CASE STUDY: BROOKLYN, NY

ENERGY USE AND UTILITY COSTS IN PASSIVE HOUSE-LIKE BUILDINGS

SUBJECT PROPERTY

Location:
Brooklyn, NY

Construction Type:
New Construction

Building Size:
4 floors, 24 units, 90 rooms, 26,331 gross sqft

Metering Configuration:
Owner paid heat, hot water, water & sewer

Certification:
Enterprise Green Communities

High-Performance Building Elements:

Envelope:
Thermally broken, highly insulated, airtight envelope

Heating:
Centralized high-efficiency gas-fired condensing boiler with apartment radiators

Cooling:
Owner provided ENERGY STAR window A/C units with special air-sealed enclosures

Ventilation:
Unitized Energy Recovery Ventilation (ERVs)

Renewable Energy On-site:
Solar thermal system for domestic hot water (DHW)

COMPARABLE PROPERTY

Location: Brooklyn, NY

Construction Type: New Construction

Building Size: 4 floors, 24 units, 96 rooms, 29,705 gross sqft

Metering Configuration: Owner paid heat, hot water, water & sewer

High-Performance Building Elements:

- Similar Heating, Ventilation, and Air Conditioning (HVAC) design
- Built incorporating Passive House design principles, not certified

Comparable Property

To better understand how envelope and HVAC system design can affect expenses, lenders can look to shared platforms—like EPA's Portfolio Manager, or paid platforms like Bright Power's EnergyScoreCards—to analyze typical energy performance of similar buildings to compare against the projected performance of high-performance projects. These benchmarking platforms and data resources can provide additional insight into how lenders can and should interpret improvements in energy consumption and how that correlates to reduced utility expenses.

The Subject and Comparable Properties are developments in Brooklyn, NY built by the same owner and designed by the same architect. While these buildings were not certified, they were designed, modeled, and built incorporating Passive House principles; both buildings have highly-insulated, thermally broken envelopes, mechanical ventilation with unitized ERVs, and high-efficiency hydronic heating systems. Since cooling is not included, higher efficiency window A/C units were provided and installed in highly-insulated through-wall sleeves with an insulated and airtight cover to prevent air infiltration in the colder months.

In both the Subject and Comparable Properties, the owner pays gas costs for heating and domestic hot water, and common area electric, whereas electric baseload for each unit is directly metered to the tenants. The tenants are responsible for their apartment plug loads including electric ranges and any cooling costs.

A solar thermal array on the roof further reduces the Subject Property's energy demand using the sun's energy to preheat water for the DHW distribution system.

These features improve indoor air quality, tenant comfort, and affordability for residents, and positively impact the project's bottom line.

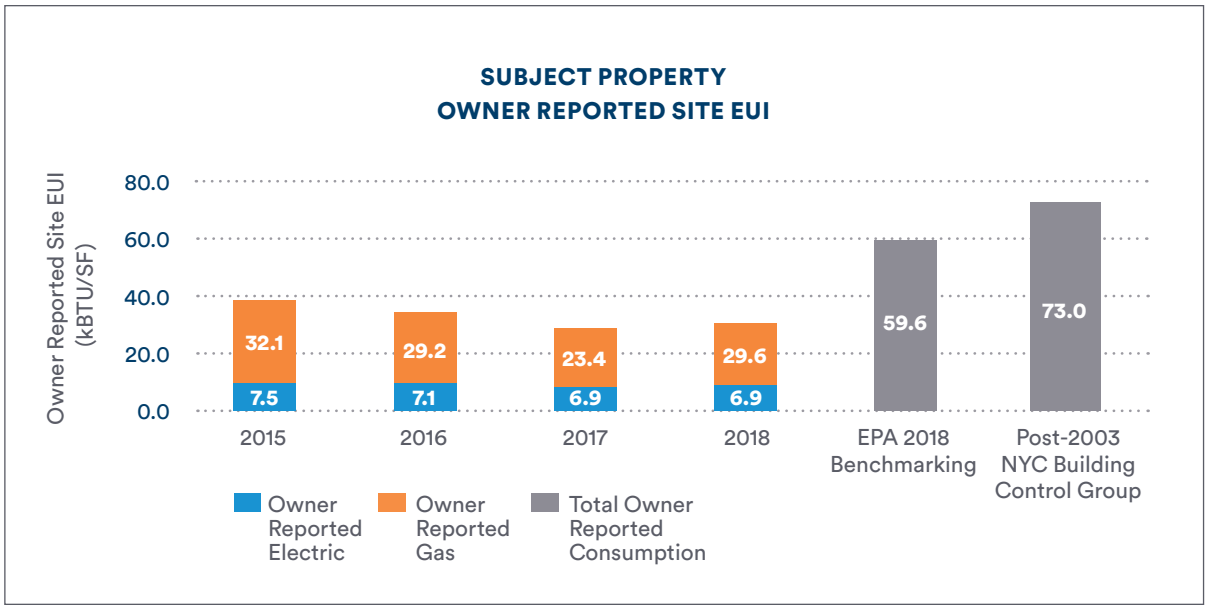

Chart A: Subject property owner reported site EUI compared to the site EUI from EPA Portfolio Manager (2018), utilizing Fannie Mae portfolio inputs, and a control group of NYC buildings constructed after 2003. The Post-2003 building sample was compiled from benchmarking data reported in Bright Power's EnergyScoreCards and is meant to represent similar buildings (age and type) to the NYC Housing Development Corporation's (HDC) portfolio of buildings.

BUILDING PERFORMANCE

The energy consumed through common area plug loads, lighting, and owner-paid heating is shown in Chart A in kBtu per square foot. In this example we are looking only at site energy use intensity (site EUI).

According to EPA Portfolio Manager benchmarking data—gathered from Fannie Mae's 2018 Industry Survey—site EUI for a typical multifamily residential building is 59.6 kBtu /sqft.[1]

The average site EUI at the Subject property, calculated based on five years of stabilized operations (2015-2018) is 35.7 kBtu/sqft. Chart A shows that owner reported building electric and gas usage at the Subject Property is, on average, **40% lower than the Fannie Mae EPA inputs from 2018. When compared to the Post-2003 NYC Building Control Group—compiled using data from Bright Power's EnergyScoreCards to represent buildings similar in age and type to NYC Housing Development Corporation's (HDC) portfolio of buildings in NYC—the Subject Property exhibits a 51% reduction in overall site EUI.**

1 EPA ENERGY STAR, What is energy use intensity (EUI)?, https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/understand-metrics/what-energy

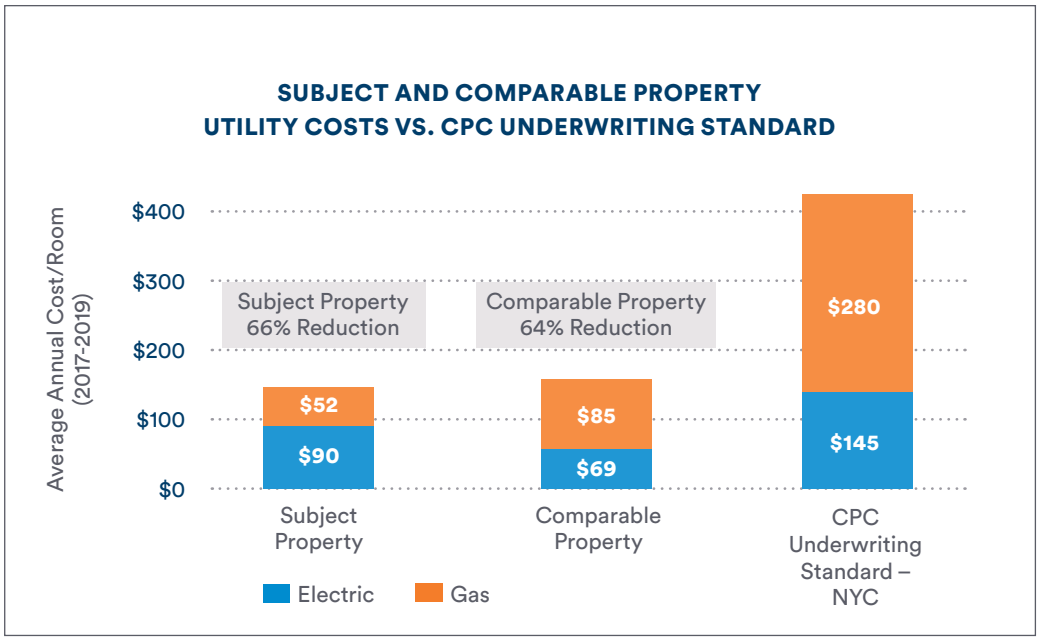

Chart B: Average annual utility cost per room for Subject and Comparable Properties compared to CPC standard underwriting for NYC. The subject property exhibits a 66% reduction in total owner costs, and the comparable property exhibits a 64% reduction in total owner costs, compared to CPC's standard underwriting.

UTILITY COSTS

The Subject and Comparable Properties both employ high-performance envelope design to enhance HVAC performance; both the radiant heating system and the window A/C units are able to condition the living space without overworking the systems.

CPC's underwriting standards are compiled by analyzing income and expense statements from buildings in the lending portfolio. The number of rooms per unit is calculated as the number of bedrooms plus one.

When compared to CPC's standard underwriting for utilities in New York City, both buildings clearly outperform the standard estimates.

When initially underwriting this deal, there was little guidance for how to incorporate the projected performance or available operational data from comparable buildings to develop adequate utility cost comps. There were, also, few comps available to the lender related to any increase in the cost to build to Passive House standards. The project teams for both the Subject and Comparable Properties had no prior experience with Passive House construction but were able to execute both high-performance builds without overburdening project budgets. Both projects were built at "typical" NYC construction costs; looking at total hard costs, including contingency, the Subject Property was constructed for $235 per square foot and the Comparable Property for $225 per square foot – well within the baseline cost range for subsidized affordable new construction projects in New York City.

After three stable years of benchmarking performance and utility cost data from both buildings, it is clear that the high-performance measures incorporated into the scope of work result in significant savings for the owner, and stable utility costs for the low-and-moderate income tenants the buildings serve.