

# Passive House Construction

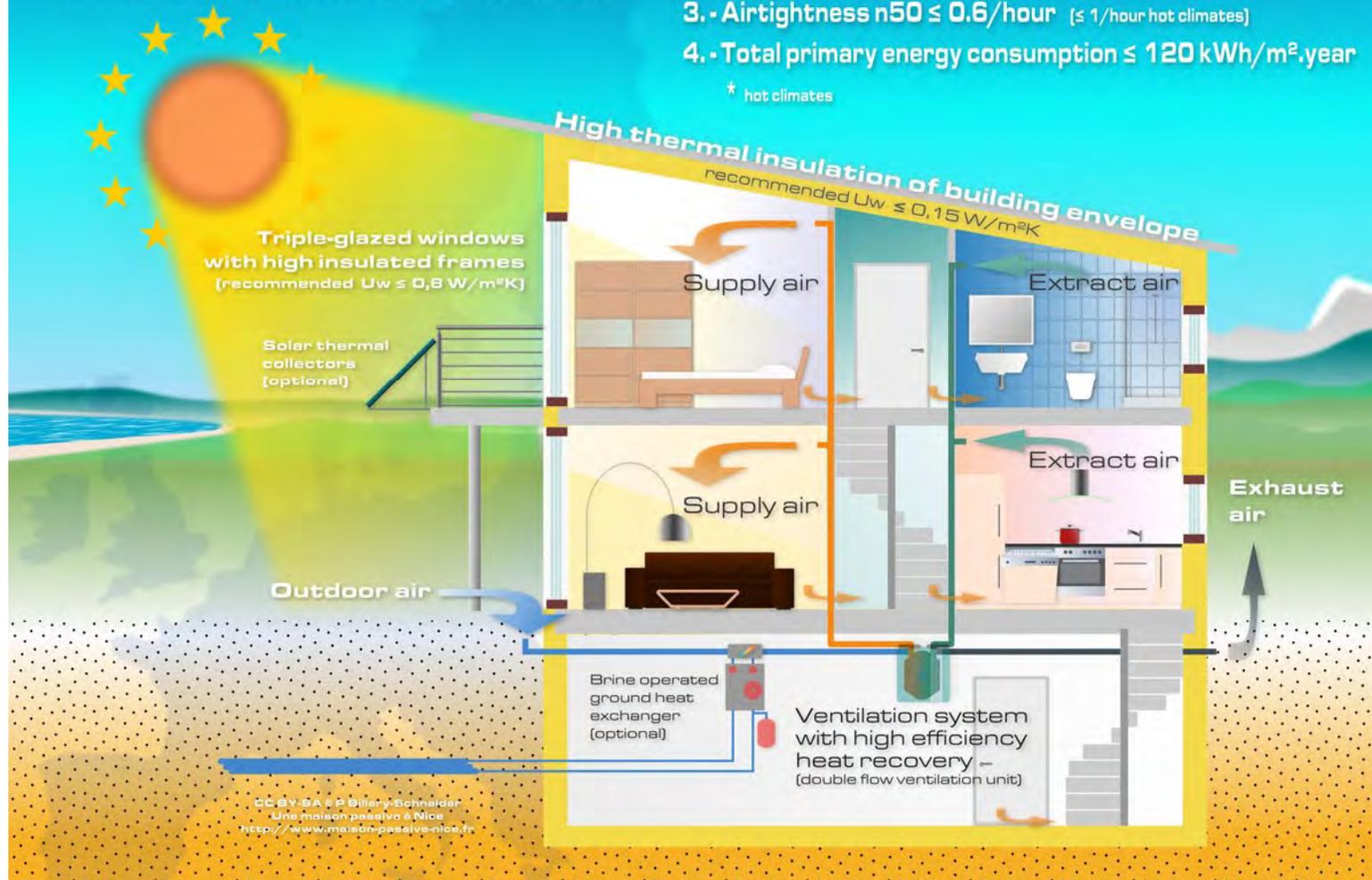


# Passive house

The universal standard in very low energy buildings

1. - Annual heat requirement  $\leq 15 \text{ kWh/m}^2 \cdot \text{year}$
2. - Annual active cooling needs\*  $\leq 15 \text{ kWh/m}^2 \cdot \text{year}$
3. - Airtightness  $n_{50} \leq 0.6/\text{hour}$  ( $\leq 1/\text{hour}$  hot climates)
4. - Total primary energy consumption  $\leq 120 \text{ kWh/m}^2 \cdot \text{year}$

\* hot climates



# PASSIVE BUILDING PRINCIPLES



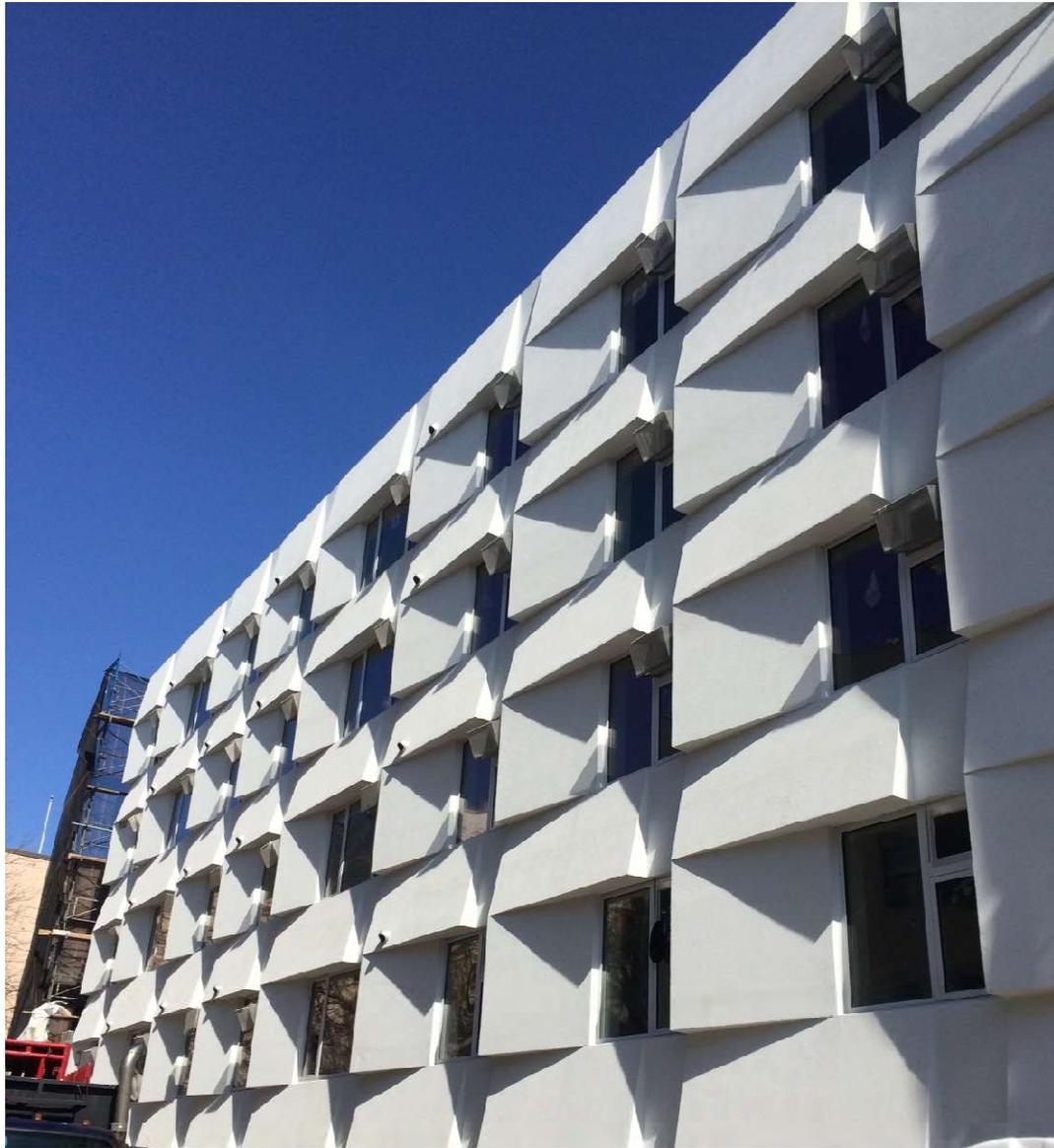
# BENEFITS OF PASSIVE building

- Quality of Life
- Innovation
- Environmental
- Economic

# CONSTRUCTION COSTS

	extra	credit	unit	amount	\$/sf
<b>ITEMS THAT CHANGE FOR PASSIVE HOUSE</b>					
windows fiberglass instead of aluminum	\$500		157	\$78,500	\$2.16
ranges - electric instead of gas-no gas piping		(\$400)	25	(\$10,000)	(\$0.28)
eifs insulation instead of brick at façade		(\$10)	11,912	(\$119,120)	(\$3.28)
ac covers/sun screens	\$200		157	\$31,400	\$0.87
ac structure bar	\$5		157	\$785	\$0.02
reduced heating system		(\$1,750)	24	(\$42,000)	(\$1.16)
erv instead of typ exhaust only	\$750		24	\$18,000	\$0.50
insulation completely under slab	\$5		6708	\$33,540	\$0.92
R 40 at roof instead of R30	\$1.50		6708	\$10,062.00	\$0.28
credit for int insulatrion		(\$0.75)	11912	(\$8,934.00)	(\$0.25)
					\$0.00
					\$0.00
<b>total</b>				<b>(\$7,767.00)</b>	<b>(\$0.21)</b>





# Knickerbocker Commons

EIFS Shading  
Functionality



# Mennonite United Revival Apartments

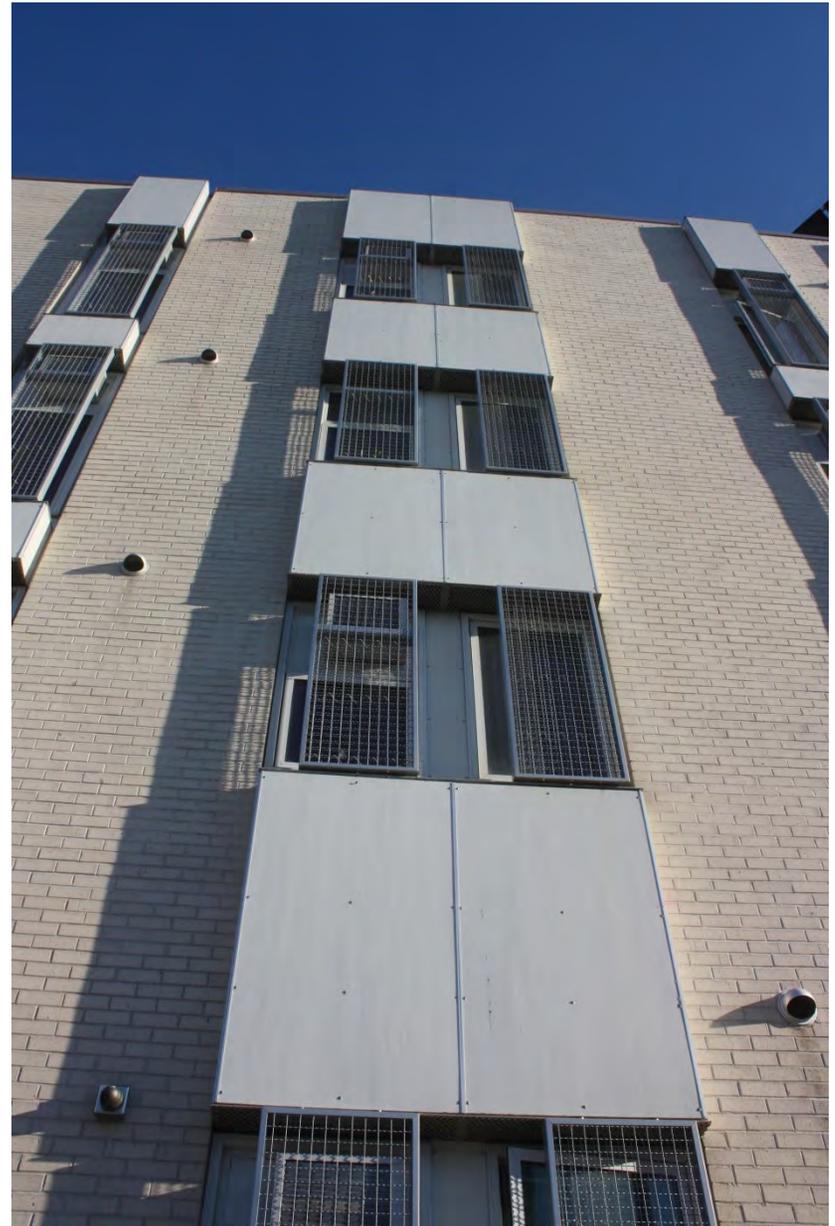
Exterior

Effective Passive **Solar Shading**

**Individual Unit** Ventilation

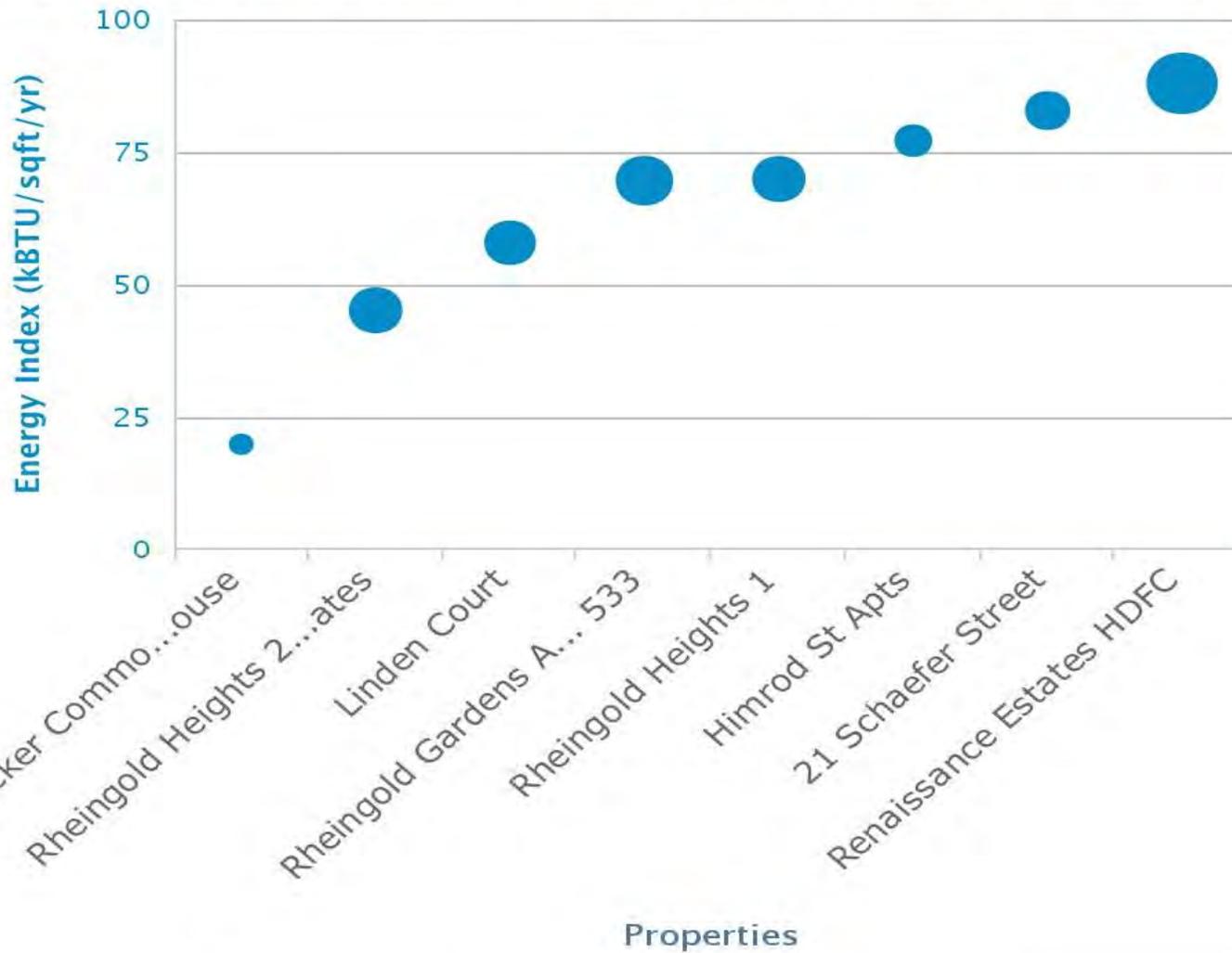
**Continuous** Air Sealing

**Highly Insulated** Walls



## Energy Index and with Annual Energy Spending

Filter: [site-filtered:[41830, 44622, 45749, 41827, 41836, 42005, 41839, 41842], year:Full Year 2



- Energy Index (Owner, Full Year 2015 Scorecard)
- ◆ (Owner, Most Recent Year Scorecard)

EnergyScoreCards.com



## Properties in Context

Properties Ranked by Owner Energy Index

Owner vs. Total

Owner

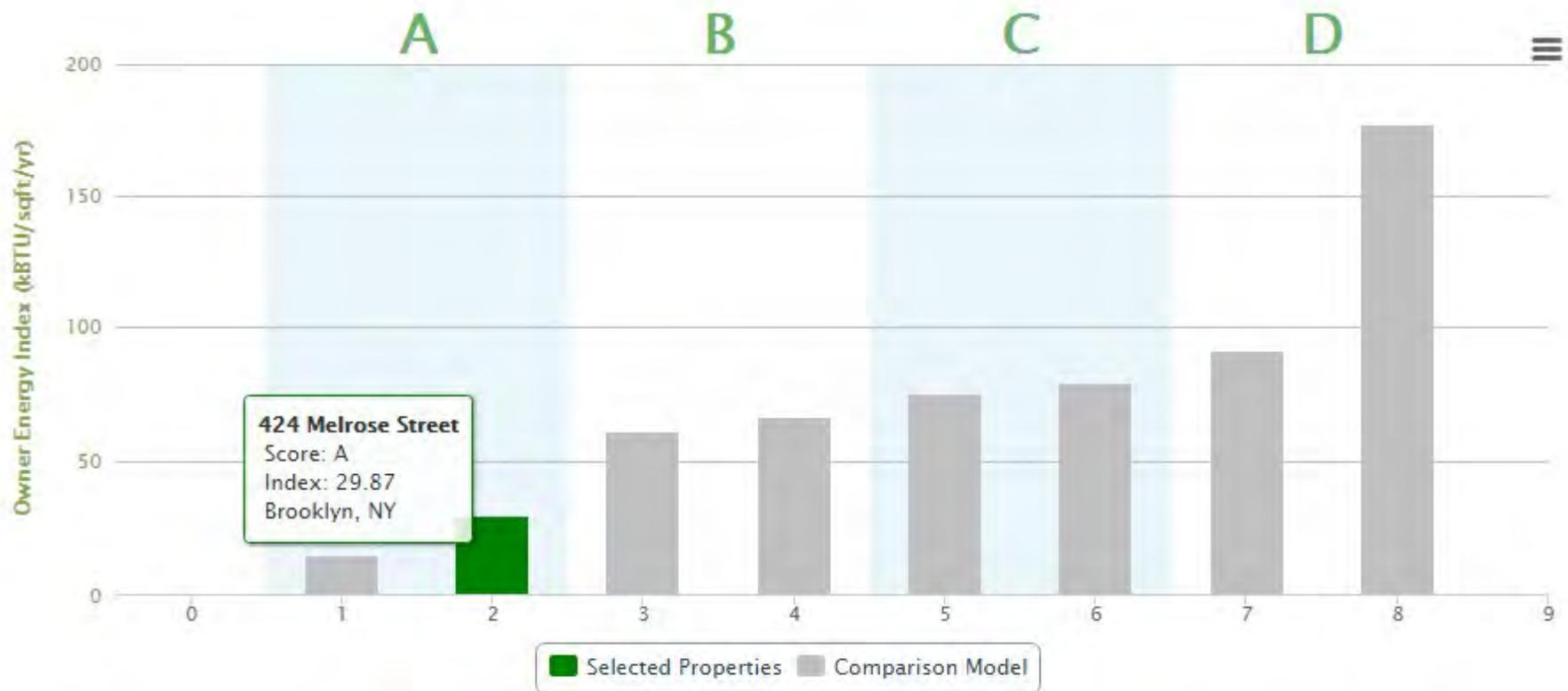
Payment Code

Central Heating (TTO\*)

Compare to Region

NY

Plot





# 424 Melrose Street

424 Melrose Street, Brooklyn, NY, 11237



Tools

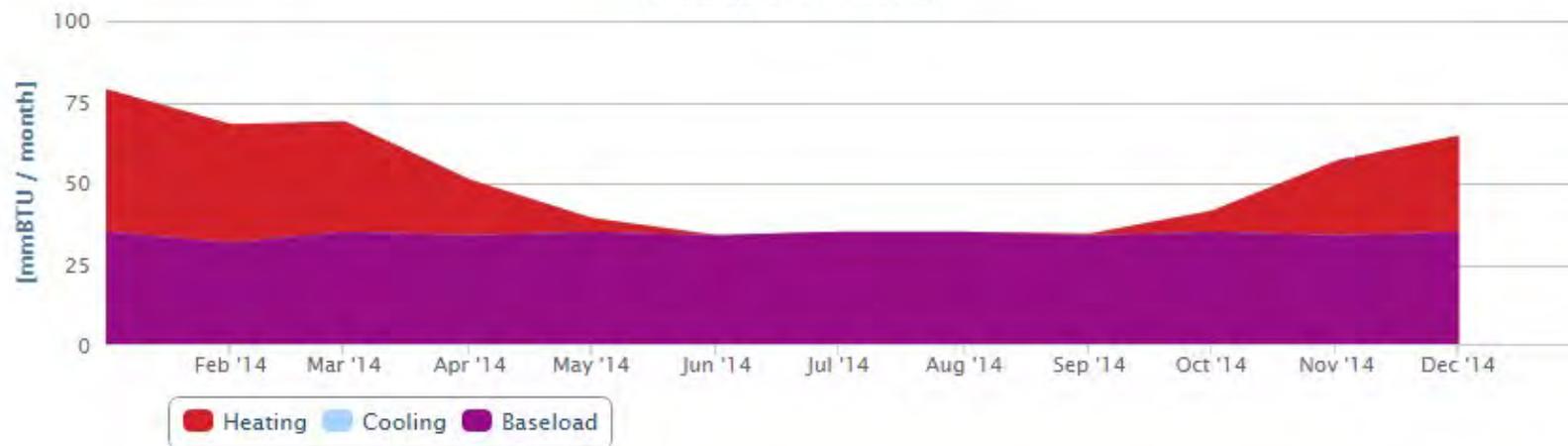
## Usage and Fuel Summary

Export

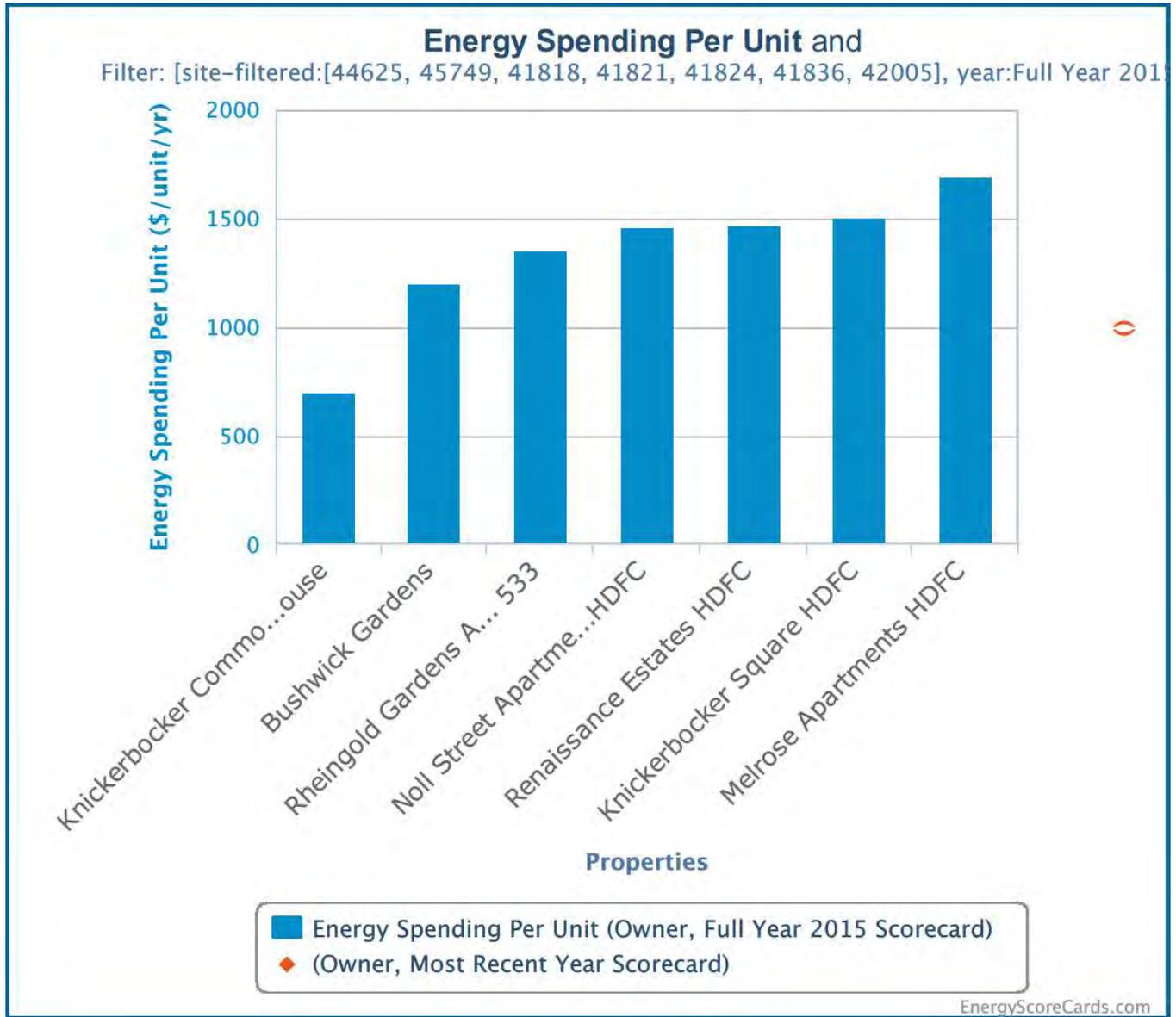
Full Year 2014 - Owner	Heating	Cooling	Baseload	Usage	Rate	Spending	# of Accounts
▶ Electricity (kWh)	7,820	0.00	51,587	59,406	\$0.2028	\$12,047	1
▶ Gas (therms)	1,443	0.00	2,344	3,787	\$1.10	\$4,171	1
<b>Total Energy (mmBTU)</b>	<b>171</b>	<b>0.00</b>	<b>410</b>	<b>581</b>	<b>\$27.90</b>	<b>\$16,218</b>	<b>2</b>
▶ Water (kGallons)	0.00	0.00	1,048	1,048	\$12.70	\$13,312	1
<b>Total Utilities</b>						<b>\$29,530</b>	<b>3</b>

### Full Year 2014 - Owner - Total Utilities

(01 Jan 2014 - 31 Dec 2014)



**50-80%** utility savings



# PRH UTILITY analysis

	<u>Water</u>	<u>Gas</u>	<u>Electric</u>	<u>Oil</u>	<u>Total</u>
2015 Utilities	\$308,231.17	\$164,828.00	\$112,691.15	\$131,736.33	\$717,486.65
Passive House Rehab Estimates	\$246,584.94	\$55,202.40	\$98,158.88	\$16,477.15	\$416,423.36

Est. Annual Savings

**\$301,063.29**

Supportable Debt based on savings

**\$4,184,569.37**

Supportable Debt (per unit)

**\$15,850.64**

## ASSUMPTIONS

20% Water savings

38kBTU/sqft/yr or 70% savings from current usage

10% DHW savings



# Future of High Efficiency Construction

Local Laws

Increased Data Collection

Improved Efficiency/Technology

Renewables & Net Zero

## One City: Built to Last

### What is Passive House?

A building constructed to "Passive House" standards must meet strict energy efficiency criteria for its insulation, space heating and cooling, and primary energy demand within the building. These standards require minimizing heating and cooling loads through substantial insulation, the "passive" use of solar heat and internal heating sources, such as people and electrical equipment, to heat the building; solar shading to cool the building; and heat recovery systems for space heating that is required. Because the building is essentially airtight, a continuous supply of low volume filtered fresh air must also be supplied to living and working spaces, and stale air regularly exhausted from spaces with high-efficiency heat exchange to minimize heating losses.

Passive House standards can be applied to both new construction and renovations. For the renovation of existing buildings, the performance standard is slightly more lenient, but still results in a roughly 90 percent reduction in average heating and cooling energy usage and up to a 75 percent reduction in primary energy usage. A Passive House building can also be any type of building, including an apartment building, a school, an office building, a factory, a supermarket, or a single-family house.

### Case Study: Knickerbocker Commons Affordable Housing

803 Knickerbocker Avenue, Brooklyn  
Architect: Chris Benedict, R.A.  
Owner: Ridgewood Bushwick Senior Citizen's Council  
General Contractor: Galaxy Construction  
Construction Cost: \$180/square foot  
No. of Units: 24



**Knickerbocker Commons, the first mid-sized apartment building designed to Passive House standards in the United States**

Knickerbocker Commons, a six-story residential building containing 24 units of affordable housing, is the country's first mid-sized apartment building to conform to Passive House design standards. To achieve the strict Passive House standards, each rental unit in Knickerbocker Commons has its own ventilation system and small radiators for heating and airtight window air conditioning units for cooling. In addition, the building features triple-paneled windows and a sculpted exterior that shades windows from the sun in the summer and maximize exposure in the winter. According to the project's architect, Chris Benedict, the building will use 85 percent less energy than is typically required to heat a New York City apartment building in the winter.

The apartment is located in the Bushwick neighborhood of Brooklyn and was developed through HPD's Low Income Rental Program. Of the 24 units, six units will be rented to households earning up to 30 percent of Area Median Income (AMI), five units will be rented to households earning up to 50 percent of AMI, 12 units will be rented to households earning up to 80 percent of AMI, and one unit will be set aside for a building superintendent. In addition to the residential units, the project includes almost 5,000 square feet of community facility space.

One City Built to Last

