One Bryant Park: Case Study

Durst

Empire Building Challenge

A $50 million NYSERDA investment to:

1. **Accelerate private sector commitment and investment in carbon reduction, working with large portfolio owners.**
2. Enable replication and scale across NY's existing large commercial/multifamily building stock.
3. **Make NY a global hub for low carbon retrofits.**
4. Drive innovation to meet the needs of NY's large commercial/multifamily building stock.

Low Carbon Retrofits Unlock Climate Progress

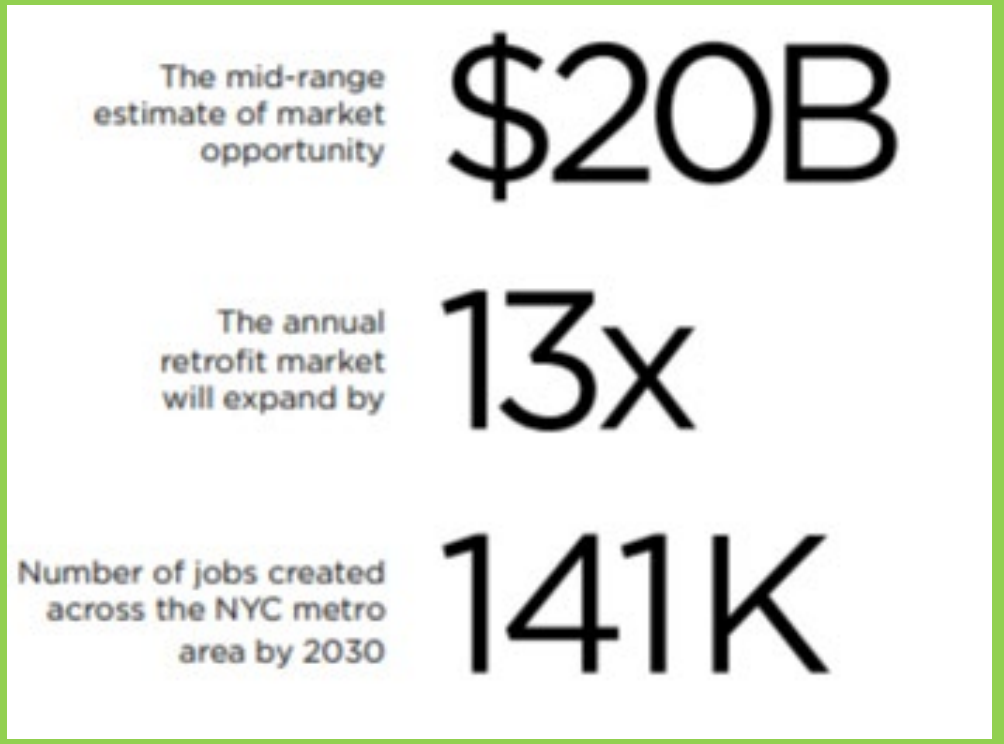
NYC: 3 billion square feet of existing office, multifamily buildings

~70% of today's buildings constructed prior to energy code

~90% of today's buildings will still be in operation in 2050

Buildings account for ~45% of NYS energy-related greenhouse gas emissions

Low Carbon Retrofits: Highlight on NYC Market Opportunity



Source: Urban Green Council, Retrofit Market Analysis 2019

Low Carbon Playbooks

In 2020, Vornado, The Durst Organization, Hines and Empire State Realty Trust partnered with NYSERDA to conduct in-depth analysis of their buildings.

The animating question is: **What are the retrofit pathways that transition this building to carbon neutrality and are economically and technically viable?**

What follows is the answer from the Durst team.

Playbook Partner

Who is Durst

- Founded in 1915, the Durst Organization (TDO) is a privately held family-owned business dedicated to developing, building, owning, and managing premier office towers and residential buildings.
- A long-term holder and operator of its real estate assets; when Durst develops a property, it retains the asset in the family-owned portfolio in perpetuity.
- Durst owns and manages 13 million square feet of Class A office and retail space and over three million square feet of residential rental properties, with 3,200 apartments built and over 5,000 in the pipeline.
- For over 100 years The Durst Organization has prided itself as an industry leader in sustainable development including landmark projects such as 151 West 42nd Street, the first green skyscraper, and the first LEED Platinum office-tower in the world, One Bryant Park

Durst's Commitment to Carbon Neutral Buildings

TDO proposes a layered approach of building improvements and investments with a commitment to achieve carbon neutrality by 2035.

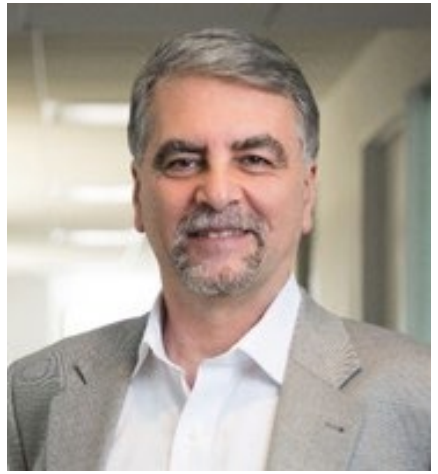
The Team

The Durst Team was led by Phil Skalaski, Ed Bricker, and Brian Geller in partnership with lead energy modeling consultant Socotec, and the support of engineering firm Jaros, Baum, & Bolles (JB&B), and construction manager The Fulcrum Group.

Phil Skalaski
Senior Vice President of Engineering and Energy Services

Ed Bricker
Senior Engineering Manager

Brian Geller
Senior Sustainability Manager



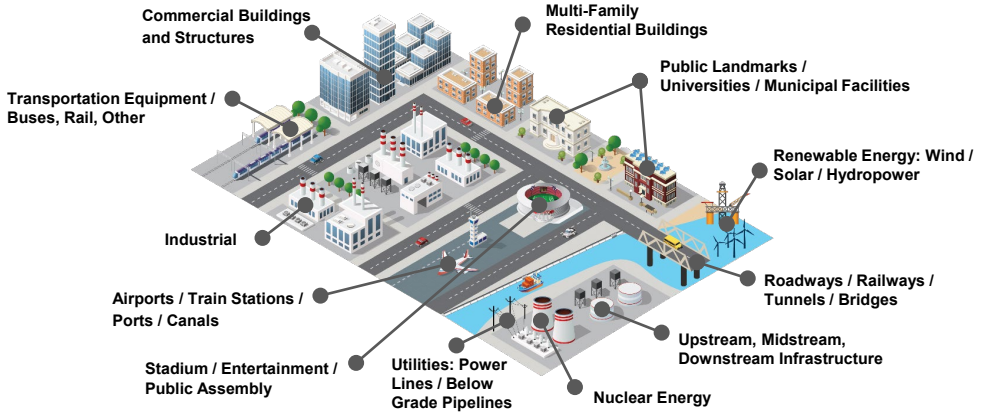
Adrian Tuluca
Senior Principal

Durst's Engineering & Energy Services and Sustainability Teams

- The Durst Organization's Engineering and Sustainability teams have a long history of working closely on projects large and small throughout the existing portfolio as well as new developments.
- For the Carbon Playbook Challenge Ed Bricker of the Engineering Department and Brian Geller of the Sustainability Department collaborated with external consultants to develop, test, and price multiple energy efficiency measures at One Bryant Park.

About SOCOTEC

We optimize the integrity and sustainability of assets in the built environment through high-value technical advisory services



400+

PEOPLE

1000+

CLIENTS

6

SERVICE LINES

- Building Envelope
- Energy & Sustainability
- Code & Planning
- Dispute Resolution
- Project Advisory
- Specialty Engineering

26 **OFFICES**

10 **STATES**

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The Building:
One Bryant Park

One Bryant Park Overview

- One Bryant Park is the flagship 2.35 Million Square Foot office building in the Durst portfolio located in midtown Manhattan.
- With a height of 1,200 feet, the 55 story Bank of America Tower is the eighth tallest building in New York City and the tenth tallest building in the United States as of 2021.
- It opened in 2008. Its facade is largely composed of a curtain wall made of insulated glass panels. The building's base incorporates the Stephen Sondheim Theatre, a New York City designated landmark, as well as several retail spaces and a pedestrian atrium.
- The Bank of America Tower was named one of The 50 Most Influential Tall Buildings of the Last 50 Years by the Council on Tall Buildings and Urban Habitat.
- It is the world’s first skyscraper to achieve LEED Platinum certification.

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One Bryant Park Overview

One Bryant Park is an environmentally responsible high-rise office building, focusing on sustainable siting, water efficiency, indoor environmental quality, and energy conservation:

- In the EBC, One Bryant Park is aspiring to reduce EUI from 213.6 KBTU/SF/YR (2015 baseline year) to 170.9 Kbtu/sf.
- Compared to a code building baseline at the time of construction:
  - Reduced energy consumption by a minimum of 50%
  - Reduced potable water consumption by 50%
  - Reduced storm water contribution by 95%

Why Focus on One Bryant Park?

Hard to decarbonize. This building is a test bed for the unique study of deep retrofit options in a building facing a unique set of challenges:

- **Relatively new construction (2008)** : The young age of the building makes major capex investments difficult to rationalize, as equipment has not yet reached the end of useful life.
- **Large cogeneration facility (4.5 MW)**: Constructed as an environmental boon, a future greener electric mix in zone J and a local penalty structure which dis-incentivizes on-site fossil fuel combustion may cause the current operating strategy to be difficult to rationalize. The above conditions may necessitate re-envisioning the use case for the cogeneration plant, such as a resiliency and demand response feature, in lieu of a 24/7/365 operation.
- **24/7 Operations:** A building leasing to a tenant with international operations, or otherwise operating outside of regular business hours is more efficient than spreading operating hours over multiple properties, however is seen as inefficient operation when compared only on a per square foot basis.
- **High-intensity tenant energy use** (one large tenant occupying 75% of interior, with data center and dense trading floors): optimizing tenant energy use is a necessity to significantly reducing the building's carbon footprint.
- **Expected end of useful life** for major building systems not until 2030 or later.

One Bryant Park Building Energy Attributes

Façade: High performing steel and glass curtain wall, 62% Vision glazing

Heating Energy: District steam, Natural Gas Cogeneration

Heating Terminal: steam coils in AHUs, hot water perimeter finned tube

Cooling Energy: Electric grid, Cogenerated steam

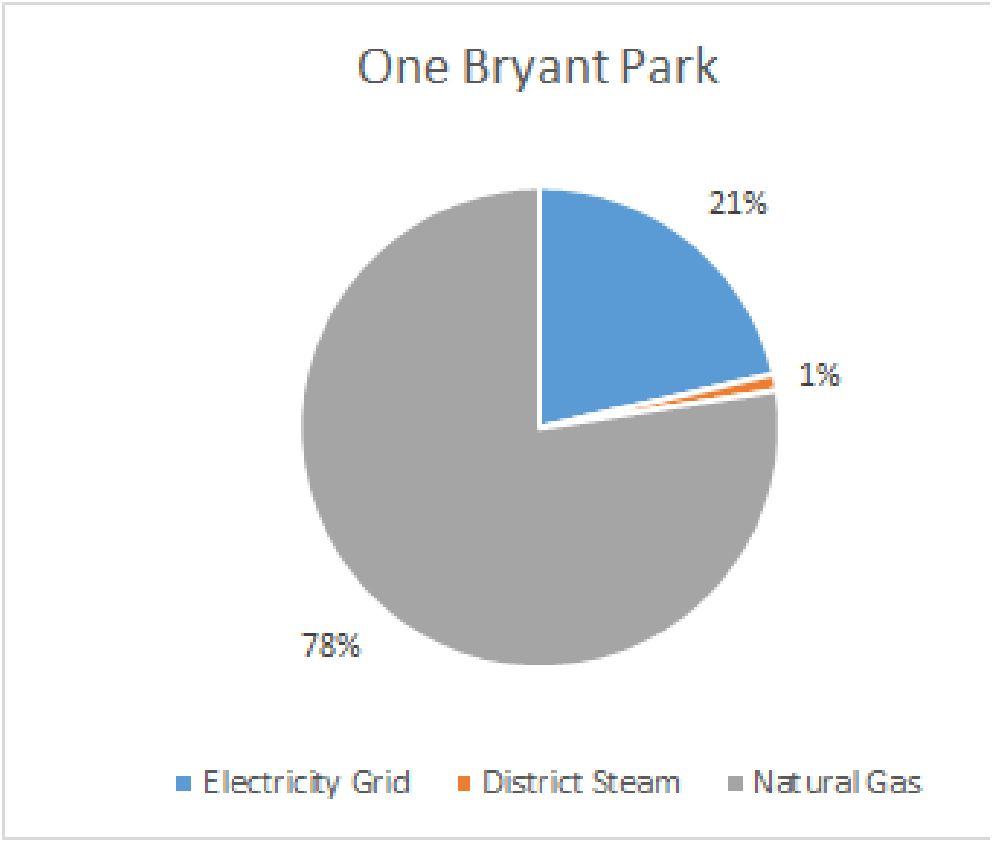
Cooling Plant: Two existing electrically driven chiller plants – base building and tenant, with additional 410-ton absorption chiller from natural gas cogeneration.

Cooling Terminal: Chilled water coil AHUs and fan powered boxes

OBP – energy and carbon profile

Year	Energy Star Score	EUI (kBtu/sqft)	CO2 Emissions (MtCO2e)	Total Energy Used (kBtu)
2015 (Baseyear)	N/A	215.90	28,500	477,806,071
2019	41	214.00	28,000	473,519,226
2035*	TBD	170.9	19,199	346,781,917

*Represents an aspirational EBC target for study. Not reflective of internal ESG goals. Requires all ECMs aside from Data Virtualization to achieve. $218M CapEx Cost.



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The Analysis

Approach

The Design Team worked in stages directly with the owner's engineering and sustainability teams to identify façade and MEP systems to test performance:

- Various packages of EEMs were studied ranging from façade and insulation improvements, small-mid scale MEP equipment upgrades, MEP controls upgrades, and full electrification opportunities.
- Implementing façade improvements in an occupied building presented logistical issues associated with overtime labor costs, as well as the incremental nature of the improvements due to the high quality and relatively new construction. The simple monetary payback for façade measures ranged between 176.5 to 494.3 years, with a minimum initial capex outlay of $11,887,199 (258.8 year payback)

Electrification Opportunities Identified

1. Air source heat pumps providing heat for the whole building, removing the ConEdison steam service and cogeneration facility, and replacing all finned tube in the building to accommodate lower loop temperatures.
   - No payback was achieved with this method due to an increase in opex costs net of Local Law 97 fine savings and utility increases. (*N/A Payback, $113M Cost, 6,827 tCO2e annual carbon savings)*
2. Second, with only air source heat pumps providing heat as described above, however all other studied ECMs (façade improvements, MEP systems upgrades where applicable, etc…) were implemented, as well as virtualizing the high intensity data center and trading uses in the building. (*118 year payback, $218M Cost, 12,441 tCO2e annual carbon savings)*

Layering Carbon Neutrality

1. Operate existing systems as efficiently as possible, including responding to time-of-use carbon signals
2. Advocate for a Green Con Ed steam system
3. As the electric grid greens, re-envision use case for cogeneration plant from 24/7/365 operation to a resiliency and demand response asset.
4. As electric grid greens, strategically electrify end uses as equipment reaches end of useful life, pending incorporation of renewables into ConEd's steam system.

Takeaways

- Relatively new construction, presence of a large cogeneration facility, and high-intensity data center and trading floors limit current carbon reduction opportunities.
- Primary near-term opportunities are technology and control improvements and operations enhancements
- Wait until end of major equipment's end of useful life to take advantage of incremental, rather than total, capital expenditure to improve overall payback

Reflections

Lessons learned

- Decarbonization plans should be formulated through consensus of a team of internal stakeholders and external consultants in order to provide a level of quality assurance and control to be sure all benefits and drawbacks of a given solution are identified and accounted for prior to committing to a given project or set of projects.

- Even though no new in-building solutions were identified, the exercise did provide the opportunity to consider indirect and utility improvements that would either put One Bryant Park on a path to decarbonization (green ConEd steam) as well as alternative use cases for existing infrastructure (cogeneration facility)

Business and/or Technical Constraints

- Challenges associated with re-fitting typical infrastructure present in tenant spaces throughout the building (perimeter heating systems, etc.) remain significant, as do the technical limitations of existing air source heat pump technology to provide a reliable heating solution in an economical and space-conscious manner.

- Proposing upgrades prior to the end of useful life has a negative impact on the financial feasibility of a given project, given that the initial cost of a project cannot be weighed against an incremental cost over the “bare minimum”.

Additional Technical Information

How did the team conduct this analysis?

- Socotec generated a matched energy model based on extensive utility and sub-metered interval usage for almost all utilities, as well as certain services “bought” and “sold” between the building and cogeneration plant.
- When favorable energy conservation measures (ECMs) were identified, they were placed into packages that had coincident benefits and submitted for cost estimating.
- Various packages of EEMs were studied ranging from façade and insulation improvements, small-mid scale MEP equipment upgrades, MEP controls upgrades, and full electrification opportunities.
- Partial and full building electrification were studied extensively.