

# Multifamily Passive House: Connecting Performance to Financing



building  
energy  
exchange

How energy efficiency and  
operational savings can provide  
additional, ongoing cash flow

Thursday, March 18, 2021



BE-Ex is a center of excellence dedicated to reducing the effects of climate change by improving the built environment. BE-Ex accelerates the transition to healthy, comfortable, and energy efficient buildings by serving as a resource and trusted expert to the building industry.

# Sadie McKeown

Executive Vice President, Lending and  
Initiatives, Community Preservation  
Corporation

# introduction

## Playbook

- NYC HPD, Bright Power, CPC, SWA, BE-Ex & NYC Accelerator
- Available for download at [be-exchange.org](https://be-exchange.org)

## Agenda

- Presentation
- Panel Discussion
- Audience Q&A

**\*Please submit questions using Zoom Q&A feature**

playbook

### Multifamily Passive House: Connecting Performance to Financing

How energy efficiency and operational savings can provide additional, ongoing cash flow.

Figure 1. Improved performance and utility cost savings associated with Passive House construction increase NOI, which supports additional private debt and can also reduce reliance on public subsidies for certain types of buildings.

be ex building energy exchange

NYC ACCELERATOR

NYC Department of Housing Preservation & Development

MARCH 2021

be-exchange.org

Passive House: Connecting Performance to Financing

17

### Underwriting to Incremental Costs and Passive House Savings

Incremental first construction costs of Passive House Projects are likely to decrease as components become more widely available and cost-efficient, increasing demand for high-performance buildings.

Objectives 5 & 6: Demonstrate a methodology for underwriting incremental first costs and operational savings.

**Offsetting Incremental First Costs**  
Information reviewed as part of this study—including experience from other Northeast states employing Passive House to address climate goals—indicates that it is possible to construct Passive House multifamily buildings at minimal additional cost, ranging from 2-5% for experienced project teams. Incremental costs are strongly correlated with the baseline of comparison, but are expected to approach zero as code requirements and market demand increase, and as products become more widely available and cost-competitive.<sup>25</sup>

- Soft cost increases for Passive House include certification, consulting, verification, and performance testing, typically ranging from \$100K to \$200K for multifamily projects. This varies with building size and team experience.
- Hard cost increases for Passive House are primarily related to higher performing HVAC equipment, particularly variable refrigerant flow (VRF) and energy recovery ventilation (ERV). Building envelopes also contribute to costs—primarily triple-glazed windows—which are required for many projects.
- Maintenance & operating (M&O) costs can run up to \$200/apartment per year for ERV and VRF filter changes. This would be less for centralized systems and does not take into account the M&O costs of base case systems, like A/C units.
- The learning curve and “fear of the unknown” among contractors and sub-contractors can increase costs for teams new to Passive House.

**Translating Savings into Additional Private Debt**  
One way to cover incremental costs of Passive House construction is to factor energy performance cost savings into the first mortgage.

Net operating income (NOI) is calculated based on the difference between rental and other income and M&O expenses. If lenders can prove some measure of cost reduction for certified Passive House and Passive House-like buildings, they can increase the supportable loan by reducing expenses and increasing NOI. This could also decrease the amount of subsidy often required from city and state agencies.

**Underwriting to Improved Performance**  
Underwriting Passive House performance and cost reduction into a first mortgage takes into account the financial stability of the project. Below are key recommendations for lenders to consider:

1. Compare projected energy costs to conventional M&O standards to assess potential energy cost savings.
  - a. Confirm what portion of the energy cost savings will accrue to the owner. Those savings can be underwritten by the lender.
  - b. Ensure that renewables, if included, are factored into energy cost savings.
  - c. If applicable, factor in avoided costs (e.g. future carbon penalties, reduced vacancies) over the project's life cycle.
2. Collect relevant project information and relevant comparables (“comps”) to assess risk.
  - a. How does the projected performance compare to available Passive House comps?
  - b. Has the team (e.g. architect, contractor, etc.) built to a Passive House standard before?
  - c. Does the team plan to certify to a Passive House standard?
3. Determine the NOI.
4. Determine a reasonable percentage of energy cost savings that can be underwritten, and use that to assess the additional debt that the project can leverage.

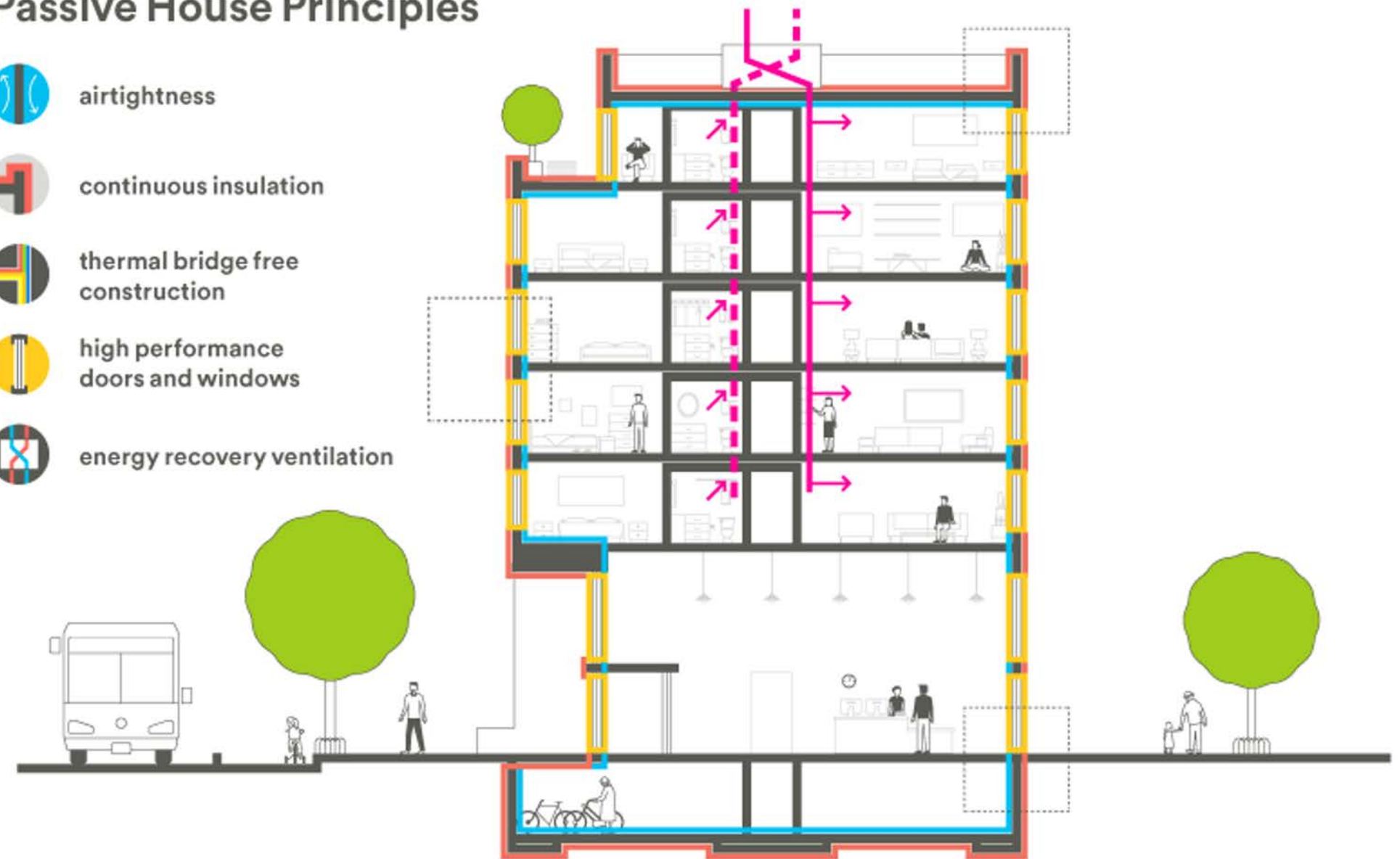
# why passive house?

## Benefits

- Utility cost savings
- Avoidance of carbon penalties
- Construction risk reduction
- Excellent indoor air quality & occupant health
- Superior comfort
- Climate resilience & reliability

## Passive House Principles

-  airtightness
-  continuous insulation
-  thermal bridge free construction
-  high performance doors and windows
-  energy recovery ventilation



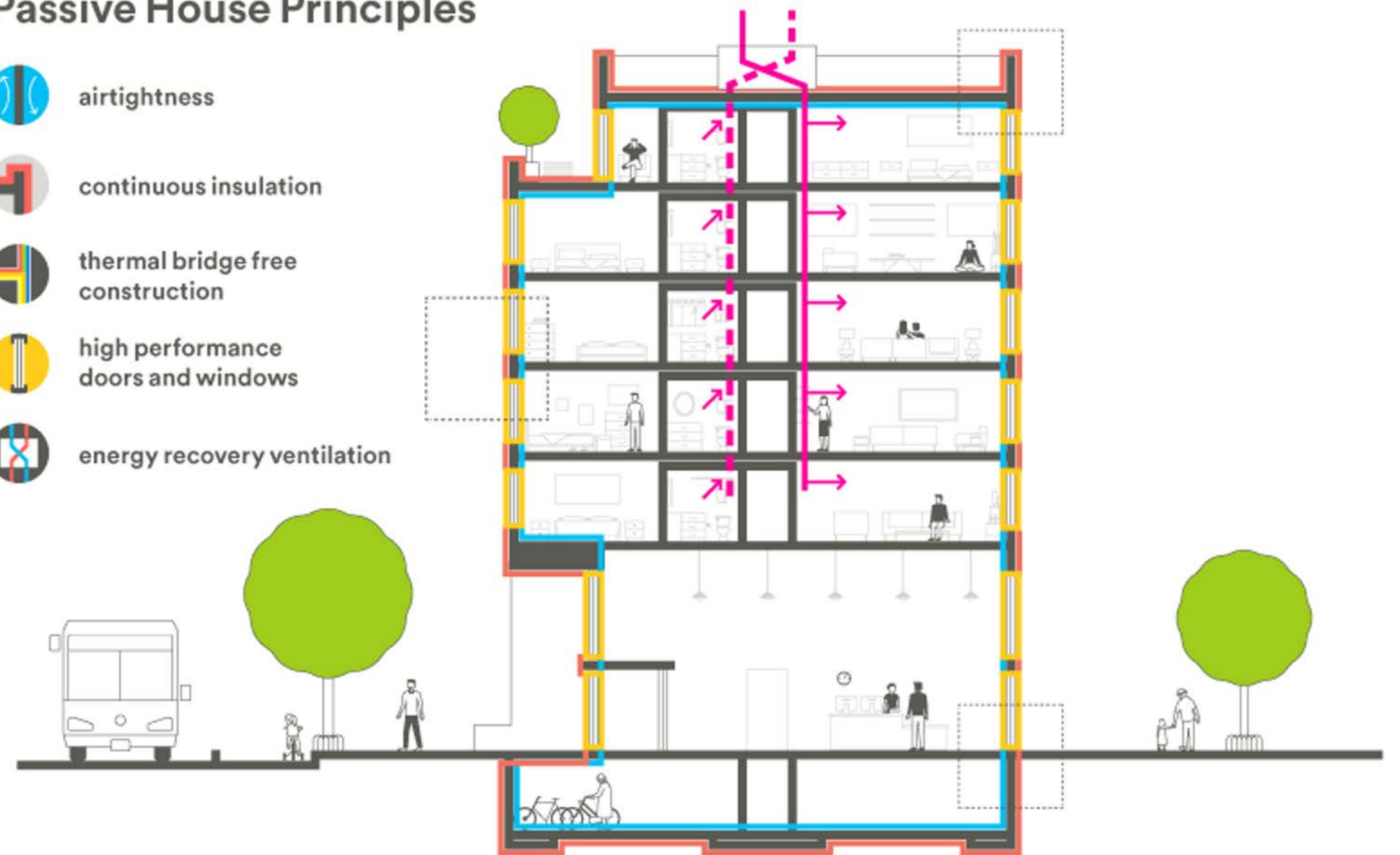
# barriers to passive house adoption

## Limited Access to Financing

- Perceived first cost increase
- Limited data to prove operational savings
- Inability to quantify the value of non-energy benefits
- Lack of methodology to underwrite to high performance

### Passive House Principles

-  airtightness
-  continuous insulation
-  thermal bridge free construction
-  high performance doors and windows
-  energy recovery ventilation



# objective 1: provide a framework to compare data from case study and control groups

Compare metrics for:

- Energy consumption
- Greenhouse gas emissions
- Utility costs
- First costs
- Operational savings



The House at Cornell Tech

# establishing the passive house study group

## Gas-Heated Group

- Two projects
- Hydronic heating
- Window air conditioners (A/C)
- Not Passive House certified
- Small, affordable housing



Knickerbocker  
Commons, RiseBoro  
(C-2)



Mennonite United,  
RiseBoro  
(C-1)



# establishing the passive house study group

## Electric-Heated Group

- Four projects
- Two certified, one pursuing certification, one “Passive House Like”
- Projects of all scales
- Variable refrigerant flow (VRF) heating & cooling



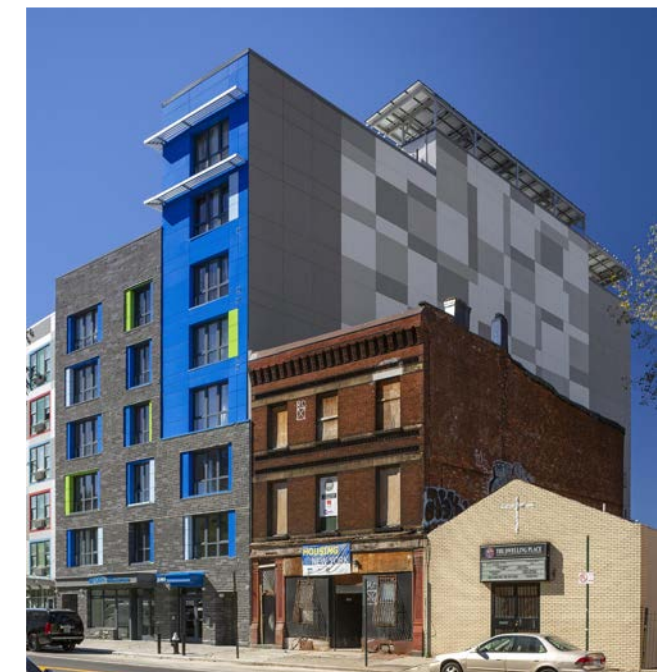
Woodycrest Veterans Housing,  
CMC Development (C-3)



Beach Green Dunes,  
Bluestone Organization (C-5)



Cornell Tech, Hudson &  
Related Companies (C-6)



Third Avenue Development,  
Bronx Pro Group (C-4)

# establishing the control groups

## Pre-2003 Group

- Benchmarking data from 1,633 NYC buildings
- 96% gas heating
- 4% electric heating

# establishing the control groups

## Pre-2003 Group

- Benchmarking data from 1,633 NYC buildings
- 96% gas heating
- 4% electric heating

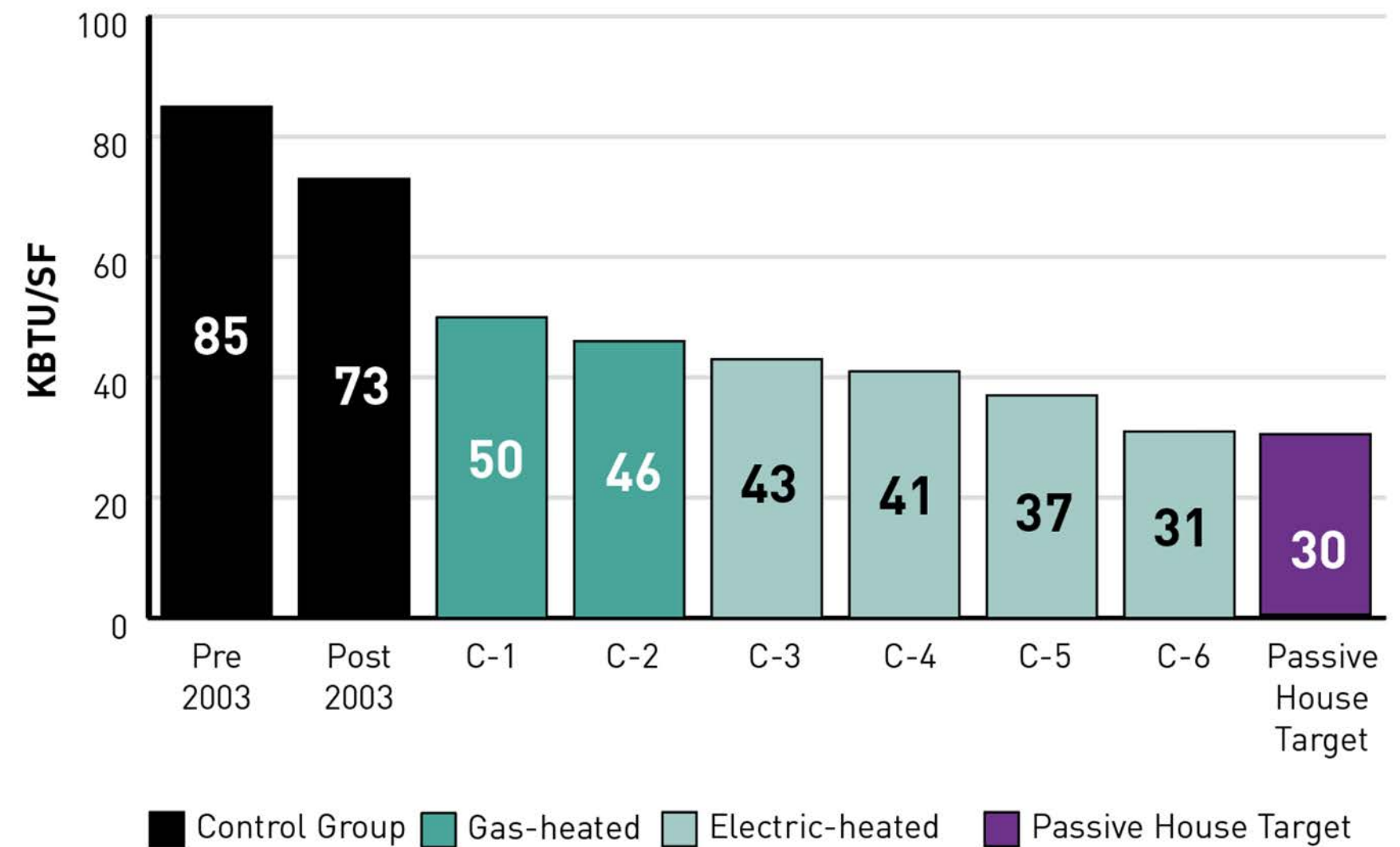
## Post-2003 Group

- 315 buildings
- 94% gas heating
- 6% electric heating

# objective 2: compare site energy use intensity (EUI)

## Findings:\*

- Passive House study group buildings perform 32% to 58% better
- Electric-heated Passive House buildings perform better than gas-heated
- Certified Passive House buildings perform best



\* Passive House EUI targets range from high 20s to low 30s when properly commissioned. For methodology and additional context, see the Playbook at [be-exchange.org](http://be-exchange.org).

# objective 3: compare carbon emissions

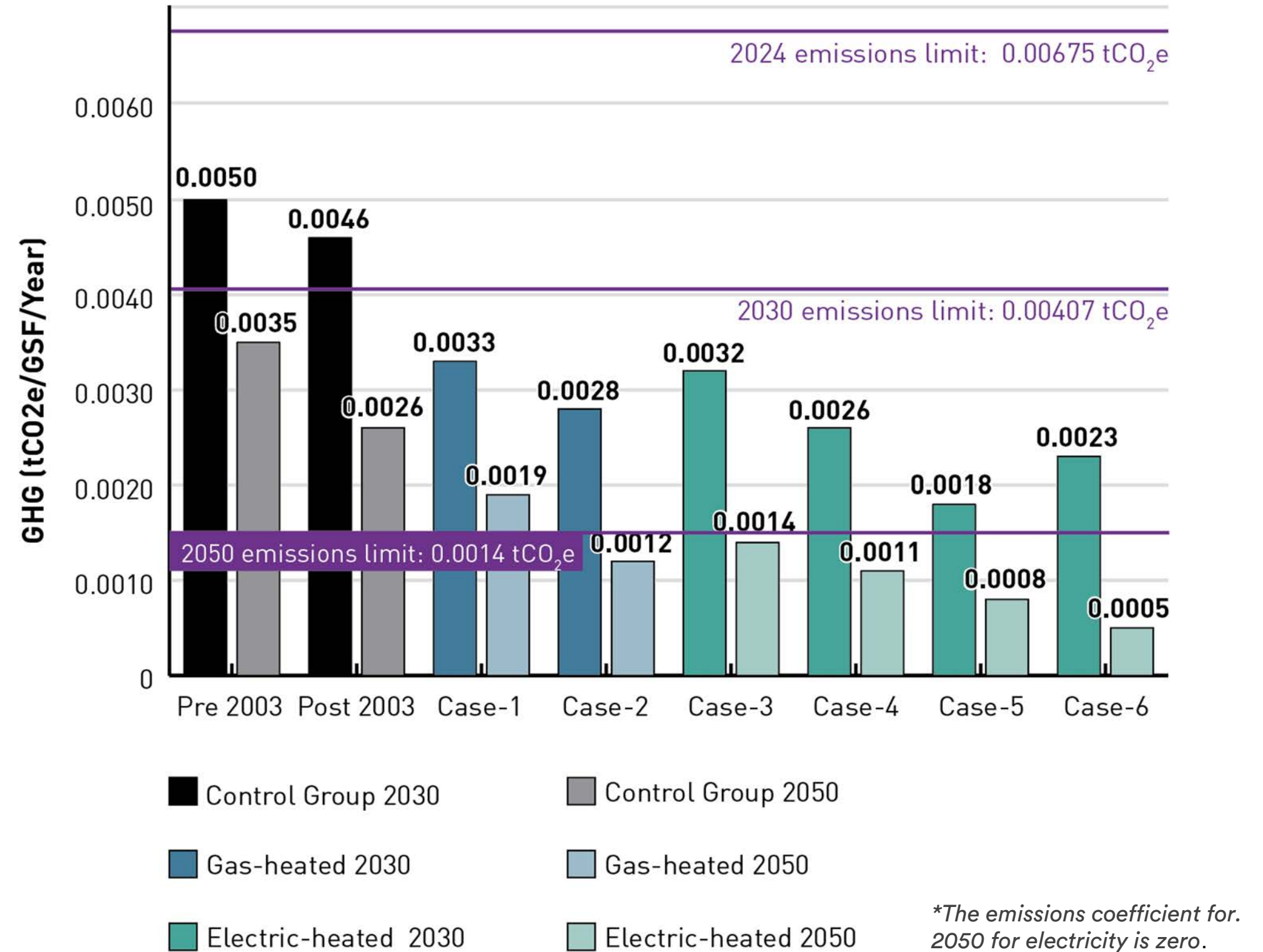
## Rationale:

- Buildings account for two-thirds of total NYC emissions
- NYC Local Law 97 (LL97) established emissions limits
- Certain types of affordable housing are subject to alternative compliance requirements

# objective 3: compare carbon emissions

## Findings:

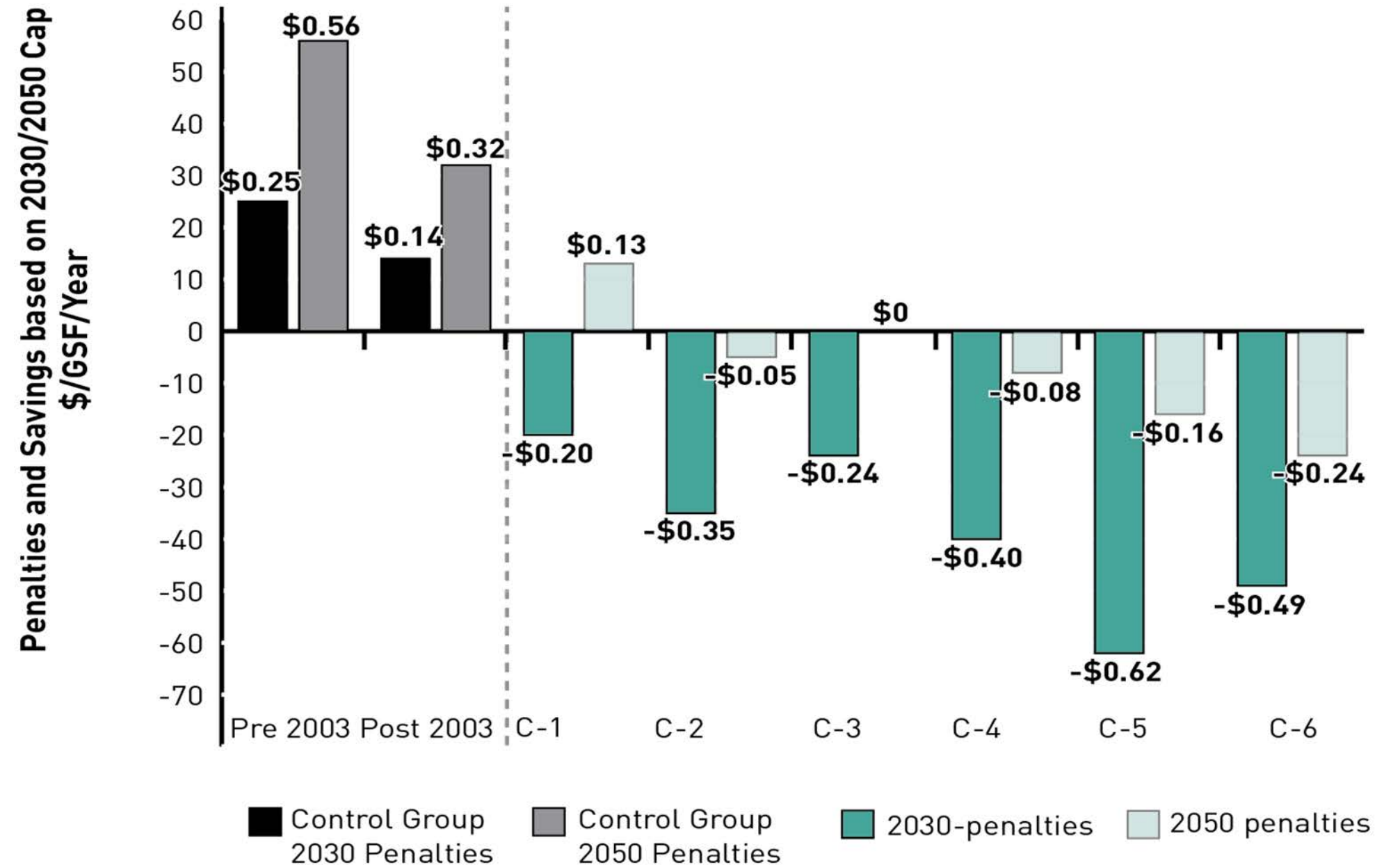
- Both control groups will require capital improvements to comply with the 2030 and 2050 limits
- All Passive House buildings would comply with the 2024 and 2030 limits and avoid civil penalties.
- All but one of the Passive House buildings would comply in 2050



# putting a price on carbon

If carbon trading passes in NYC:

- Building owners below cap may be able to sell carbon savings to owners who exceed cap.
- For the Passive House study group, revenues in 2030 could be \$5,000 to \$132,000.\*



\* Potential revenues are based on the LL97 price of \$268/ton of carbon

# objective 4: calculate utility cost savings

## Rationale:

- Energy savings create additional cash flow
- Underwriting to energy savings can unlock access to financing
- Financing can offset incremental first costs of green buildings



# objective 4: calculate utility cost savings

## Findings:\*

- 28– 68% annual cost savings for Passive House study group
- Performance improves as owners and tenants acclimate
- Renewables can contribute to savings

FUEL SOURCE	C-1	C-2	C-3	C-4	C-5	C-6
ELECTRIC COST REDUCTION	52%	40%	41%	12%	62%	30%
GAS COST REDUCTION	62%	70%	65%	60%	80%	85%
TOTAL ENERGY COST REDUCTION	55%	50%	48%	28%	68%	47%
DEBT THAT COULD BE LEVERAGED (\$/SF)	\$9-\$13	\$7-\$10	\$7-\$11	\$2-\$4	\$9-\$13	\$6-\$9

\* Cost savings are based on a comparison to underwriting standards for utility expenses in NYC affordable housing. Potential additional debt leverage assumes 50% of whole building energy savings.

# objective 5: demonstrate methodology to underwrite incremental first costs

## Rationale:

- Better understanding of first costs
- Better understanding of how to offset any incremental costs
- Overcome hesitancy to underwrite to Passive House performance

# incremental first costs

## Findings

- 0-5% incremental cost for Passive House
- **Soft Costs** (certification, consulting, verification, and performance testing): \$100-\$200k
- **Hard Costs** (higher performing HVAC equipment, windows, insulation, etc.)
- **Maintenance & Operating Costs** (filter changes, etc.): Up to \$200/apartment per year
- **Unknowns** (costs related to initial learning curve)

# incremental first costs

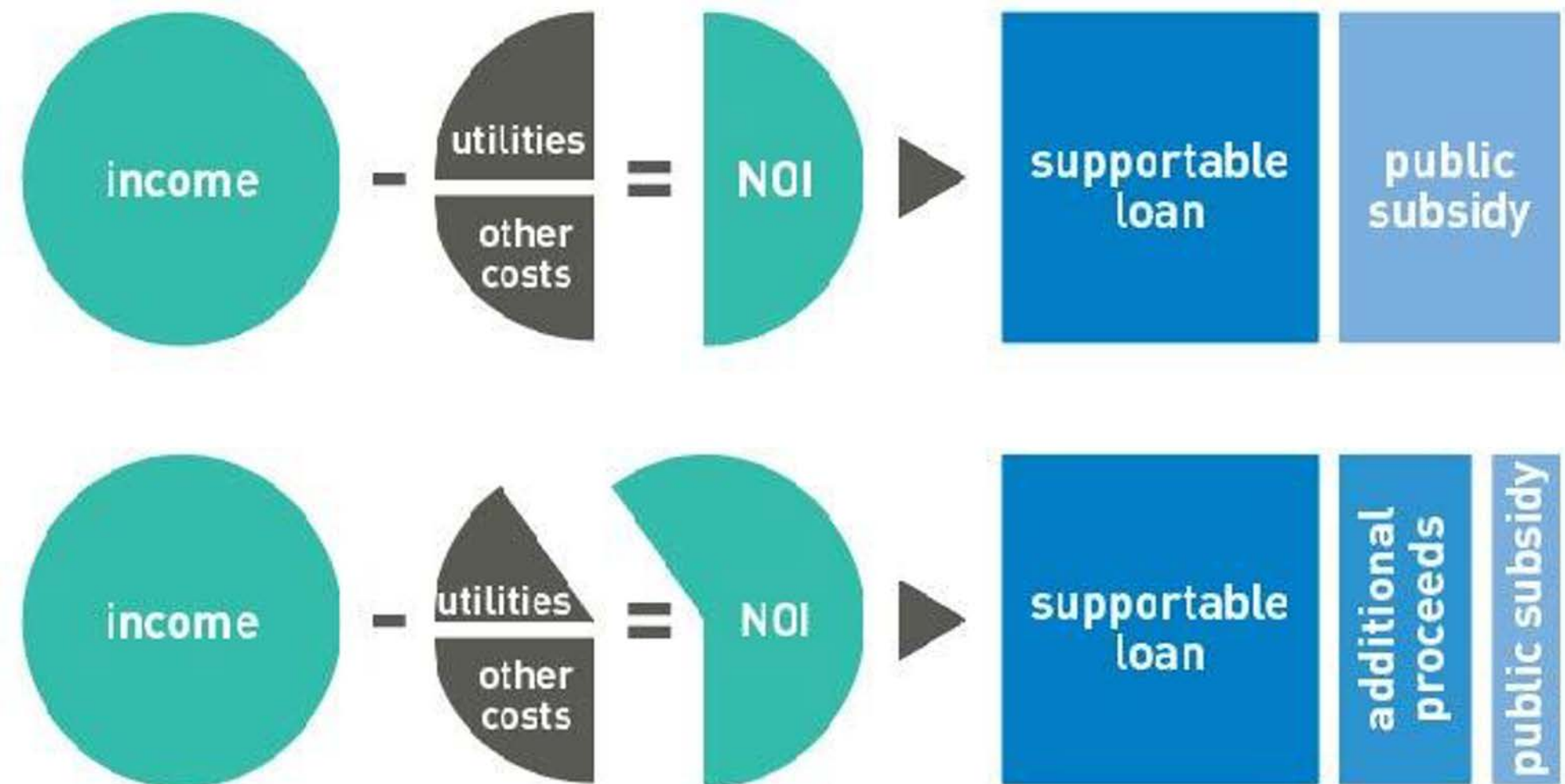
## Findings, cont'd

- Costs come down as team experience and market demand increase, and as equipment prices drop
- Operational savings can offset first costs
- Non-Energy Benefits add value to appraisals
  - Occupant Comfort
  - Indoor Air Quality & Health
  - Resiliency
  - Reduced construction risk
  - Emissions reduction

# Objective 6: demonstrate a methodology to underwrite operational cost savings

## Rationale:

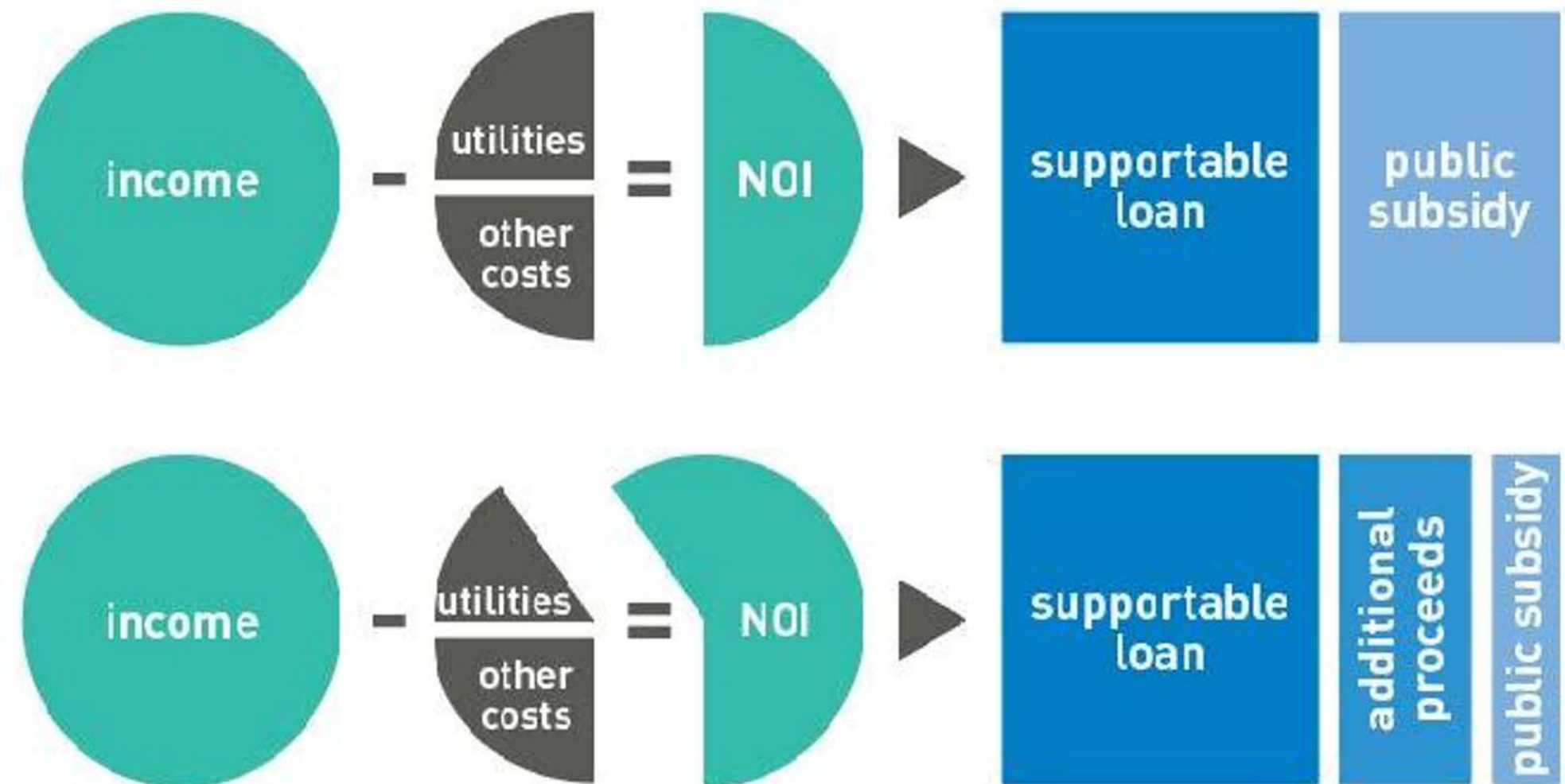
- Savings from Passive House performance can increase net operating income (NOI)
- Increase loan amount
- Decrease subsidies
- Accelerate adoption of Passive House construction



# Objective 6: demonstrate a methodology to underwrite operational cost savings

## Key Considerations for Lenders:

1. Compare projected energy costs to conventional M&O standards
2. Determine a reasonable percentage of energy cost savings that can be underwritten
3. Determine the NOI
4. Collect relevant project information and comparables



# summary of key findings

## Lessons from Passive House study buildings:

1. 28-68% annual energy cost savings
2. \$2- \$13/sf extra debt could be leveraged
3. Compliance with NYC emissions limits and avoided civil penalties
4. Electric heating and Passive House certification improve performance

# looking ahead

1. Deep dive into energy performance, to understand implications of:
  - Building design
  - Operation
  - System choices
  - Tenant behavior



# looking ahead

## 2. Collect more data:

- City College of New York (CUNY) Sustainability in the Urban Environment capstone team
- Multifamily Passive House database
- North American climates similar to NYC
- Online survey to collect data

Participate in the survey!

[Openpassivehouse.commons.  
gc.cuny.edu](https://openpassivehouse.commons.gc.cuny.edu)

# looking ahead

## 3. Provide better data and tools for lenders

- Quantify energy savings and non-energy benefits of Passive House
- Improve accuracy of underwriting
- Create a Passive House comps database
- Improve data collection and energy modelling

# panel discussion: Beach Green Dunes



## Project Team

- The Bluestone Organization
- Curtis + Ginsberg
- Steven Winter Associates

# panel discussion: Beach Green Dunes

## Building Information

- Rockaways, NY
- 94,000 Gross ft
- 101 units
- Completed in 2017



# panel discussion: Beach Green Dunes

## Project Details

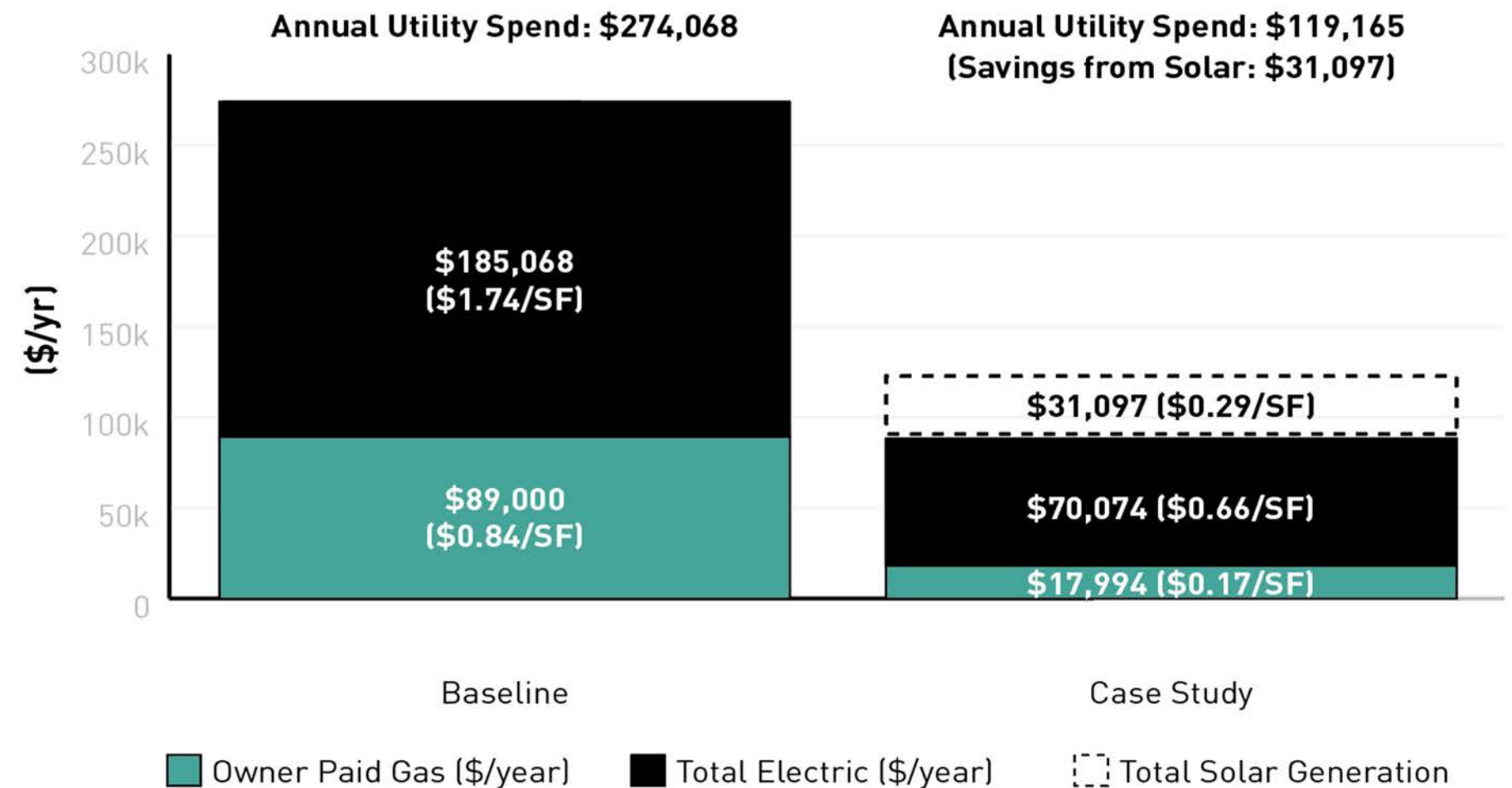
- Passive House certified
- VRF heating and cooling
- Energy recovery ventilation
- On-site solar and co-generation



# panel discussion: beach green dunes

## Study findings:\*

- 56% annual utility savings (before renewables)
- 68% annual utility savings with renewables



**More to come in panel discussion!**

\* For methodology and additional context, please see the Playbook at [be-exchange.org](https://be-exchange.org)

# Please submit questions through Zoom Q&A!

## **Moderator:**

- **Elizabeth Kelly, Senior Policy Advisor, NYC Mayor's Office of Sustainability**

## **Panelists:**

- **Eric Bluestone, Partner, Bluestone Organization**
- **Mark Ginsberg, Partner, Curtis + Ginsberg Architects**
- **Jennifer Leone, Chief Sustainability Officer, NYC HPD**