

660 Fifth Ave.

- New York City
- 1.4 million SF
- 41 stories commercial
- office building built in 1957



Modern heat recycling and fresh air systems help meet accelerated climate goals

Project Team:

**Brookfield
Properties**

Cosentini
A TETRA TECH COMPANY

660 Fifth Ave is a 42-story commercial office building located in Midtown Manhattan that is currently undergoing a full redevelopment to modernize the building.

Brookfield Properties is leveraging the redevelopment of this property to integrate decarbonization solutions that will upgrade its internal systems, reducing its reliance on fossil fuels and positioning it for full decarbonization by 2035.

The decarbonization plan for this property utilizes a variety of solutions that will cut energy use, recycle heat that would otherwise be wasted, and electrify existing building systems.

As part of the overall carbon neutrality roadmap, the Empire Building Challenge is funding the measures starting implementation in 2023 and 2024, including: lower distribution temperatures, thermal network expansion and waterside heat recovery.

NYSERDA Investment	EBC Funded Measures Private Investment
\$3 Million	\$6.7 Million

Disclaimer: The project plan outlined in this presentation is in its early design stage and can be subject to potential changes in the future.

Brookfield

demonstrates a multi-faceted, strategic approach to decarbonization of a high-rise office building

Energy Load Reduction:

Brookfield is incorporating several measures to immediately reduce the building's steam demand and enable strategic implementation of low carbon heating solutions. These include:

- Replace single pane windows with an insulated curtain wall.
- Replace steam turbine chillers with electric chillers.
- Install a full energy recovery dedicated outdoor air system (DOAS), which separates the building's ventilation system from the heating system, allowing each to operate independently.
- Optimize the existing hydronic system to lower heating hot water supply temperatures and enable integration of air source heat pumps in the future.

Maximize Heat Recovery:

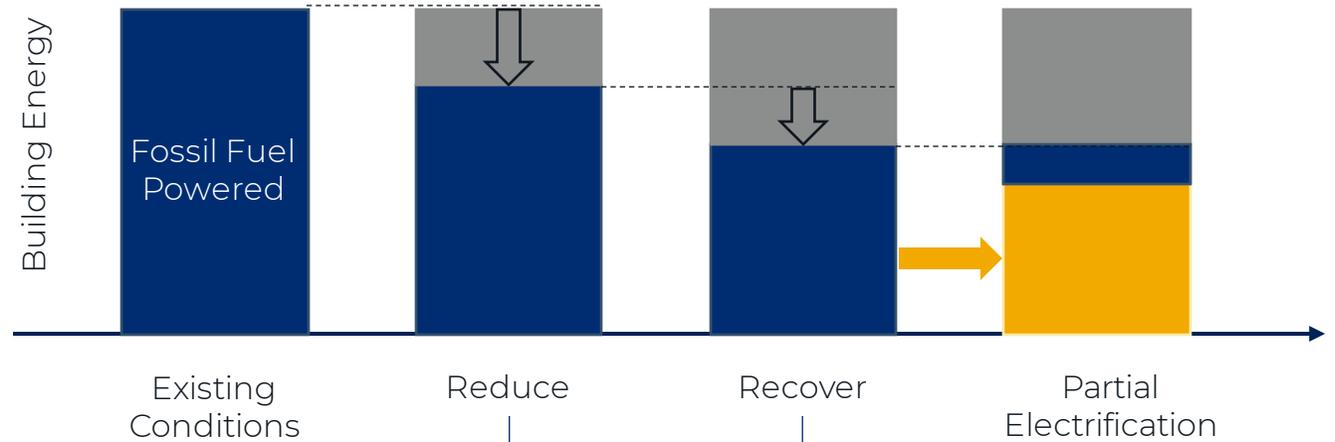
This project utilizes water source heat pumps in a variety of heat recovery and reuse applications to dramatically reduce steam use throughout the building. The team looks to maximize heat recovery by integrating retail and tenant supplemental cooling loops to the main condenser water loop.

Current Baseline	Expected by 2035	
119.5 kBtu/SF/yr	47.9 kBtu/SF/yr	↓ 60%
62% Electricity + 38% District Steam	94% Electricity + 6% District Steam	
12,508 Ton CO2e/yr	3,059 Ton CO2e/yr	↓ 76%
\$340,000 /year of LL97 fines starting in 2030	\$0 LL97 fines starting in 2030	

Resource Efficient Decarbonization (RED):

An incremental methodology and integrated design process combined with strategic capital planning creates a path towards carbon neutral buildings.

A holistic approach and phasing can make decarbonization technically and economically feasible.



Reduce Energy Load

- **New Façade:** install new insulated curtain walls
- **Lower Heating Distribution Temperatures:** reduce heating hot water supply temperatures to 120-130F

Recover Wasted Heat

- **Thermal Network Expansion:** connect retail tenant condenser water loop to main condenser water loop to maximize waterside heat recovery
- **Waterside Heat Recovery:** recapture heat from condenser water loop using WSHPs (Lobby, Garage, DHW production)
- **Energy Recovery DOAS:** recapture heat from ventilation exhaust to condition make-up air, energy recovery units replacing high-pressure induction system

Partial Electrification

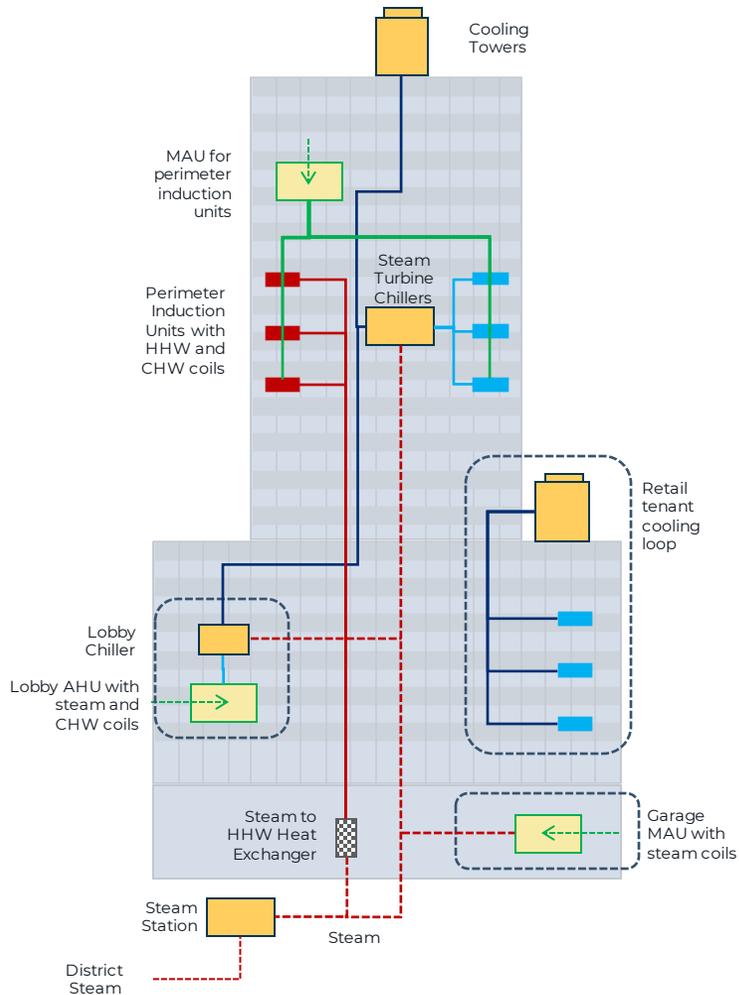
- **Electric Chillers:** replace steam turbine chillers to electric chillers
- **Air Source Heat Pumps:** ASHP to provide supplemental heating and cooling

660 Fifth Ave Decarbonization Plan

Heating
Cooling
Ventilation

Key Takeaways: Building Redevelopment, Reduce district steam usage, Maximize waterside heat recovery, Lower heating hot water temp., DOAS with ERV, Remove perimeter induction units

BEFORE



2022:

Envelope Improvements
Replace single pane windows with no wall insulation with insulated curtain wall

Install DOAS+ERV
Replace Make-up Air Unit (MAU) supplying high pressure perimeter induction units with energy recovery DOAS with heating/cooling coils

Perimeter Terminal Units
Replace high pressure perimeter induction units with fin-tube radiators

Electric Chillers
Replace steam turbine chillers with electric chillers

2023:

Lower Distribution Temperatures
Reducing heating hot water supply temperature to 120-130F

Thermal Network Expansion
Connect retail tenants to main condenser water loop to maximize waterside heat recovery

Lobby Heat Pump Chiller
Replace lobby chiller with WSHP to supply heating and cooling reusing hydronic coils in lobby AHU

Garage Ventilation Heat Pump
Install water source VRF heat pump to provide minimum heating, replacing steam coils in the garage MAU

2024:

Domestic Hot Water WSHP
Waterside heat recovery using WSHPs to produce DHW

2026:

Air Source Heat Pumps
Install ASHPs to provide supplemental heating and cooling

AFTER

