Take the Heat!
Part 2:

Building Core & Perimeter

In this 2-part series focused on building decarbonization, NYERDA and BE-Ex have gathered industry experts that will feature projects deploying breakthrough heating & cooling recovery solutions across the commercial and multifamily buildings sector.

presentations by
Christopher Colasanti, Associate Partner, JB&B Deep Carbon Reduction Group
David Noyes, Project Executive, Brookfield Properties
Jonathan Da Silva Johrden, Building Systems Director, Steven Winter Associates, Inc.

moderator
Mike Richter, President, Brightcore Energy

speakers
Karen Oh, Vice President, Energy Innovation and Strategy, Vornado Realty Trust
Christopher Colasanti, Associate Partner, JB&B Deep Carbon Reduction Group
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Jonathan Da Silva Johrden, Building Systems Director, Steven Winter Associates, Inc.

31 Chambers Street
New York, NY

February 8, 2024
9:30 to 11 am

1.5 AIA LU
PENN ONE BUILDING SUMMARY

- 2.5 million square feet
- Iconic midcentury commercial office (incl. retail and amenities)
- Fifty-seven (57)-story skyscraper
- 750 feet high with three setbacks
- Penn District neighborhood (Midtown Manhattan)
- 6 MW cogeneration plant
- Recent Lobby renovation & window replacement
- Pillar of Vornado’s Vision 2030
- Anticipated to face LL97 penalties in 2030
**DECARBONIZATION ROADMAP**

- **Baseline**
- **Triple Pane Glazing**
- **All Electric Chillers**
- **Induction Units Replace (VAV)**
- **Condenser Heat Recovery**
- **Partial Air Source Heat Pumps**
- **CRAC Conversion**
- **Enhanced Tenant Fitout**

**2019**
- Completed

**In the Pipeline**

**2030**
- Hybrid
- CoGen Repurposing
- More ASHP
- Ice Thermal Storage

**Future pathway**
- "Full" Electrification

**2040**
- Long term (under consideration)
“This strategy is a cornerstone project, which is a subset of Hybrid Electrification, that is a foundational first-step to prepare for Cogen plant decommissioning. It’s a key enabler of deeper decarbonization projects such as heat pumps and thermal storage in the future.”
Steam heating reduced by **21%**

Additional heat pumps can increase to **40%+**
THE PROJECT

- Estimated total project cost $4 million
  - Estimated $100K energy cost savings
- NYSERDA award of $1 million
- Project completion mid 2026
660 Fifth Avenue
Empire Building Challenge
Project Highlights

David Noyes
Vice President, Strategic Projects
February 8, 2024
7000+ properties around the world

637+ million square feet of commercial space

65 million square feet of development
Brookfield’s Net Zero Carbon Emissions Commitment

• Achieve net zero greenhouse gas emissions by 2050 or sooner
• Focus on reducing emissions in the companies we invest in and use long-term solutions to remove carbon if needed
• Set an interim target for the proportion of assets to be managed in line with the attainment of net zero emissions by 2050 or sooner, ramping up to include all assets, and review our interim target every five years
• Account for portfolio scope 1 and 2 emissions and, to the extent possible, material scope 3 emissions

The Net Zero Asset Managers initiative

More than 315 signatories with USD 57 trillion in AUM
**Brookfield Properties Real Estate Net-Zero Strategy**

1. **Procure Clean Energy**
   - We leverage both onsite and offsite clean energy through solar installations and power purchase agreements, decarbonizing both our business operations and the local electricity grid.

2. **Invest in Asset-Level Improvements**
   - We invest in asset-level improvements to reduce our demand for energy, avoiding significant GHG emissions.

3. **Acquire High-Quality Carbon Offsets and Removals**
   - We plan to procure high-quality carbon offsets and removals to eliminate remaining emissions once all other economically feasible measures have been exhausted.
660 Fifth Ave
New York, New York

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 $400M+ 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 measures including lower distribution temperatures, thermal network expansion, and waterside heat recovery.

Property highlights
• 42-story, trophy class office
• 1.25 million sq. ft.
• 42,000 sq. ft. exclusive terraces
• 11’ x 9’ single-pane glass - largest in NYC redevelopment history

Sustainability + Recognition
• LEED Gold v4 BD+C C+S certified
• 60% EUI reduction
• 40% water use reduction
• 75% construction waste recycled
• 100% renewable electricity
**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.

<table>
<thead>
<tr>
<th>Current Baseline</th>
<th>Expected by 2035</th>
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<tr>
<td>119.5 kBtu/SF/yr.</td>
<td>47.9 kBtu/SF/yr.</td>
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<tr>
<td><strong>62% Electricity + 38% District Steam</strong></td>
<td><strong>94% Electricity + 6% District Steam</strong></td>
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<tr>
<td>12,508 Ton CO2e/yr</td>
<td>3,059 Ton CO2e/yr</td>
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<tr>
<td><strong>$340,000 /year of LL97 fines starting in 2030</strong></td>
<td><strong>$0 LL97 fines starting in 2030</strong></td>
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**Reduction:**
- Energy load: 60%
- Heat recovery: 76%
LeFrak (59-17 Junction Blvd)
EBC – Central Plant Rebuild
February 8, 2024
LeFrak Building Background

- Building Type: Office Space
- No. of Fls: 20
- Area: 395,745 ft²
- EUI = 131.7 kBtu/SF

- Baseline Building Information:
  - Two (2) Scotch Marine Boilers
  - Two (2) 770-Ton Steam-Fired Absorption Chillers
  - Two (2) double cell CTs
  - Dual-Temp hydronic distribution system serving constant volume/pressure, core AHUs and perimeter FCUs on each floor
  - One (1) FCU perimeter distribution pump
  - One (1) AHU core distribution pump
  - One (1) Swing/Standby distribution pump
Opportunity from Natural Disaster

• What was the catalyst for this project? Energy Efficiency Goals?
  • Central Plant *flooding* which occurred due to Hurricane Ida in 2021!

• Flooded end of life equipment provided an opportunity for a central plant rebuild and exploring *additional energy savings*!
Project Requirements, Constraints, & Goals

1) Project Requirements:
   • Replace existing central plant
   • Do not disrupt existing tenants
   • Increase plant resiliency
   • Future proof for LL97

2) Project Constraints:
   • Limited electric service availability
   • Additional electric service request wait time
   • Phased construction
   • Focus design to meet budget requirements
   • Design to maintain existing building operations

3) Project Goals:
   • Implement building Heat Recovery from core AHUs to perimeter FCUs during shoulder season
   • Provide future connection taps for district thermal loop
   • Zone building systems to properly increase overall operational efficiency
Central Plant Project Timeline

1. Hurricane Ida 2021 Central Plant Flooding [August 2021]
2. LeFrak/SWA EBC Phase I Application Submitted [December 2022]
3. LeFrak EBC Application Accepted by NYSERDA [June 2023]
4. Project Demolition Started [December 2023]
5. Phase I – New Central Plant Construction Started [Q1 2024]
6. Phase II – Core & Perimeter Heat Recovery Construction Starts [Q4 2024]
7. NYSERDA EBC Heat Recovery M&V Study Starts [Q1 2025]
8. Phase III – Future Thermal District Loop Connection Completed [In the Future]
Central Plant Demolition
New Equipment Deliveries
Shoulder Season Heat Recovery Operation

Heat Recovery Flow:

1) Core AHU loop requires cooling

2) Chillers reject heat and produce cooling for the core AHU loop

3) CWS from Chiller to Heat Recovery HX

4) Heat Recovery hot water supply to perimeter FCU loop
discuss.

panelists

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thank you.