
A BETTER CITY
BUILT TO LEAD:
LESSONS IN BUILDING DECARBONIZATION IN EXISTING BUILDINGS
LEARN MORE HERE

BUILT TO LEAD: LESSONS IN BUILDING DECARBONIZATION AND RESILIENCE PANEL SERIES

1. **September 24th Built to Lead: Lessons in Building Decarbonization in Existing Buildings**
2. **October 30th Built to Lead: Lessons in Building Decarbonization in New Construction** (*1 Financial Center @ 10-11:30 AM)*

- Rustom Cowasjee, Tishman Speyer—*Enterprise Research Center (ERC), net zero residential building, hotel, and lab*
- Heather Henriksen, Harvard University—*ERC, conference center using Mass Timber and low embodied carbon concrete*
- David Gillespie, AvalonBay—*Salem, MA, passive house development*
- Christoph Stump, Trinity Financial—*Bronx, NY, passive house development*
- Yanni Tsipis, WS Development—*Seaport, net zero carbon office building using Sublime cement and all-electric systems*
- Randy Boles, Vertex—*Seaport, 95% electric lab development*

3. **Built to Lead: Lessons in New Technologies and Opportunities**
4. **Built to Lead: Lesson in Deconstruction and Embodied Carbon**
5. **Built to Lead: Lessons in Resilience**

A BETTER CITY

ADDITIONAL RESOURCES

Boston Green Ribbon Commission (GRC) Decarbonization Case Studies
GRC member institutions case studies highlighting projects that comply with BERDO requirements, while advancing climate innovation across Boston
greenribboncommission.org/approaching-net-zero/

BERDO Fest
October 23rd @ 12-6 PM event for BERDO building owners and property managers to meet and build connections with experts and professionals across the building decarbonization ecosystem
boston.gov/departments/environment/berdo-fest

The Massachusetts Building Performance Exchange
Built Environment Plus partnership with MassCEC to provide a resource to support building owners, professionals, service providers, and community leaders in reducing emissions and increasing efficiency in large existing buildings
builtenvironmentplus.org/exchange/

AGENDA

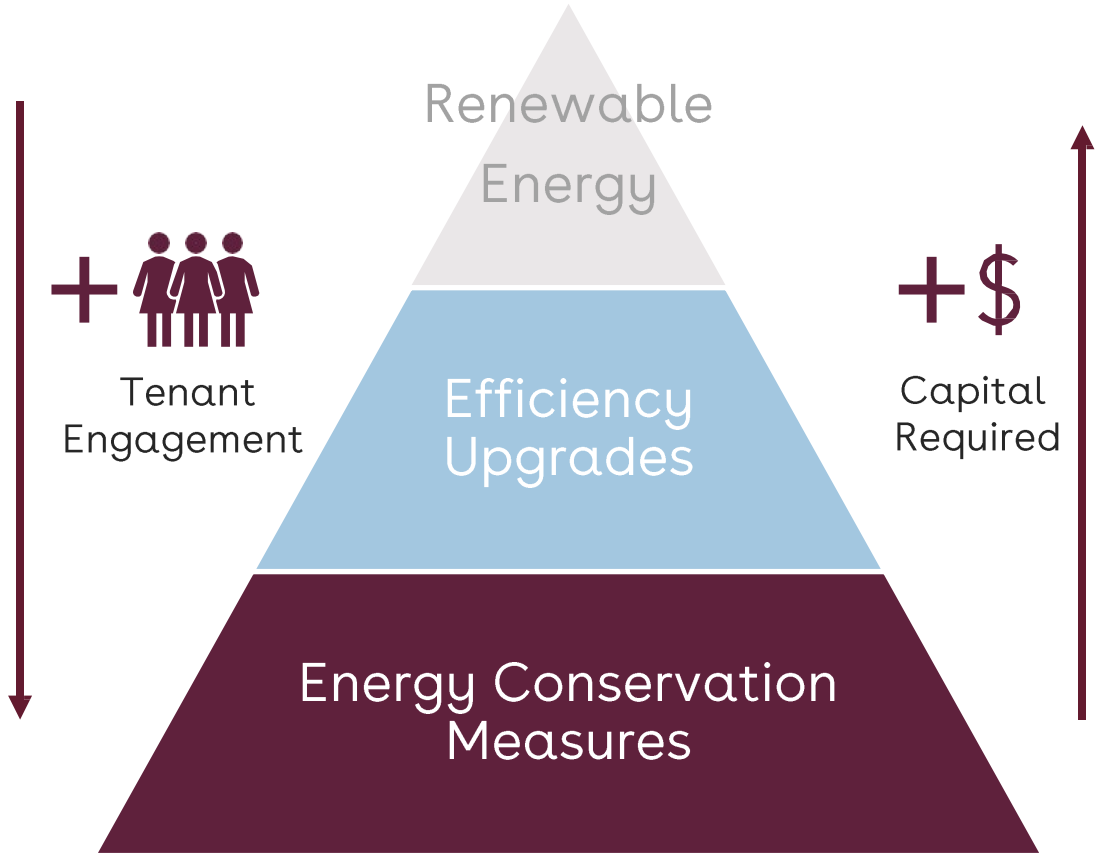
9:00 AM	**Kate Dineen, A Better City**—Welcome
9:02 AM	**Yve Torrie, A Better City**—Introduction
9:05 AM	**Torey Brooks, Pembroke**—*relaxing temperature settings in back-of-house pilot*
9:15 AM	**Saagar Patel, Equity Residential**—*new window technology pilot*
9:25 AM	**Al Scaramelli, Beacon Capital**—*building equipment optimization pilot*
9:35 AM	**Neetu Siddarth, BXP**—*waste heat recovery project*
9:45 AM	**Kailash Viswanathan, Consigli**—*retrofit phasing pilot in a Hines building*
9:55 AM	**Q+A**, facilitated by Yve Torrie, A Better City
10:30 AM	**Event Concludes**

TOREY BROOKS, PEMBROKE

Temperature Setting in Buildings

High prevalence of overly conditioned office spaces

- ~58% of energy used in US office buildings is for heating, ventilation & air conditioning (HVAC)*
  - Reducing HVAC load is a key energy conservation measure
- Typical sources of guidance only give wide ranges
  - OSHA: 68°F-76°F
  - ASHRAE 55: 69°F-78°F
- Most offices are set to temperature norms developed in the 60's and 70's
  - Males in a full business suit
  - Nearly full occupancy assumed
  - Older, less effective building systems
- Adjusting temperature settings can be a positive way to engage with tenants on sustainability while simultaneously improving comfort



*Source: U.S› Energy Information Administration, Commercial Buildings Energy Consumption Survey

Pembroke Heating & Cooling Temperature Setting Pilot Initiatives

BOH & Common Areas

- Lobbies, amenity spaces, multi-tenant corridors/ bathrooms
- *Estimated 2-5% energy consumption reduction for base building*

+

Smart Set Tenant Pilot

- Tenant space, single tenant corridors & bathrooms
- *Potential for up to 20% improvement in individual spaces*

=

Whole Building Energy Savings

- High potential for energy savings with minimal disruption or capital improvements
- *Estimated 5-10% energy reduction overall*

Pembroke Lessons Learned & Replicability

Savings are dependent on maximizing square footage engaged and technical capabilities

- Tenant Engagement is key for whole building savings
- Building system & control capabilities are major factors for success
- Tenant considerations such as winter sensitivity and incremental change is imperative

- Conduct building controls assessment (ensure thermostats are calibrated!)
- Start with low hanging fruit such as off-hours best practices and common areas
- Make changes maximum of 1 degree at a time and start in spring or summer

Contact for Questions: PembrokeSustainability@Pembroke.com

SAAGAR PATEL, EQUITY RESIDENTIAL

New Fenestration Test Pilot

Equity Residential

SEPTEMBER 2025

Equity Residential At-a-Glance

310
Communities

80,407
Units

12
Strategic Markets

2021 USGBC LEED Homes Award for Chloe on Madison in Seattle

1st
Residential REIT included in both Dow Jones Sustainability World and North American Indices

100%
LEED Gold+ for all new developments and HQ redesigns

98th
Percentile for Global REITs 2024 S&P Corporate Sustainability Assessment

Guiding Principles

Decarbonization and Resource Conservation: Operate the assets we have today as efficiently and cost-effectively as possible while proactively planning to reduce reliance on fossil fuels and other resources.

Healthy and Resilient Communities: Ensuring the properties we own, acquire, and develop are protected against a changing climate and provide a stable, healthy home for our residents.

Industry Leadership and Governance: Position EQR as the most attractive investment in our asset class due to our preparedness to operate in a low-carbon economy and ability to comply with future regulations.

Equity Residential

West 96th Apartments

West 96 Apartments- New York

W96 is a 10 Floor Apartment building on the Upper West Side of NY

The building consists of:

- 209 Units
- Through wall PTACs with Steam Reheat
- Onsite Cogen System
- Steam Boilers

Grid Carbon Emissions

LOCAL LAW 97: Summary of GHG Emissions Fuel Coefficients

- **70%** of electricity will be from renewable energy source by **2030**
- State aims to achieve **100% renewable** electricity by **2040**
- **ConEd** has **district steam** GHG reduction goals

	GHG Coefficient (tCO2e/kBTU)			
Fuel	**2024-2029**	**2030-2034**	**2035-2039**	**2040-2050**
Grid Electricity per kwh	0.000288962	0.000145	0.0000866886	0.0000000
Natural Gas	0.00005311	0.00005311	0.00005311	0.00005311
Fuel Oil #2	0.00007421	0.00007421	0.00007421	0.00007421
Fuel Oil #4	0.00007529	0.00007529	0.00007529	0.00007529
District Steam	0.00004493	0.00004320	0.00003200	0.00002500

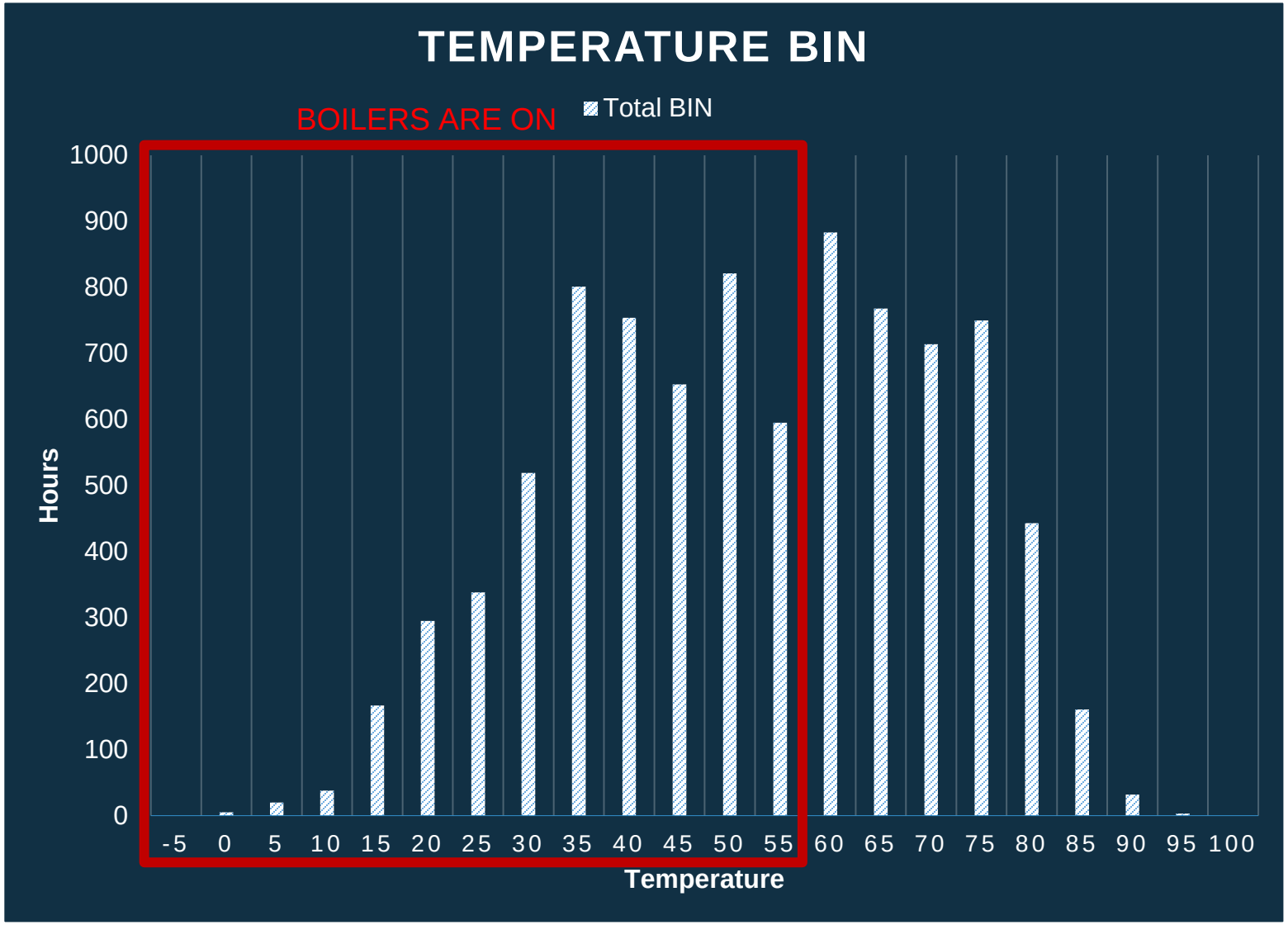
29

build safe | live safe

NYC Buildings

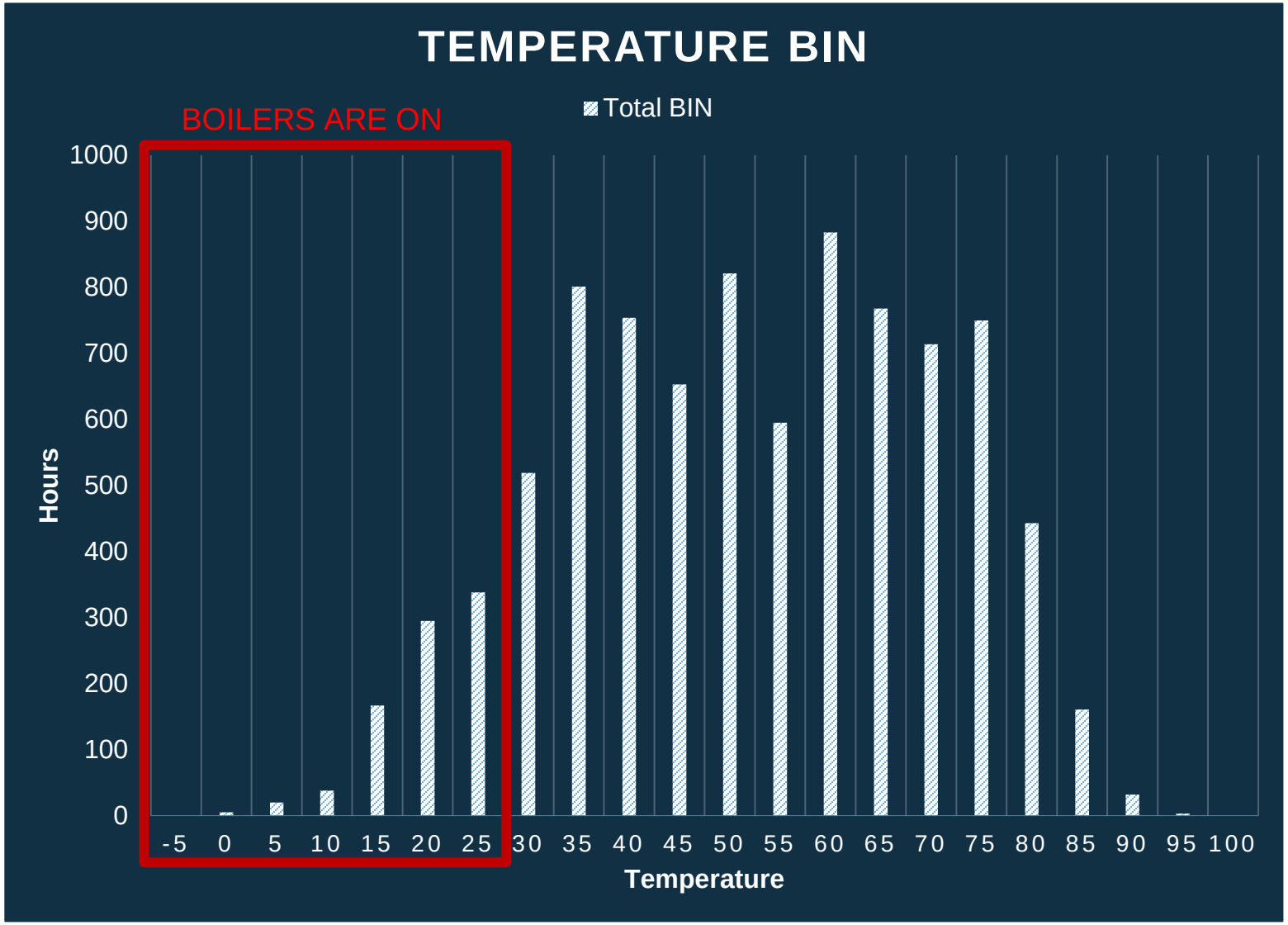
	2024-2029	2030-2034
Elec to NG Comparison	**5.44**	**2.73**

Boston Emissions Factor (via BERDO)	
Fuel Type	Emissions [kgCO2e/MMBtu]
Electricity - 2023 Data	77.1
Natural Gas	53.1
Elec to NG Comparison	**1.45**



Temp < 55 ~5000 Hours

Temperature Bin (F)	HOURS
-5	0
0	5
5	20
10	38
15	167
20	295
25	338
30	519
35	801
40	754
45	653
50	821
55	595
60	883
65	768
70	714
75	750
80	443
85	161
90	32
95	3
100	0



Temp < 30 ~1300 Hours

Temperature Bin (F)	HOURS
-5	0
0	5
5	20
10	38
15	167
20	295
25	338
30	519
35	801
40	754
45	653
50	821
55	595
60	883
65	768
70	714
75	750
80	443
85	161
90	32
95	3
100	0

PTHP Performance

- Ideally convert PTACS to PTHPS
- Low temp PTHPs still struggle below 30 Deg
- Back up electric heaters use a lot of power (2 kW)
- Additional power for defrost cycles

NYSERDA-
High-Performance Packaged Terminal Heat Pump Market and Development Research Report

Figure 6. LG model LP093HDUC1 heating capacity vs. outdoor temperature

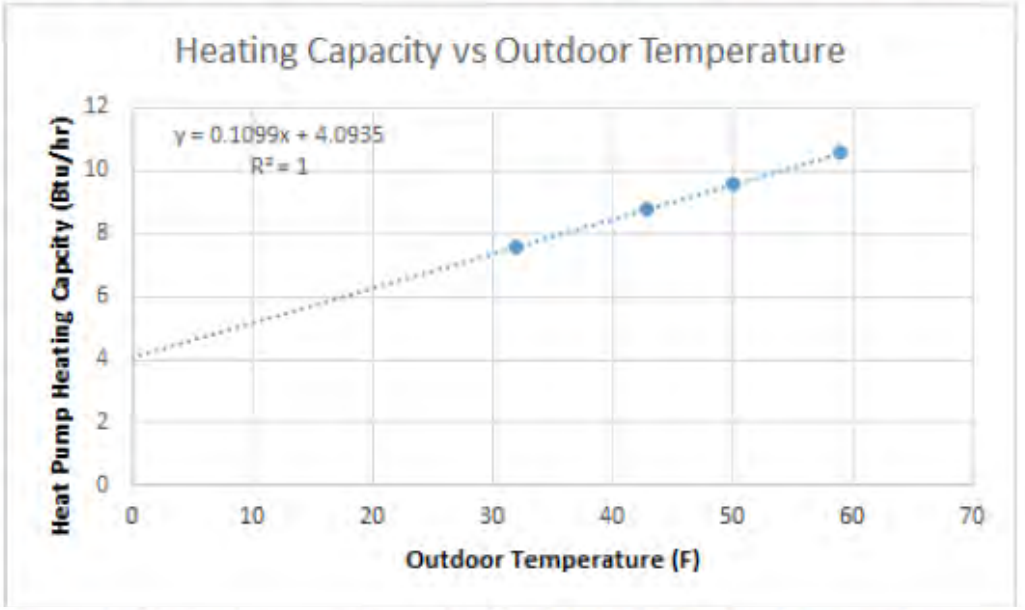
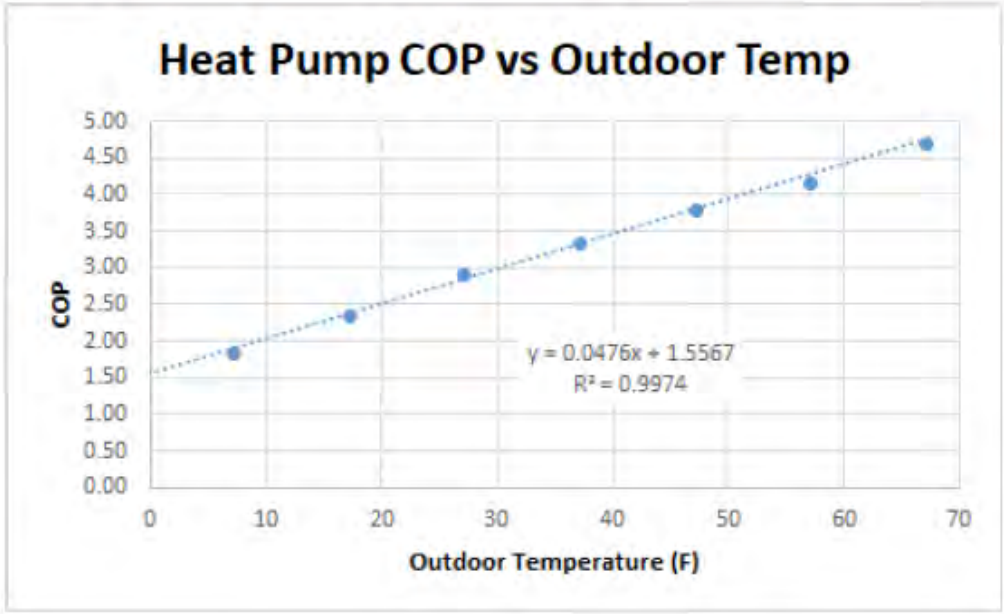


Figure 8. Carrier heat pump model 25HCC518A30 rated COP vs. outdoor temperature



Decarb Dilemma

Dilemma 1

- Balancing decarbonization reduction efforts needed now against grid emissions in the future

Dilemma 2

- PTHPS efficiencies below 30 deg F drop and have to use electric heaters

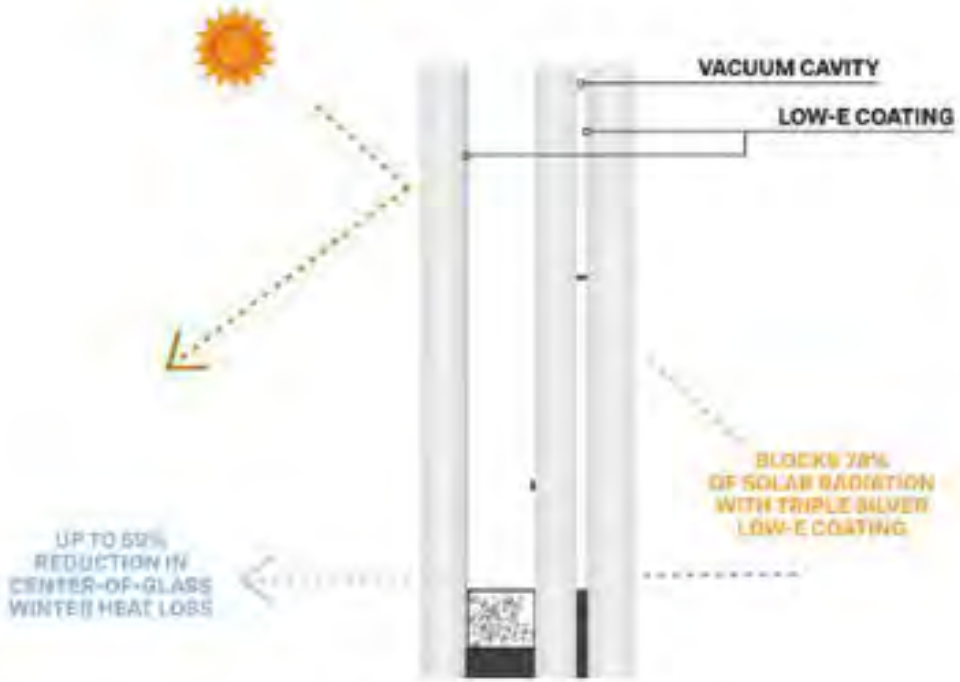
Dilemma 3

- Tenants are not used to paying for electricity for heat in the winter months

Conclusion: To decarbonize effectively in a short time horizon but not sacrifice thermal comfort performance- EQR must reduce the thermal loads the property to reduce the use of the PTACs (and future PTHPs)

LUXWALL™

Enthermal PLUS | u-0.047



Surface 2,5 configuration as shown.[3]

R21
Center of Glass Insulation

77
Condensation Resistance Factor

0.22
Solar Heat Gain Coefficient

35+
Sound Transmission Coefficient

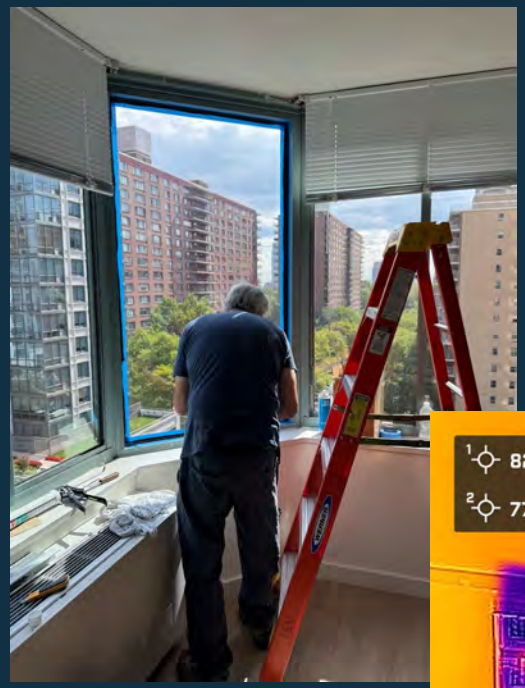
25 mm
Slim Profile Design

10-Year
Product Warranty

8.2 kg/ft²
Embodied Carbon Emissions

100%
Recyclable Product

Equity Residential



Savings

Natural Gas

- (Estimated) 54% Reduction due to reduce steam boiler run times

Electricity

- (Estimated) 30% Reduction for cooling

Acoustical Performance

- Improved acoustical performance due to the Vacuum of the glazing

Conclusion: Increasing the performance of the fenestration will reduce the energy requirements for a building while maintaining indoor environmental comfort for the clients. Reducing the thermal loading of the property will give PTHP a better opportunity to succeed. (Phase 2 will be PTHPs in 2026)

Equity Residential

THANK YOU

Saagar Patel

Sr Director of Decarbonization

spatel@eqr.com

AL SCARAMELLI, BEACON CAPITAL

BEACON
CAPITAL PARTNERS

Lessons in Building Decarbonization

September 24th, 2025

Al Scaramelli, Managing Director
AScaramelli@beaconcapital.com

Lessons in Building Decarbonization

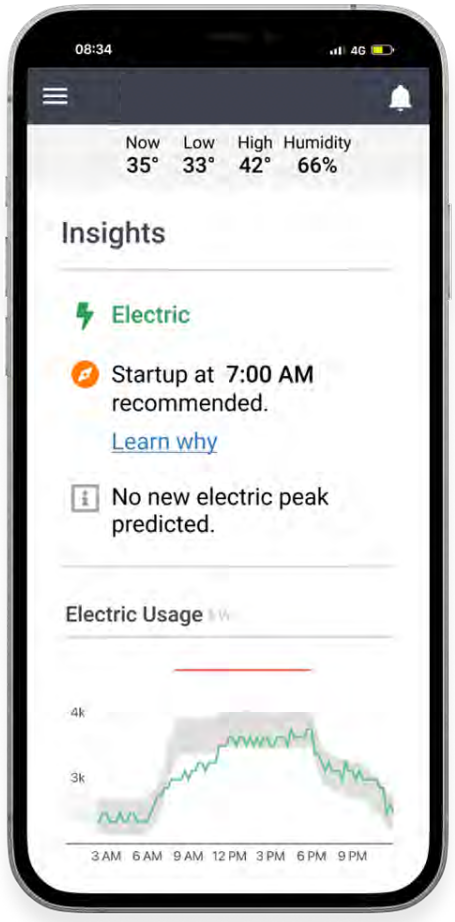
Office Building Energy Use Optimization

- For past 16 years, we analyzed real-time whole building energy use at all our properties (the Utility meters – electricity, natural gas, district steam…):
  - Helpful but did not tell you where or what the cause of higher building energy use.

- Now testing Cortex Energy Use Optimization software that analyzes real-time and historical energy use in specific building equipment (mostly HVAC related) to identify potential energy savings.

- Building Engineers are regularly using the Cortex platform to adjust operating strategies.

Executive Summary



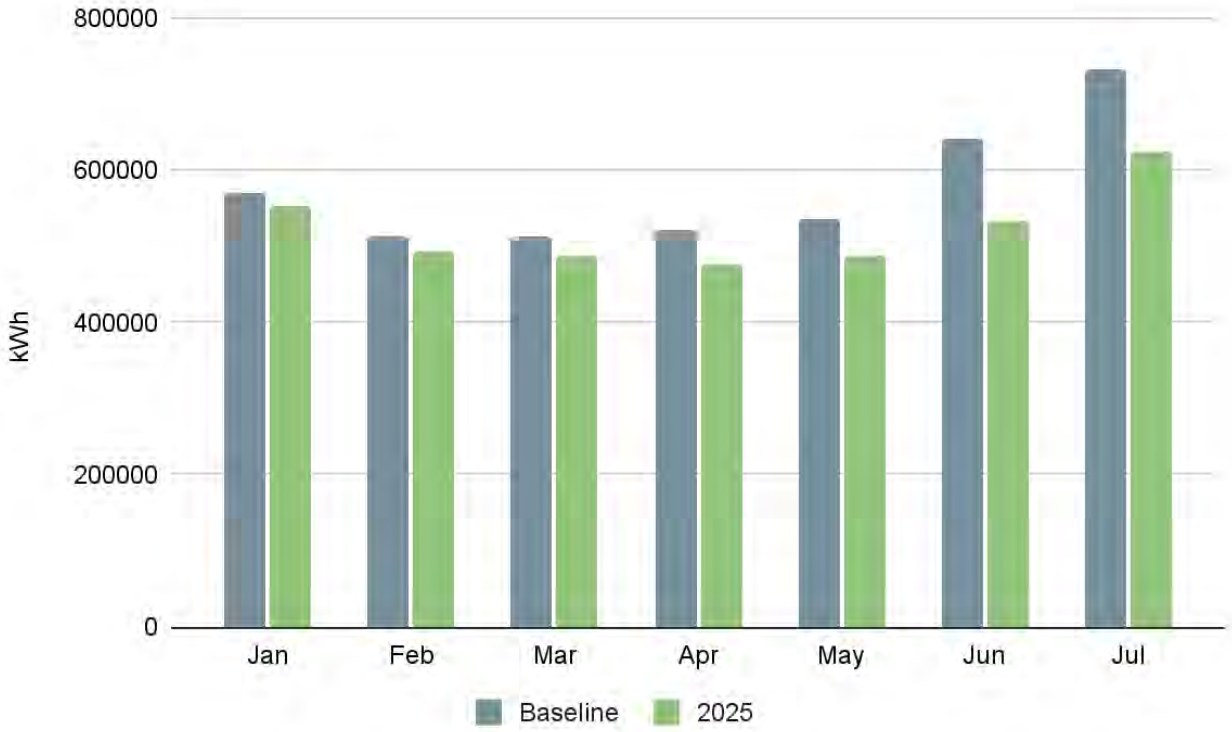
High Engagement: Engineers at each site use the software application regularly and meet with Cortex monthly to discuss different strategies and their impact at the building. Cortex engineers have been to the property and know the building equipment and Building Engineers.

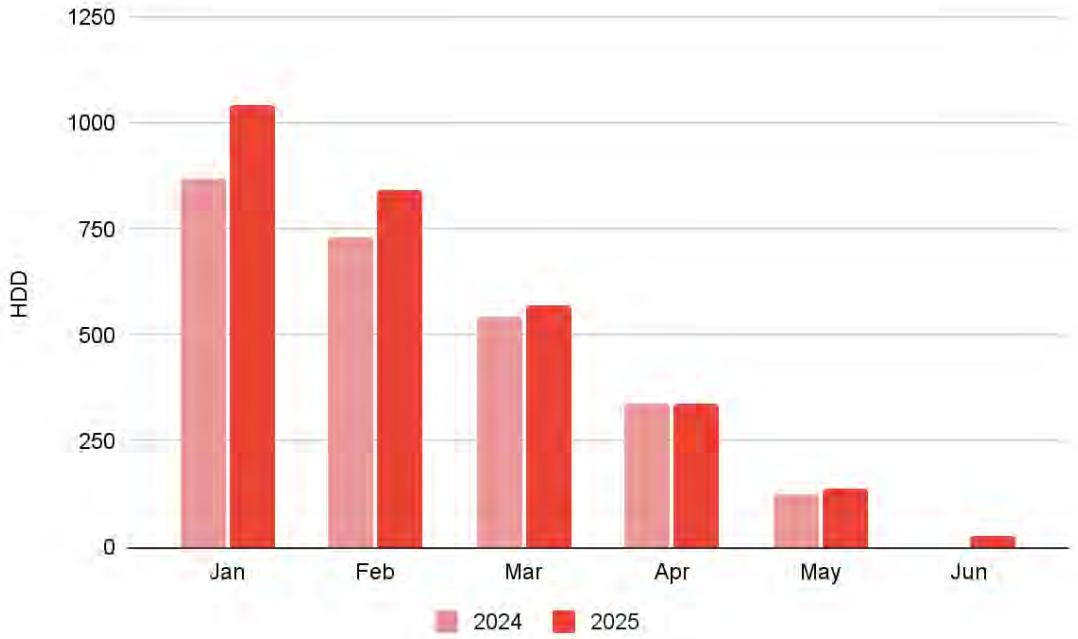
- Started at 2 office properties to “test it” – very favorable/positive results.
- Now just started operating at 6 office properties – very favorable.

- Key Takeaway: Building Engineers really like it because the communications are excellent and Cortex does 90% of the work (Building Engineers have their “Day Jobs”).

* Cooling Degree Days

1745 Broadway Performance: 2025 YTD
High-Rise Office Building





Savings from Baseline are 260,633 kWh YTD
Est. Savings: $150,000/yr
Cortex Fee: $40,000/yr
Guaranteed Savings: 120% of Fee

1745 Broadway experienced a
13.45% increase in Heating Degree Days

Persistent Commissioning - 1745 Broadway

Since launching in May 2024, 1745 Broadway has continued to achieve increases in energy efficiency throughout the entire day.

Key Strategies Used

Morning Startup
80% adherence to AI and weather driven daily startup recommendations, reducing runtime and saving 78,184 kWh.

Afternoon Coasting
The building had an adherence of 96% to chiller coasting recommendations.

Peak Demand Management
Peak Demand kW dropped by 10%

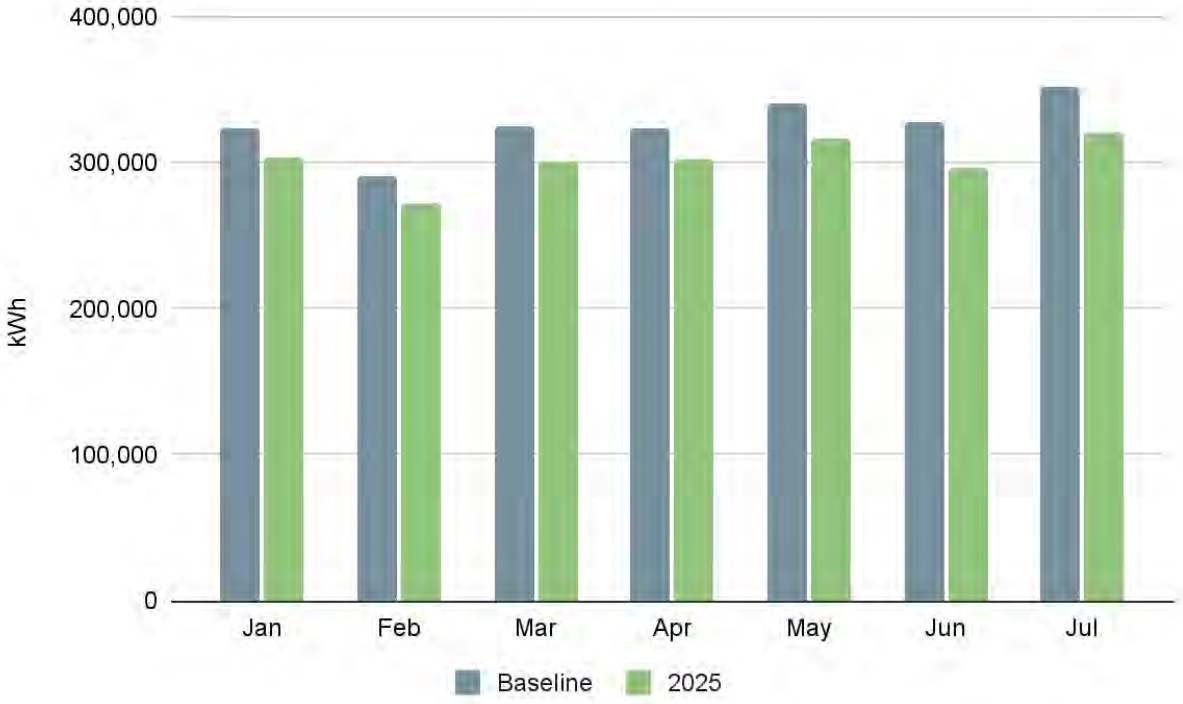
Eliminate Extra Consumption
Increased visibility into any equipment running overnight unnecessarily.

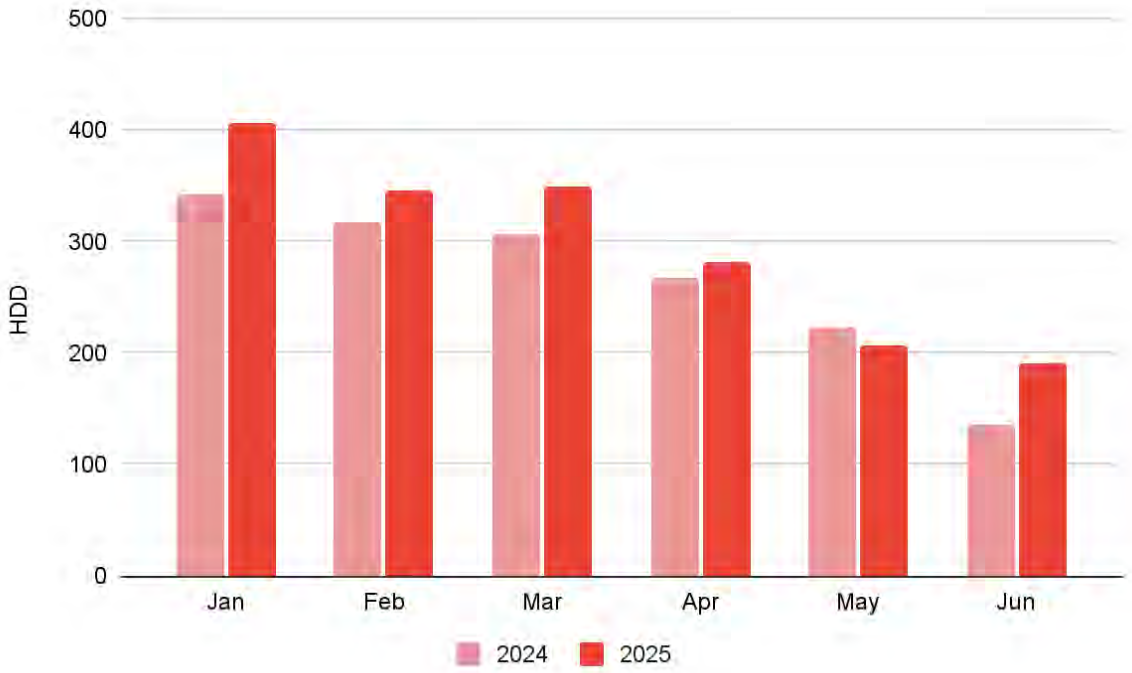
Strategies Utilized – 1745 Broadway

Building Engineer has been very active, particularly coasting chillers and take advantage of any kWh savings Cortex suggests.

Timeline	Strategy	Description
Active	Start Time	Provide optimal time to start the building's airside equipment.
Active	Airside Economization	Monitor existing program for opportunities for free cooling and minimizing fresh air intake at suboptimal temperatures.
Active	Chiller Coasting	Evaluate opportunity to coast chillers in afternoon.
Active	Shut Off Check	Checks if equipment is unnecessarily running overnight
Active	Peak Demand Management	Formulate strategy to curtail demand during peak hours this summer.
Active	Terminal Unit Report	Highlights terminal units that are out of optimal temperature or damper position range
Active	Optimal Stop	Monitor existing program for reducing fan speeds in the afternoon, and fine tune as necessary.
Active	Supply Air Temperature Reset	AHU Supply Air Temperature setpoints adjust depending on space temperatures

Lake Merritt Performance: 2025 YTD
High-Rise Office Building



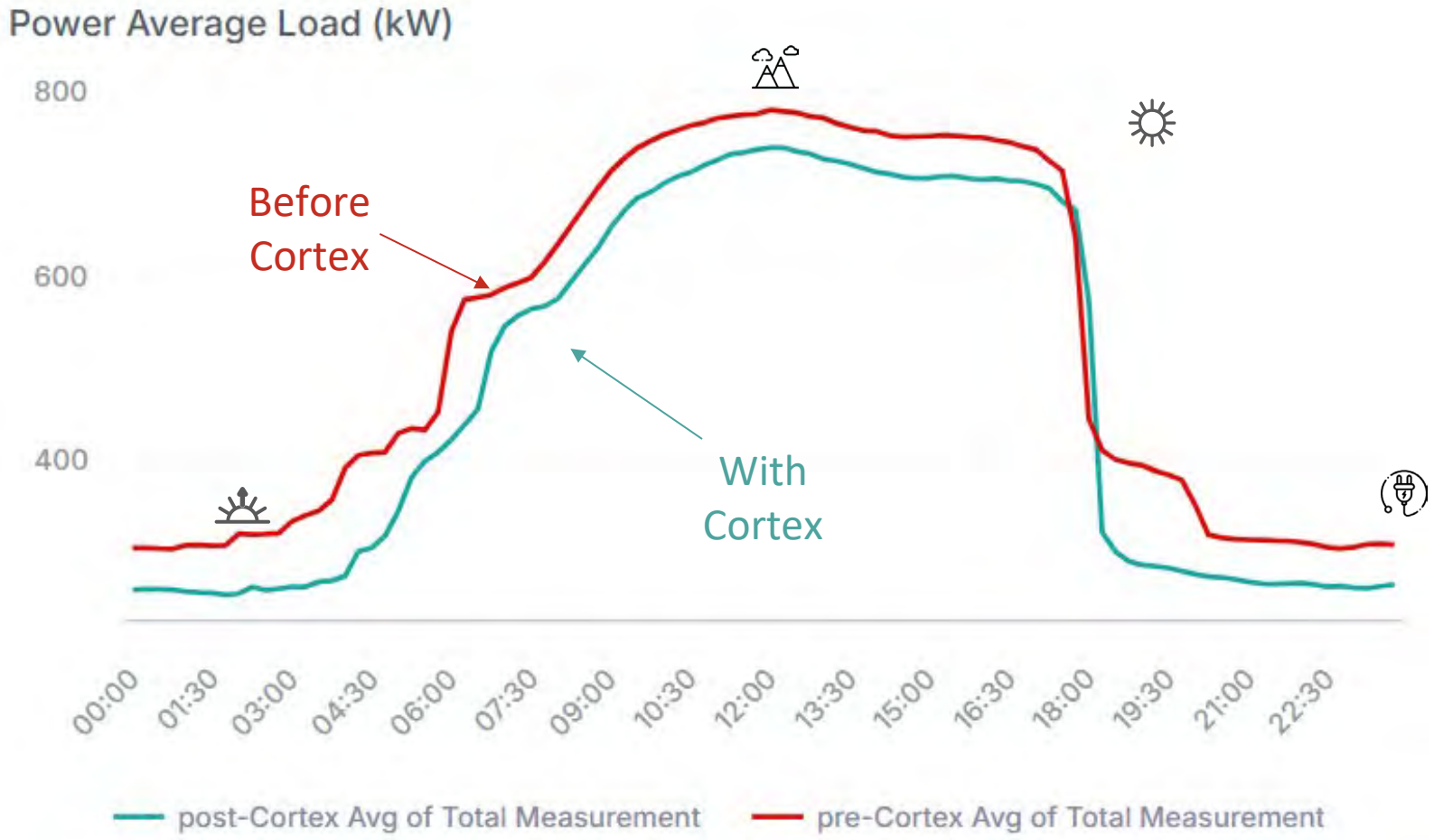


Savings from Baseline are 172,583 kWh YTD
Est. Savings: $80,000/yr
Cortex Fee: $33,000/yr

Lake Merritt experienced a
12% increase in Heating Degree Days

Building Optimization - Lake Merritt

Since launching, Lake Merritt has achieved significant results and has an opportunity to further reduce kWh usage through optimization



Key Strategies Used at Lake Merritt

Morning Startup
AI and weather driven daily startup recommendations reducing runtime, saving 38,183 kWh.

Afternoon Coasting
Lake Merritt has an opportunity to take greater advantage of afternoon coasting.

Peak Demand Management
Peak kW usage has gone up by <1% despite occupancy increasing by nearly 10%.

Eliminate Extra Consumption
Increased visibility into any equipment running overnight unnecessarily.

SUMMARY

- Now have been testing Cortex Energy Use Optimization software that analyzes real-time and historical energy use in specific building equipment (mostly HVAC related) to identify potential energy savings.
- Results very good with expected savings of $75-150,000/yr per property.
- Key reasons for success:
  - Excellent communication between Cortex engineers and Building Engineers.
  - Cortex software clearly shows how existing equipment is operating and how operations could be changed to save energy.
  - Building Engineers say the Cortex program does 90% of the work to identify and track energy savings (Building Engineers have their ”Day Job” and typically don’t have the time to spend hours looking at graphs, tables and data.)
  - The Cortex business model guarantees realized savings exceed their Fee by 20%.

NEETU SIDDARTH, BXP

Waste Heat Recovery

601 Lexington Avenue

Public Targets

2015

Established targets with a 2008 base year:

- Energy Use 15x20
- GHG Emissions (S1&2) 20x20
- Water Use 20x20
- Waste Diversion 65x20

2016

Met Energy Use, GHG Emissions, and Water Use targets early

2017

Set new targets with a 2008 base year:

- Energy Use 32x25
- GHG Emissions (S1&2) 45x25
- Water Use 30x25

Increased Waste Diversion Rate

2019

Met second GHG reduction target

Established Science-based targets at the 1.5-degree level with a 2018 base year:

- GHG Emissions (S1&2) 39x24
- GHG Emissions (S3) 14x25

2020

Established Carbon-Neutral Operations goal (S1&2)

Reset Waste diversion target to 60x25

Met Science-based GHG Emissions (S1&2) target early

2021

Established Building Certification target (87x25)

Disclosed Scope 3 GHG Emissions

Met Science-based GHG Emissions (S3) target early

2022

Met second Energy and Water targets early

2023

Met Building Certification target early

2024

Met Carbon-Neutral Operations goal (S1&2)

Established third Energy and Water targets with a 2008 base year:

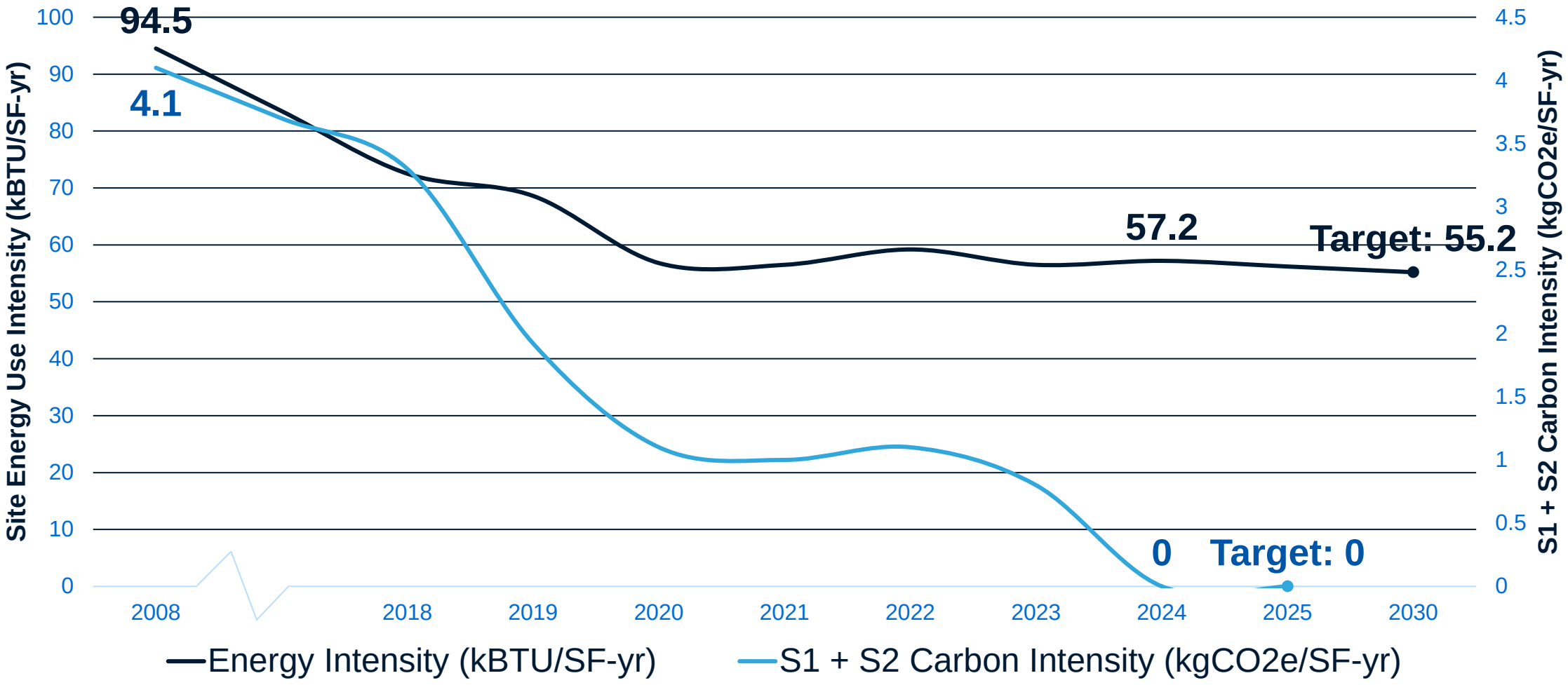
- Energy Use 42x30
- Water Use 49x30

Established second Science-based targets at the 1.5-degree level with a 2018 base year:

- GHG Emissions (S1&2) 74x30
- GHG Emissions (S3) 58x30

Energy and Carbon-Neutral Target Progress

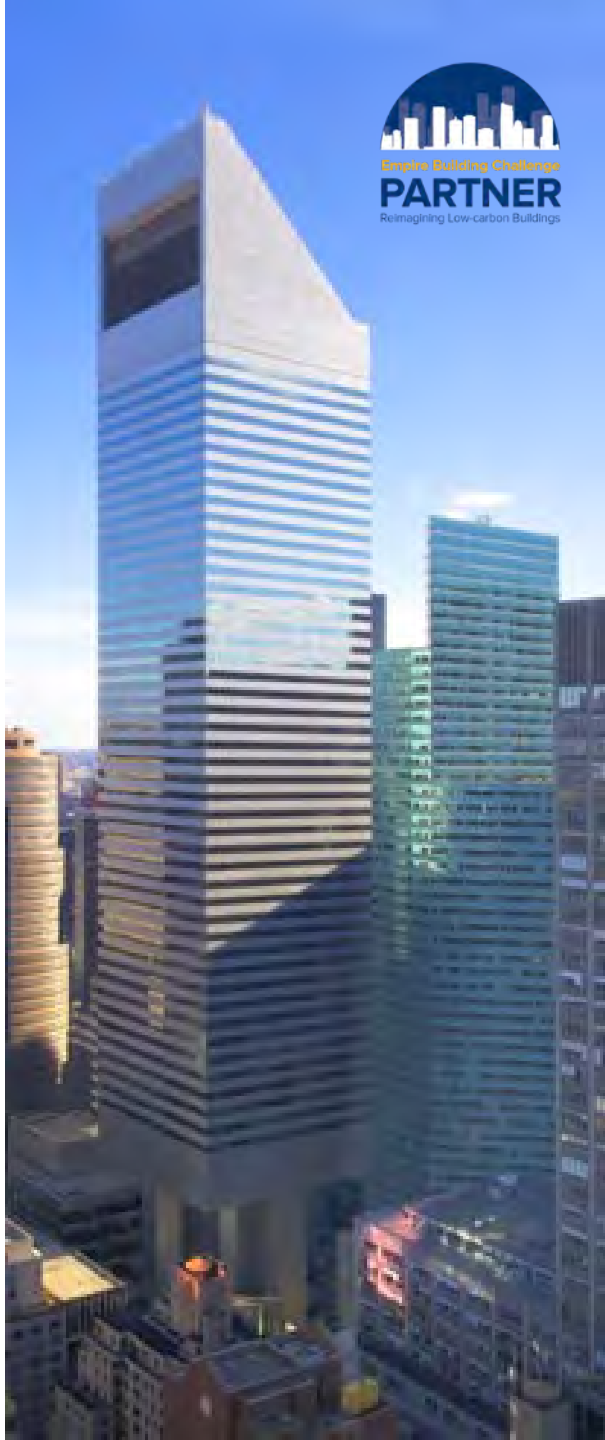
Actively-managed Office Portfolio



Decarbonization Roadmap and Implementation

601 Lexington Avenue, New York City

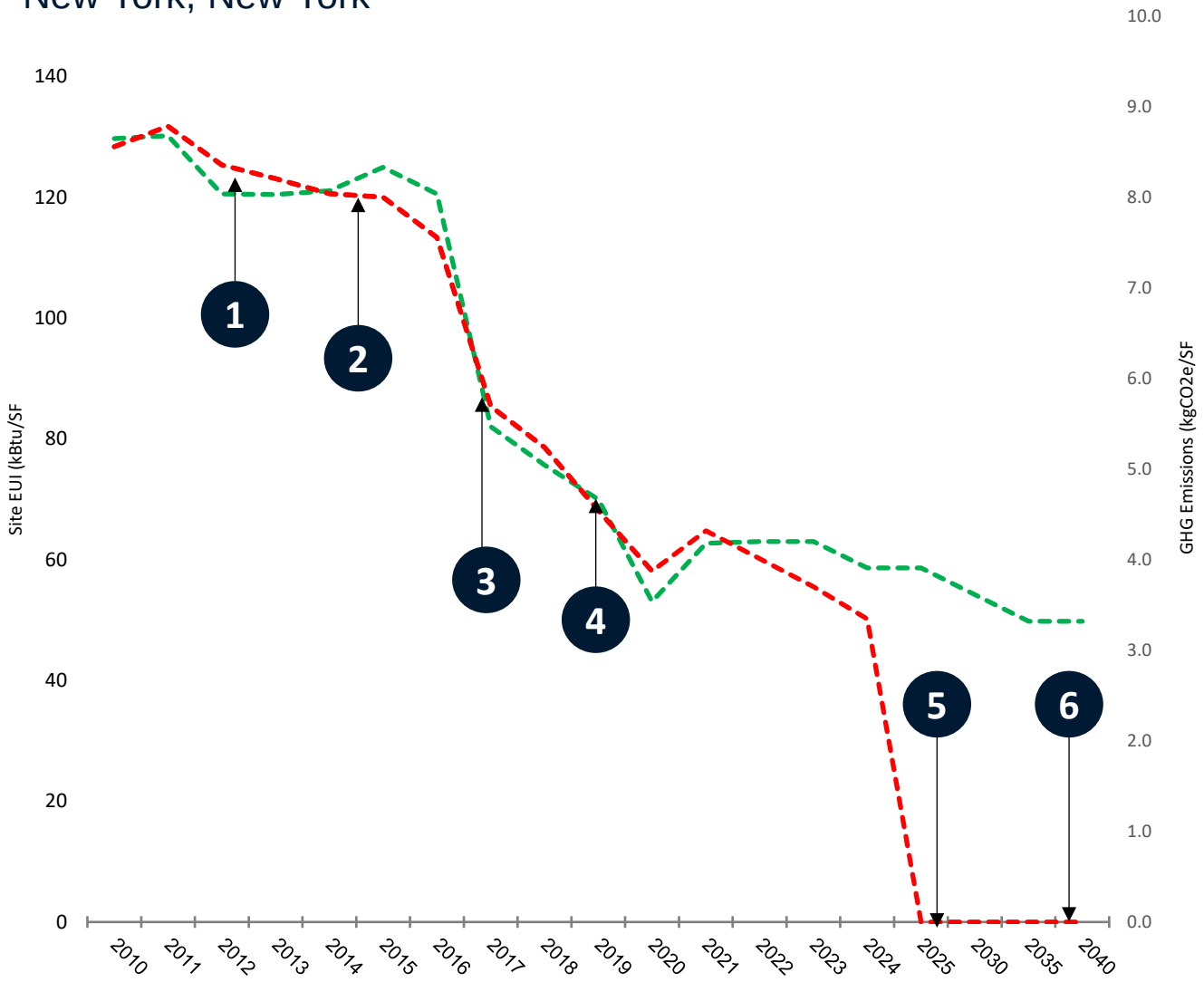
- 1.5 Million SF High-rise.
- The Class-A multi-tenant office building, with ground floor retail, was constructed in 1977.
- Infrastructure is typical of NYC commercial high-rises of its vintage.
- Heating is achieved with district steam converted to hot water.
- Cooling is achieved by way of a central plant featuring electric chillers and rooftop cooling towers.
- Tenant’s Supplemental AC units tied to the Cooling Tower.
- 2024 EUI of 74.7 kBTU/SF, steam contributes 32%.



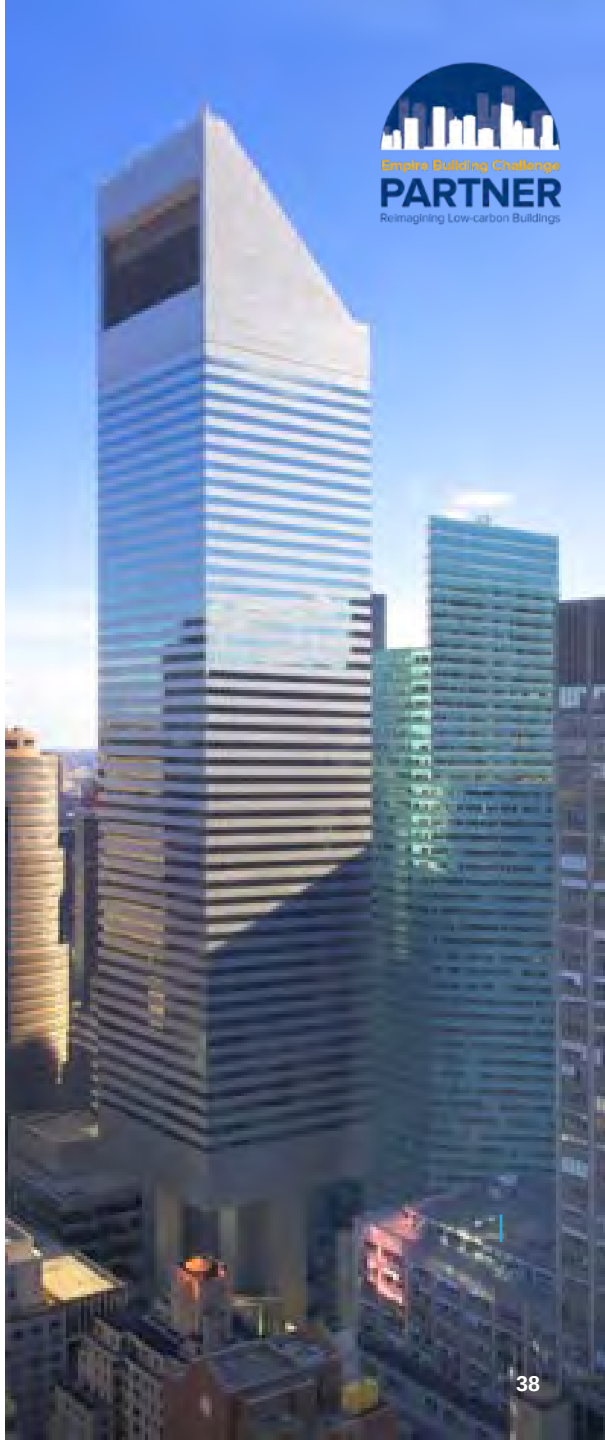
bxp

Decarbonization Roadmap and Implementation

601 Lexington Avenue
New York, New York



1. VFDs on Pumps and Fans & New BMS
2. Façade & Back of House Lighting Improvements
3. 4. Chiller Plant Modernization and Controls Optimization
5. CWHR & Partial Heating Electrification, Renewable Energy & Carbon Offsets
6. Full Electrification of Thermal Heating Systems



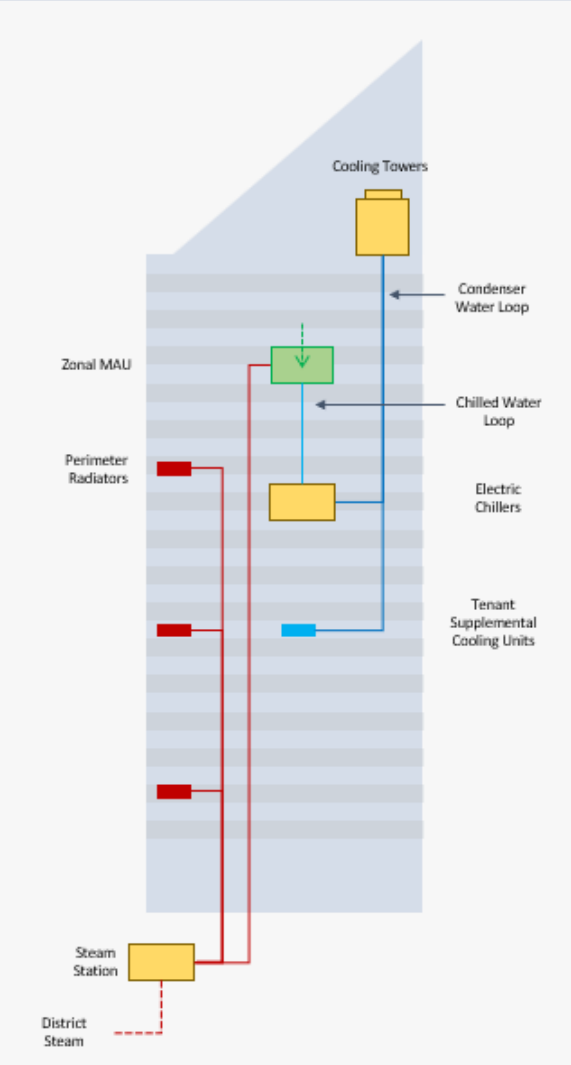
Waste Heat Recovery Project

- Enablement Step for Building Decarbonization.
- Phased approach – reduce dependence on fossil-fuel driven heating systems.
- Use of existing technology in an innovative way.
- Business Case for the pilot project:
  - Evolving policy landscape- LL 97,
  - Electrification incentives,
  - Significant Avoided Steam Costs, given the steam cost escalations[1]
  - Existing infrastructure can support the retrofit,
  - Positive NPV,
  - No disruption to tenant operations,
  - Maintaining existing steam infrastructure, resiliency
  - Long-term asset value.

1. Steam prices increases are >10% year over year.

Waste Heat Recovery Project

Current Building

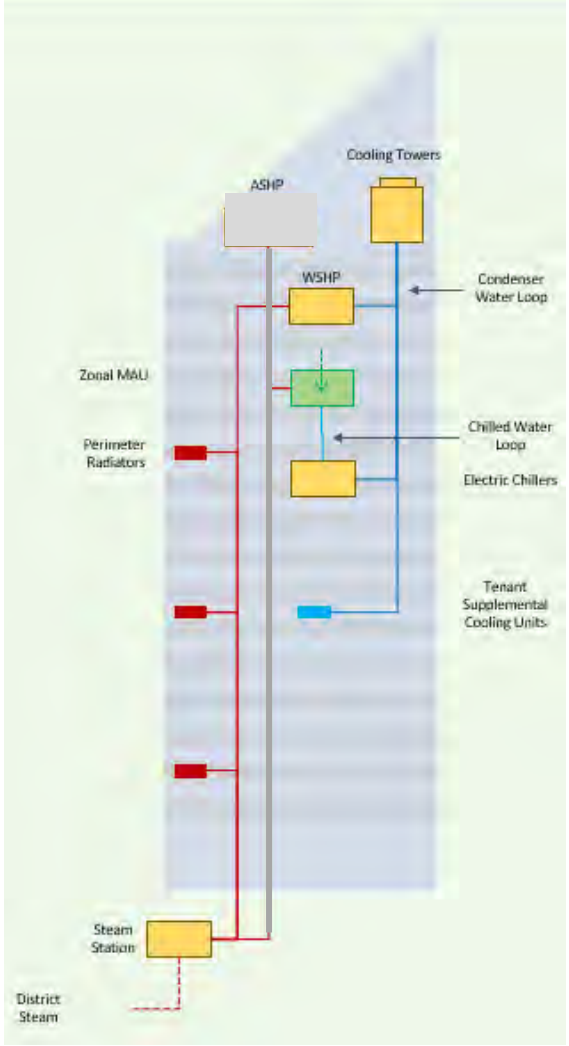


Condenser Water Heat Recovery

Install WSHP to reclaim heat for re-use in the building's perimeter heating systems. An automated cooling tower bypass valve will retain heat in the building, maximizing heat available for recovery during the heating season.

- 30% steam use reduction
- 13% Annual GHG Emissions reduction

Phased Decarbonization



Waste Heat Recovery Project

Empire Building Challenge partner with NYSERDA.

NYSERDA incentives for the project

Anticipated ConEd rebates from the Clean Heat Program.

Scalable and replicable decarbonization solution.

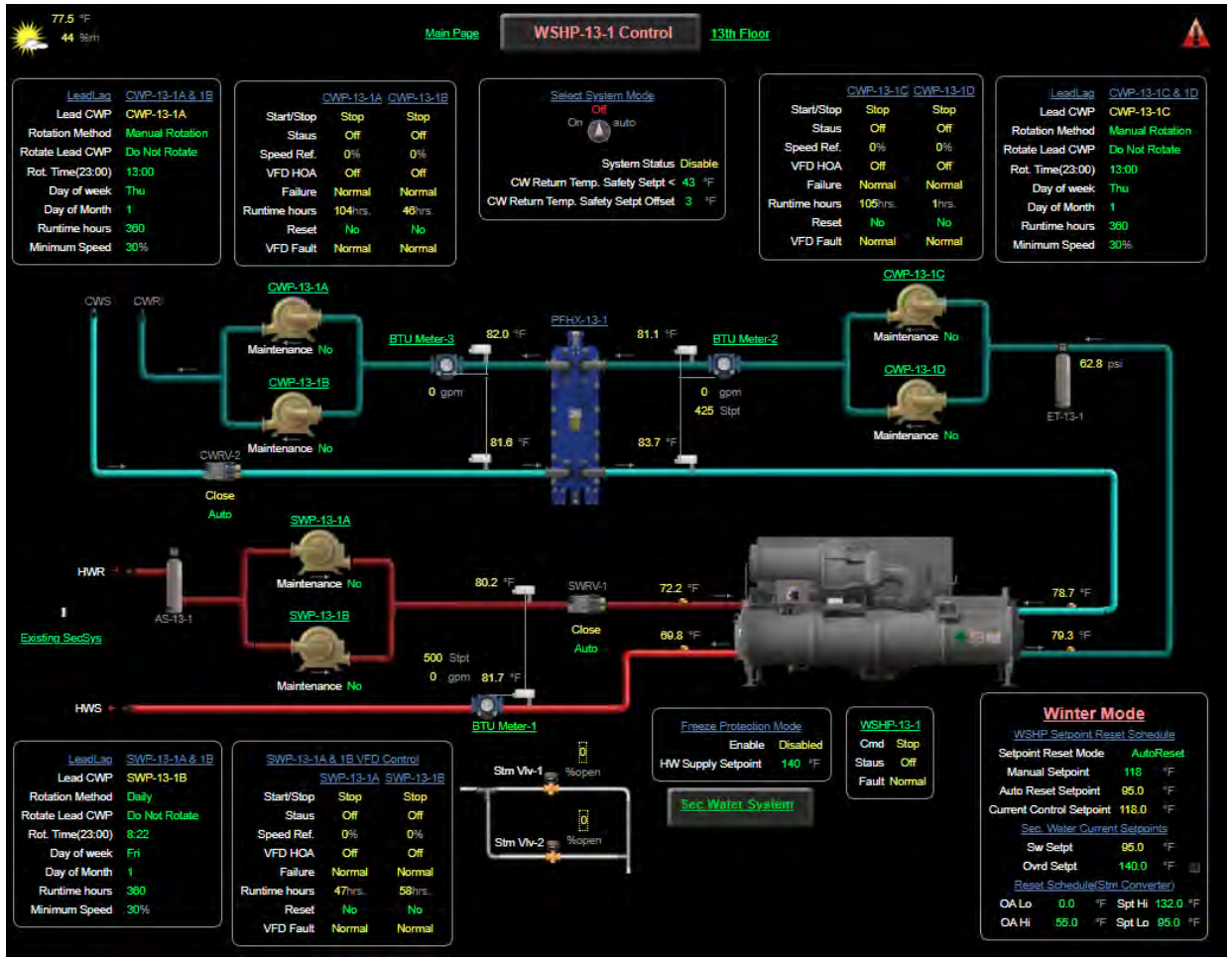
Heat rejection load metering in place at other buildings to evaluate loads and applicability:

GM Building

399 Park Ave

601 Lexington Avenue – WSHP

Waste Heat Recovery Project



Thank you!

Neetu Siddarth,
nsiddarth@bxp.com

Empire Building Challenge
Case Studies Link

KAILASH VISWANATHAN, CONSIGLI

CONSIGLI
Est. 1905

Consigli Construction Co., Inc.

Hudson Square Properties, 345 Hudson

Introduction to Arch Energy

Arch Energy, Consigli's energy division, empowers organizations to meet their decarbonization goals and future-proof their operations with energy-efficient, waste-reducing solutions.

Kailash Viswanathan, CEM, LEED AP
Director of Energy
kviswanathan@consigli.com

Learn more about how Arch Energy, Consigli's energy division, can support your decarbonization goals.

350+

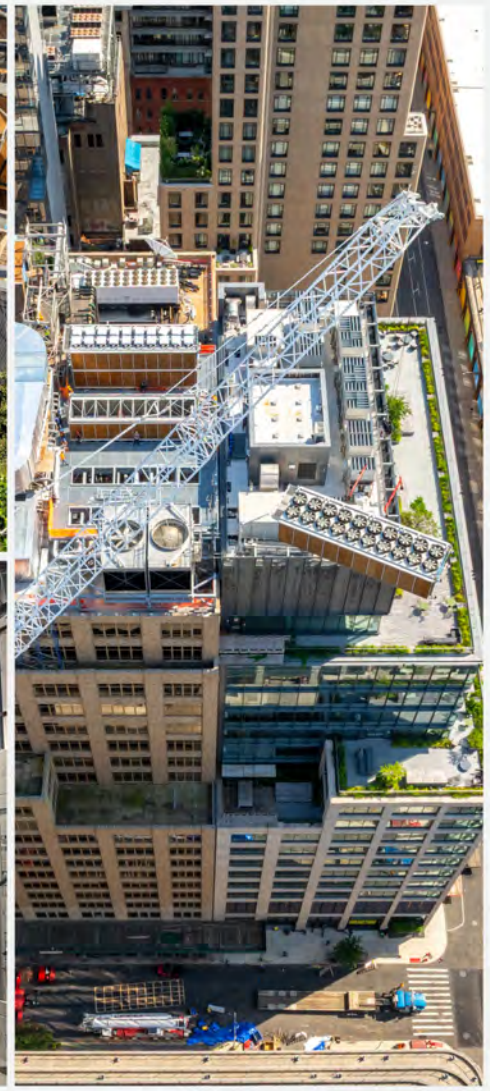
U.S. colleges & universities have Net Zero targets, with more than half in the Northeast

NYC & BOSTON

impose fines to commercial buildings if they do not comply with reducing carbon emissions

Decarbonization is a journey.

Hudson Square Properties, 345 Hudson



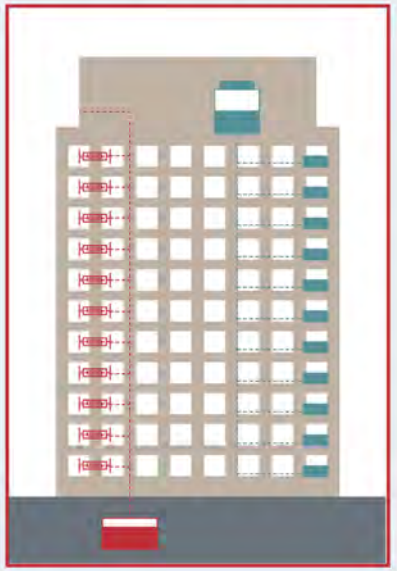
PROJECT OVERVIEW

345 Hudson, owned and currently being repositioned by Hudson Square Properties (HSP), is a model for sustainable practices, incorporating Nordic design principles of holistic energy recycling and electrification and serving as a scalable solution for Local Law 97 compliance.

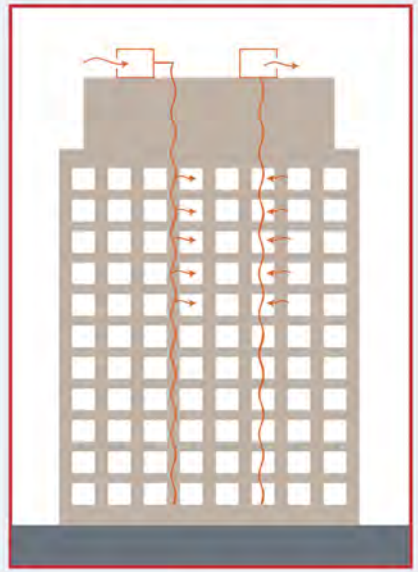
The Challenge

Like most older NYC commercial buildings, the 1931, 990,000 sq. ft., 17-story 345 Hudson operated using a more traditional, fossil-fuel-based heating system and condenser water-based cooling system which operated independently from one another. 345 Hudson was projected to face recurring Local Law 97 carbon emissions fines starting in 2035.

Running on two separate systems for heating and cooling, 345 Hudson had steam and cast-iron radiators wrapped around each floor.



The building's outside and exhaust air supply is not recovered, increasing 345 Hudson's emissions. This is typical of most NYC high rises.



BUILDING ENERGY GRADE

B

ENERGY USE INTENSITY (EUI)

83

YEARLY CARBON EMISSIONS

4,999

TON CO2e PER YEAR

Engage Collaborative Partners

PROJECT PARTNERS

HUDSON SQUARE PROPERTIES

Hines

Trinity Church
A Parish in the City of New York

Norges Bank Investment Management

urbs.
URBAN SYSTEMS

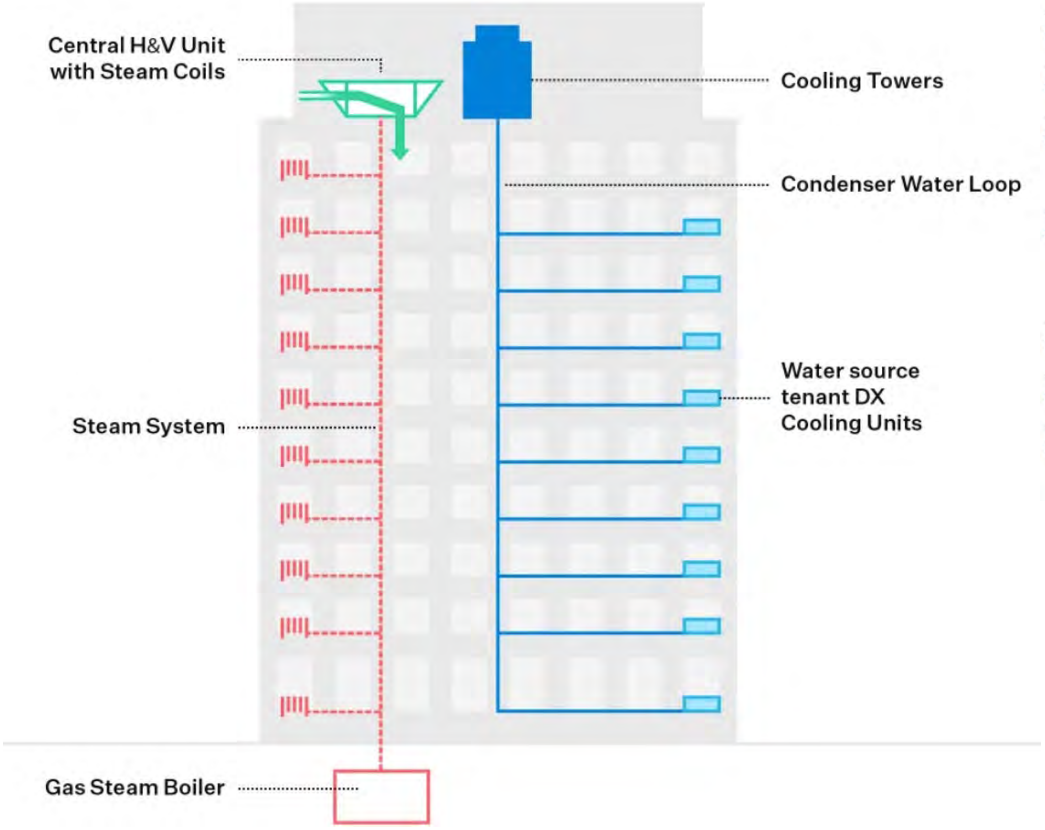
CONSIGLI
Est. 1905

ENERGY MACHINES

JB&B

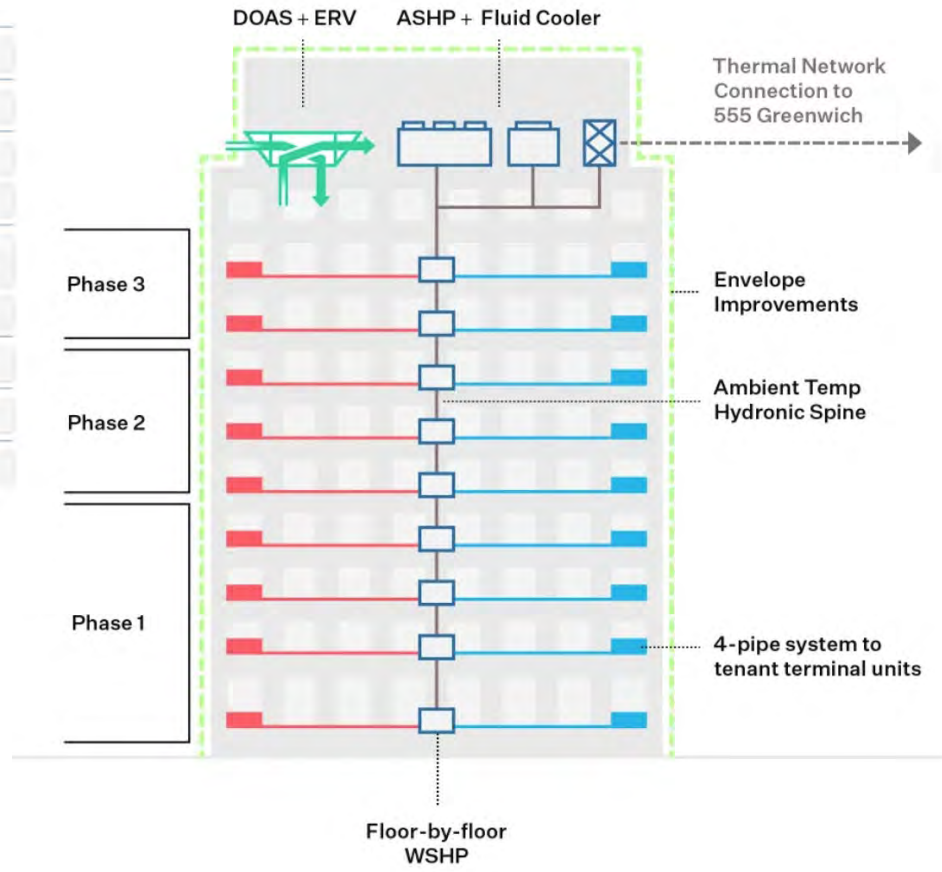
Thinking Different Works

BEFORE



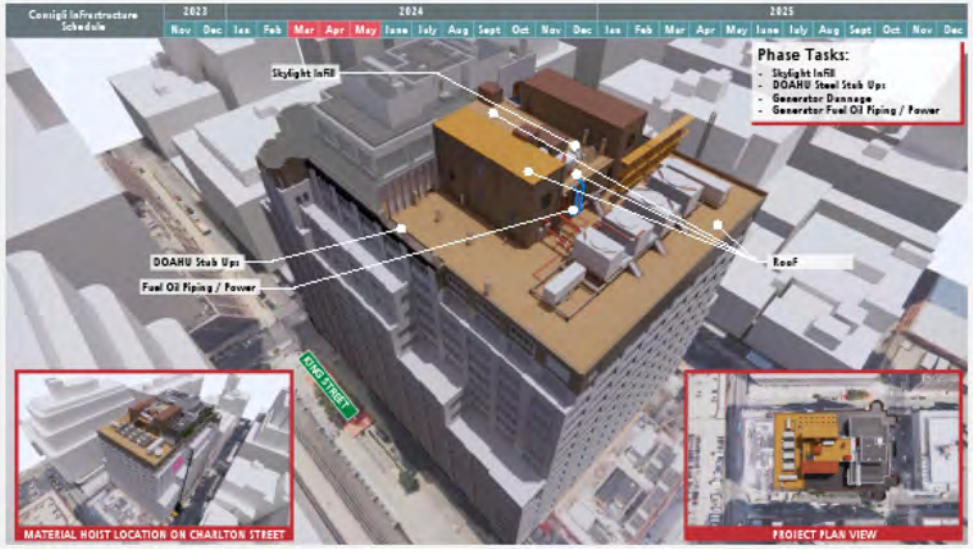
2022	Install Ambient Loop Hydronic Spine
2023	Tenant Conversion Phase 1
2024	Install Central ASHP and Adiabatic Fluid Cooler
	Thermal Network Improvements
2025	Install Central Dedicated Outside Air System (DOAS) with Energy Recovery Ventilation(ERV)
	Commission Central Plant
2026	Potential Envelope Improvements
2027	Tenant Conversion Phase 2
2029	Tenant Conversion Phase 3

AFTER

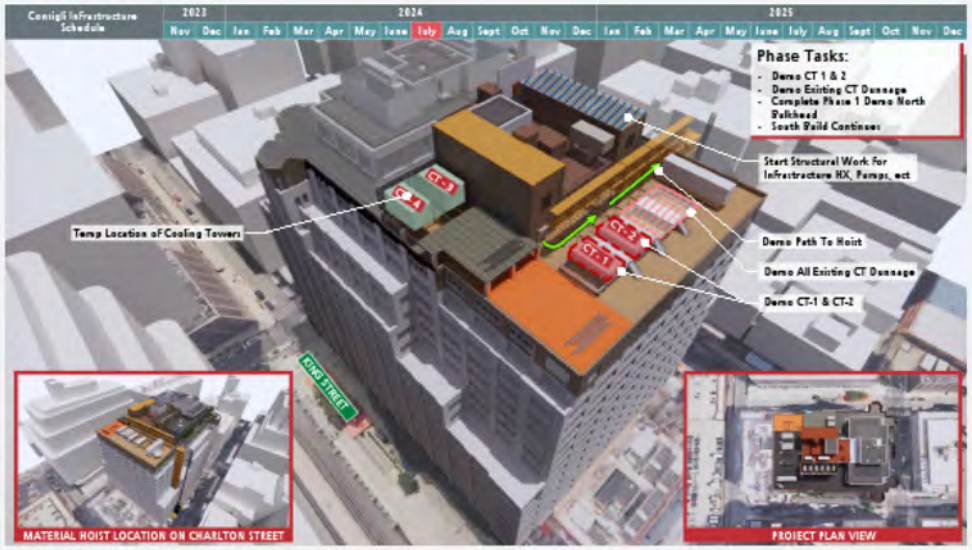


Logistics & Coordination

SEQUENCE 1



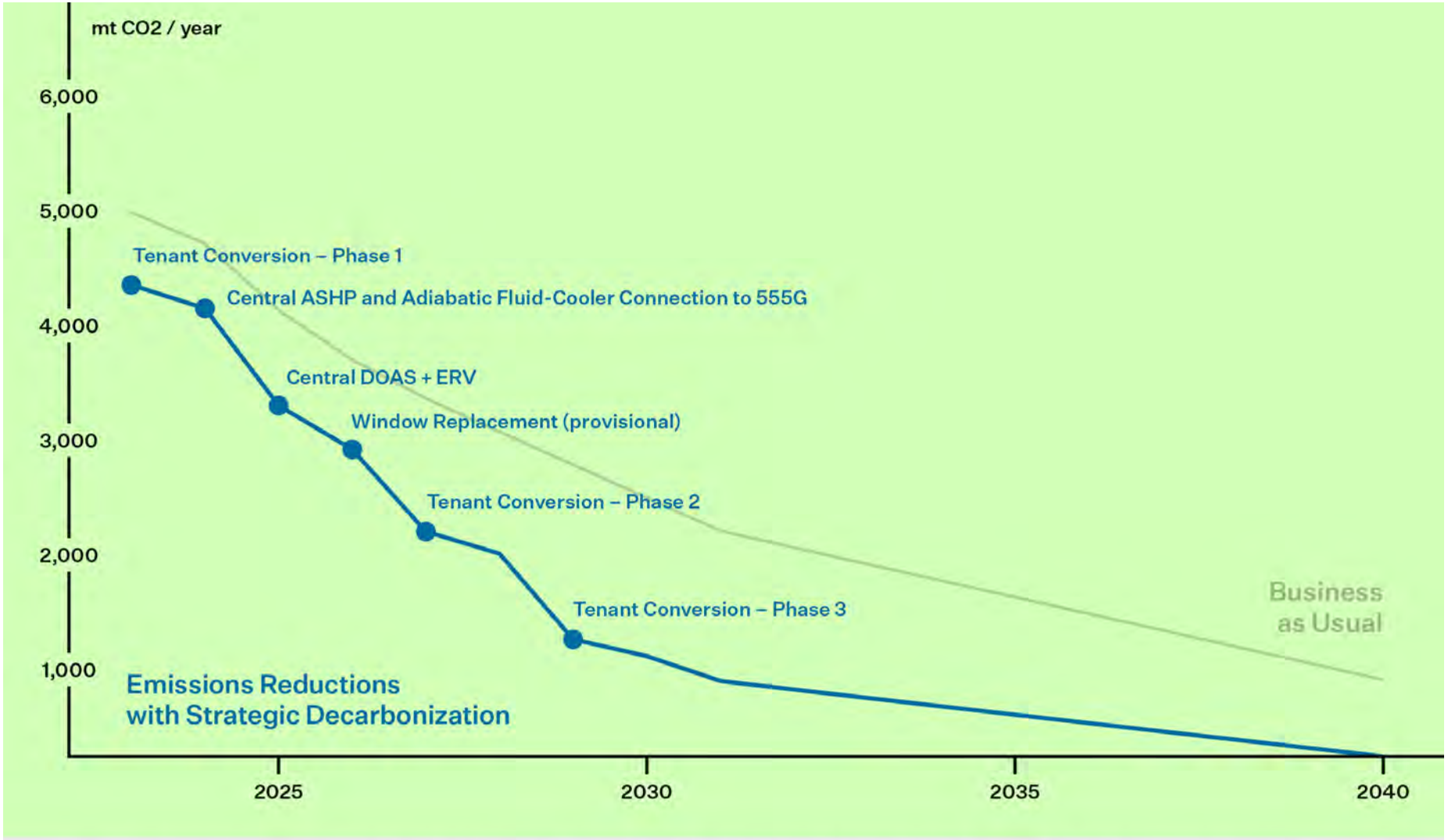
SEQUENCE 3



SEQUENCE 6

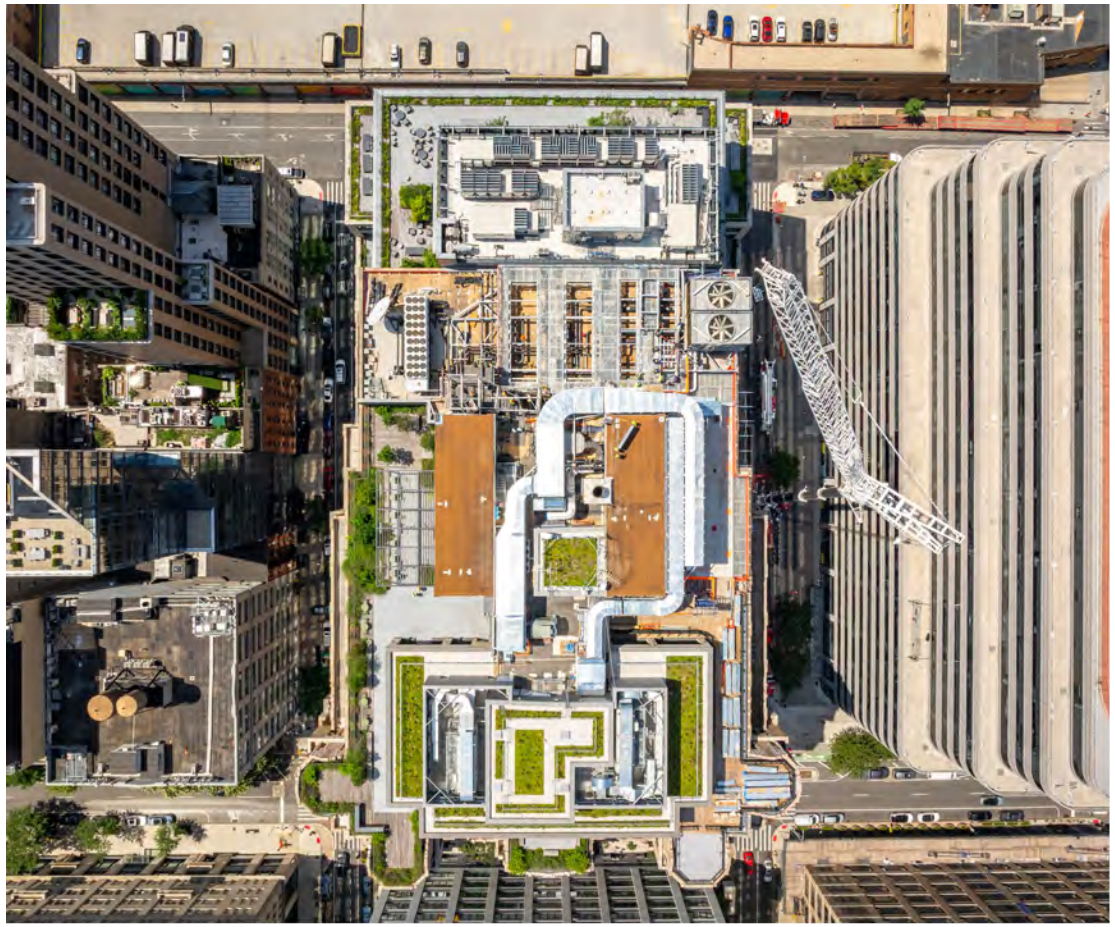
SEQUENCE 12

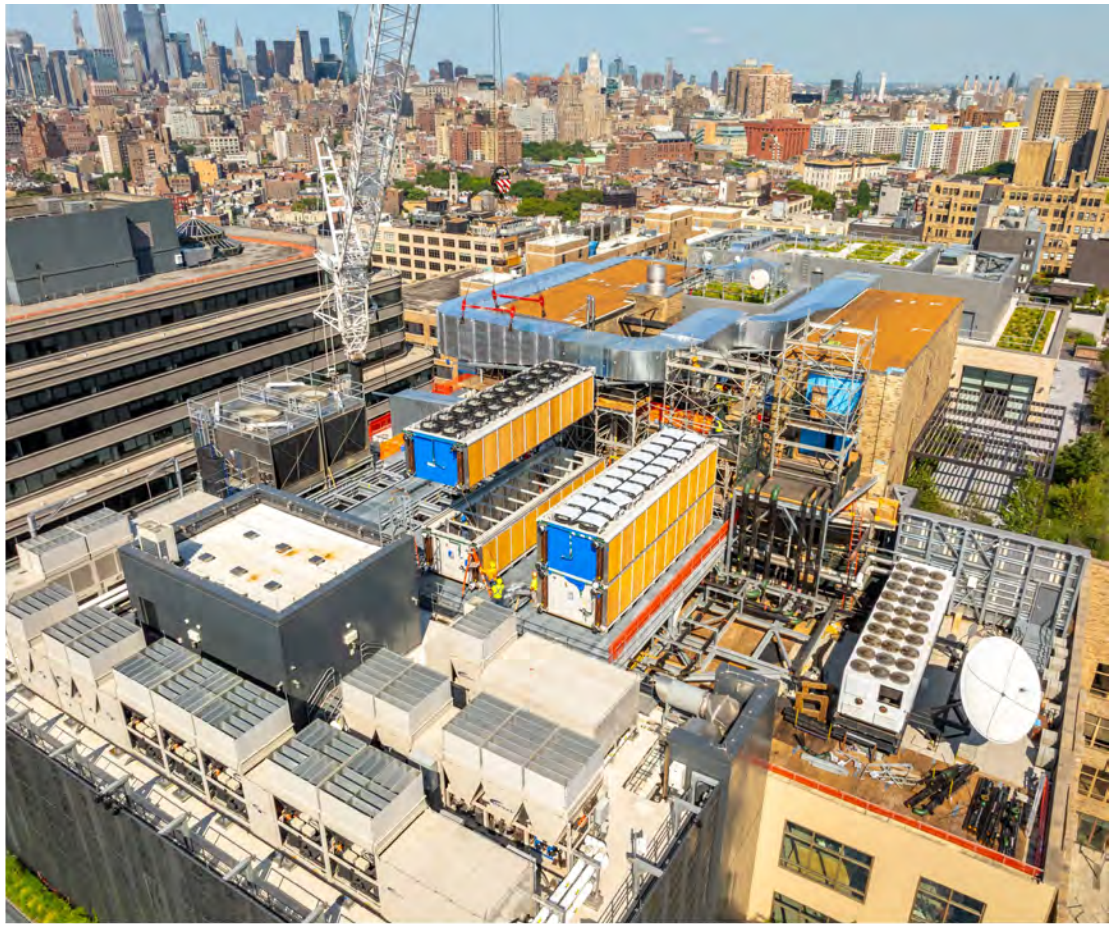
Strategic Decarbonization Action Plan



Note: The projected paths assume that New York's electricity sector will fully decarbonize by 2040 per CLCPA projections. In the Business-as-Usual (BAU) scenario emissions plateau after 2040 due to ongoing fossil fuel use. This project began its decarbonization work before their participation in the Empire Building Challenge.

The Results





90% REDUCTION IN ANNUAL EMISSIONS

30% MINIMUM EUI REDUCTION BY 2035 FROM A 2019 BASELINE

$204K AVOIDED IN ANNUAL LL97 FINES STARTING IN 2023

Plan For Your Legacy Building

1

Benchmark Your Emissions

2

Engage Collaborative Partners

3

Analyze Emissions Data

4

Reduce, Recover, Electrify

5

Leverage Available Incentives


CONSIGLI
Est. 1905
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Q&A


A BETTER CITY
BUILT TO LEAD:
LESSONS IN BUILDING DECARBONIZATION IN NEW CONSTRUCTION
THURSDAY, OCTOBER 30, 2025
SIGN UP FOR OUR NEXT PANEL: