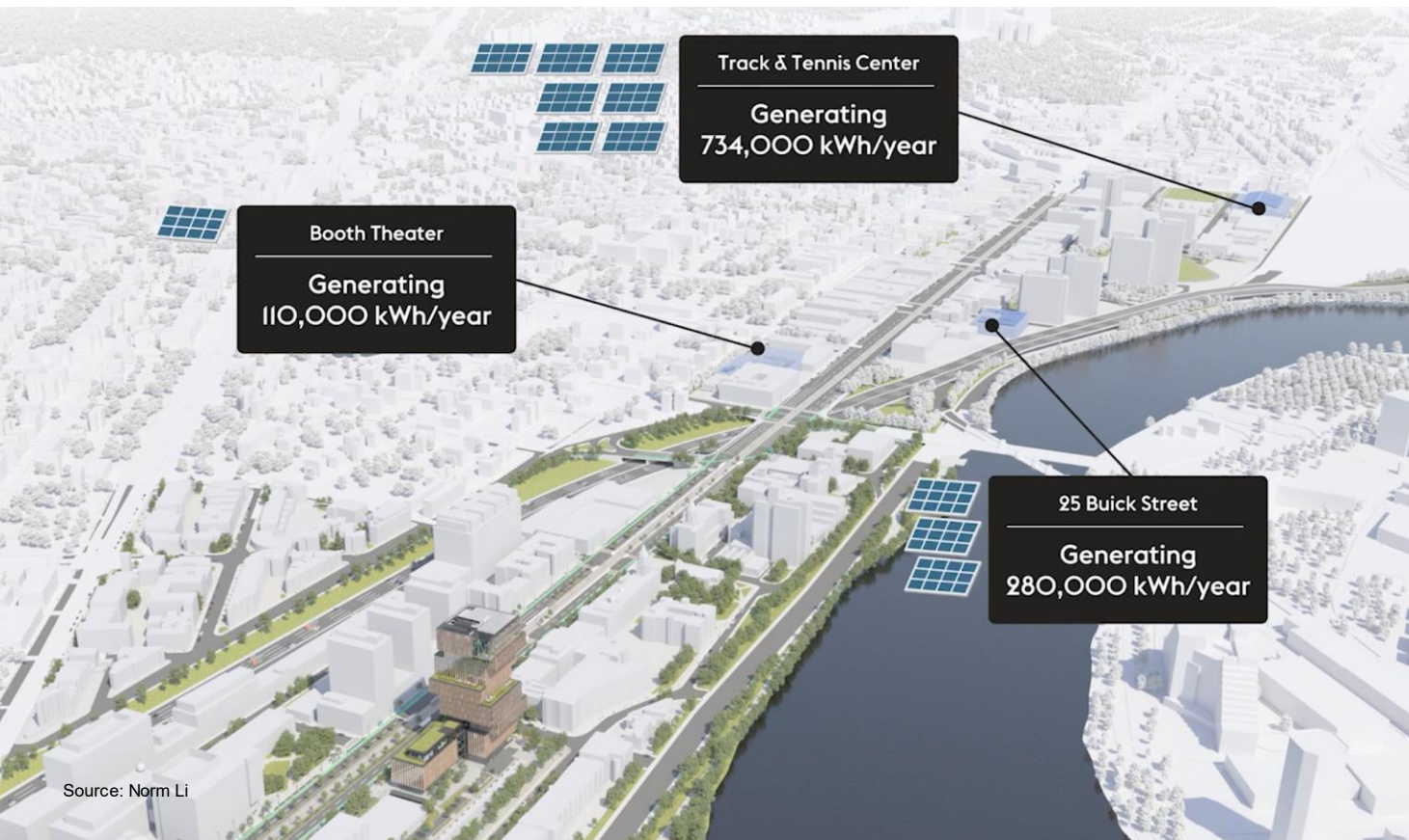
Reason #2 Net-zero direct emissions

MODELED HOURLY HEATING + COOLING LOADS
LONG-TERM OPERATION



Reason #2 Net-zero direct emissions

Renewable energy



BU Solar

- 734,000 kWh/yr
- 280,000 kWh/yr
- 110,000 kWh/yr

Total

- 1,124,000 kWh/yr

Reason #2 Net-zero direct emissions

Renewable energy



BU Wind

- 205,000,000 kWh/yr



Reason #3 Indoor environmental quality

Interconnected spaces



Reason #4 Outdoor environmental quality

Green roofs



Reason #5 Embodied carbon

Reducing embodied carbon



Photo: Janice Checchio for Boston University Photography.

LEED
Platinum

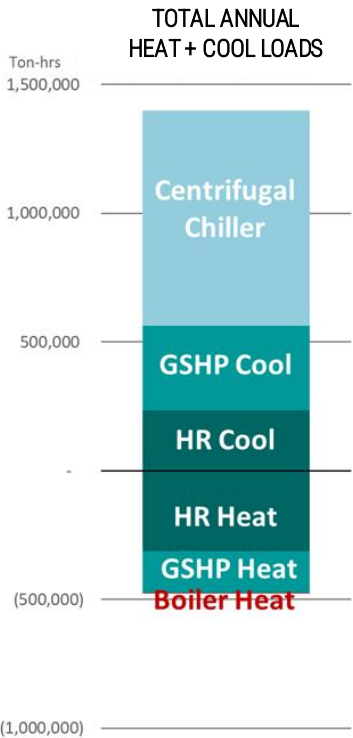
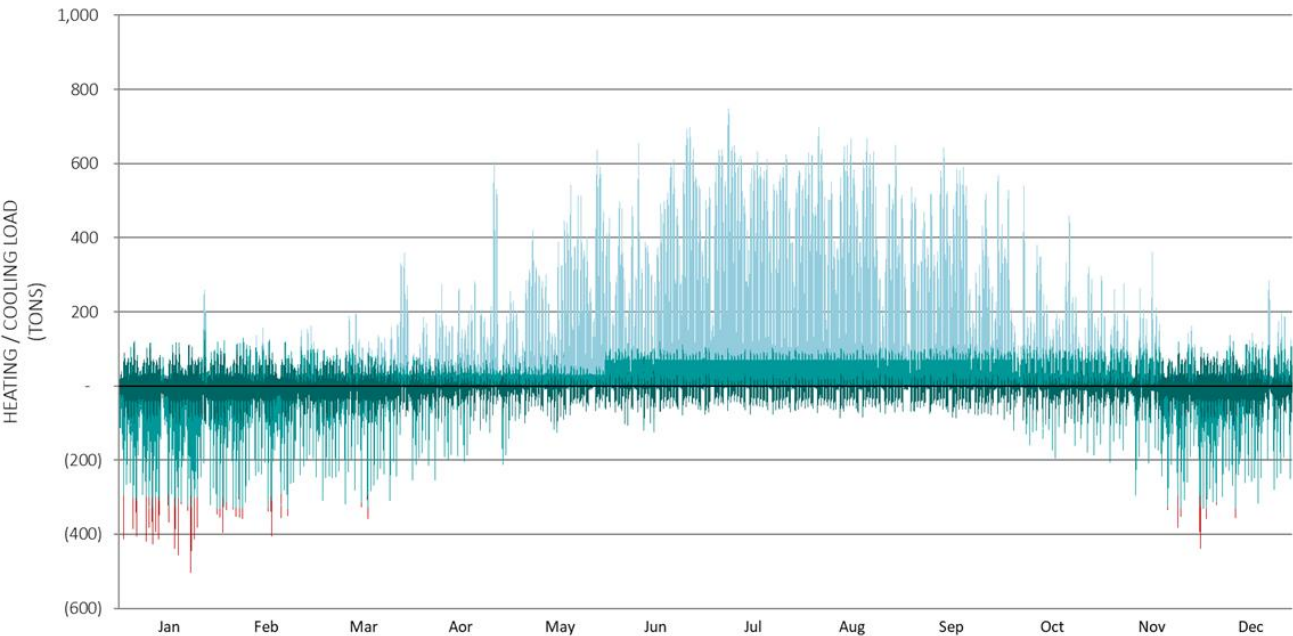


Photo: Tom Arban

PERFORMANCE?

Load Profile

MODELED HOURLY HEATING + COOLING LOADS
LONG-TERM OPERATION

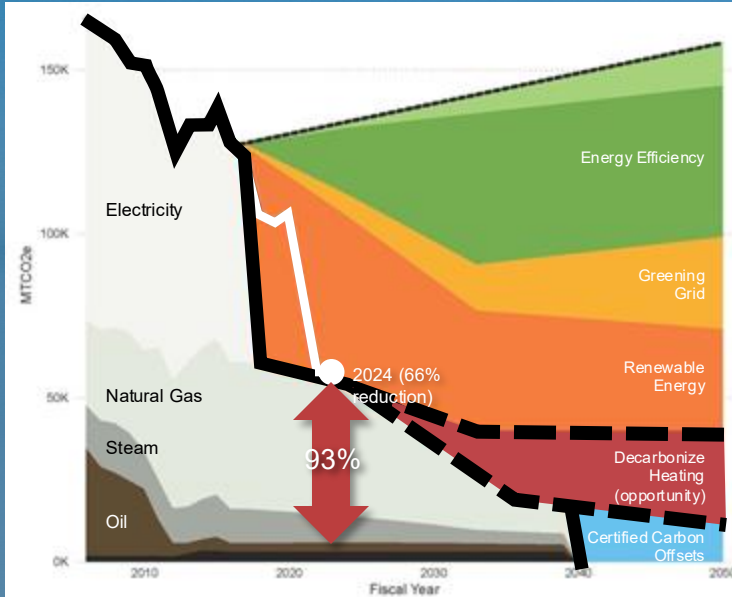


WHAT'S NEXT?

Climate Action – Decarbonization



Climate Action Plan Update - Strategies



Time to Update

- 8 years since Plan was approved
- Learning from implementing the Plan to date

Changes since 2017

- 100% of electricity now matched with renewables
- 93% of remaining emissions come from burning natural gas and buying district steam

Thank You.