Evolution of an Electrified Lab

I2SL October 2025

INTRODUCTIONS

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OBJECTIVES

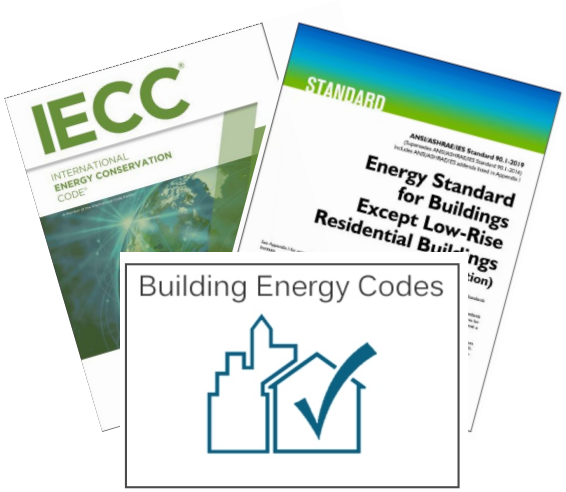
Identify the different types of electrification applicable to a lab building

Describe the changes in electrified lab design over the last decade

Understand how exhaust source heat pumps can help heat a campus

Compare different applications of electrification and how they apply to different projects

WHY ELECTRIFY?

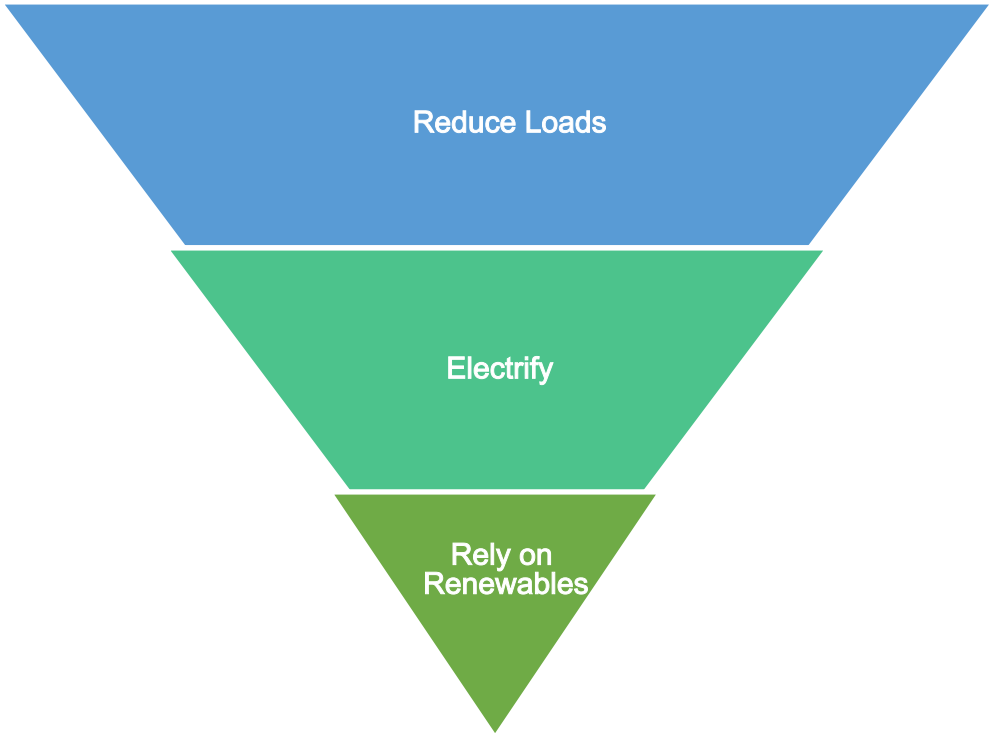


Code Requirement

Reduce Emissions

Owner Goals

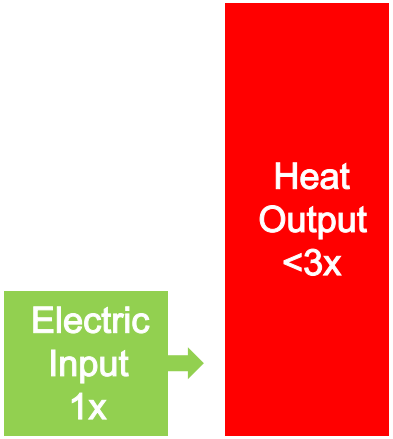
COST EFFECTIVE APPROACH TO ELECTRIFICATION

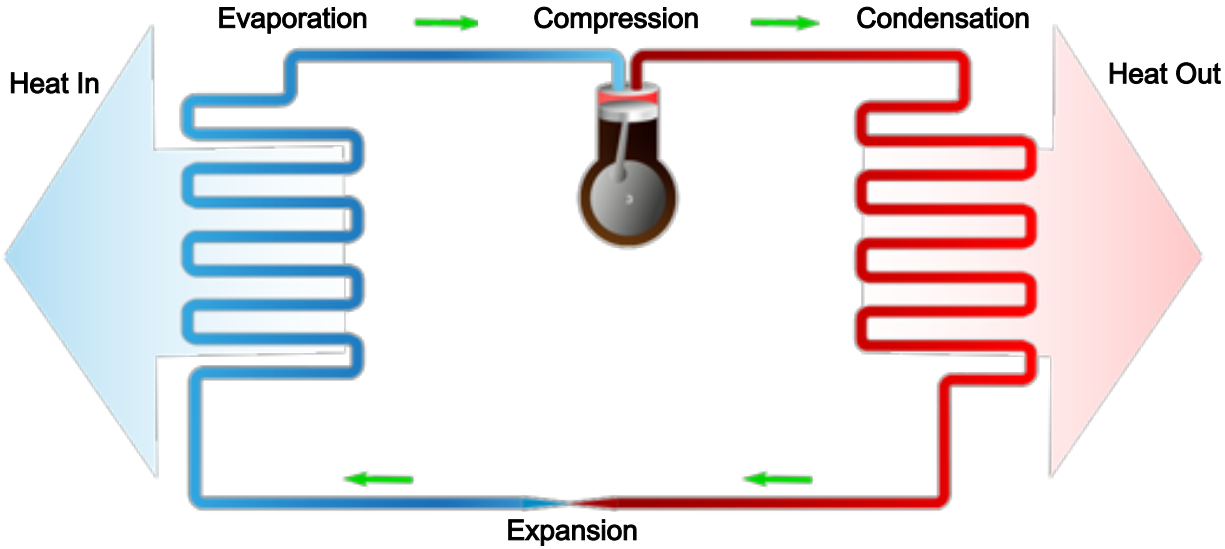


ELECTRIFY – Why Electric Heat Pumps?

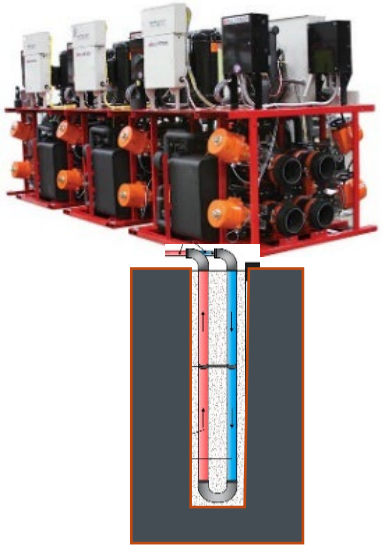
Electric Input 1x → Heat Output 1x

ELECTRIFY – Why Electric Heat Pumps?



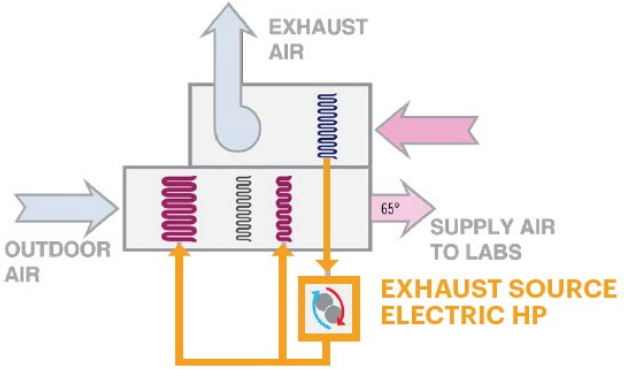


HEAT PUMP TECHNOLOGIES



GROUND-SOURCE

AIR-SOURCE



EXHAUST-SOURCE

Where we started

John J Sbrega Health & Science Building

Client: Bristol Community College

Size: 50,000 SF

Location: Fall River, MA

Completion: 2016

Building EUI: 50 kbtu/sf/yr

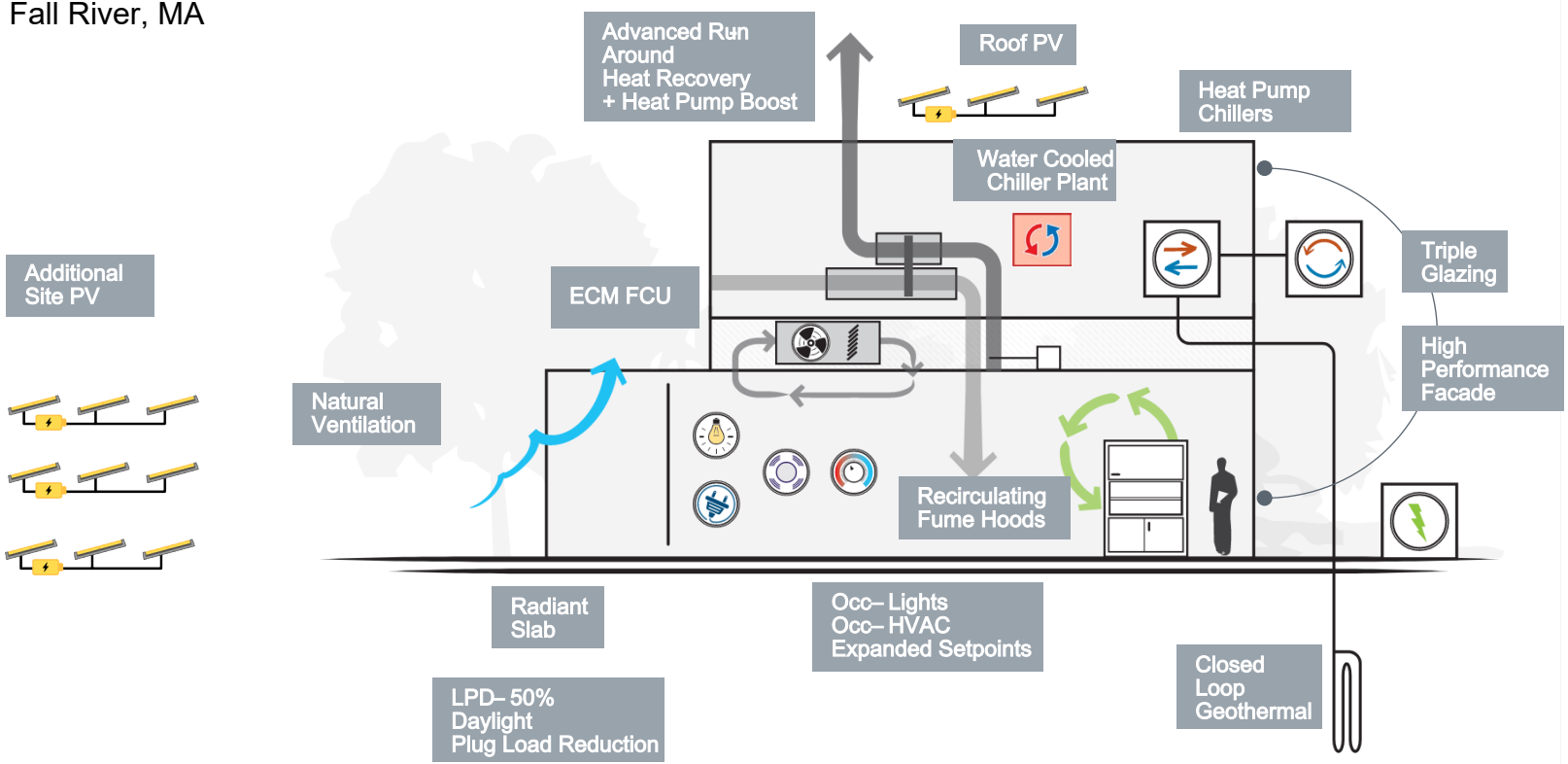
PV Production: 350,000 kWh Positive

1st Net Zero Lab in the US

BUILDING OVERVIEW

John J Sbrega Health & Science Building

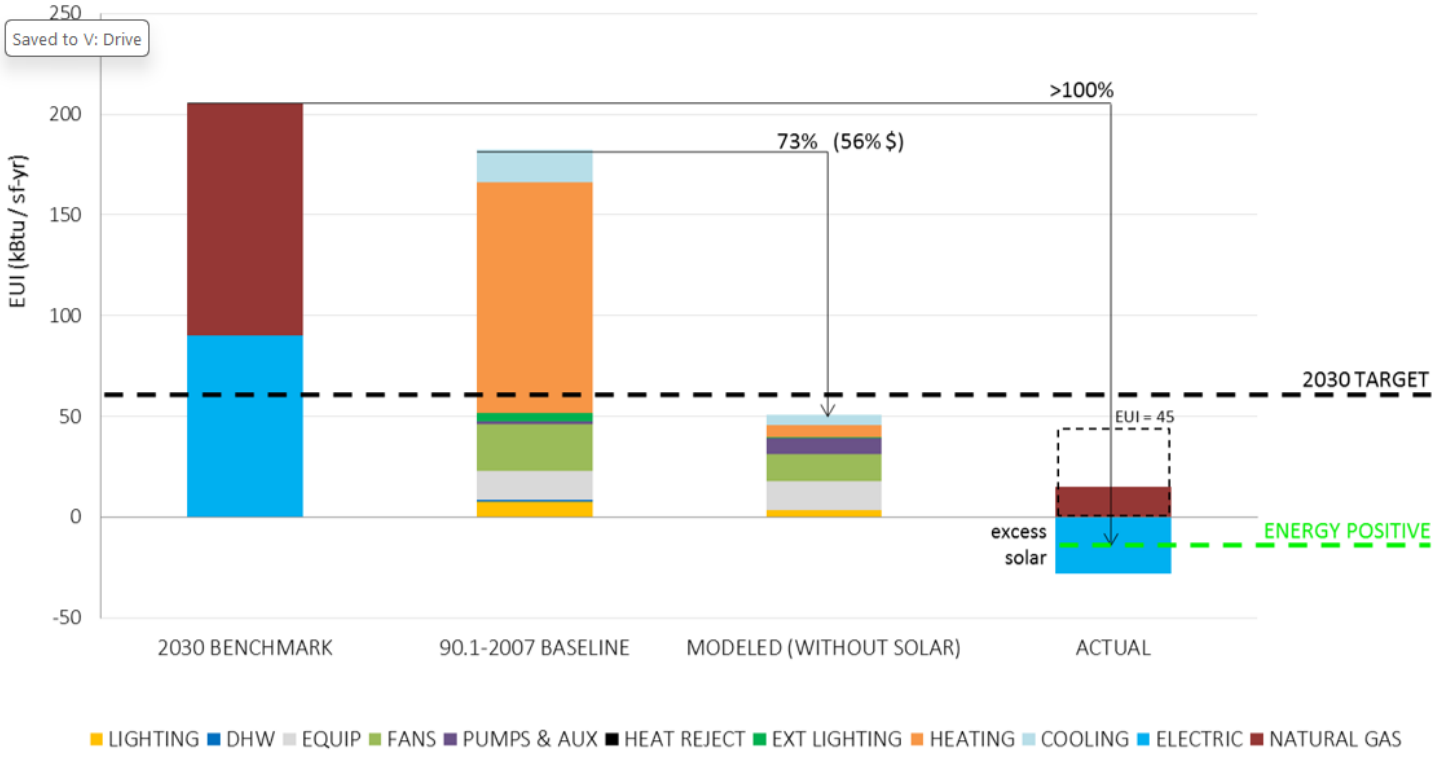
Fall River, MA



BUILDING OVERVIEW

John J Sbrega Health & Science Building

Fall River, MA



Moderna Headquarters

Client: Moderna

Size: 500,000 SF

Location: Cambridge, MA

Completion: 2023

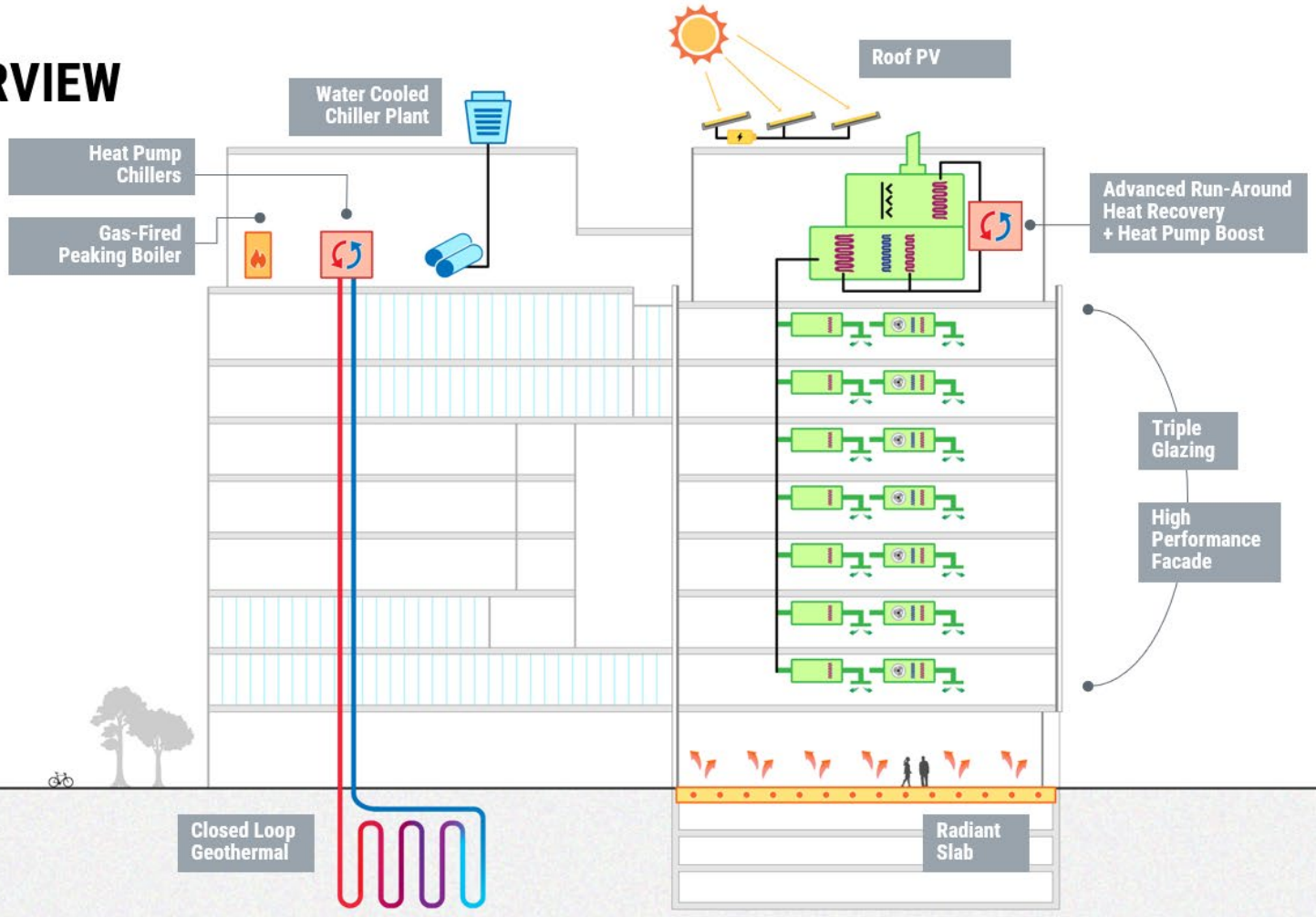
Building EUI: 146 kbtu/sf/yr

Most Sustainable Laboratory in Cambridge

BUILDING OVERVIEW

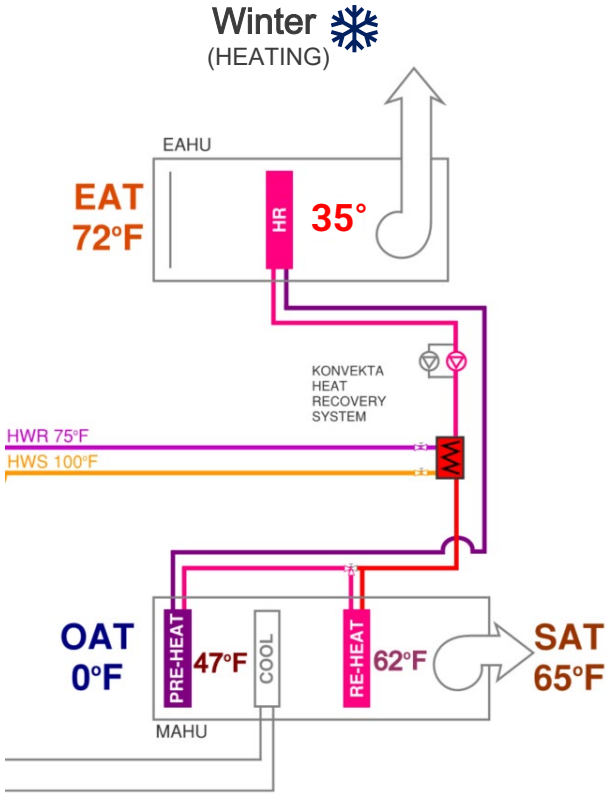
325 Binney Street

Cambridge, MA



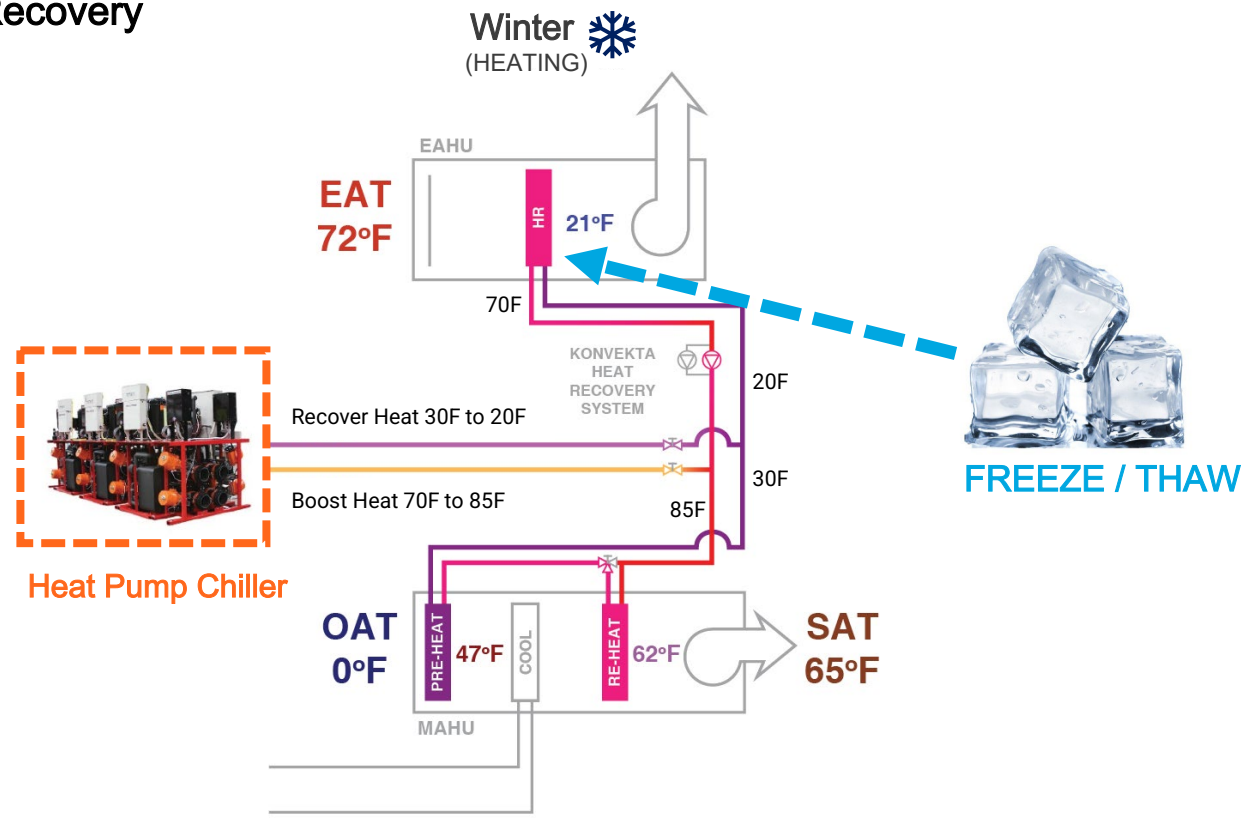
EXHAUST SOURCE – What is it?

Traditional Glycol Heat
Recovery Run Around Loop



EXHAUST SOURCE - What is it?

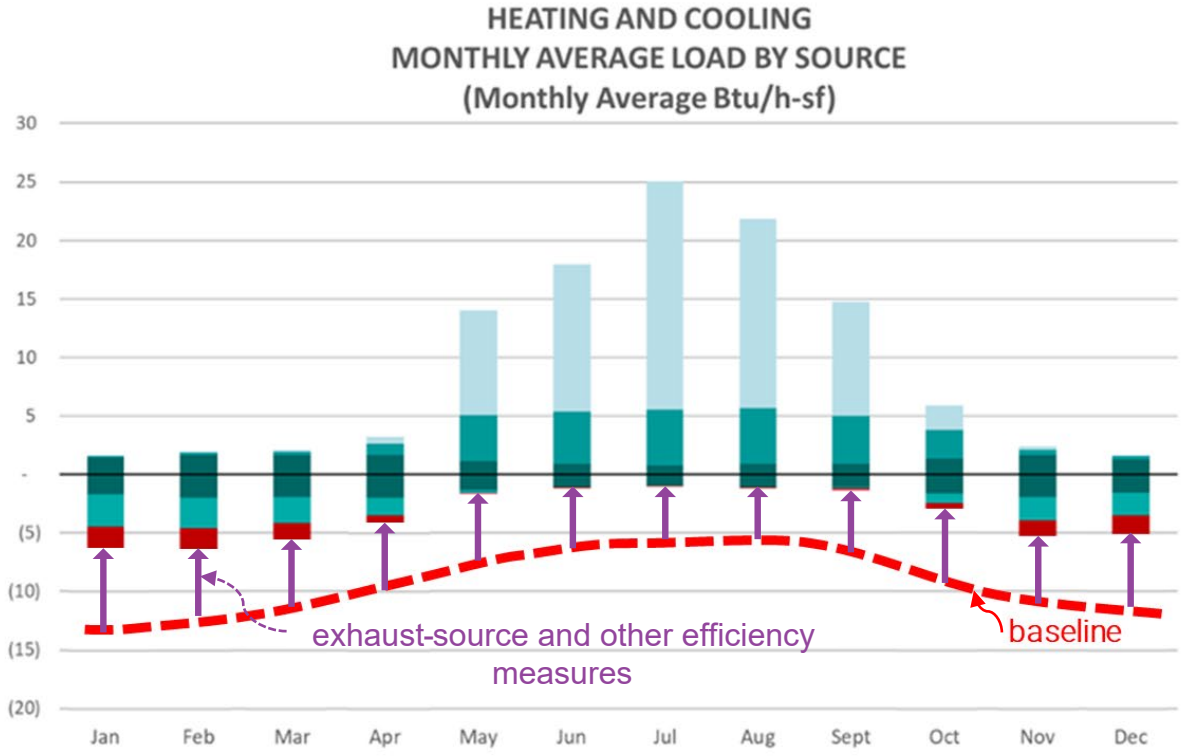
Advanced Run-Around Heat Recovery + Heat Pump Boost

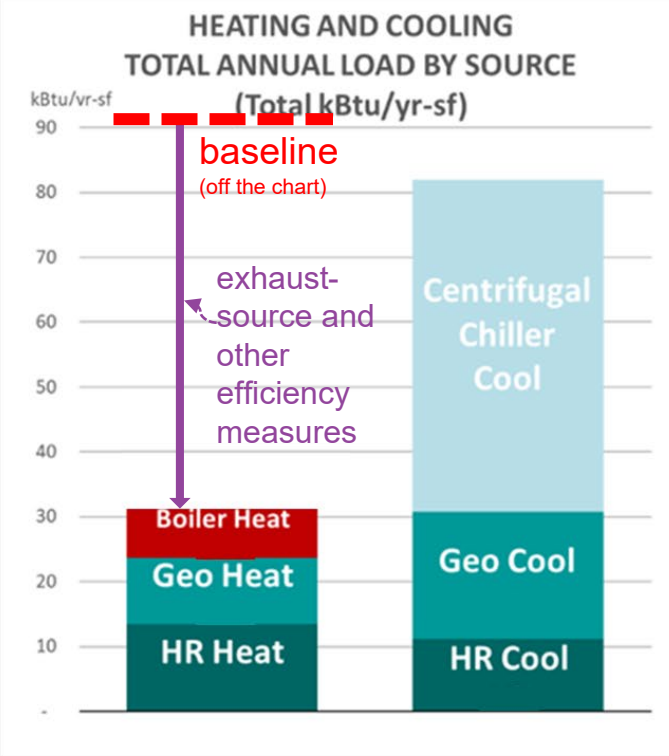


BUILDING OVERVIEW

325 Binney Street

Cambridge, MA





BUILDING OVERVIEW

325 Binney Street

Cambridge, MA

Harnessing Geothermal Energy

On Track to Have the Lowest Fossil Fuel Consumption Relative to Commercial Laboratory Buildings of Similar Size in Cambridge

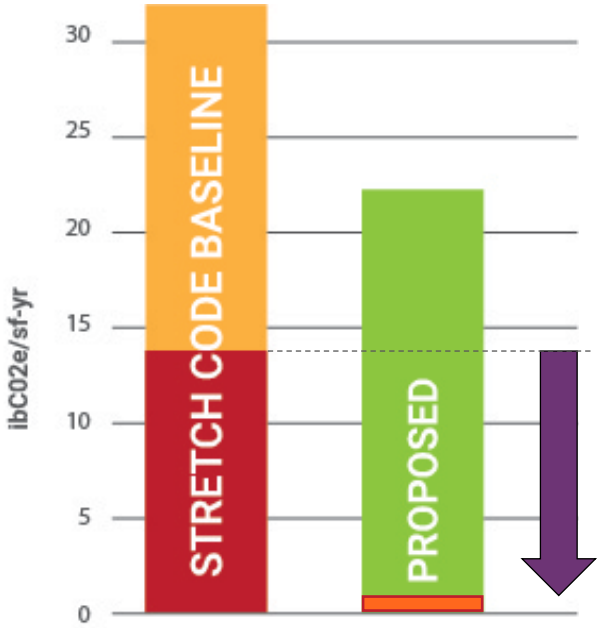
TARGETING

92% reduction in fossil fuel use

10% reduction in embodied carbon

100% of building energy consumption offset by on- and off-site renewable energy

LEED Platinum Core & Shell and **LEED Zero Energy** certifications



93% Fossil Fuel Reduction

Vertex Leiden Center II

Client: Vertex

Size: 345,000 GSF

Location: Boston, MA

Completion: 2026

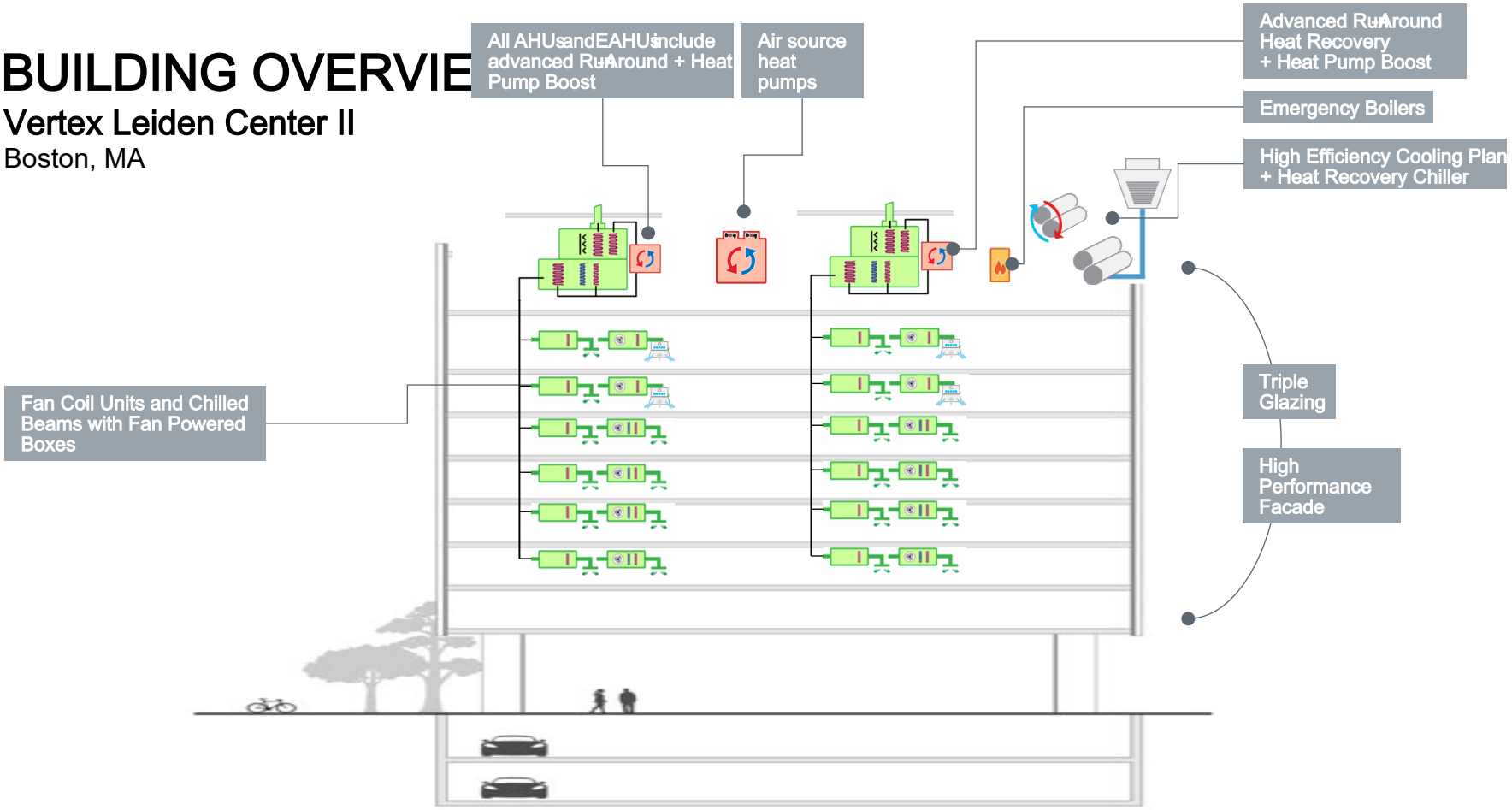
Building EUI: 128 kbtu/sf/yr

Designed to operate without fossil fuels down to 12F

BUILDING OVERVIE

Vertex Leiden Center II

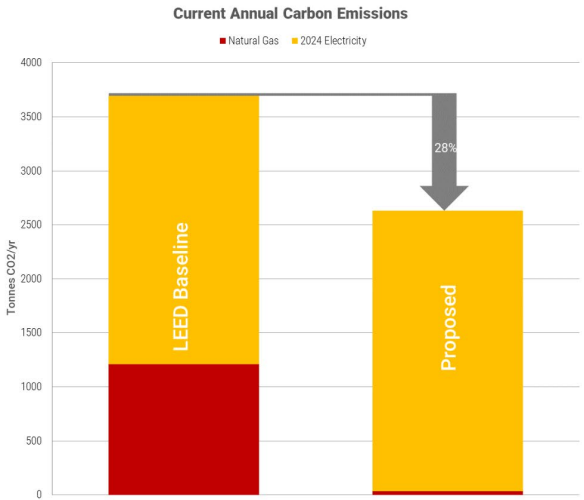
Boston, MA

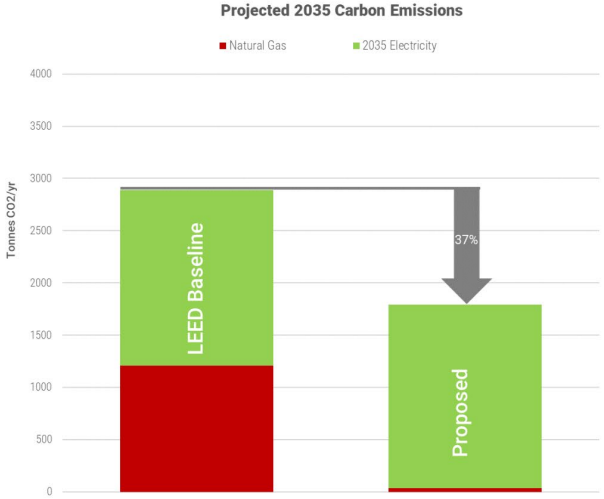


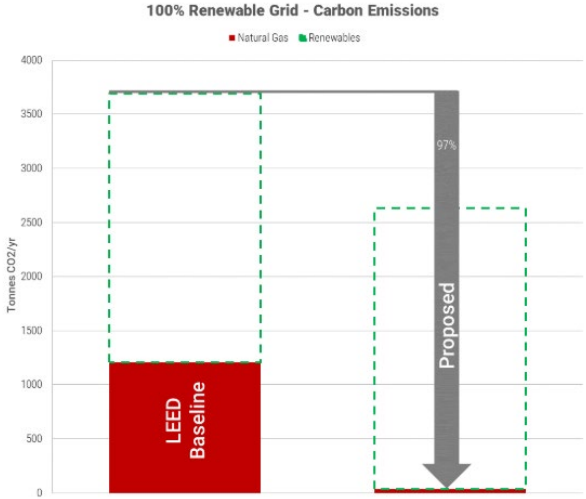
BUILDING OVERVIEW

Vertex Leiden Center II

Boston, MA







Integrated Life Science Building / Danoff Laborator

Client: Brown University

Size: 300,000 SF

Location: Providence, RI

Targeted Completion: 2027

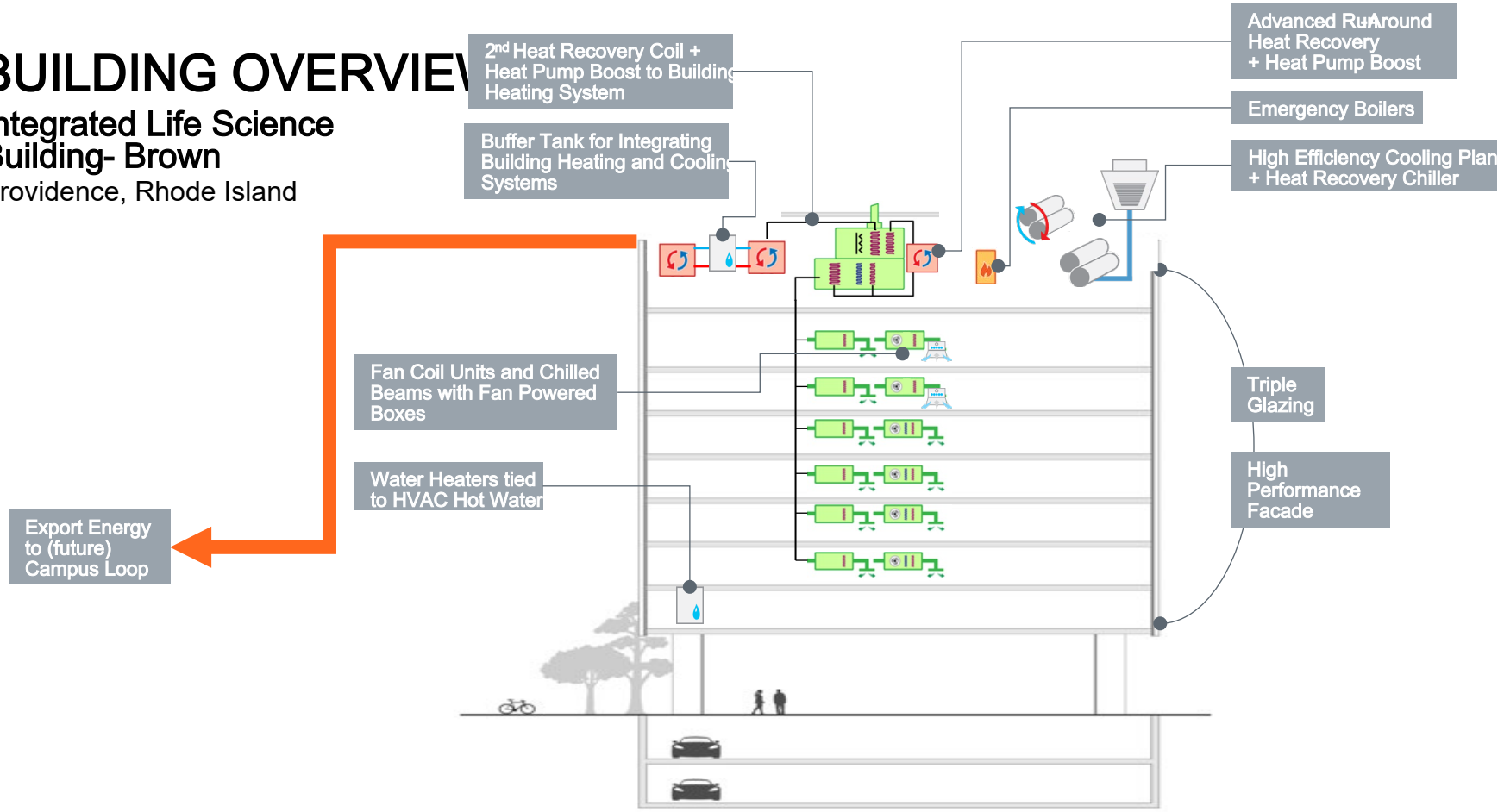
Building EUI: 127 kbtu/sf/yr

Brown began effort in 2019 to reduce greenhouse gasses by 75% by 2025, and full net zero carbon by 2040.

BUILDING OVERVIEW

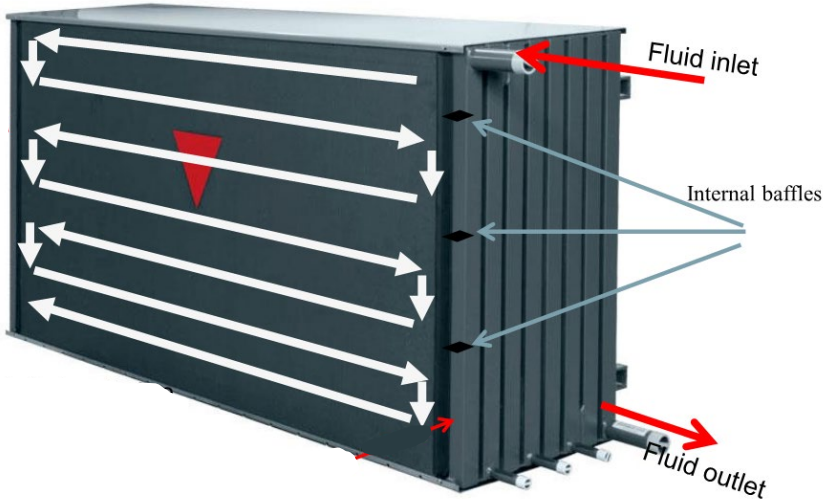
Integrated Life Science Building- Brown

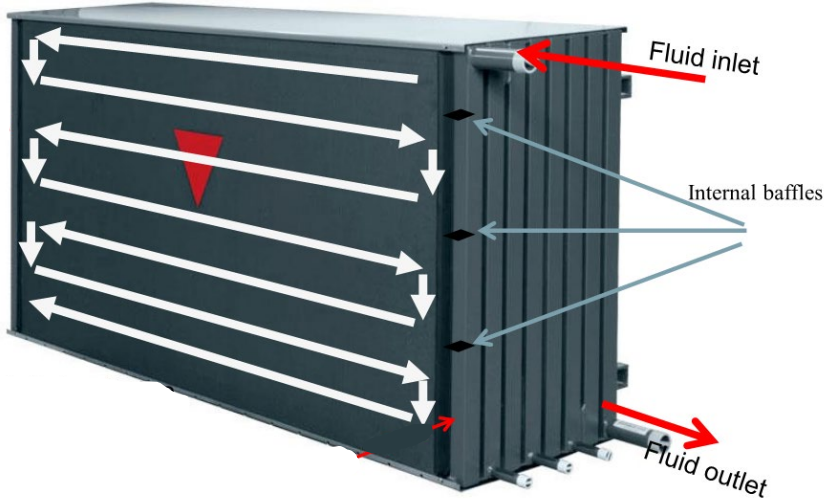
Providence, Rhode Island



INCREASED HEAT RECOVERY CAPACITY

2 Coils!

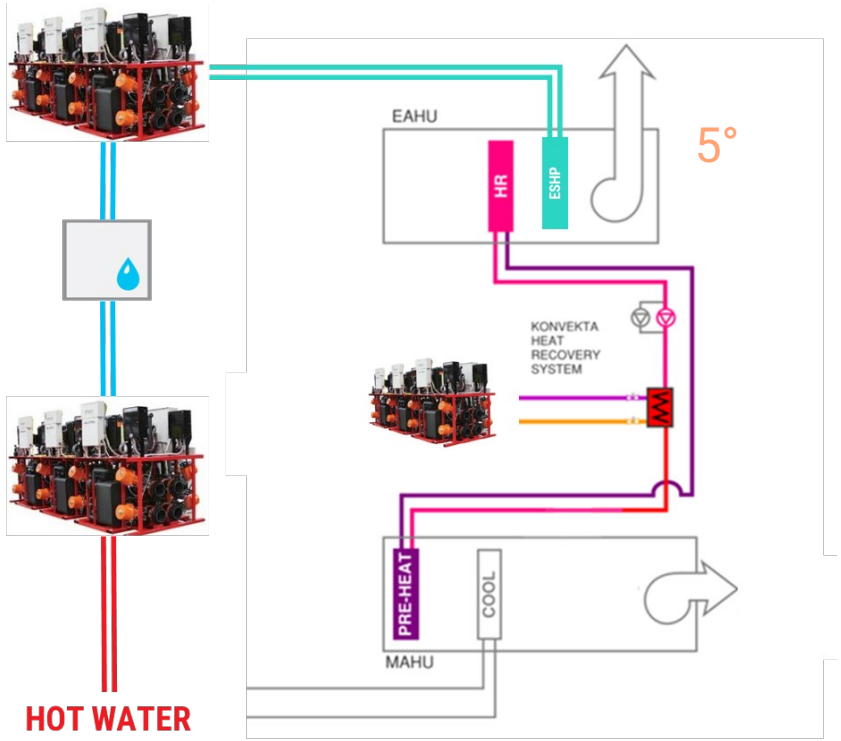




INCREASED HEAT RECOVERY CAPACITY

Integrated Life Science Building- Brown

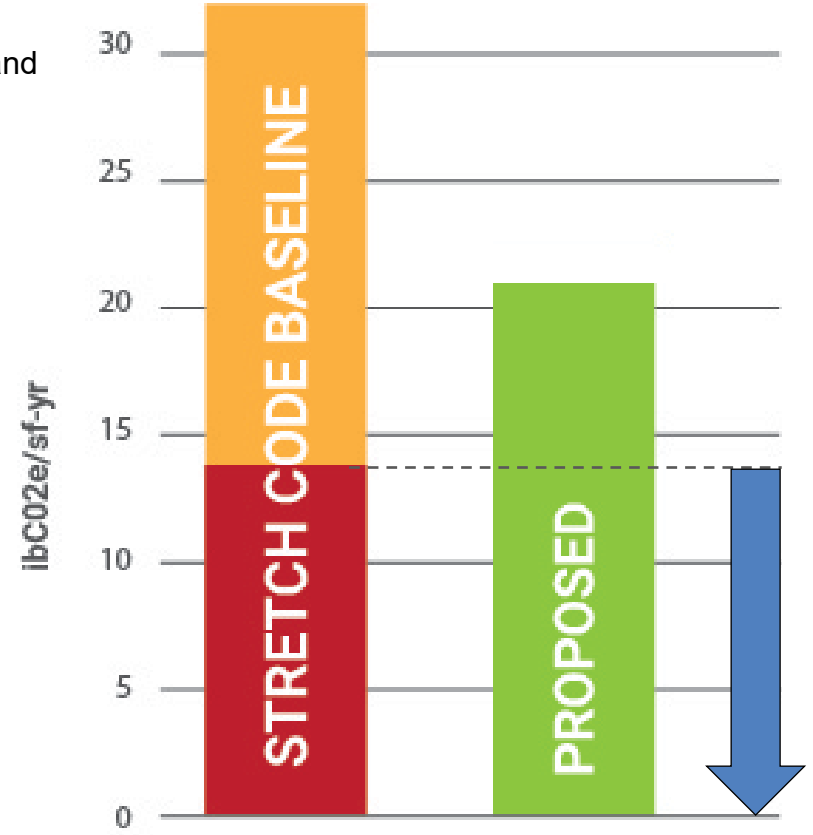
Providence, Rhode Island



BUILDING OVERVIEW

Integrated Life Science Building- Brown

Providence, Rhode Island

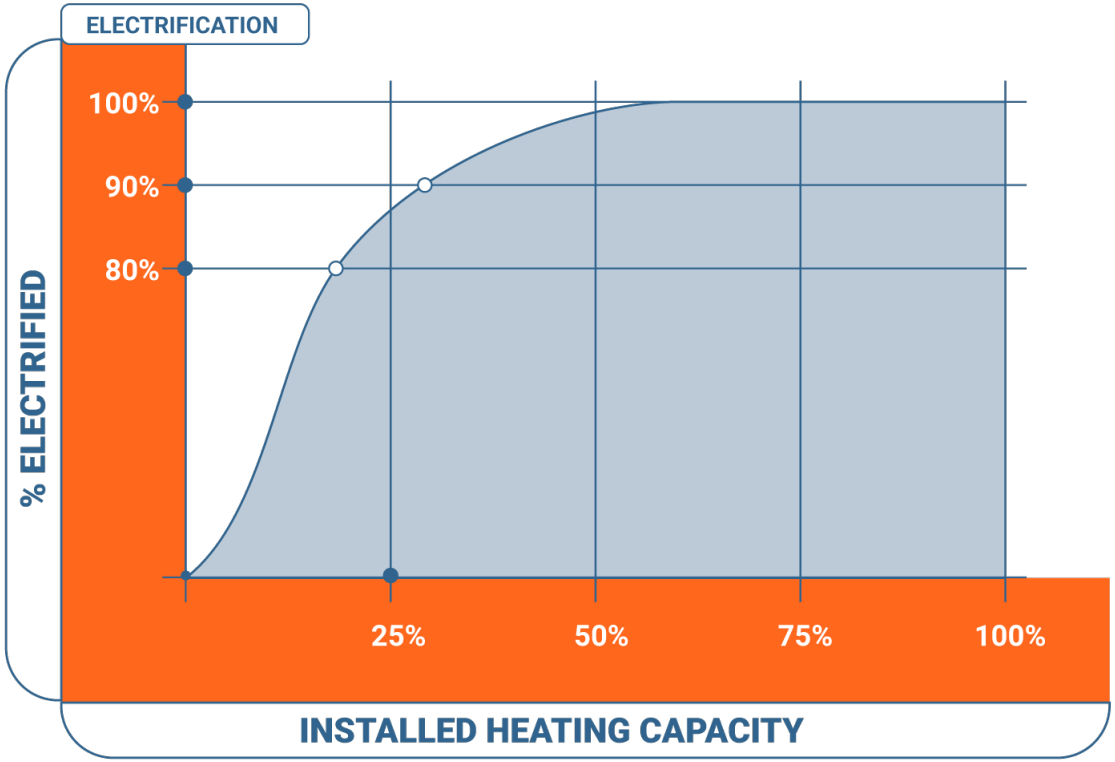


Future Campus Mitigated Loop

100% Electric Operation

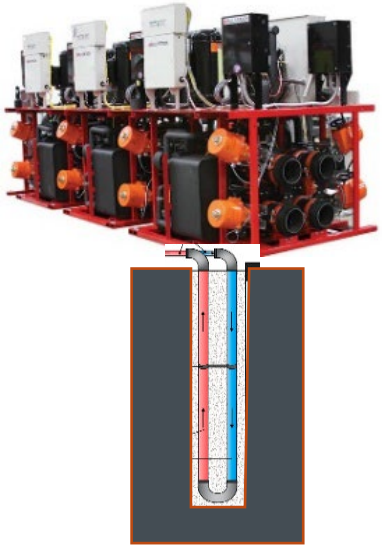
How Do You Apply This To YOUR Next Project?

% OF PEAK HEATING LOAD ELECTRIFIED

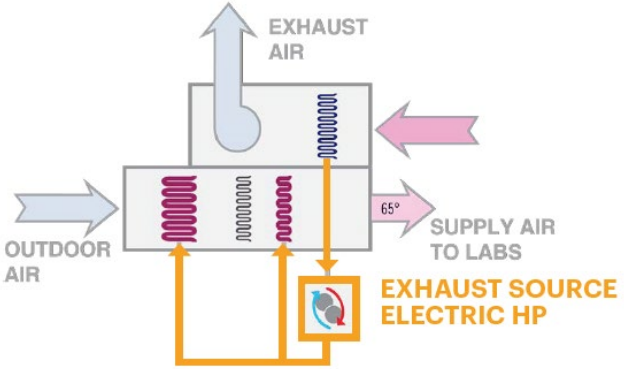


HEAT PUMP TECHNOLOGIES

AIR-SOURCE



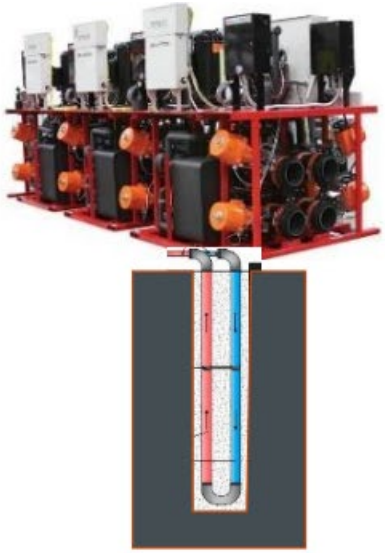
GROUND-SOURCE

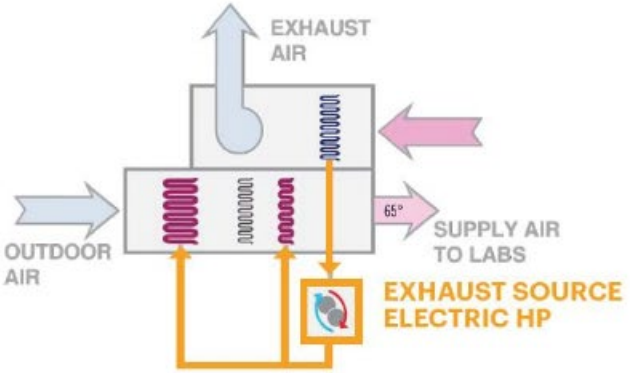


EXHAUST-SOURCE

HEAT PUMP TECHNOLOGIES – CHOOSING BY ADVANTAGE

Partial Electrification – Large Site



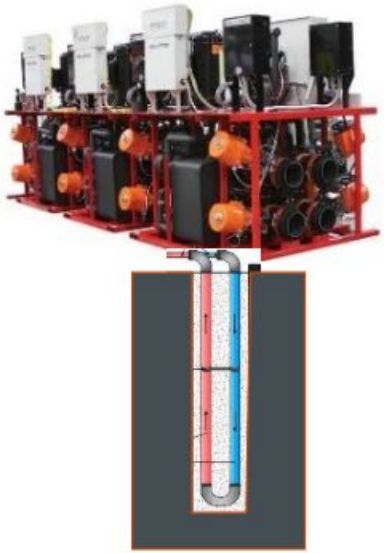


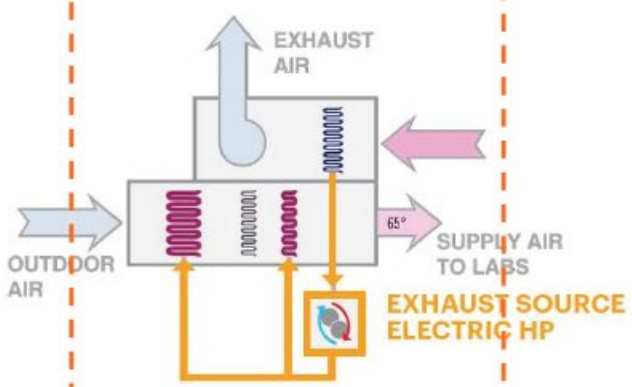
	AIR-SOURCE	GROUND-SOURCE	EXHAUST-SOURCE
Construction Cost	lowest	high (low with large incentives)	moderate
Life Cycle Cost	moderate	high (low with large incentives)	moderate
Reliable+Maintainable	poor	good	good
Space Requirements	moderate	largest	moderate

HEAT PUMP TECHNOLOGIES CHOOSING BY ADVANTAGE

High Electrification

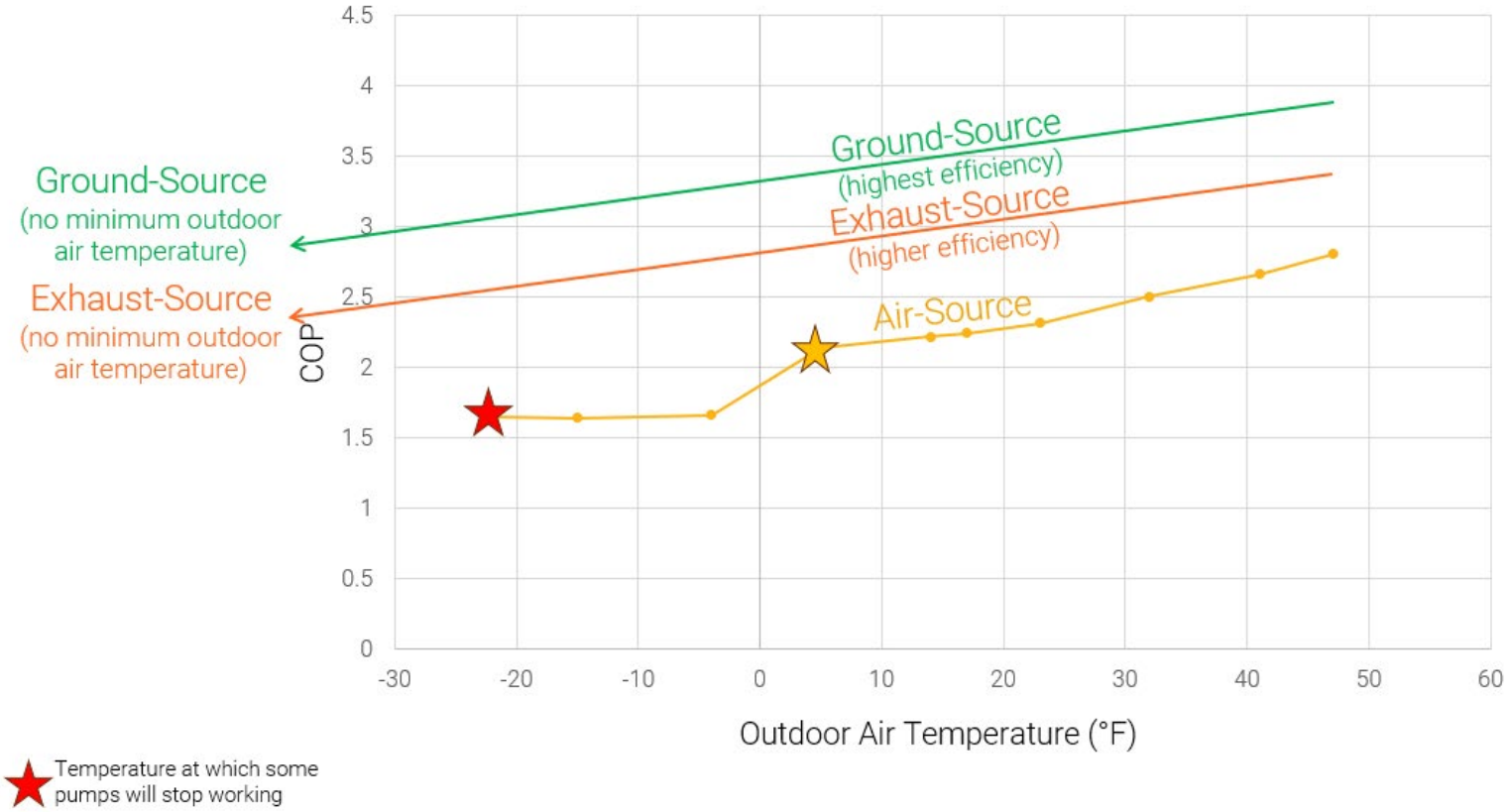
>60% Design Load,
>90% Fossil Fuel Reduction



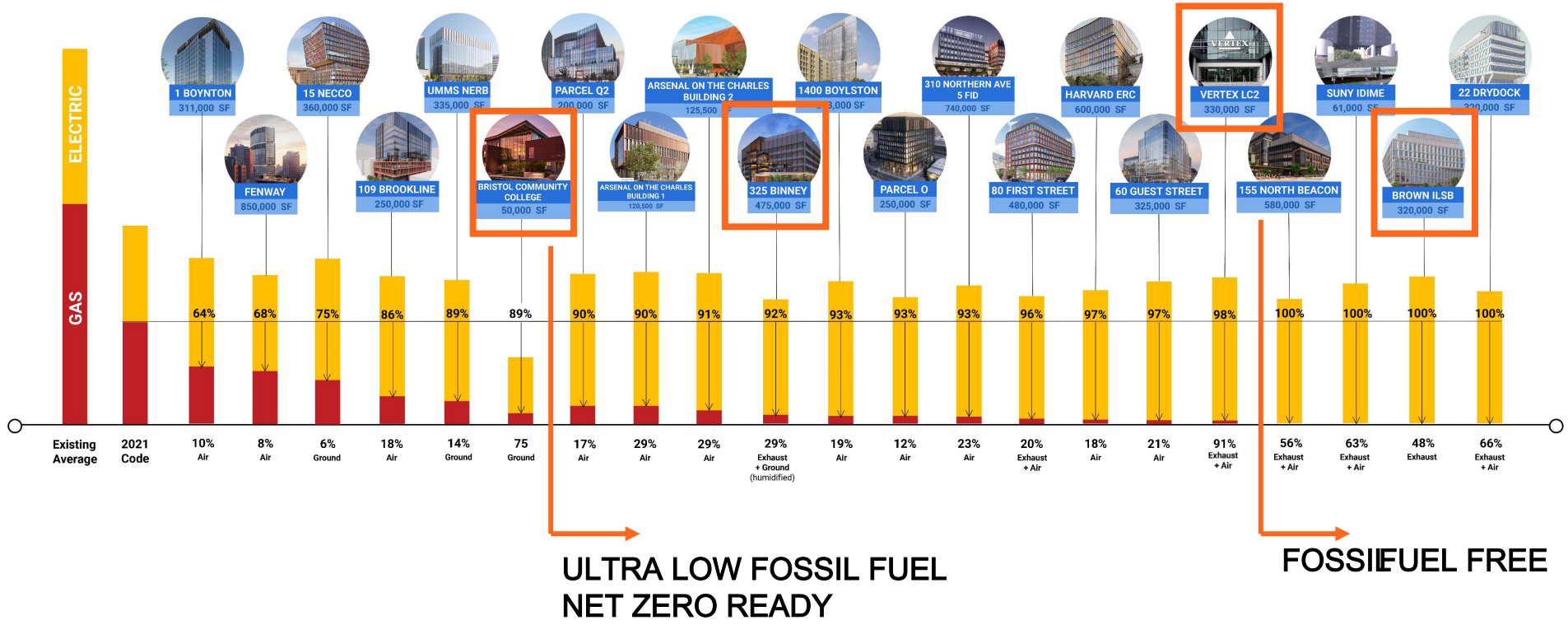


	AIR-SOURCE	GROUND-SOURCE	EXHAUST-SOURCE
Construction Cost	very high	very high	high
Life Cycle Cost	very high	very high	high
Reliable+Maintainable	very poor	good	good
Space Requirements	high	highest	moderate

TAILOR THE TECHNOLOGY TO YOUR CLIMATE ZONE



% OF PEAK HEATING LOAD ELECTRIFIED



ULTRA LOW FOSSIL FUEL
NET ZERO READY

FOSSIL FUEL FREE

QUESTIONS?

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