Decarbonization Pathways for Affordable Housing

presentations by
Katie Schwamb, Director, Educational Resources, Building Energy Exchange
Jennifer Leone, Chief Sustainability Officer, NYC HPD
Tony Piscopia, Director of Housing Preservation, Senior Associate, Magnusson Architecture & Planning, PC

moderator
Katie Schwamb, Director, Educational Resources, Building Energy Exchange

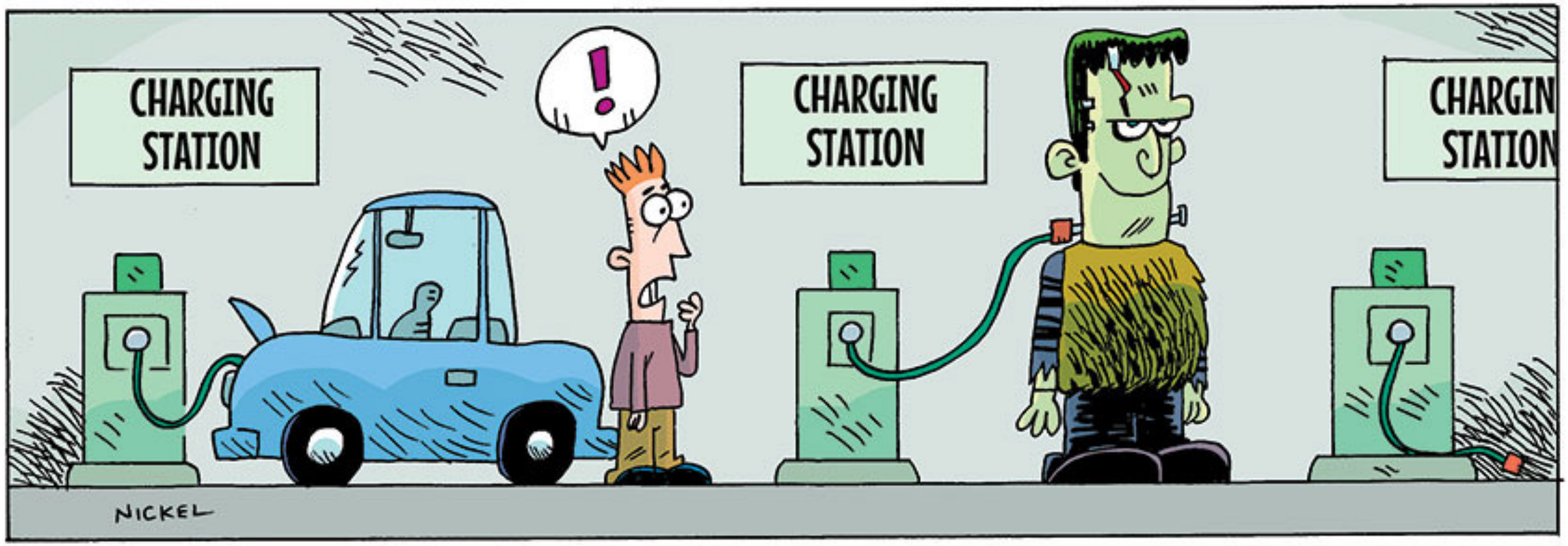
panelists
Jennifer Leone, Chief Sustainability Officer, NYC HPD
James Henshaw, Manager, Sustainability Services, Bright Power
Tony Piscopia, Director of Housing Preservation, Senior Associate, Magnusson Architecture & Planning, PC
Jerry Mascuch, Vice President of Real Estate, Samaritan Daytop Village

be ex
building energy exchange

31 Chambers Street
New York, NY

October 31, 2023
9:30 to 11 am

1.5 AIA
LU | HSW



Frankenstein's charging station

Comic by Scott Nickel

https://jokes.scoutlife.org/comics/frankensteins-charging-station/

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Decarbonization Roadmap for Multifamily Affordable Housing

October 31, 2023
31 Chambers Street
New York, NY

Project Team

be ex
building energy exchange

BRIGHT POWER

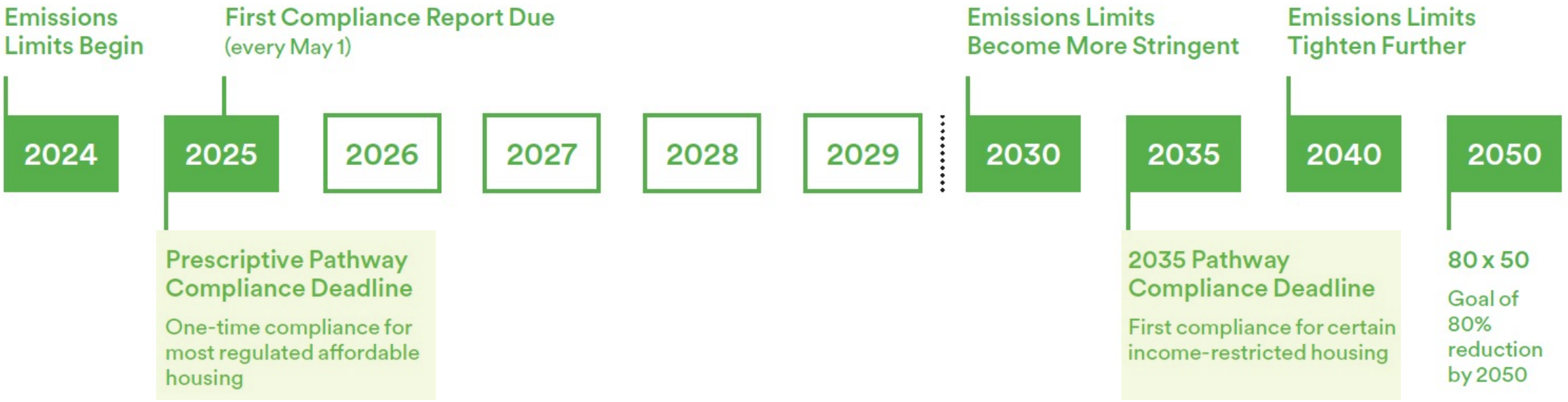
NYC
Department of Housing Preservation & Development

NEW YORK STATE | NYSERDA
Supported

Project Goals

To understand how affordable housing ***could*** comply with LL97's short- and long-term limits and to inform project scopes and policy decisions.

LL97 Timeline



Building Typologies

post-1980 mid-rise senior rental

year built: 1988
size: 99 units · 70,460 sq. ft.
heating system: hydronic baseboard
LL97 path: Prescriptive Pathway

post-war high-rise Mitchell-Lama

year built: 1975
size: 182 units · 127,009 sq. ft.
heating system: two pipe steam w/baseboard
LL97 path: 2035 Pathway

pre-war low-rise rent stabilized rental

year built: 1927
size: 52 units · 44,250 sq. ft
heating system: hydronic convectors
LL97 path: Prescriptive Pathway

pre-war low-rise HDFC co-op

year built: 1913
size: 40 units · 40,850 sq. ft.
heating system: one-pipe steam radiators
LL97 path: Prescriptive Pathway

post-1980 high-rise rental

year built: 1995
size: 198 units · 182,828 sq. ft.
heating system: steam PTACs
LL97 path: Prescriptive Pathway

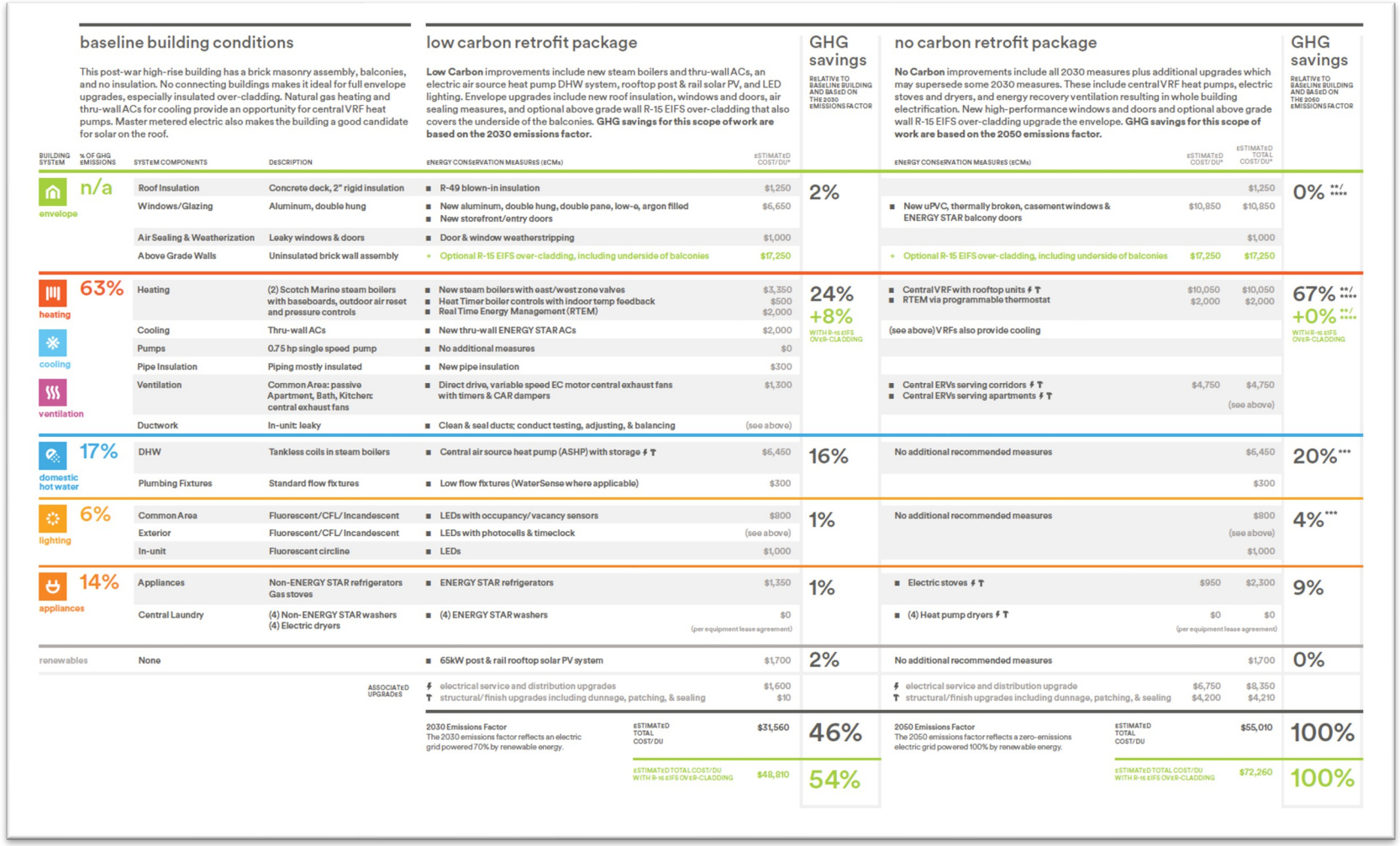
see pages 4-5 of the Manual

Scoping for Compliance

Low Carbon Retrofit

No Carbon Retrofit

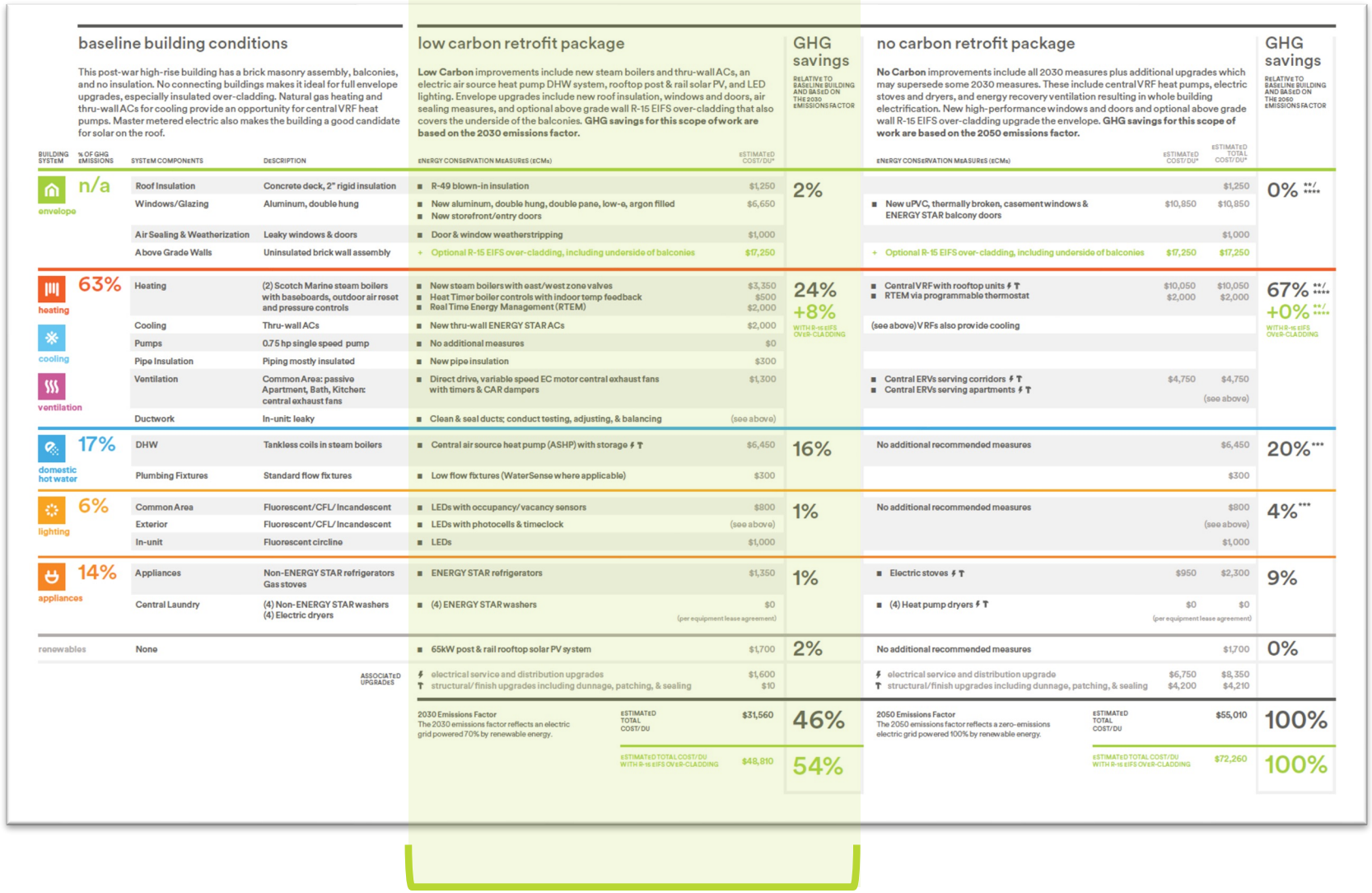
Enhancing Efficiency



BUILDING SYSTEM	% OF GHG EMISSIONS	SYSTEM COMPONENTS	DESCRIPTION	baseline building conditions	low carbon retrofit package: ENERGY CONSERVATION MEASURES (ECMs)	ESTIMATED COST/DU*	GHG savings (RELATIVE TO BASELINE BUILDING AND BASED ON THE 2030 EMISSIONS FACTOR)	no carbon retrofit package: ENERGY CONSERVATION MEASURES (ECMs)	ESTIMATED COST/DU*	ESTIMATED TOTAL COST/DU*	GHG savings (RELATIVE TO BASELINE BUILDING AND BASED ON THE 2050 EMISSIONS FACTOR)
envelope	n/a	Roof Insulation	Concrete deck, 2" rigid insulation	This post-war high-rise building has a brick masonry assembly, balconies, and no insulation. No connecting buildings makes it ideal for full envelope upgrades, especially insulated over-cladding. Natural gas heating and thru-wall ACs for cooling provide an opportunity for central VRF heat pumps. Master metered electric also makes the building a good candidate for solar on the roof.	■ R-49 blown-in insulation	$1,250	2%			$1,250	0% **/****
		Windows/Glazing	Aluminum, double hung		■ New aluminum, double hung, double pane, low-e, argon filled ■ New storefront/entry doors	$6,650		■ New uPVC, thermally broken, casement windows & ENERGY STAR balcony doors	$10,850	$10,850	
		Air Sealing & Weatherization	Leaky windows & doors		■ Door & window weatherstripping	$1,000				$1,000	
		Above Grade Walls	Uninsulated brick wall assembly		+ Optional R-15 EIFS over-cladding, including underside of balconies	$17,250		+ Optional R-15 EIFS over-cladding, including underside of balconies	$17,250	$17,250	
heating	63%	Heating	(2) Scotch Marine steam boilers with baseboards, outdoor air reset and pressure controls		■ New steam boilers with east/west zone valves ■ Heat Timer boiler controls with indoor temp feedback ■ Real Time Energy Management (RTEM)	$3,350 $500 $2,000	24% +8% WITH R-15 EIFS OVER-CLADDING	■ Central VRF with rooftop units ϟ ₸ ■ RTEM via programmable thermostat	$10,050 $2,000	$10,050 $2,000	67% **/**** +0% **/**** WITH R-15 EIFS OVER-CLADDING
cooling		Cooling	Thru-wall ACs		■ New thru-wall ENERGY STAR ACs	$2,000		(see above) VRFs also provide cooling			
		Pumps	0.75 hp single speed pump		■ No additional measures	$0					
		Pipe Insulation	Piping mostly insulated		■ New pipe insulation	$300					
ventilation		Ventilation	Common Area: passive Apartment, Bath, Kitchen: central exhaust fans		■ Direct drive, variable speed EC motor central exhaust fans with timers & CAR dampers	$1,300		■ Central ERVs serving corridors ϟ ₸ ■ Central ERVs serving apartments ϟ ₸	$4,750	$4,750 (see above)	
		Ductwork	In-unit: leaky		■ Clean & seal ducts; conduct testing, adjusting, & balancing	(see above)					
domestic hot water	17%	DHW	Tankless coils in steam boilers		■ Central air source heat pump (ASHP) with storage ϟ ₸	$6,450	16%	No additional recommended measures		$6,450	20%***
		Plumbing Fixtures	Standard flow fixtures		■ Low flow fixtures (WaterSense where applicable)	$300				$300	
lighting	6%	Common Area	Fluorescent/CFL/ Incandescent		■ LEDs with occupancy/ vacancy sensors	$800	1%	No additional recommended measures		$800	4%***
		Exterior	Fluorescent/CFL/ Incandescent		■ LEDs with photocells & timeclock	(see above)				(see above)	
		In-unit	Fluorescent circline		■ LEDs	$1,000				$1,000	
appliances	14%	Appliances	Non-ENERGY STAR refrigerators Gas stoves		■ ENERGY STAR refrigerators	$1,350	1%	■ Electric stoves ϟ ₸	$950	$2,300	9%
		Central Laundry	(4) Non-ENERGY STAR washers (4) Electric dryers		■ (4) ENERGY STAR washers	$0 (per equipment lease agreement)		■ (4) Heat pump dryers ϟ ₸	$0 (per equipment lease agreement)	$0	
renewables		None			■ 65kW post & rail rooftop solar PV system	$1,700	2%	No additional recommended measures		$1,700	0%
		ASSOCIATED UPGRADES			ϟ electrical service and distribution upgrades ₸ structural/ finish upgrades including dunnage, patching, & sealing	$1,600 $10		ϟ electrical service and distribution upgrade ₸ structural/finish upgrades including dunnage, patching, & sealing	$6,750 $4,200	$8,350 $4,210	
					2030 Emissions Factor The 2030 emissions factor reflects an electric grid powered 70% by renewable energy.	ESTIMATED TOTAL COST/DU $31,560 ESTIMATED TOTAL COST/DU WITH R-15 EIFS OVER-CLADDING $48,810	46% 54%	2050 Emissions Factor The 2050 emissions factor reflects a zero-emissions electric grid powered 100% by renewable energy.	ESTIMATED TOTAL COST/DU $55,010 ESTIMATED TOTAL COST/DU WITH R-15 EIFS OVER-CLADDING $72,260		100% 100%

Low Carbon Retrofit Package

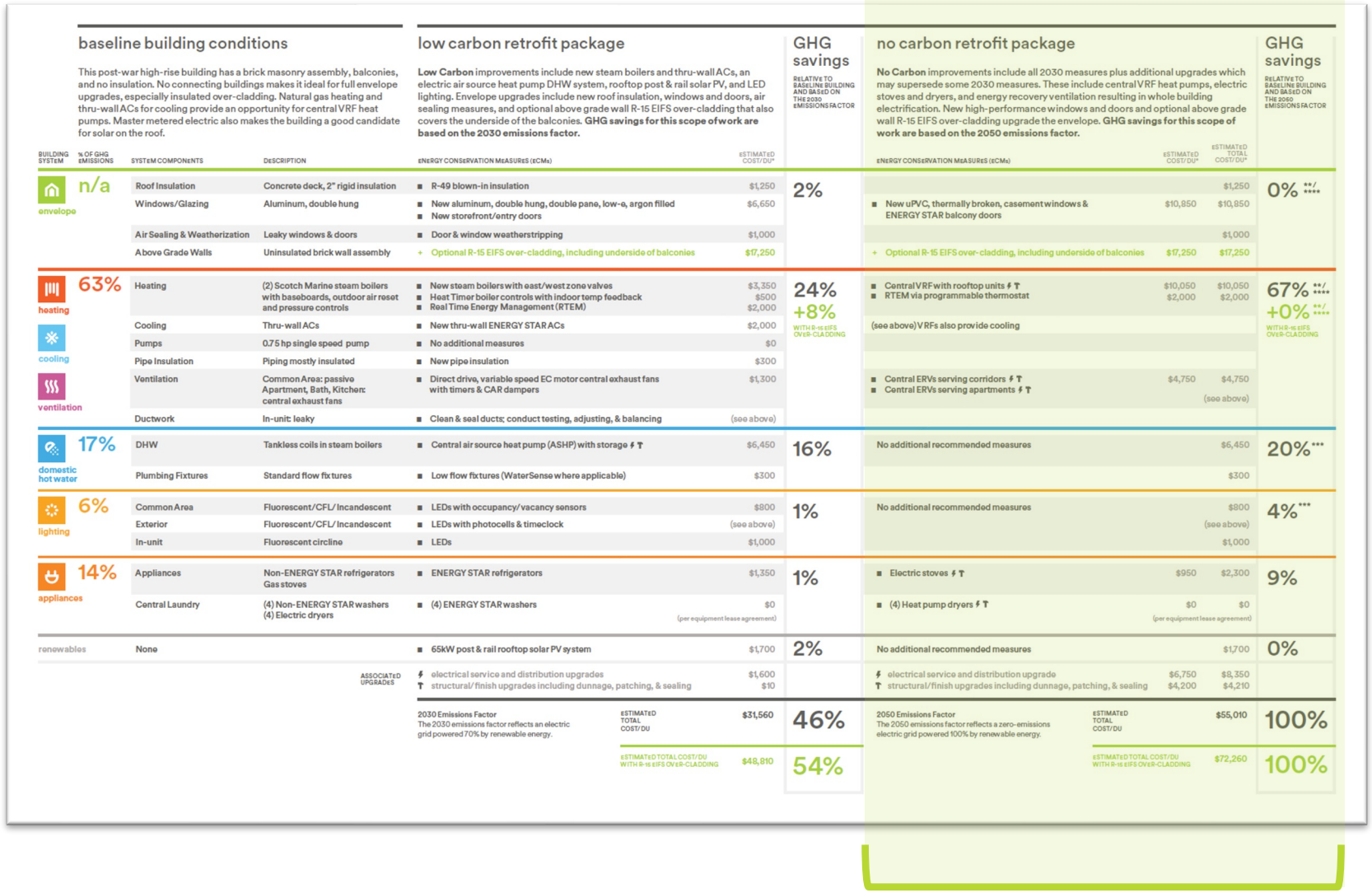
Provides **moderate** emissions reductions and meets **near-term LL97 limits** through strategic system upgrades and **partial electrification**.



BUILDING SYSTEM	% OF GHG EMISSIONS	SYSTEM COMPONENTS	DESCRIPTION	ENERGY CONSERVATION MEASURES (ECMs)	ESTIMATED COST/DU*	GHG savings (RELATIVE TO BASELINE BUILDING AND BASED ON THE 2030 EMISSIONS FACTOR)	ENERGY CONSERVATION MEASURES (ECMs)	ESTIMATED COST/DU*	ESTIMATED TOTAL COST/DU*	GHG savings (RELATIVE TO BASELINE BUILDING AND BASED ON THE 2050 EMISSIONS FACTOR)
			baseline building conditions This post-war high-rise building has a brick masonry assembly, balconies, and no insulation. No connecting buildings makes it ideal for full envelope upgrades, especially insulated over-cladding. Natural gas heating and thru-wall ACs for cooling provide an opportunity for central VRF heat pumps. Master metered electric also makes the building a good candidate for solar on the roof.	**low carbon retrofit package** **Low Carbon** improvements include new steam boilers and thru-wall ACs, an electric air source heat pump DHW system, rooftop post & rail solar PV, and LED lighting. Envelope upgrades include new roof insulation, windows and doors, air sealing measures, and optional above grade wall R-15 EIFS over-cladding that also covers the underside of the balconies. **GHG savings for this scope of work are based on the 2030 emissions factor.**			**no carbon retrofit package** **No Carbon** improvements include all 2030 measures plus additional upgrades which may supersede some 2030 measures. These include central VRF heat pumps, electric stoves and dryers, and energy recovery ventilation resulting in whole building electrification. New high-performance windows and doors and optional above grade wall R-15 EIFS over-cladding upgrade the envelope. **GHG savings for this scope of work are based on the 2050 emissions factor.**			
envelope	n/a	Roof Insulation	Concrete deck, 2" rigid insulation	■ R-49 blown-in insulation	$1,250	2%			$1,250	0% ***/****
		Windows/Glazing	Aluminum, double hung	■ New aluminum, double hung, double pane, low-e, argon filled ■ New storefront/entry doors	$6,650		■ New uPVC, thermally broken, casement windows & ENERGY STAR balcony doors	$10,850	$10,850	
		Air Sealing & Weatherization	Leaky windows & doors	■ Door & window weatherstripping	$1,000				$1,000	
		Above Grade Walls	Uninsulated brick wall assembly	+ Optional R-15 EIFS over-cladding, including underside of balconies	$17,250		+ Optional R-15 EIFS over-cladding, including underside of balconies	$17,250	$17,250	
heating	63%	Heating	(2) Scotch Marine steam boilers with baseboards, outdoor air reset and pressure controls	■ New steam boilers with east/west zone valves ■ Heat Timer boiler controls with indoor temp feedback ■ Real Time Energy Management (RTEM)	$3,350 $500 $2,000	24% +8% WITH R-15 EIFS OVER-CLADDING	■ Central VRF with rooftop units ϟ ₸ ■ RTEM via programmable thermostat	$10,050 $2,000	$10,050 $2,000	67% **/**** +0% **/**** WITH R-15 EIFS OVER-CLADDING
cooling		Cooling	Thru-wall ACs	■ New thru-wall ENERGY STAR ACs	$2,000		(see above) VRFs also provide cooling			
		Pumps	0.75 hp single speed pump	■ No additional measures	$0					
		Pipe Insulation	Piping mostly insulated	■ New pipe insulation	$300					
ventilation		Ventilation	Common Area: passive Apartment, Bath, Kitchen: central exhaust fans	■ Direct drive, variable speed EC motor central exhaust fans with timers & CAR dampers	$1,300		■ Central ERVs serving corridors ϟ ₸ ■ Central ERVs serving apartments ϟ ₸	$4,750	$4,750 (see above)	
		Ductwork	In-unit: leaky	■ Clean & seal ducts; conduct testing, adjusting, & balancing	(see above)					
domestic hot water	17%	DHW	Tankless coils in steam boilers	■ Central air source heat pump (ASHP) with storage ϟ ₸	$6,450	16%	No additional recommended measures		$6,450	20%***
		Plumbing Fixtures	Standard flow fixtures	■ Low flow fixtures (WaterSense where applicable)	$300				$300	
lighting	6%	Common Area	Fluorescent/CFL/ Incandescent	■ LEDs with occupancy/vacancy sensors	$800	1%	No additional recommended measures		$800	4%***
		Exterior	Fluorescent/CFL/ Incandescent	■ LEDs with photocells & timeclock	(see above)				(see above)	
		In-unit	Fluorescent circline	■ LEDs	$1,000				$1,000	
appliances	14%	Appliances	Non-ENERGY STAR refrigerators Gas stoves	■ ENERGY STAR refrigerators	$1,350	1%	■ Electric stoves ϟ ₸	$950	$2,300	9%
		Central Laundry	(4) Non-ENERGY STAR washers (4) Electric dryers	■ (4) ENERGY STAR washers	$0 (per equipment lease agreement)		■ (4) Heat pump dryers ϟ ₸	$0	$0 (per equipment lease agreement)	
renewables		None		■ 65kW post & rail rooftop solar PV system	$1,700	2%	No additional recommended measures		$1,700	0%
		ASSOCIATED UPGRADES		ϟ electrical service and distribution upgrades ₸ structural/ finish upgrades including dunnage, patching, & sealing	$1,600 $10		ϟ electrical service and distribution upgrade ₸ structural/finish upgrades including dunnage, patching, & sealing	$6,750 $4,200	$8,350 $4,210	
				2030 Emissions Factor The 2030 emissions factor reflects an electric grid powered 70% by renewable energy.	ESTIMATED TOTAL COST/DU $31,560	46%	2050 Emissions Factor The 2050 emissions factor reflects a zero-emissions electric grid powered 100% by renewable energy.	ESTIMATED TOTAL COST/DU	$55,010	100%
					ESTIMATED TOTAL COST/DU WITH R-15 EIFS OVER-CLADDING $48,810	54%		ESTIMATED TOTAL COST/DU WITH R-15 EIFS OVER-CLADDING	$72,260	100%

No Carbon Retrofit Package

Provides **deep** emissions reductions and meets **long-term LL97 limits**, through more robust system upgrades and **full building electrification**.



baseline building conditions

This post-war high-rise building has a brick masonry assembly, balconies, and no insulation. No connecting buildings makes it ideal for full envelope upgrades, especially insulated over-cladding. Natural gas heating and thru-wall ACs for cooling provide an opportunity for central VRF heat pumps. Master metered electric also makes the building a good candidate for solar on the roof.

low carbon retrofit package

Low Carbon improvements include new steam boilers and thru-wall ACs, an electric air source heat pump DHW system, rooftop post & rail solar PV, and LED lighting. Envelope upgrades include new roof insulation, windows and doors, air sealing measures, and optional above grade wall R-15 EIFS over-cladding that also covers the underside of the balconies. **GHG savings for this scope of work are based on the 2030 emissions factor.**

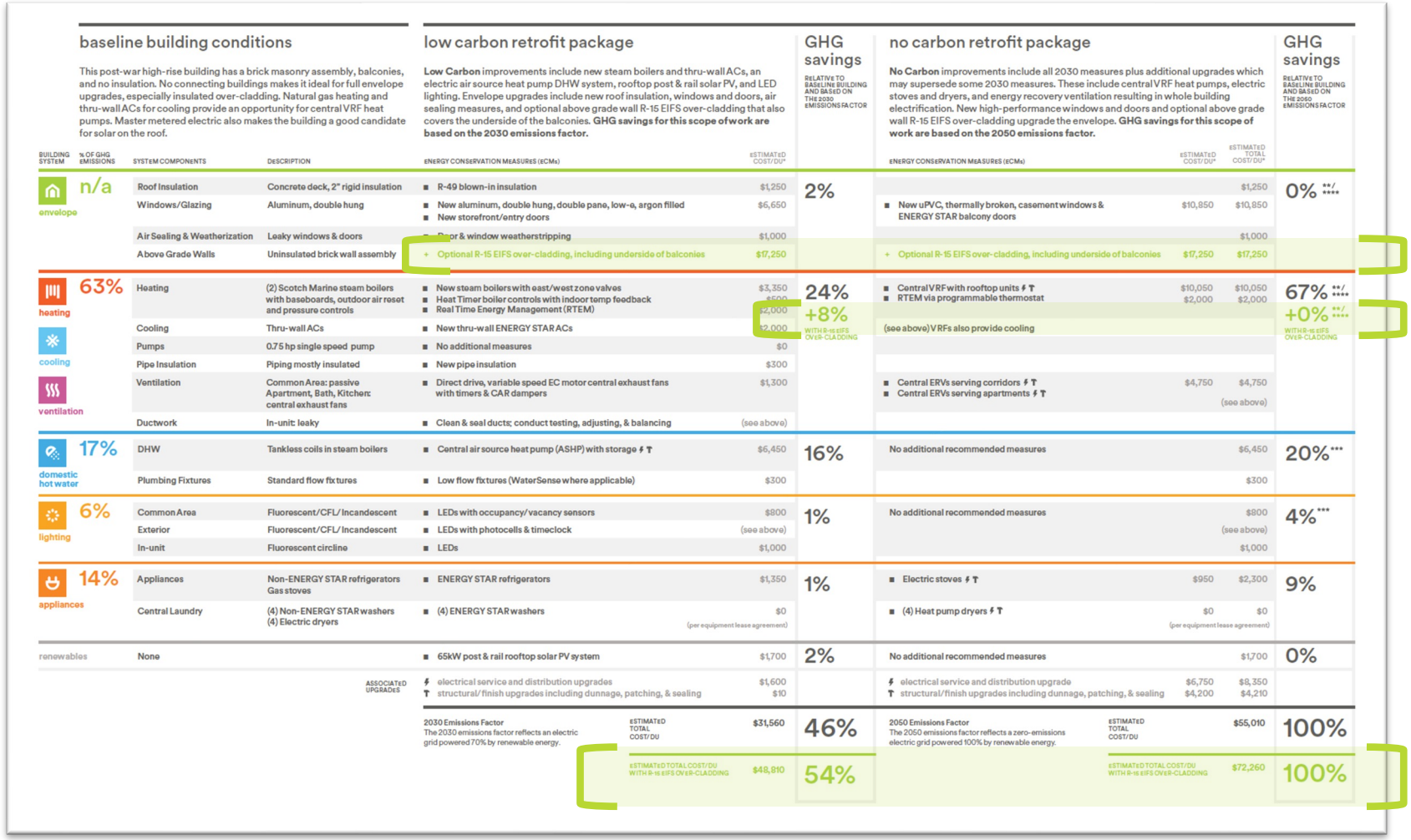
no carbon retrofit package

No Carbon improvements include all 2030 measures plus additional upgrades which may supersede some 2030 measures. These include central VRF heat pumps, electric stoves and dryers, and energy recovery ventilation resulting in whole building electrification. New high-performance windows and doors and optional above grade wall R-15 EIFS over-cladding upgrade the envelope. **GHG savings for this scope of work are based on the 2050 emissions factor.**

BUILDING SYSTEM	% OF GHG EMISSIONS	SYSTEM COMPONENTS	DESCRIPTION	ENERGY CONSERVATION MEASURES (ECMs)	ESTIMATED COST/DU*	GHG savings (RELATIVE TO BASELINE BUILDING AND BASED ON THE 2030 EMISSIONS FACTOR)	ENERGY CONSERVATION MEASURES (ECMs)	ESTIMATED COST/DU*	ESTIMATED TOTAL COST/DU*	GHG savings (RELATIVE TO BASELINE BUILDING AND BASED ON THE 2050 EMISSIONS FACTOR)
envelope	n/a	Roof Insulation	Concrete deck, 2" rigid insulation	■ R-49 blown-in insulation	$1,250	2%			$1,250	0% **/****
		Windows/Glazing	Aluminum, double hung	■ New aluminum, double hung, double pane, low-e, argon filled ■ New storefront/entry doors	$6,650		■ New uPVC, thermally broken, casement windows & ENERGY STAR balcony doors	$10,850	$10,850	
		Air Sealing & Weatherization	Leaky windows & doors	■ Door & window weatherstripping	$1,000				$1,000	
		Above Grade Walls	Uninsulated brick wall assembly	+ Optional R-15 EIFS over-cladding, including underside of balconies	$17,250		+ Optional R-15 EIFS over-cladding, including underside of balconies	$17,250	$17,250	
heating	63%	Heating	(2) Scotch Marine steam boilers with baseboards, outdoor air reset and pressure controls	■ New steam boilers with east/west zone valves ■ Heat Timer boiler controls with indoor temp feedback ■ Real Time Energy Management (RTEM)	$3,350 $500 $2,000	24% +8% WITH R-15 EIFS OVER-CLADDING	■ Central VRF with rooftop units ⚡ T ■ RTEM via programmable thermostat	$10,050 $2,000	$10,050 $2,000	67% **/**** +0% **/**** WITH R-15 EIFS OVER-CLADDING
cooling		Cooling	Thru-wall ACs	■ New thru-wall ENERGY STAR ACs	$2,000		(see above) VRFs also provide cooling			
		Pumps	0.75 hp single speed pump	■ No additional measures	$0					
		Pipe Insulation	Piping mostly insulated	■ New pipe insulation	$300					
ventilation		Ventilation	Common Area: passive Apartment, Bath, Kitchen: central exhaust fans	■ Direct drive, variable speed EC motor central exhaust fans with timers & CAR dampers	$1,300		■ Central ERVs serving corridors ⚡ T ■ Central ERVs serving apartments ⚡ T	$4,750	$4,750 (see above)	
		Ductwork	In-unit: leaky	■ Clean & seal ducts; conduct testing, adjusting, & balancing	(see above)					
domestic hot water	17%	DHW	Tankless coils in steam boilers	■ Central air source heat pump (ASHP) with storage ⚡ T	$6,450	16%	No additional recommended measures		$6,450	20%***
		Plumbing Fixtures	Standard flow fixtures	■ Low flow fixtures (WaterSense where applicable)	$300				$300	
lighting	6%	Common Area	Fluorescent/CFL/Incandescent	■ LEDs with occupancy/vacancy sensors	$800	1%	No additional recommended measures		$800	4%***
		Exterior	Fluorescent/CFL/Incandescent	■ LEDs with photocells & timeclock	(see above)				(see above)	
		In-unit	Fluorescent circline	■ LEDs	$1,000				$1,000	
appliances	14%	Appliances	Non-ENERGY STAR refrigerators Gas stoves	■ ENERGY STAR refrigerators	$1,350	1%	■ Electric stoves ⚡ T	$950	$2,300	9%
		Central Laundry	(4) Non-ENERGY STAR washers (4) Electric dryers	■ (4) ENERGY STAR washers	$0 (per equipment lease agreement)		■ (4) Heat pump dryers ⚡ T	$0	$0 (per equipment lease agreement)	
renewables		None		■ 65kW post & rail rooftop solar PV system	$1,700	2%	No additional recommended measures		$1,700	0%
		ASSOCIATED UPGRADES		⚡ electrical service and distribution upgrades T structural/finish upgrades including dunnage, patching, & sealing	$1,600 $10		⚡ electrical service and distribution upgrade T structural/finish upgrades including dunnage, patching, & sealing	$6,750 $4,200	$8,350 $4,210	
		2030 Emissions Factor The 2030 emissions factor reflects an electric grid powered 70% by renewable energy.		ESTIMATED TOTAL COST/DU	$31,560	46%	2050 Emissions Factor The 2050 emissions factor reflects a zero-emissions electric grid powered 100% by renewable energy.	ESTIMATED TOTAL COST/DU	$55,010	100%
				ESTIMATED TOTAL COST/DU WITH R-15 EIFS OVER-CLADDING	$48,810	54%		ESTIMATED TOTAL COST/DU WITH R-15 EIFS OVER-CLADDING	$72,260	100%

Enhancing Efficiency

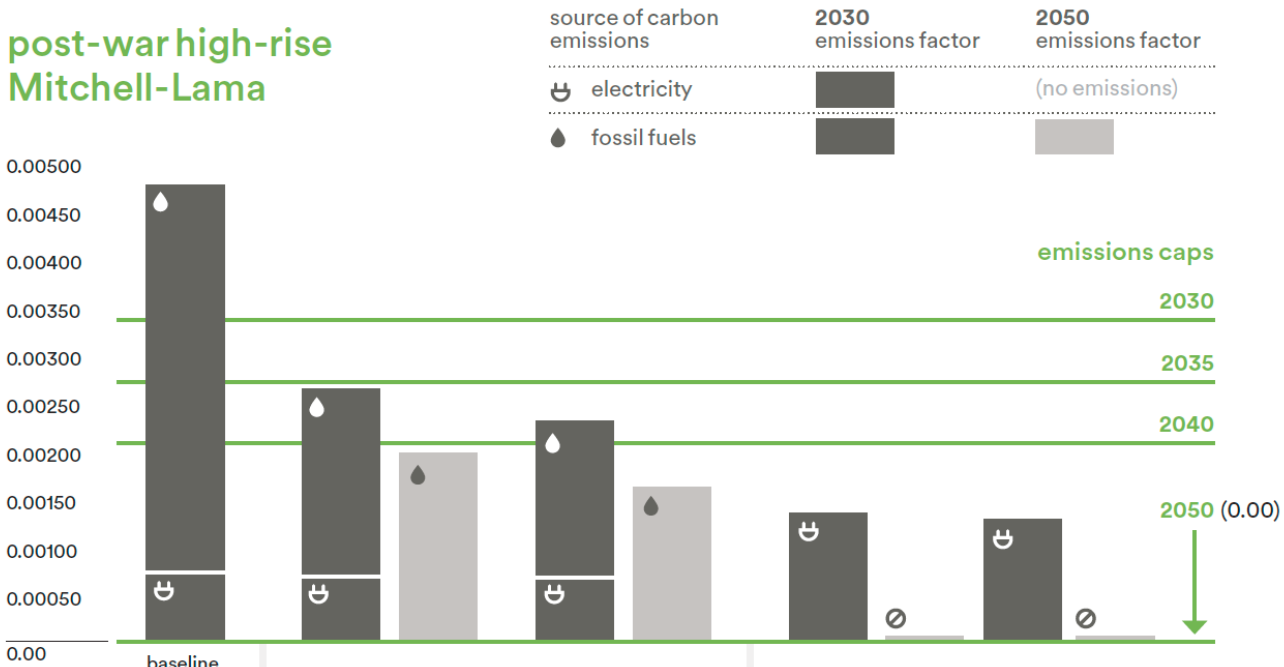
Each retrofit package includes an **optional over-cladding** scope to show how more **comprehensive envelope upgrades** provide additional benefits and savings.



BUILDING SYSTEM	% OF GHG EMISSIONS	SYSTEM COMPONENTS	DESCRIPTION	baseline building conditions: ENERGY CONSERVATION MEASURES (ECMs)	ESTIMATED COST/DU*	GHG savings (RELATIVE TO BASELINE BUILDING AND BASED ON THE 2030 EMISSIONS FACTOR)	low carbon retrofit package: ENERGY CONSERVATION MEASURES (ECMs)	ESTIMATED COST/DU*	ESTIMATED TOTAL COST/DU*	GHG savings (RELATIVE TO BASELINE BUILDING AND BASED ON THE 2050 EMISSIONS FACTOR)
envelope	n/a	Roof Insulation	Concrete deck, 2" rigid insulation	R-49 blown-in insulation	$1,250	2%			$1,250	0% **/****
		Windows/Glazing	Aluminum, double hung	New aluminum, double hung, double pane, low-e, argon filled New storefront/entry doors	$6,650		New uPVC, thermally broken, casement windows & ENERGY STAR balcony doors	$10,850	$10,850	
		Air Sealing & Weatherization	Leaky windows & doors	Door & window weatherstripping	$1,000				$1,000	
		Above Grade Walls	Uninsulated brick wall assembly	+ Optional R-15 EIFS over-cladding, including underside of balconies	$17,250		+ Optional R-15 EIFS over-cladding, including underside of balconies	$17,250	$17,250	
heating	63%	Heating	(2) Scotch Marine steam boilers with baseboards, outdoor air reset and pressure controls	New steam boilers with east/west zone valves Heat Timer boiler controls with indoor temp feedback Real Time Energy Management (RTEM)	$3,350 $500 $2,000	24%	Central VRF with rooftop units ϟ ፐ RTEM via programmable thermostat	$10,050 $2,000	$10,050 $2,000	67% **/****
cooling		Cooling	Thru-wall ACs	New thru-wall ENERGY STAR ACs	$2,000	+8% WITH R-15 EIFS OVER-CLADDING	(see above) VRFs also provide cooling			+0% **/**** WITH R-15 EIFS OVER-CLADDING
		Pumps	0.75 hp single speed pump	No additional measures	$0					
		Pipe Insulation	Piping mostly insulated	New pipe insulation	$300					
ventilation		Ventilation	Common Area: passive Apartment, Bath, Kitchen: central exhaust fans	Direct drive, variable speed EC motor central exhaust fans with timers & CAR dampers	$1,300		Central ERVs serving corridors ϟ ፐ Central ERVs serving apartments ϟ ፐ	$4,750	$4,750 (see above)	
		Ductwork	In-unit: leaky	Clean & seal ducts; conduct testing, adjusting, & balancing	(see above)					
domestic hot water	17%	DHW	Tankless coils in steam boilers	Central air source heat pump (ASHP) with storage ϟ ፐ	$6,450	16%	No additional recommended measures		$6,450	20%***
		Plumbing Fixtures	Standard flow fixtures	Low flow fixtures (WaterSense where applicable)	$300				$300	
lighting	6%	Common Area	Fluorescent/CFL/ Incandescent	LEDs with occupancy/ vacancy sensors	$800	1%	No additional recommended measures		$800	4%***
		Exterior	Fluorescent/CFL/ Incandescent	LEDs with photocells & timeclock	(see above)				(see above)	
		In-unit	Fluorescent circline	LEDs	$1,000				$1,000	
appliances	14%	Appliances	Non-ENERGY STAR refrigerators Gas stoves	ENERGY STAR refrigerators	$1,350	1%	Electric stoves ϟ ፐ	$950	$2,300	9%
		Central Laundry	(4) Non-ENERGY STAR washers (4) Electric dryers	(4) ENERGY STAR washers	$0 (per equipment lease agreement)		(4) Heat pump dryers ϟ ፐ	$0 (per equipment lease agreement)	$0	
renewables		None		65kW post & rail rooftop solar PV system	$1,700	2%	No additional recommended measures		$1,700	0%
		ASSOCIATED UPGRADES		ϟ electrical service and distribution upgrades ፐ structural/ finish upgrades including dunnage, patching, & sealing	$1,600 $10		ϟ electrical service and distribution upgrade ፐ structural/finish upgrades including dunnage, patching, & sealing	$6,750 $4,200	$8,350 $4,210	
				2030 Emissions Factor: The 2030 emissions factor reflects an electric grid powered 70% by renewable energy.	ESTIMATED TOTAL COST/DU $31,560	46%	2050 Emissions Factor: The 2050 emissions factor reflects a zero-emissions electric grid powered 100% by renewable energy.	ESTIMATED TOTAL COST/DU	$55,010	100%
					ESTIMATED TOTAL COST/DU WITH R-15 EIFS OVER-CLADDING $48,810	54%		ESTIMATED TOTAL COST/DU WITH R-15 EIFS OVER-CLADDING	$72,260	100%

Assessing for Compliance

Each retrofit package is compared to LL97 emissions caps using the 2030 and 2050 emissions factors to demonstrate compliance as the grid also transitions to clean energy sources.

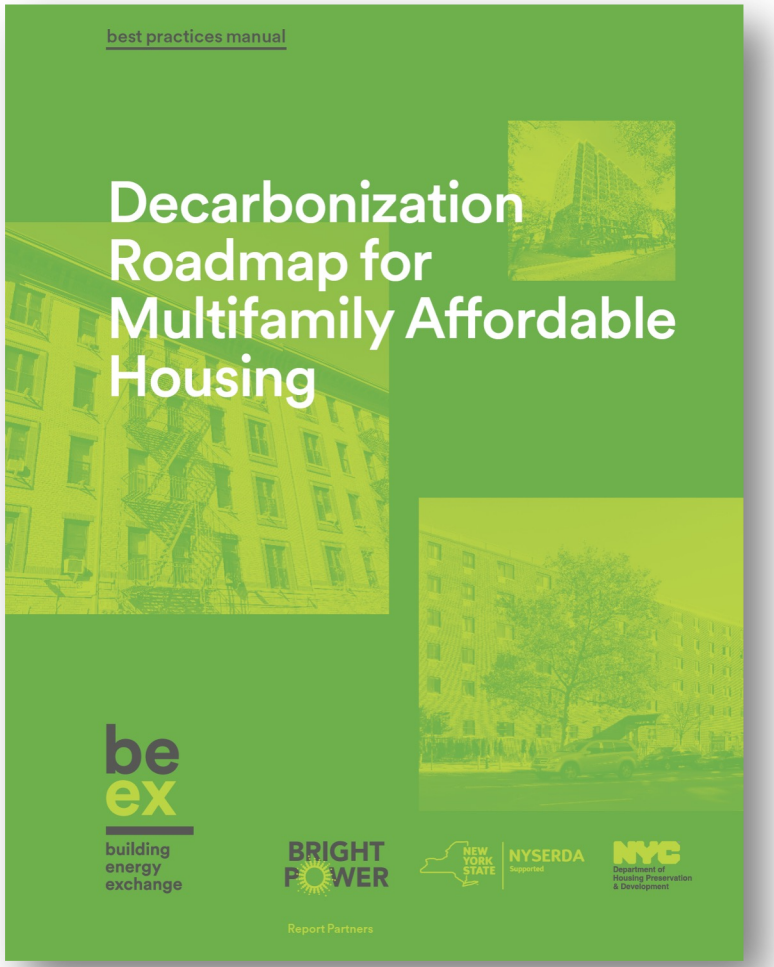


first year estimated savings ($/DU)	Low Carbon Retrofit Package		No Carbon Retrofit Package	
	w/out R–15 EIFS	w/ R–15 EIFS	w/out R–15 EIFS	w/ R–15 EIFS
owners	$300	$350	$0	$50
tenants	$125	$125	$100	$100

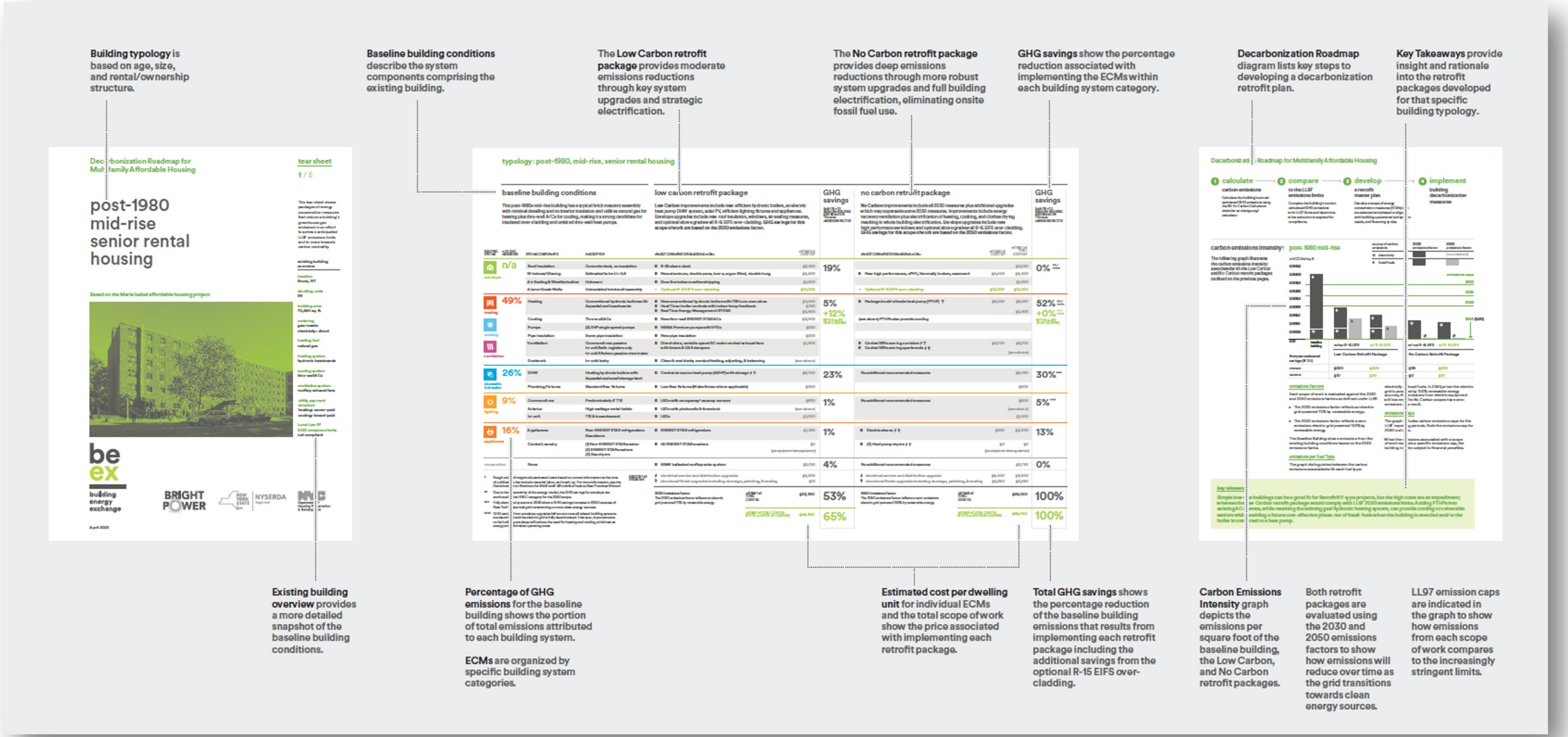
Resources

Tear Sheets

Best Practices Manual



Tear Sheets


Building typology is based on age, size, and rental/ownership structure.
Baseline building conditions describe the system components comprising the existing building.
The Low Carbon retrofit package provides moderate emissions reductions through key system upgrades and strategic electrification.
The No Carbon retrofit package provides deep emissions reductions through more robust system upgrades and full building electrification, eliminating onsite fossil fuel use.
GHG savings show the percentage reduction associated with implementing the ECMs within each building system category.
Decarbonization Roadmap diagram lists key steps to developing a decarbonization retrofit plan.
Key Takeaways provide insight and rationale into the retrofit packages developed for that specific building typology.
Decarbonization Roadmap for Multifamily Affordable Housing
tear sheet
1 / 5
post-1980 mid-rise senior rental housing
Based on the Maria Isabel affordable housing project
typology: post-1980, mid-rise, senior rental housing
baseline building conditions
low carbon retrofit package
no carbon retrofit package
GHG savings
Existing building overview provides a more detailed snapshot of the baseline building conditions.
Percentage of GHG emissions for the baseline building shows the portion of total emissions attributed to each building system.
ECMs are organized by specific building system categories.
Estimated cost per dwelling unit for individual ECMs and the total scope of work show the price associated with implementing each retrofit package.
Total GHG savings shows the percentage reduction of the baseline building emissions that results from implementing each retrofit package including the additional savings from the optional R-15 EIFS over-cladding.
Carbon Emissions Intensity graph depicts the emissions per square foot of the baseline building, the Low Carbon, and No Carbon retrofit packages.
Both retrofit packages are evaluated using the 2030 and 2050 emissions factors to show how emissions will reduce over time as the grid transitions towards clean energy sources.
LL97 emission caps are indicated in the graph to show how emissions from each scope of work compares to the increasingly stringent limits.

Manual | Performance of the Case Studies

The Low Carbon retrofit package helps all buildings meet 2035 limits and three buildings meet 2040 limits.

building typology	key takeaways		low carbon retrofit		no carbon retrofit	
			W/OUT EIFS	W/ EIFS	W/OUT EIFS	W/ EIFS
1 post-1980 mid-rise senior rental	Simple, freestanding, low-rise buildings can be a good fit for prefabricated Deep Energy Retrofit projects like RetrofitNY, but the high costs are an impediment; whereas the Low Carbon retrofit package would comply with LL97 2030 emissions limits. Adding PTHPs into existing AC sleeves, while retaining the existing gas/hydronic heating system, can provide cooling to vulnerable seniors while enabling a future cost-effective phase-out of fossil-fuels when the building is overclad and/or the boiler is converted to a heat pump.	GHG Emissions Reductions	53%	65%	100%	100%
 LL97 path: Prescriptive Pathway; existing heating system: gas-hydronic baseboards; proposed heating system: Packaged cold climate heat pump (PTHP)		Meets 2030 GHG limits?	✓	✓	✓	✓
		Meets 2035 GHG limits?	✓	✓	✓	✓
		Meets 2040 GHG limits*	✓	✓	✓	✓
		Estimated Cost per dwelling unit	$38,360	$48,360	$56,050	$66,050
		Estimated Savings per dwelling unit Owner / Tenant	$320 / $10	$400 / $50	$95 / $0	$200 / $10
2 post-war high-rise Mitchell-Lama	Many Mitchell-Lamas (ML) have poorly performing steam systems and building envelopes, so the Low Carbon retrofit package, which would meet the 2035 emissions limits, may not meet the 2040 limits, leading to penalties within a 15-year financing cycle. However, by phasing in electric heating, after 2035, penalties could be avoided. Leaving the steam system in place provides a temporary backup, until the building can be fully electrified and insulated, before the 2050 deadline. As a master-metered building, this wouldn't cause a shift in heating costs to the tenants.	GHG Emissions Reductions	46%	54%	100%	100%
 LL97 path: 2035 Pathway; existing heating system: two-pipe steam with baseboards; proposed heating system: central VRF		Meets 2030 GHG limits?	✓	✓	✓	✓
		Meets 2035 GHG limits?	✓	✓	✓	✓
		Meets 2040 GHG limits*			✓	✓
		Estimated Cost per dwelling unit**	$31,560	$48,810	$55,010	$72,260
		Estimated Savings per dwelling unit Owner / Tenant	$300 / $125	$350 / $125	$0 / $100	$50 / $100
3 pre-war low-rise rent stabilized rental	Many low-rise rentals can electrify hydronic heating systems without significant tenant disruption. Because the Low Carbon retrofit package would comply with 2030 emissions limits, and electrifying heating will increase utility costs, these buildings should typically focus on insulation and air sealing to improve comfort and reduce utility costs. They should also consider electrifying cooking and/or installing mechanical ventilation to improve comfort and air quality in the near term and convert to electric heating when the boiler fails.	GHG Emissions Reductions	59%	62%	100%	100%
 LL97 path: Prescriptive Pathway; existing heating system: gas-hydronic convectors; proposed heating system: central ASHP & WSHP		Meets 2030 GHG limits?	✓	✓	✓	✓
		Meets 2035 GHG limits?	✓	✓	✓	✓
		Meets 2040 GHG limits*	✓	✓	✓	✓
		Estimated Cost per dwelling unit**	$42,050	$55,850	$82,650	$96,450
		Estimated Savings per dwelling unit Owner / Tenant	$425 / $10	$450 / $25	-$45 / $80	$25 / $80
4 pre-war low-rise HDFC co-op	Low-rise co-ops are often a good fit for resident-paid, multi-split heat pumps because utility cost-shifting is not an issue for them; however, the Low Carbon retrofit package complies with 2030 emissions limits without electrifying heating, which would increase utility costs. Focusing on envelope improvements, ventilation, and electrification of cooking now can reduce utility costs while improving comfort and air quality. These building should develop a plan for future electrification, anticipating laws that will phase out fossil-fuel equipment.	GHG Emissions Reductions	52%	57%	100%	100%
 LL97 path: Prescriptive Pathway; existing heating system: one-pipe steam radiators; proposed heating system: mini-split heat pumps		Meets 2030 GHG limits?	✓	✓	✓	✓
		Meets 2035 GHG limits?	✓	✓	✓	✓
		Meets 2040 GHG limits*			✓	✓
		Estimated Cost per dwelling unit**	$48,050	$81,900	$107,300	$141,150
		Estimated Savings per dwelling unit Owner / Tenant	$225 / $150	$250 / $150	-$200 / $200	-$125 / $200
5 post-1980 high-rise rental	The Low Carbon retrofit package for high rise buildings complies with 2030 emissions limits, because improvements to the envelope and ventilation system can significantly reduce their energy use. Replacing steam PTACs with cold-climate PTHPs is a simple future retrofit project. Over-cladding, especially if it can offset LL11 costs, can yield additional savings and allow for conversions from exhaust-only ventilation to ERVs within the cavity behind the cladding.	GHG Emissions Reductions	56%	58%	100%	100%
 LL97 path: Prescriptive Pathway; existing heating system: steam PTACs; proposed heating system: packaged cold climate heat pumps (PTHPs)		Meets 2030 GHG limits?	✓	✓	✓	✓
		Meets 2035 GHG limits?	✓	✓	✓	✓
		Meets 2040 GHG limits*	✓	✓	✓	✓
		Estimated Cost per dwelling unit**	$26,800	$43,600	$74,600	$91,400
		Estimated Savings per dwelling unit Owner / Tenant	$450 / $400	$475 / $450	$250 / $300	$275 / $325

see pages 16-17 of the Manual

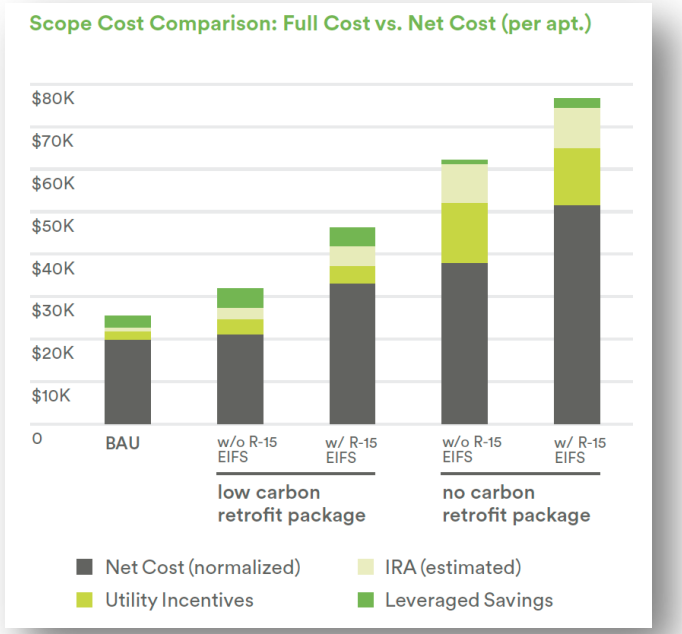
Manual | Benefits & Impacts

		benefits				impacts				when to implement		
BUILDING SYSTEM	SYSTEM COMPONENT [1]	GHG SAVINGS	COMFORT	HEALTH/IAQ	ENERGY COST SAVINGS	COSTS	LIFESPAN (YRS) [4]	MAINTENANCE	TENANT DISRUPTION	NOW	MID-CYCLE	FUTURE REFI
envelope	Roof Insulation	☆☆☆☆☆	low	low	$$$$$	$$$$$	20	medium	low	as needed	✓	✓
	Windows/Doors	☆☆☆☆☆	high	medium	$$$$$	$$$$$	20	medium	high	as needed	✓	✓
	Air Sealing & Weatherization [2]	☆☆☆☆☆	high	medium	$$$$$	$$$$$	15	medium	low	✓	✓	✓
	Exterior Wall Insulation	☆☆☆☆☆	high	medium	$$$$$	$$$$$	20	low	medium	if feasible		✓
HVAC	Heating System Upgrades [2]	☆☆☆☆☆	medium	medium	$$$$$	$$$$$	10–20	medium	low	per HPD guidelines [5]	✓	✓
	Electrify Heating	☆☆☆☆☆	high	high	$$$$$	$$$$$	15	medium	high	per HPD guidelines [5]		✓
	Pipe Insulation [2]	☆☆☆☆☆	medium	low	$$$$$	$$$$$	15	low	low	✓	✓	✓
	Ventilation Upgrades	☆☆☆☆☆	medium	high	$/$$$$$ (ERV)	$$$$$	15	medium/ high (ERV)	high	per HPD guidelines [5]		✓
domestic hot water	Electrify Hot Water Heating	☆☆☆☆☆	low	high	$$$$$	$$$$$	10	medium	low	per HPD guidelines [5]	✓	✓
	Plumbing Fixture Upgrades	☆☆☆☆☆	low	low	$$$$$	$$$$$	10	low	low	✓	✓	✓
lighting	Common Area & Exterior Upgrades [2]	☆☆☆☆☆	low	medium	$$$$$	$$$$$	15–20	low	low	✓		✓
	In-Unit Upgrades	☆☆☆☆☆	low	medium	$$$$$	$$$$$	15–20	low	medium	✓	✓	✓
plug loads	Appliance Upgrades	☆☆☆☆☆	low	low	$$$$$	$$$$$	15	low	medium	as needed	✓	✓
	Electrify Cooking	☆☆☆☆☆	medium	high	$$$$$	$$$$$	10	low	high	per HPD guidelines [5]		✓
	Electrify Laundry	☆☆☆☆☆	low	medium	$$$$$	$$$$$	10	medium	low	as needed	✓	✓
renewables	Solar PV [3]	☆☆☆☆☆	low	low	$$$$$	$$$$$	20–25	low	low	per HPD SWF [3]	✓	✓

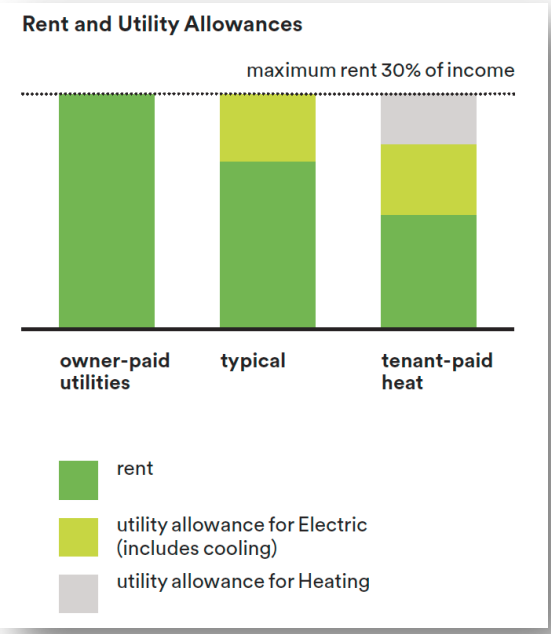
see pages 6-7 of the Manual

Manual | Key Considerations

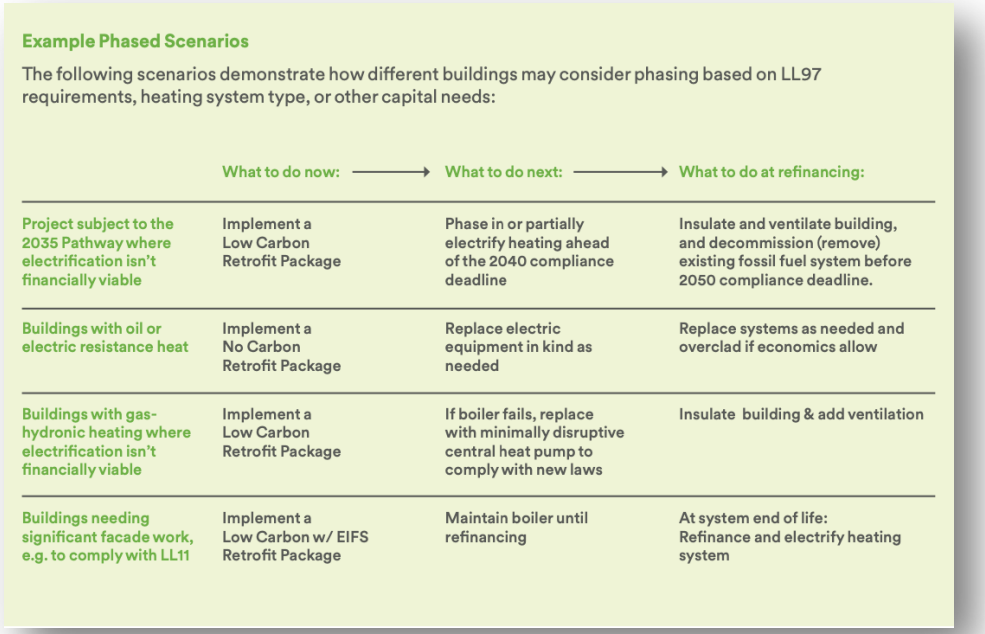
costs



utility policies



phasing



Example Phased Scenarios

The following scenarios demonstrate how different buildings may consider phasing based on LL97 requirements, heating system type, or other capital needs:

	What to do now: →	What to do next: →	What to do at refinancing:
Project subject to the 2035 Pathway where electrification isn't financially viable	Implement a Low Carbon Retrofit Package	Phase in or partially electrify heating ahead of the 2040 compliance deadline	Insulate and ventilate building, and decommission (remove) existing fossil fuel system before 2050 compliance deadline.
Buildings with oil or electric resistance heat	Implement a No Carbon Retrofit Package	Replace electric equipment in kind as needed	Replace systems as needed and overclad if economics allow
Buildings with gas-hydronic heating where electrification isn't financially viable	Implement a Low Carbon Retrofit Package	If boiler fails, replace with minimally disruptive central heat pump to comply with new laws	Insulate building & add ventilation
Buildings needing significant facade work, e.g. to comply with LL11	Implement a Low Carbon w/ EIFS Retrofit Package	Maintain boiler until refinancing	At system end of life: Refinance and electrify heating system

see pages 18-21 of the Manual

Taking Action | A Roadmap for Decarbonization

1 calculate → 2 compare → 3 develop → 4 implement

1 calculate

carbon emissions

Calculate the building's annual estimated GHG emissions using the BE-Ex Carbon Calculator: www.be-exchange.org/calculator

2 compare

to the LL97 emissions limits

Compare the building's current calculated GHG emissions with LL97 limits and determine what reduction is required for compliance.

3 develop

a retrofit master plan

Develop a scope of energy conservation measures (ECMs) that are selected and phased to align with building operational and system needs, and financing cycles.

4 implement

building decarbonization measures

see pages 23 of the Manual

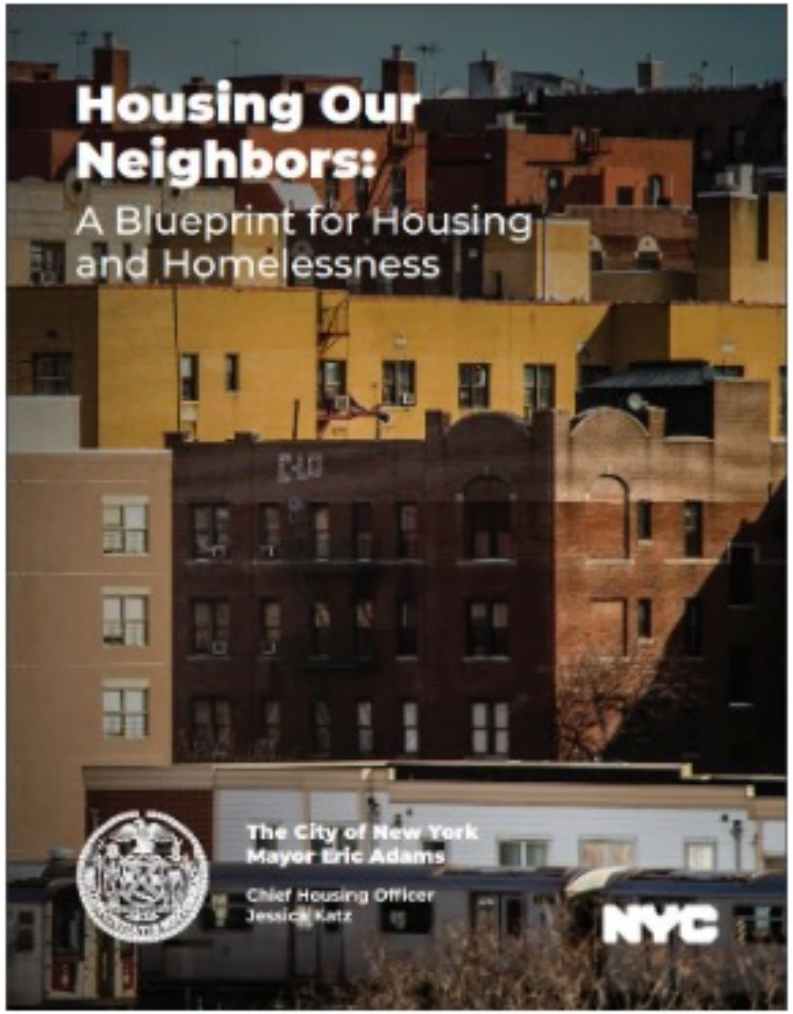
Decarbonization Roadmap Resources

https://be-exchange.org/report/hpd-ll97-decarbonization-roadmap/

HPD-NYSERDA Retrofit Electrification Pilot

Building Energy Exchange: Fall 2023

A Blueprint for Housing: 2022



Fast-track equitable decarbonization and beneficial electrification to serve low-income households

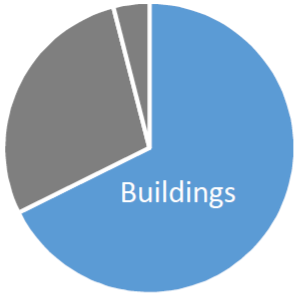
We must ensure that the transition from a fossil-fueled economy is fair and equitable. Reaching New York City's ambitious climate targets while meeting our environmental justice goals will require significant investments in our housing stock, including scaling up beneficial electrification. Beneficial electrification reduces building emissions without creating additional costs for residents, and without stretching the energy grid in ways that may increase pollution and other environmental burdens in communities already disproportionately impacted by climate change.

SPOTLIGHT; Incubate new ideas to scale beneficial electrification & resiliency

SPOTLIGHT: Release Sustainable Design Guidelines that create a clear and equitable pathway to decarbonization

Why it matters:

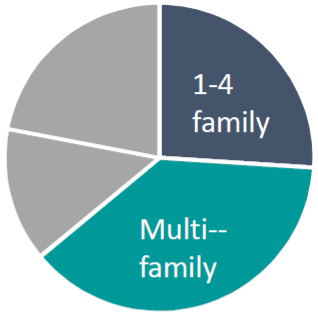
68%



GHG EMISSIONS IN NYC

of NYC's emissions come from buildings

66%

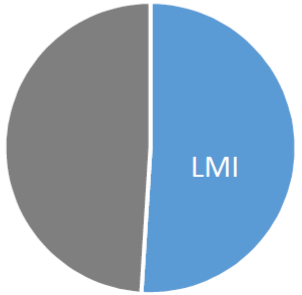


BUILDING AREA IN NYC

of NYC's built area is housing

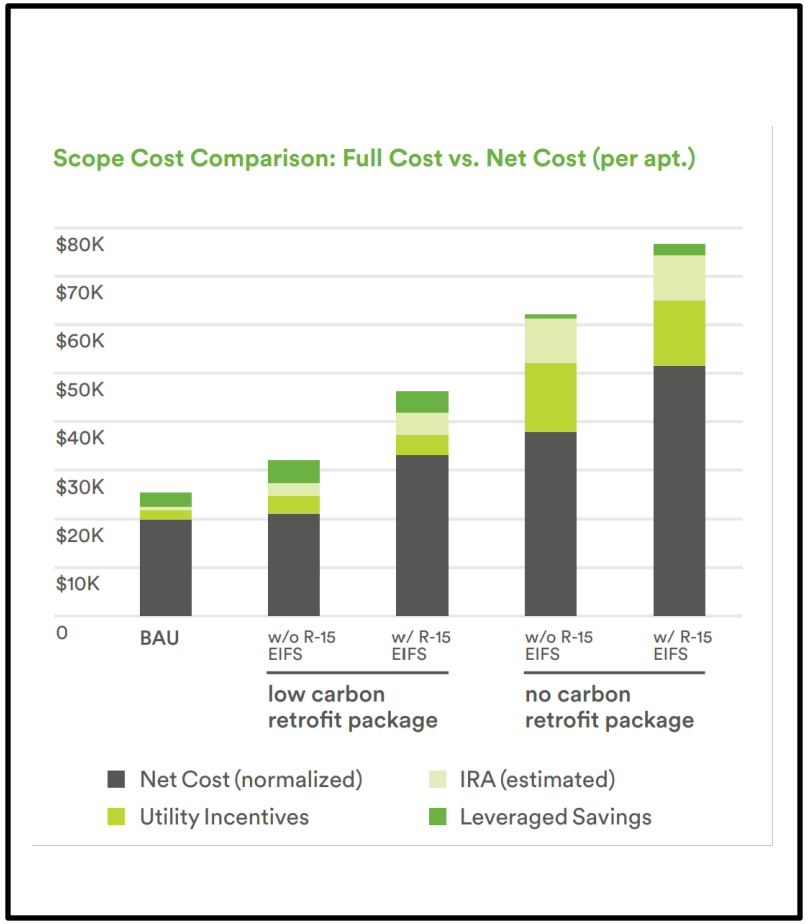
50%

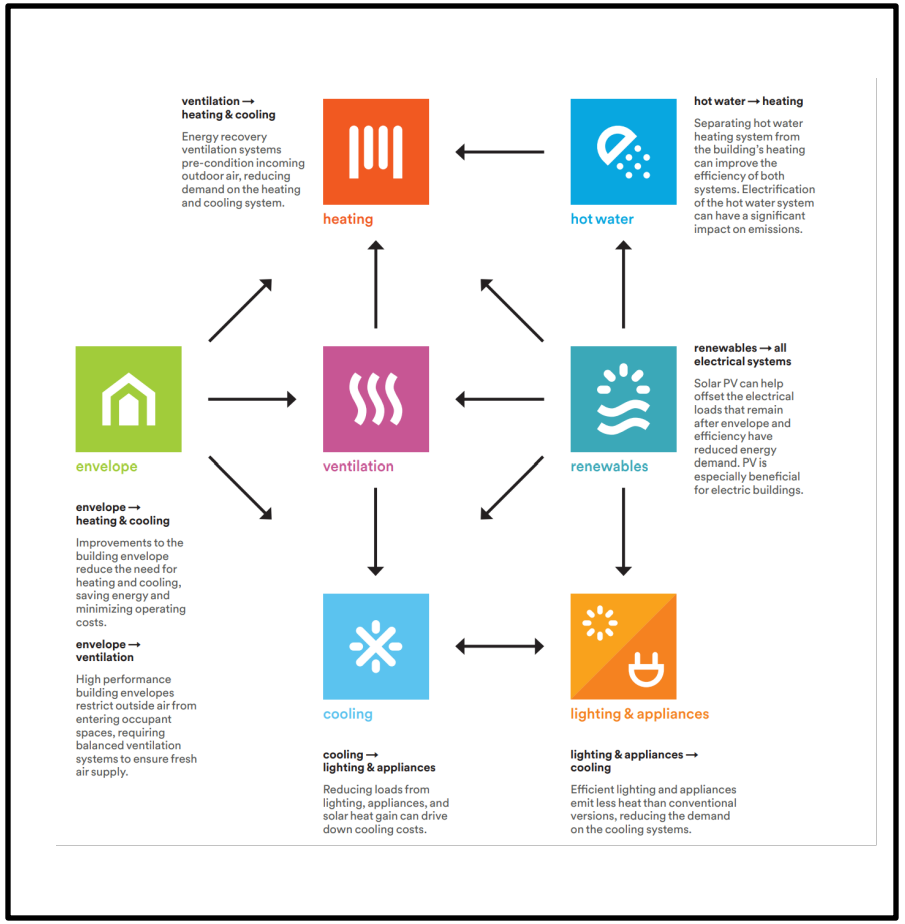
of housing serves low-or moderate-income residents

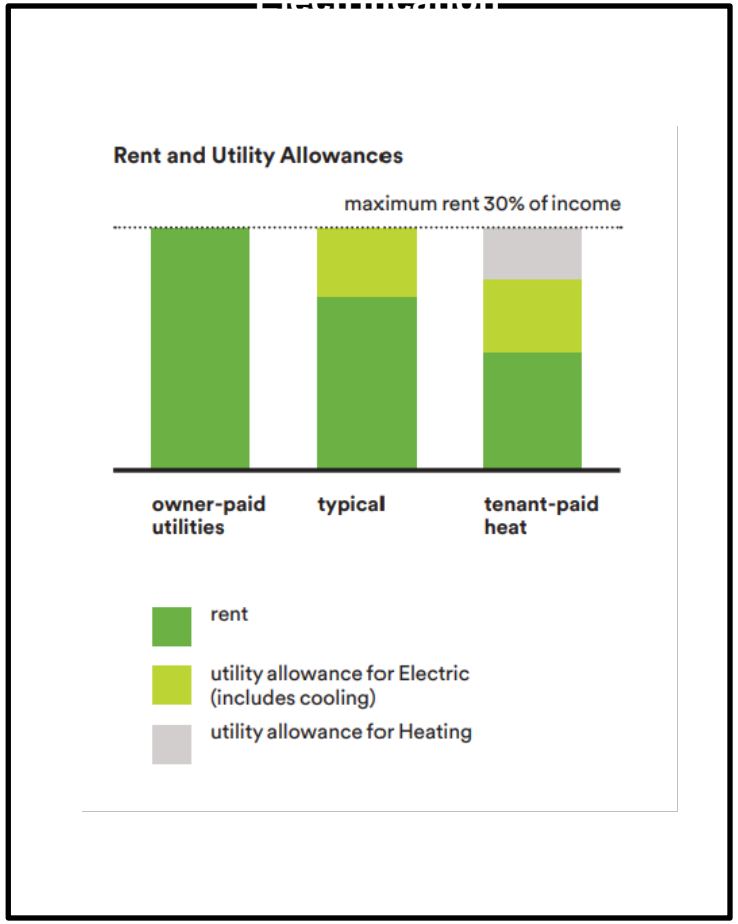


% OF AFFORDABLE HOUSING

Decarbonization Challenges





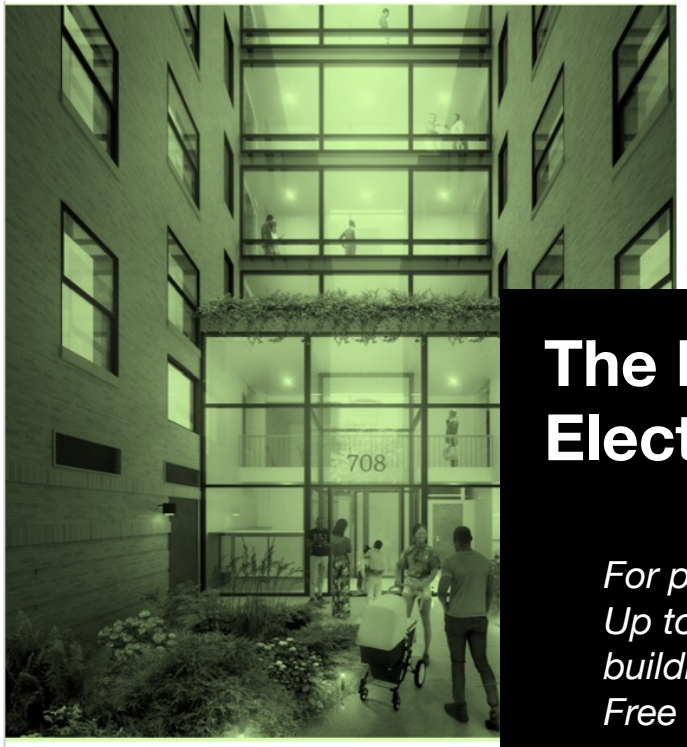


high costs

complexity

policy challenges

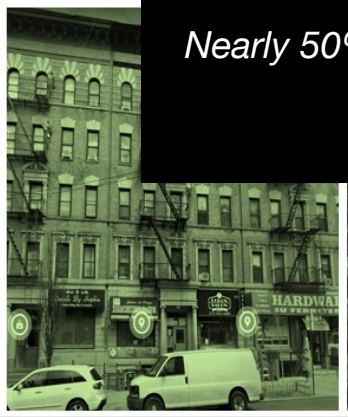
HPD-NYSERDA Retrofit Electrification Pilot



The HPD-NYSERDA $24 million Retrofit Electrification Pilot was announced in 2021

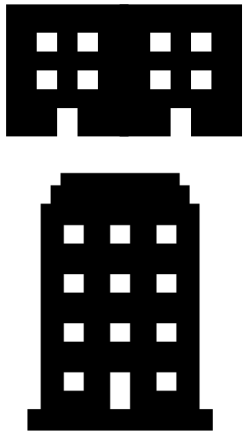
For projects in HPD's Preservation Pipeline
Up to $26,400 per dwelling unit to electrify heating & hot water paid directly to building owners during construction
Free Technical Support

Nearly 50% of funding has been allocated to electrify 21 buildings



HPD-NYSERDA Retrofit Electrification Pilot

Pilot will assist ~1,500 units in 35 Buildings



Small & Large Buildings

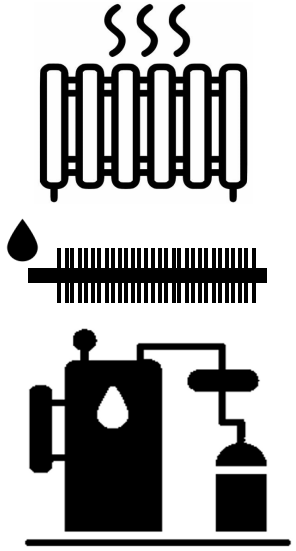
Multi-Building Clusters

Across multiple billing arrangements

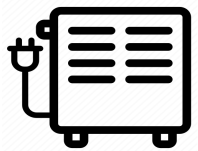
Rentals & Coops

Metering Configurations

To transition Fossil Fueled Systems

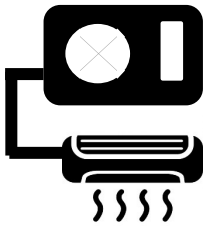


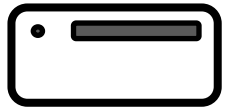
Fossil-Fueled (mainly oil)



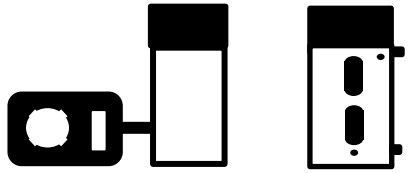
Electric Resistance

To Cold Climate Electric Heat Pumps



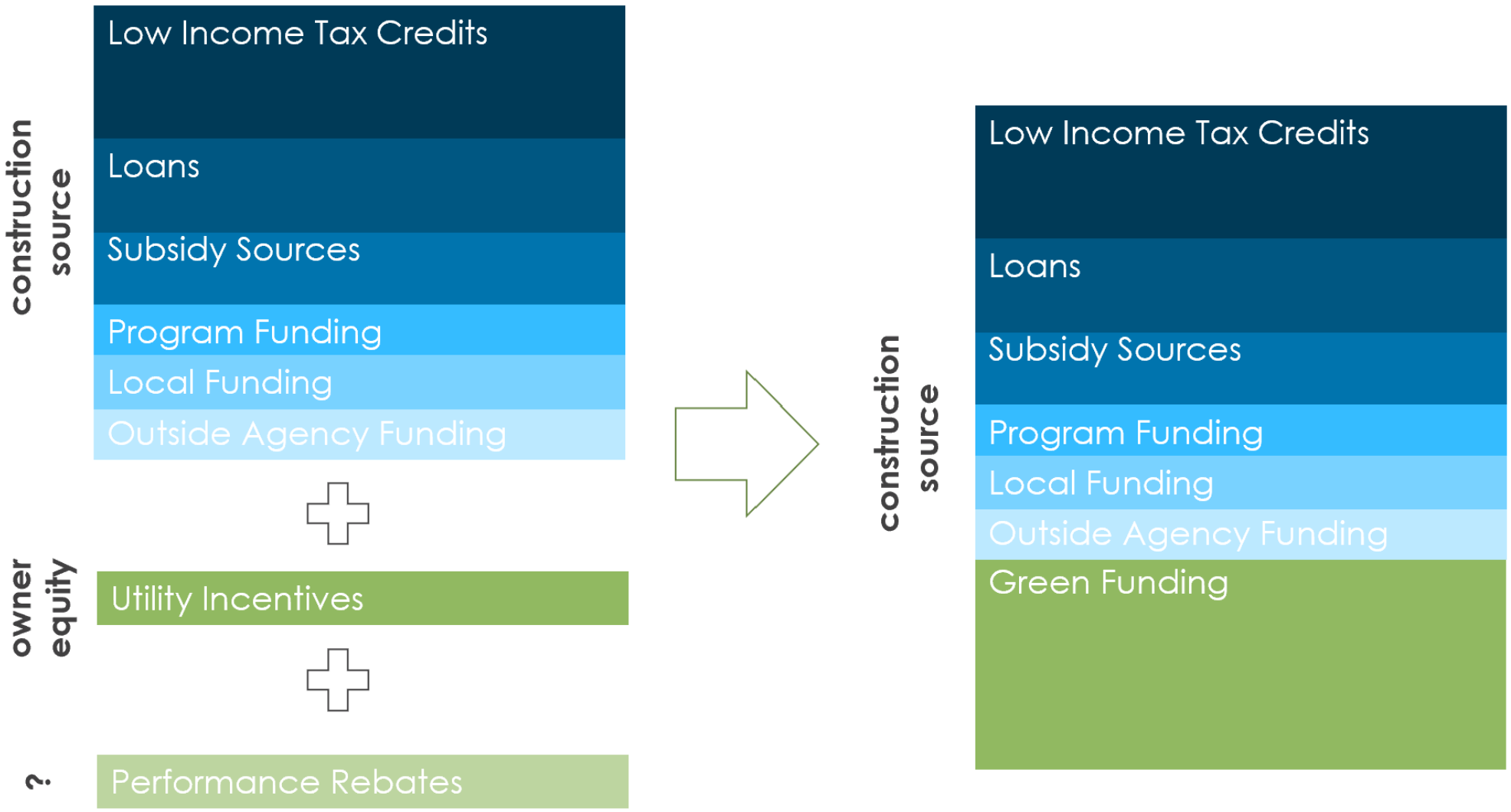


Space Heating



Domestic Hot Water

“Directly Injected” Funding

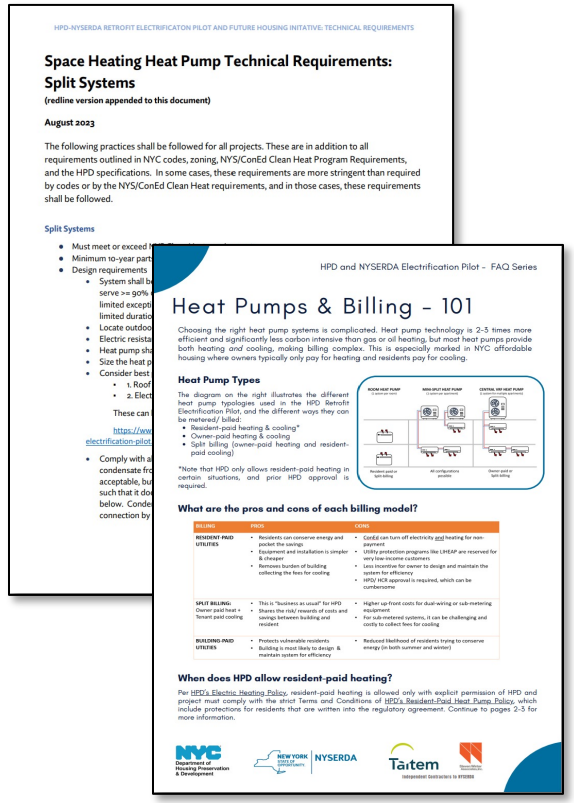


Technical & Policy Support - Pilot

Heat Pump System Decision Matrix

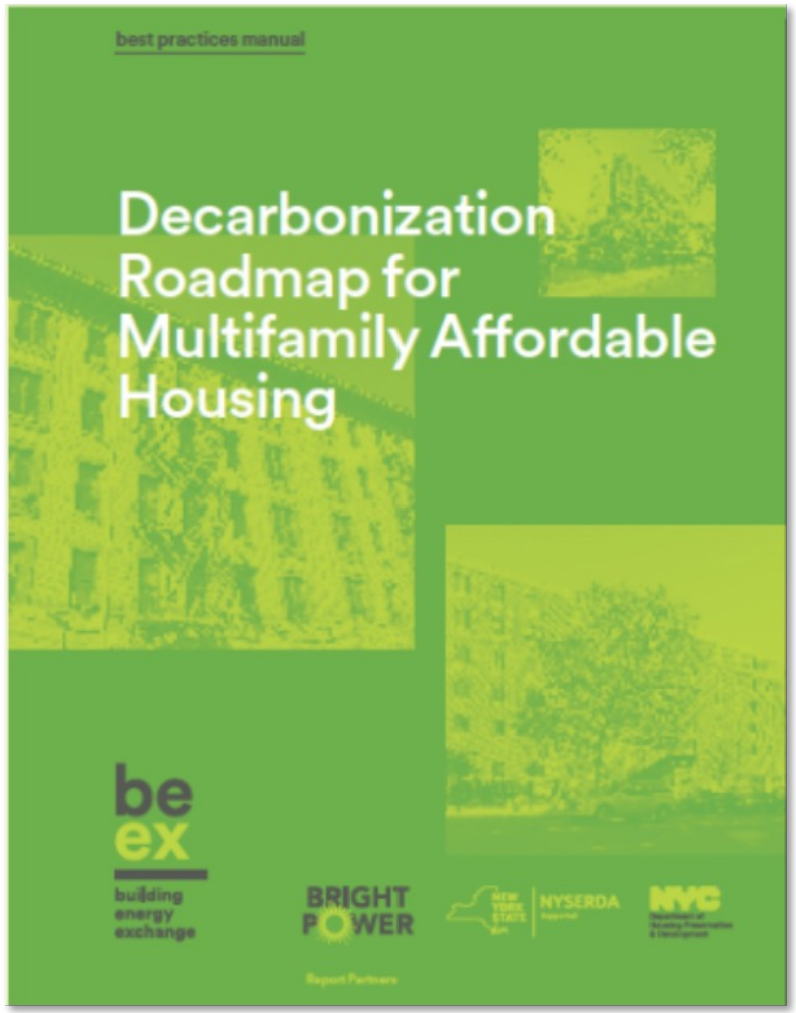
	Billing Strategy	Can be used for...	Possible Heat Pump Configurations	Building / Apartment Configuration	Considerations	First Cost	Service Cost	Energy Cost	Refrigerant Leak Risk
						estimates may vary			
1	**Resident-paid Heating & Cooling*** (requires HPD approval)	Co-ops, Rentals in certain HPD programs with prior HPD approval *For existing buildings, resident-paid heat is limited to coops/ coop conversions and rentals where tenants already pay heating*	**Mini-split on apartment meter**	< 7 stories or where building can accommodate limited refrigerant pipe legnths	Simple option when tenant-paid heating is allowed. Must comply w/ HPD's Electric Heating Policy.	$$$	$$	$$	High
			Room Heat Pumps** on apartment meter	Buildings w/ PTAC or AC sleeves, small apartments where wall penetration is feasible	No utility allowance availabe, not currently allowed by HPD	$$$**	$	$$$	Low
2	**Owner-paid Heat/ Resident-paid Cooling**	Rental buildings where tenant-paid heat is not allowed by HPD	**Central VRF on house meter w/ submetered cooling**	7+ stories	Billing for cooling usually requires a 3rd party and collecting can be difficult. Can be designed with heat recovery.	$$$$$	$$$	$$$$	High
3			**Mini-Split on house meter w/ submetered cooling**	< 7 stories or where building can accommodate limited refrigerant pipe legnths		$$$$	$$	$$	High
4			**Room Heat Pumps** on apartment meter w/ heating wired to house meter**	Any size buildings, buildings w/ PTAC or AC sleeves, smaller apartments	Simplest solution for split-billing, but new to market, dual wiring adds cost, requires wall pentrations at each unit	$$$$**	$	$$	Low
5	**Owner-paid Heating & Cooling**	Senior/ Supportive Housing, rental buildings where cooling can be included in the M&O budget	**Central VRF on house meter**	7+ stories	Simple & minimizes risk for residents, but cost for cooling adds ~$65/year/room*** to M&O budget.	$$$$	$$$	$$$$	High
6			**Mini-Split on house meter**	< 7 stories or where building can accommodate limited refrigerant pipe legnths		$$$	$$	$$	High

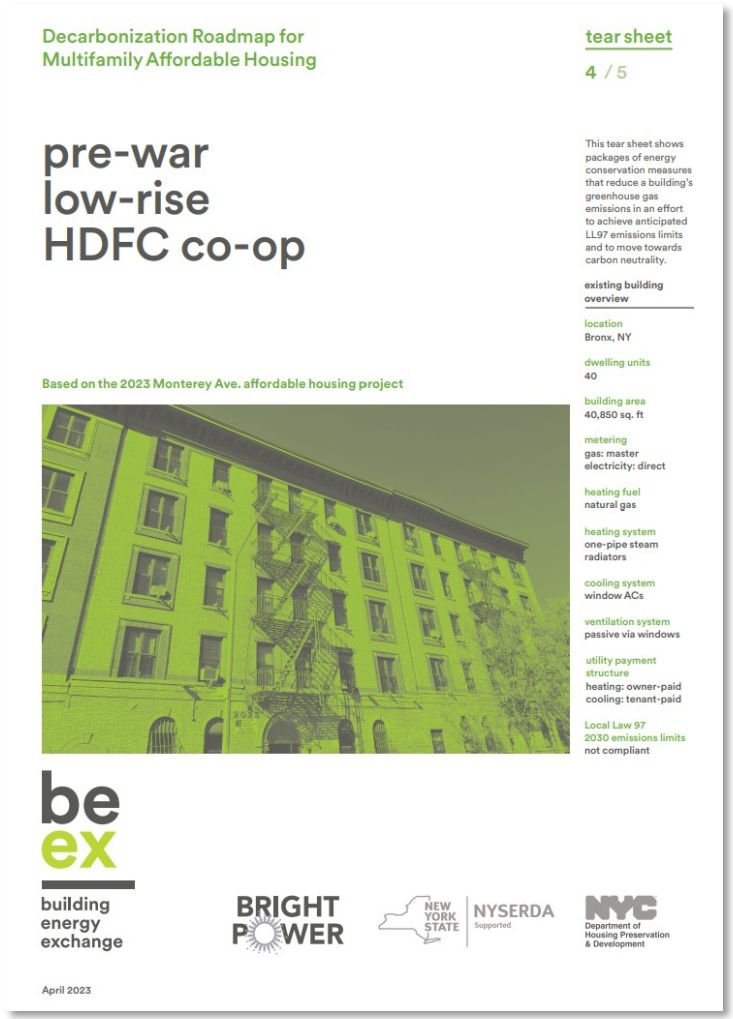
** Tenant-paid heating is only allowed with prior HPD & HCR permission and must comply with all HPD resident-paid heat requirements. Shifting heating costs to tenants is NOT allowed for rent-stabilized or rent-controlled apartments*



[HPD-NYSERDA Retrofit Electrification Pilot (nyc.gov)]

Technical & Policy Support - Roadmap





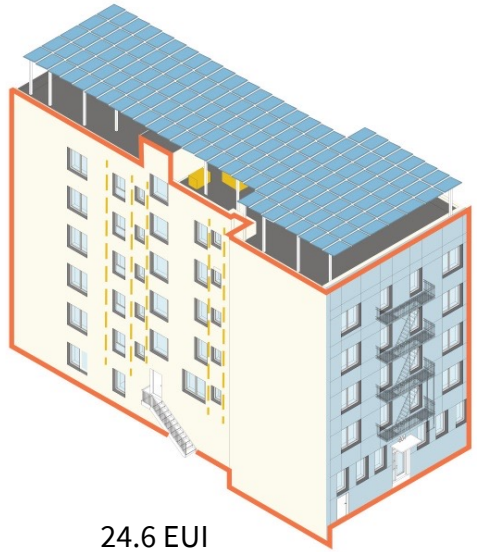
[Decarbonization Roadmap for Multifamily Affordable Housing - Building Energy Exchange (be-exchange.org)]


Sustainable,
Inclusive
Communities.
MAP

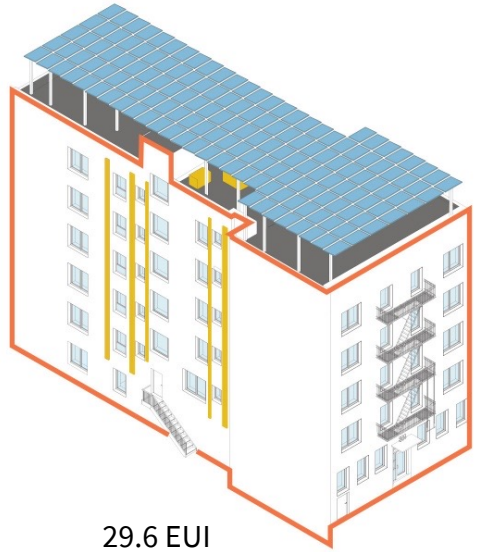

708

NYSERDA RetrofitNY Study

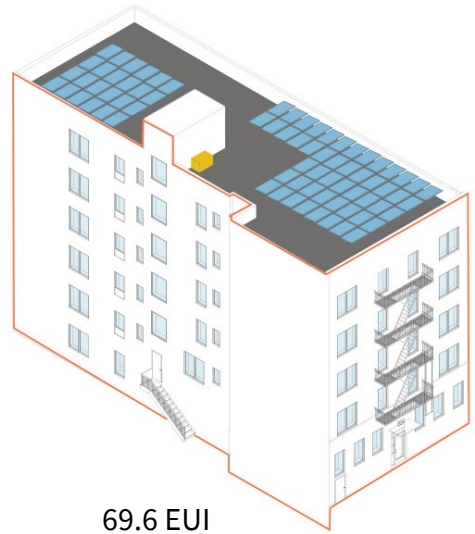
Efficiency Options:
Volmar Project



24.6 EUI



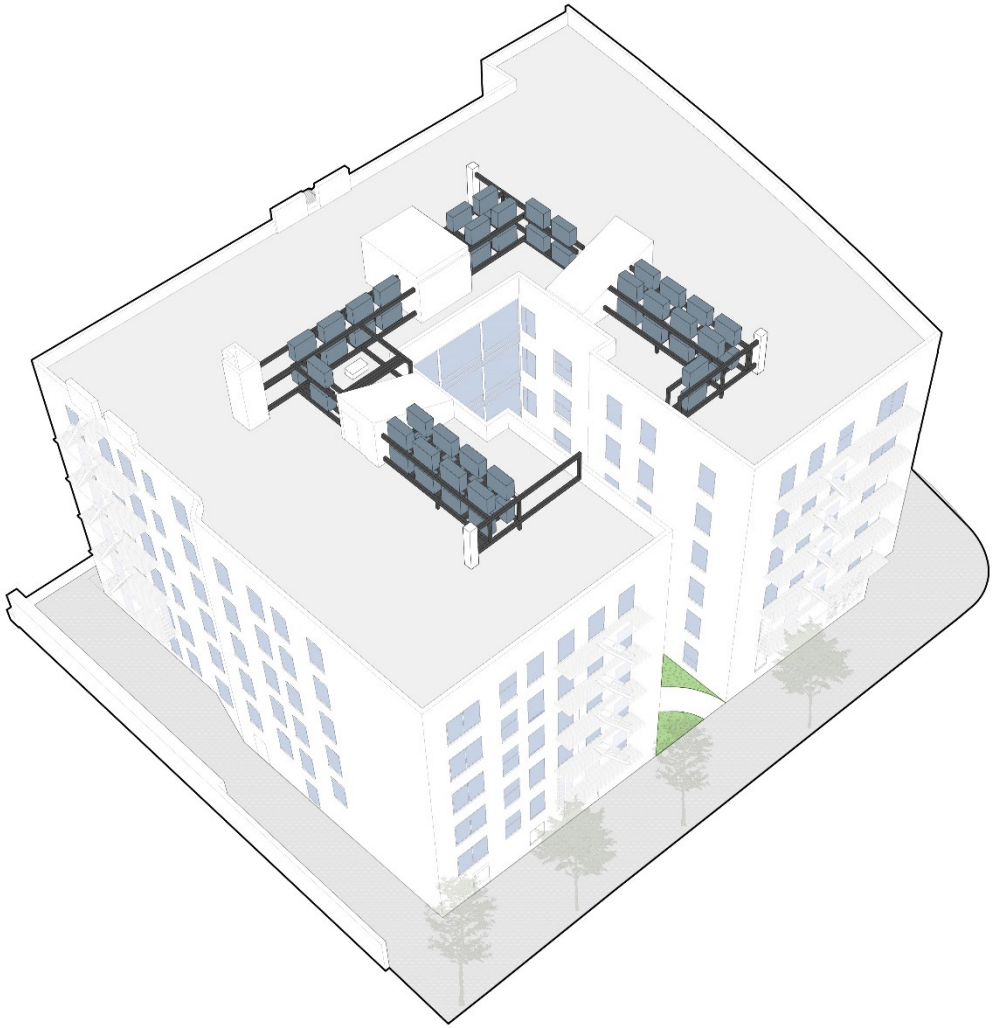
29.6 EUI

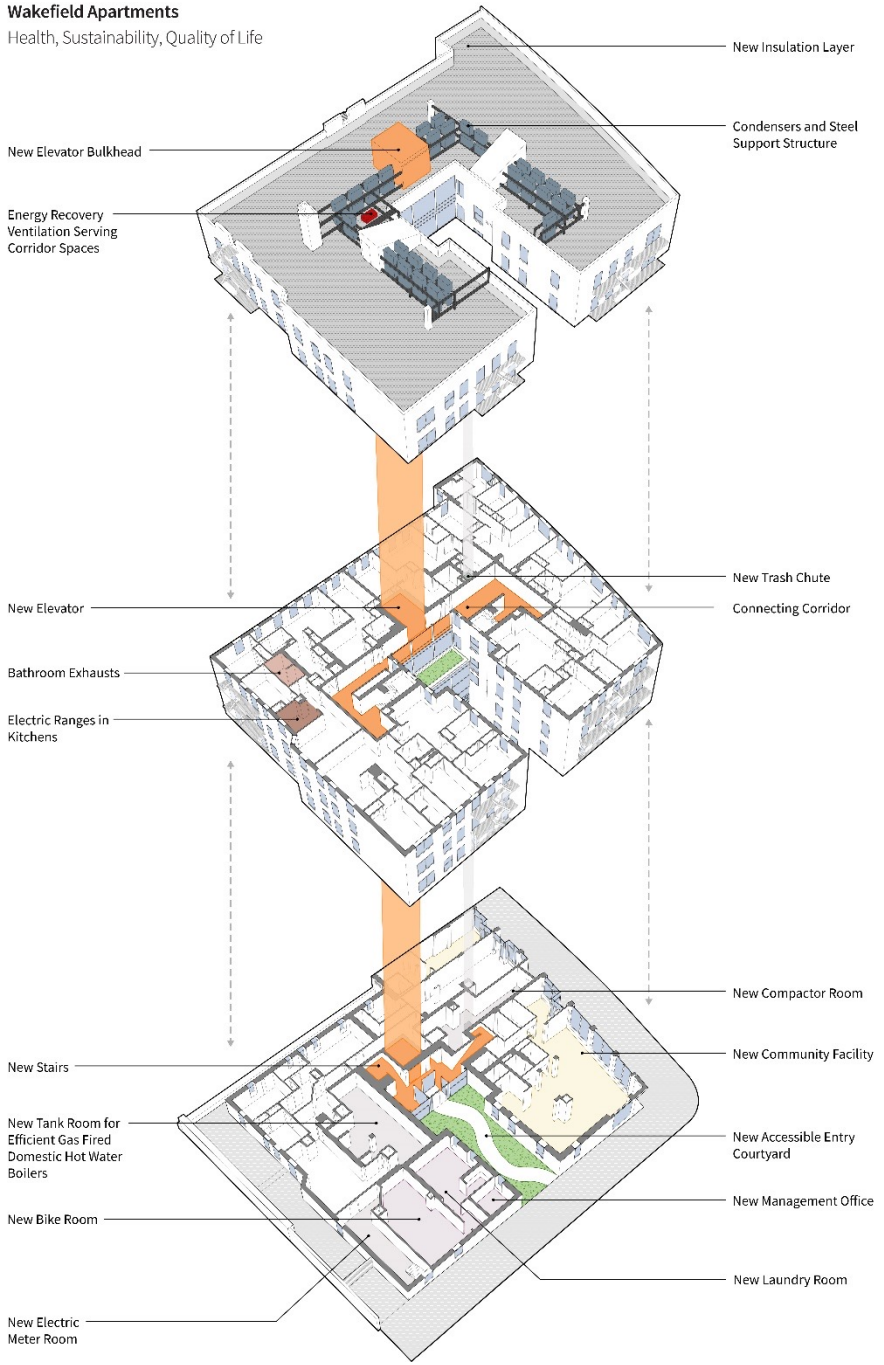


69.6 EUI

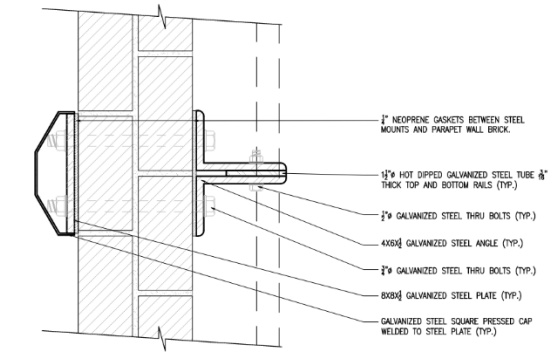
		1 **Most Efficient** Approaching Net Zero (EUI: 24.6, with solar: 15.4)	2 **NYSERDA RetrofitNY Proposal** Approaching Net Zero (EUI: 29.6, with solar: 20.4)	3 **Final Plan for Development** (EUI: 69.6, with solar: 65.3)
Building Envelope	Street Facade	Insulated panelized cladding system	Existing uninsulated brick walls	Existing uninsulated brick walls
	Sides and rear	Stone wool 6" EIFS	Existing uninsulated brick walls	Existing uninsulated brick walls
	Roof	R-30 Blown cellulose + R-16 Rigid insulation	R-30 Blown cellulose + R-16 Rigid insulation	R-30 Blown cellulose + R-16 Rigid insulation
	Air Tightness	2.33 ACH50	2.33 ACH50	5.12 ACH50
	Windows	Tilt & Turn Double glazed U-0.277 - SHGC 0.4	Tilt & Turn Double glazed U-0.277 - SHGC 0.4	Tilt & Turn Double glazed U-0.277 - SHGC 0.4 (AC panels)
Building Systems	Heating & Cooling	VRF	VRF	New steam boiler & Existing window ACs
	Ventilation	Central ERV with exterior risers (underneath insulation)	Central ERV with exterior risers	Natural ventilation
	DHW	Heat pump water heater	Heat pump water heater	Heat pump water heater
	Solar Array	Pergola 42 kW	Pergola 42 kW	Roof mounted 19.76 kW
	Lighting	LEDs + Daylight and occupancy sensors in common areas	LEDs + Daylight and occupancy sensors in common areas	LEDs + Daylight and occupancy sensors in common areas
	Stoves	Standard Electric	Standard Electric	Existing Gas
	Refrigerators	Energy Star	Existing	Existing

Electrification: Wakefield Apartments

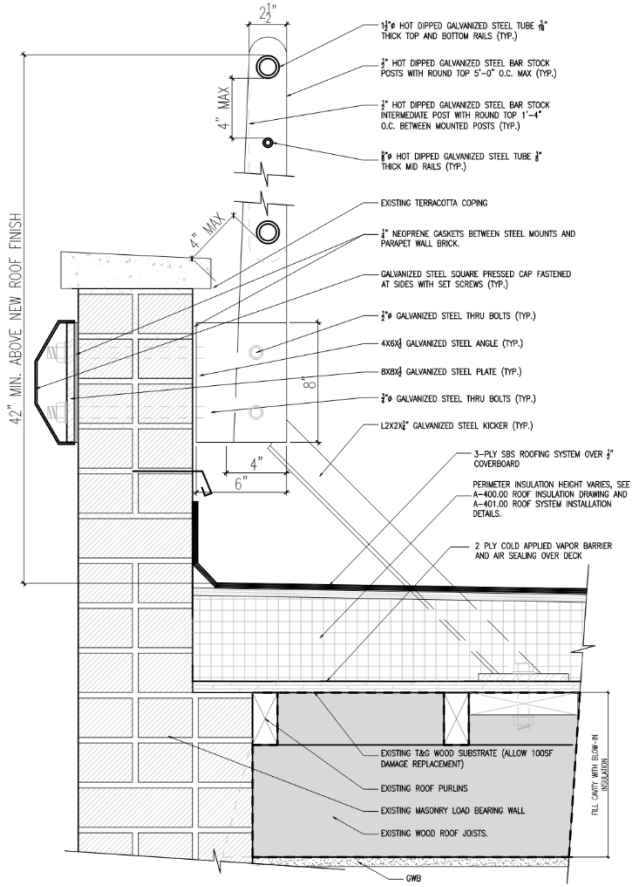




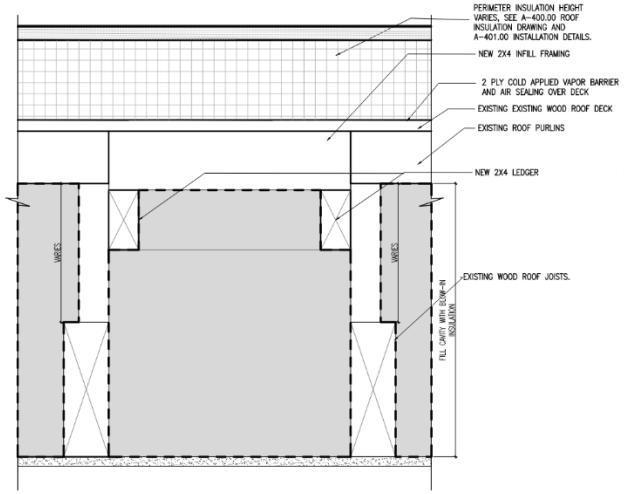
Thermal Control & Air Tightness



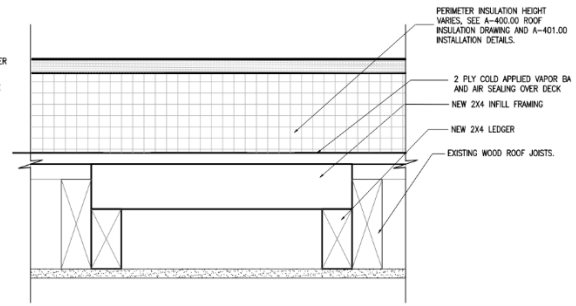
1 TYPICAL ROOF RAIL CONSTRUCTION DETAIL (PLAN)
SCALE: 3"=1'-0"

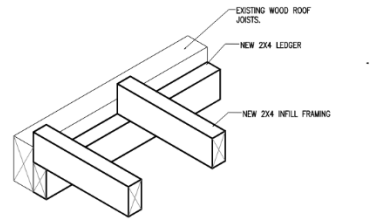


2 TYPICAL ROOF RAIL CONSTRUCTION DETAIL (SECTION)
SCALE: 3"=1'-0"

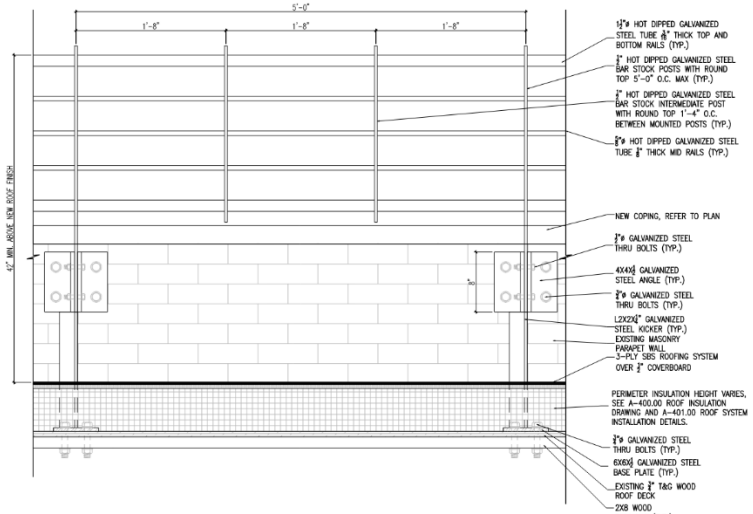


3 TYPICAL DETAIL FOR IN-FILLING EXISTING ROOF(SECTION)
SCALE: 3"=1'-0"

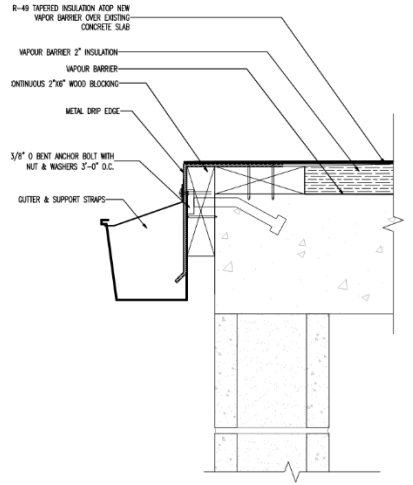




4 TYPICAL DETAIL FOR IN-FILLING EXISTING ROOF STAIR BULKHEAD (SECTION)
SCALE: 3"=1'-0"



6 TYPICAL ROOF RAIL CONSTRUCTION DETAIL (SECTION)
SCALE: 1 1/2"=1'-0"



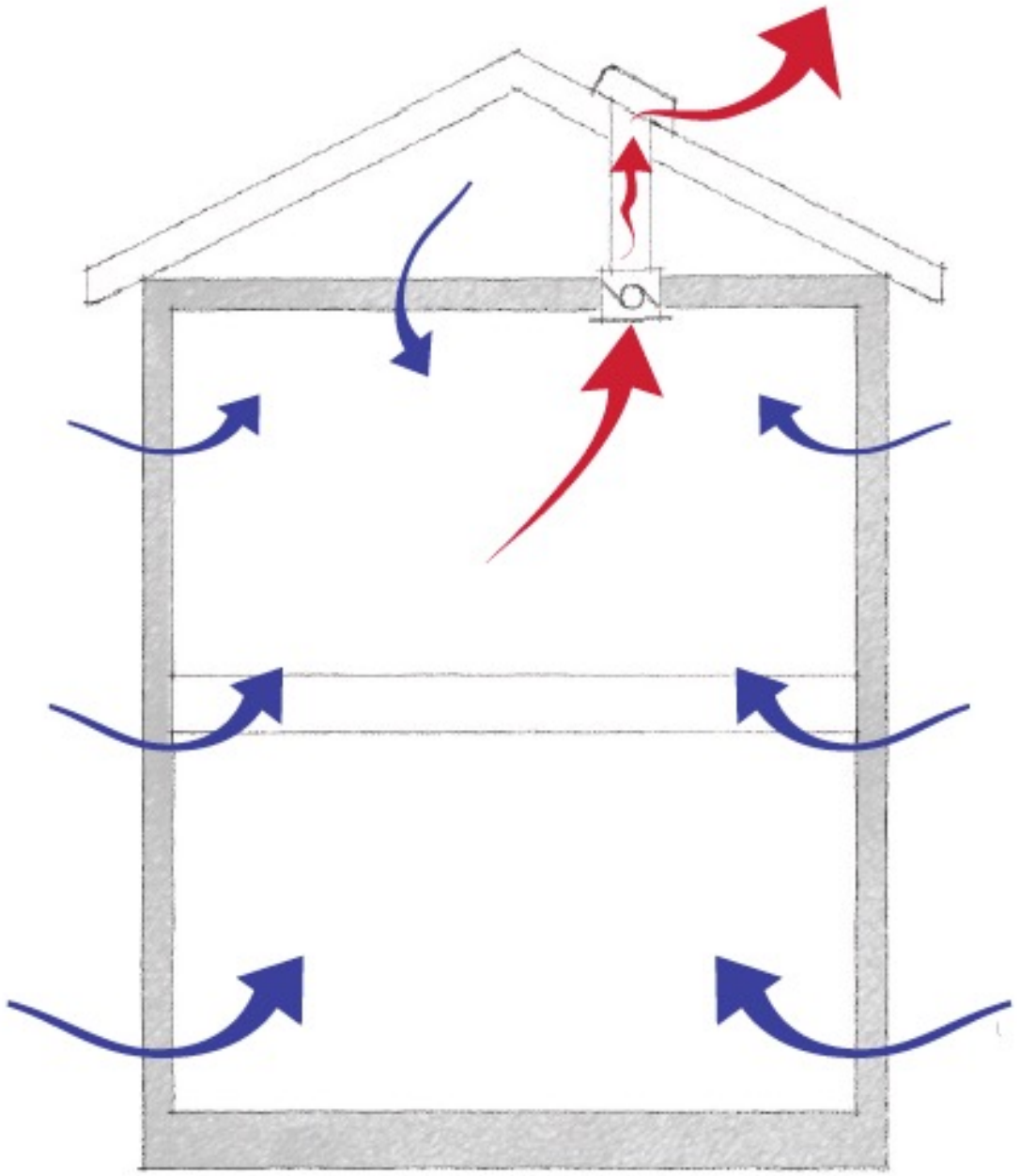
5 ELEVATOR BULKHEAD GUTTER DETAIL
SCALE: 3"=1'-0"

DOB STAMP:

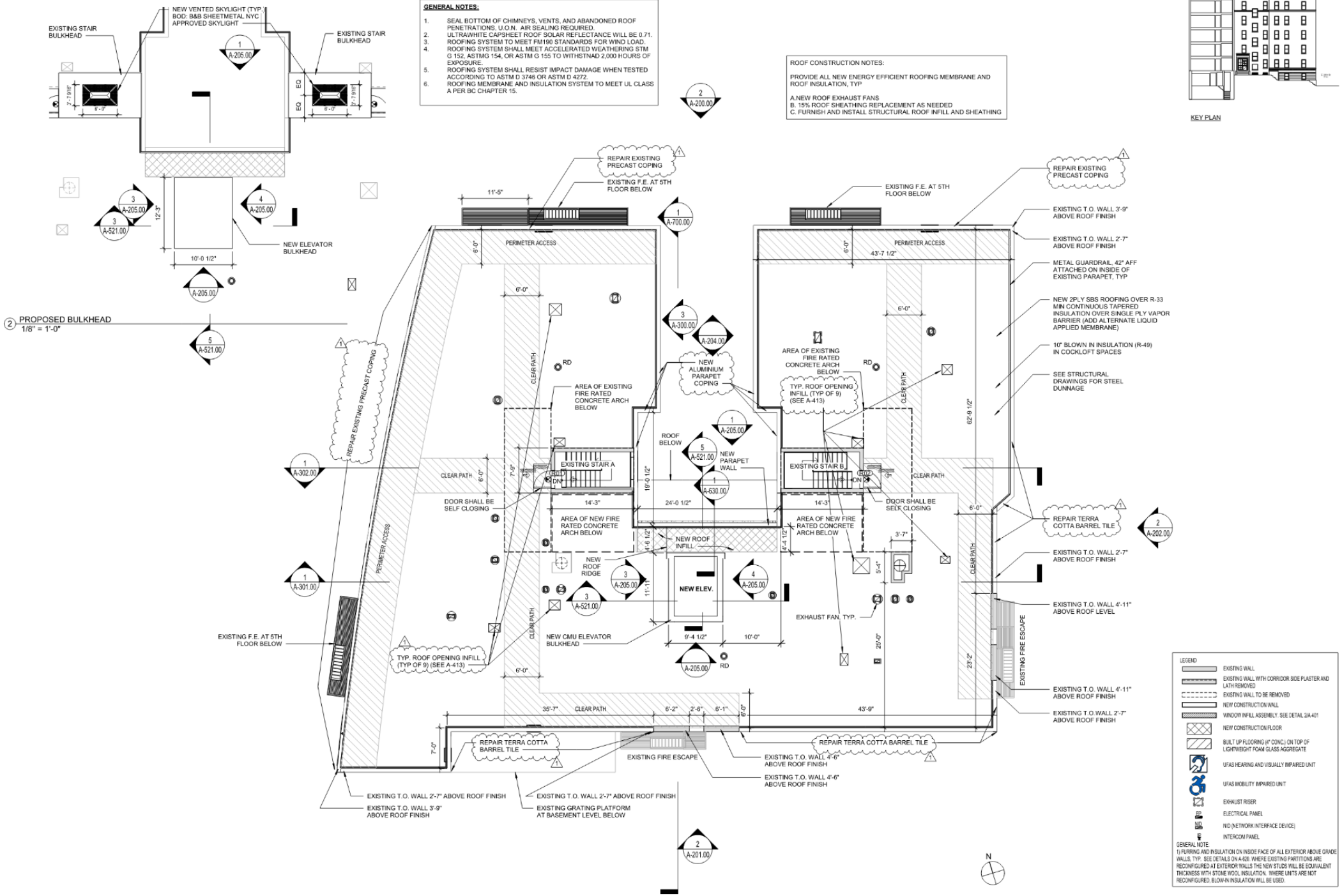
Thermal Control
& Air Tightness

Energy Recovery Ventilation

Non-airtight enclosure with exhaust only ventilation means “fresh” air comes from leaky walls!



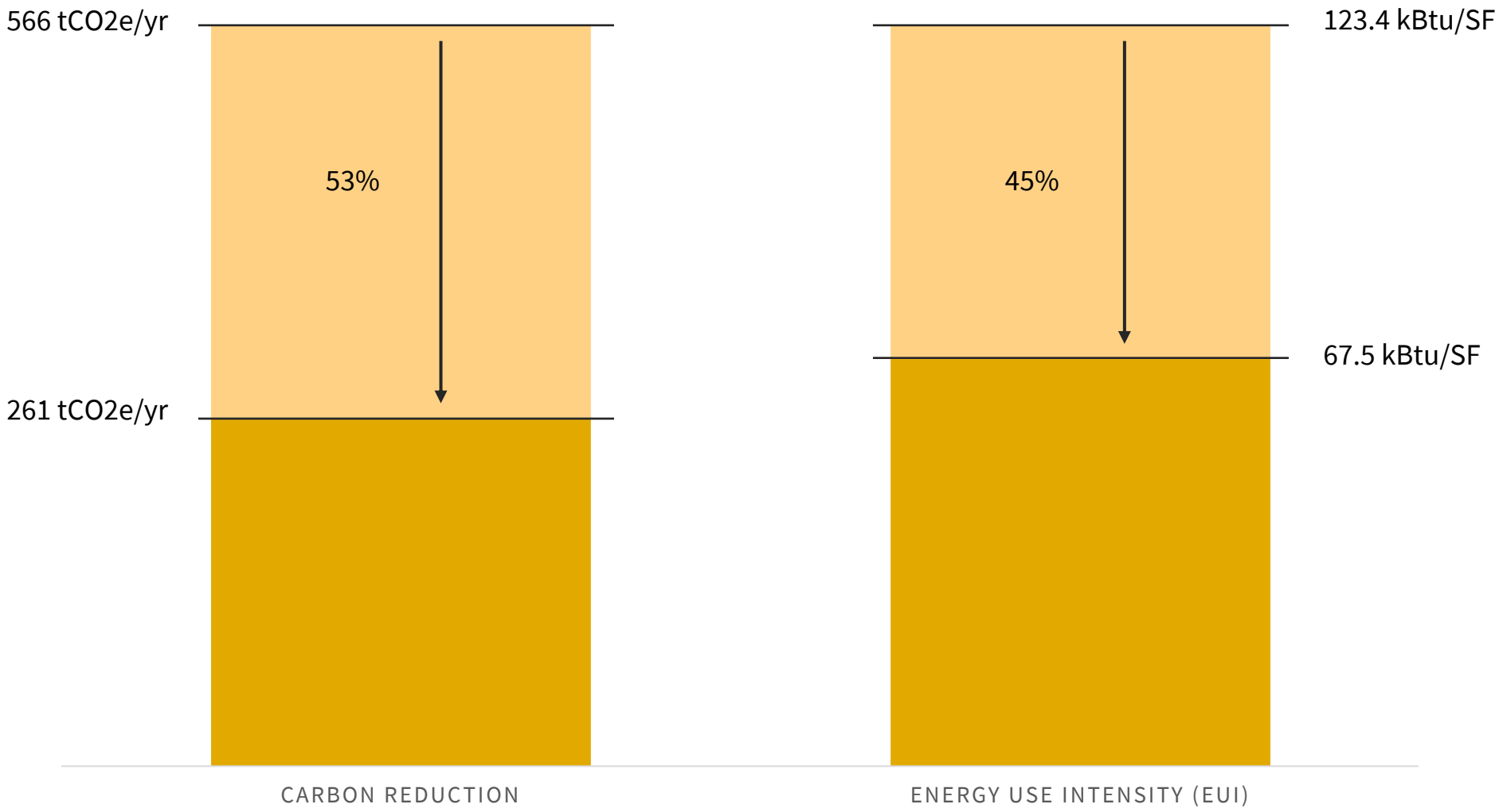
SOURCE: BUILDING SCIENCE CORP


GENERAL NOTES:
1. SEAL BOTTOM OF CHIMNEYS, VENTS, AND ABANDONED ROOF PENETRATIONS, U.O.N. AIR SEALING REQUIRED.
2. ULTRAWHITE CAPSHEET ROOF SOLAR REFLECTANCE WILL BE 0.71.
3. ROOFING SYSTEM TO MEET FM190 STANDARDS FOR WIND LOAD.
4. ROOFING SYSTEM SHALL MEET ACCELERATED WEATHERING STM G 152, ASTMG 154, OR ASTM G 155 TO WITHSTNAD 2,000 HOURS OF EXPOSURE.
5. ROOFING SYSTEM SHALL RESIST IMPACT DAMAGE WHEN TESTED ACCORDING TO ASTM D 3746 OR ASTM D 4272.
6. ROOFING MEMBRANE AND INSULATION SYSTEM TO MEET UL CLASS A PER BC CHAPTER 15.
ROOF CONSTRUCTION NOTES:
PROVIDE ALL NEW ENERGY EFFICIENT ROOFING MEMBRANE AND ROOF INSULATION, TYP
A.NEW ROOF EXHAUST FANS
B. 15% ROOF SHEATHING REPLACEMENT AS NEEDED
C. FURNISH AND INSTALL STRUCTURAL ROOF INFILL AND SHEATHING
KEY PLAN
NEW VENTED SKYLIGHT (TYP.) BOD: B&B SHEETMETAL NYC APPROVED SKYLIGHT
EXISTING STAIR BULKHEAD
EXISTING STAIR BULKHEAD
NEW ELEVATOR BULKHEAD
10'-0 1/2"
12'-3"
2 PROPOSED BULKHEAD
1/8" = 1'-0"
REPAIR EXISTING PRECAST COPING
EXISTING F.E. AT 5TH FLOOR BELOW
11'-5"
PERIMETER ACCESS
6'-0"
43'-7 1/2"
AREA OF EXISTING FIRE RATED CONCRETE ARCH BELOW
NEW ALUMINIUM PARAPET COPING
TYP. ROOF OPENING INFILL (TYP OF 9) (SEE A-413)
CLEAR PATH
ROOF BELOW
NEW PARAPET WALL
EXISTING STAIR A
EXISTING STAIR B
DOOR SHALL BE SELF CLOSING
14'-3"
24'-0 1/2"
AREA OF NEW FIRE RATED CONCRETE ARCH BELOW
NEW ROOF INFILL
NEW ROOF RIDGE
NEW ELEV.
NEW CMU ELEVATOR BULKHEAD
EXHAUST FAN, TYP.
62'-9 1/2"
REPAIR TERRA COTTA BARREL TILE
EXISTING T.O. WALL 3'-9" ABOVE ROOF FINISH
EXISTING T.O. WALL 2'-7" ABOVE ROOF FINISH
METAL GUARDRAIL, 42" AFF ATTACHED ON INSIDE OF EXISTING PARAPET, TYP
NEW 2PLY SBS ROOFING OVER R-33 MIN CONTINUOUS TAPERED INSULATION OVER SINGLE PLY VAPOR BARRIER (ADD ALTERNATE LIQUID APPLIED MEMBRANE)
10" BLOWN IN INSULATION (R-49) IN COCKLOFT SPACES
SEE STRUCTURAL DRAWINGS FOR STEEL DUNNAGE
EXISTING T.O. WALL 4'-11" ABOVE ROOF LEVEL
EXISTING T.O. WALL 4'-11" ABOVE ROOF FINISH
EXISTING T.O.WALL 2'-7" ABOVE ROOF FINISH
EXISTING FIRE ESCAPE
REPAIR TERRA COTTA BARREL TILE
EXISTING T.O. WALL 4'-6" ABOVE ROOF FINISH
EXISTING T.O. WALL 2'-7" ABOVE ROOF FINISH
EXISTING T.O. WALL 3'-9" ABOVE ROOF FINISH
EXISTING GRATING PLATFORM AT BASEMENT LEVEL BELOW
35'-7"
43'-9"
LEGEND
EXISTING WALL
EXISTING WALL WITH CORRIDOR SIDE PLASTER AND LATH REMOVED
EXISTING WALL TO BE REMOVED
NEW CONSTRUCTION WALL
WINDOW INFILL ASSEMBLY. SEE DETAIL 2/A-401
NEW CONSTRUCTION FLOOR
BUILT UP FLOORING (4" CONC.) ON TOP OF LIGHTWEIGHT FOAM GLASS AGGREGATE
UFAS HEARING AND VISUALLY IMPAIRED UNIT
UFAS MOBILITY IMPAIRED UNIT
EXHAUST RISER
ELECTRICAL PANEL
NID (NETWORK INTERFACE DEVICE)
INTERCOM PANEL
GENERAL NOTE:
1) FURRING AND INSULATION ON INSIDE FACE OF ALL EXTERIOR ABOVE GRADE WALLS, TYP. SEE DETAILS ON A-620. WHERE EXISTING PARTITIONS ARE RECONFIGURED AT EXTERIOR WALLS THE NEW STUDS WILL BE EQUIVALENT THICKNESS WITH STONE WOOL INSULATION. WHERE UNITS ARE NOT RECONFIGURED, BLOW-IN INSULATION WILL BE USED.
N

Roof Plan

Electrification: heating and cooling

Carbon and Energy Reductions from Existing



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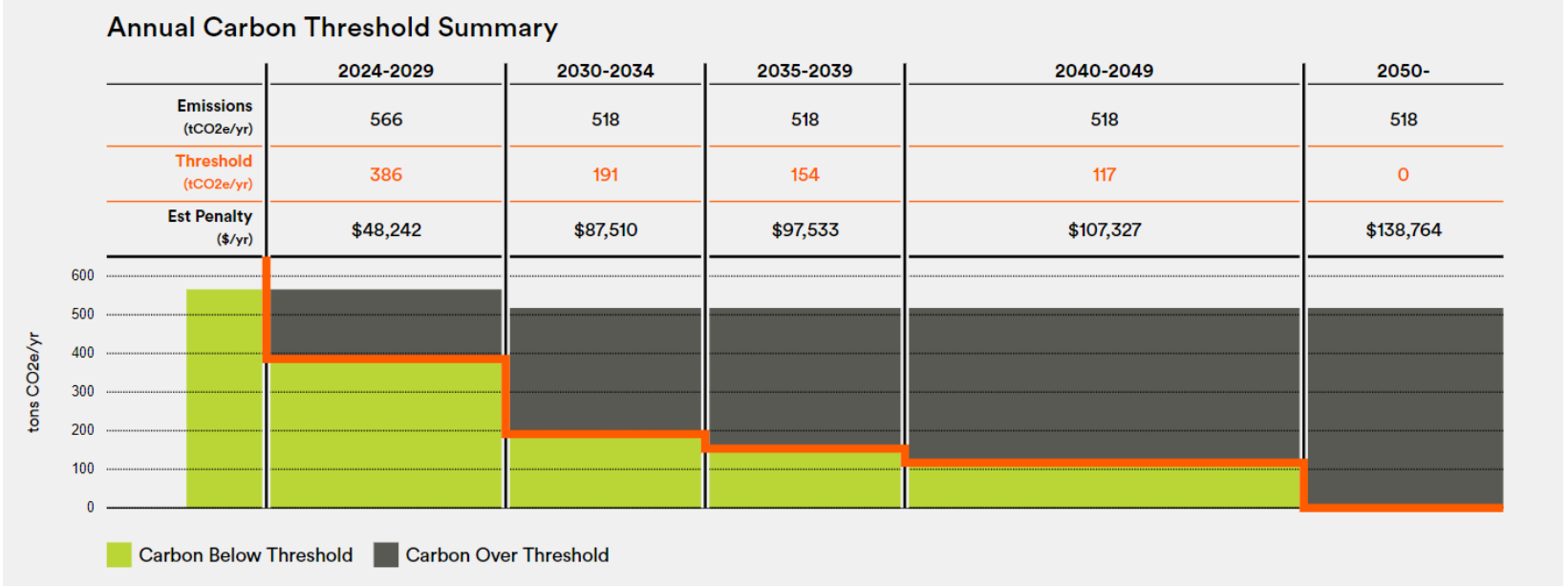
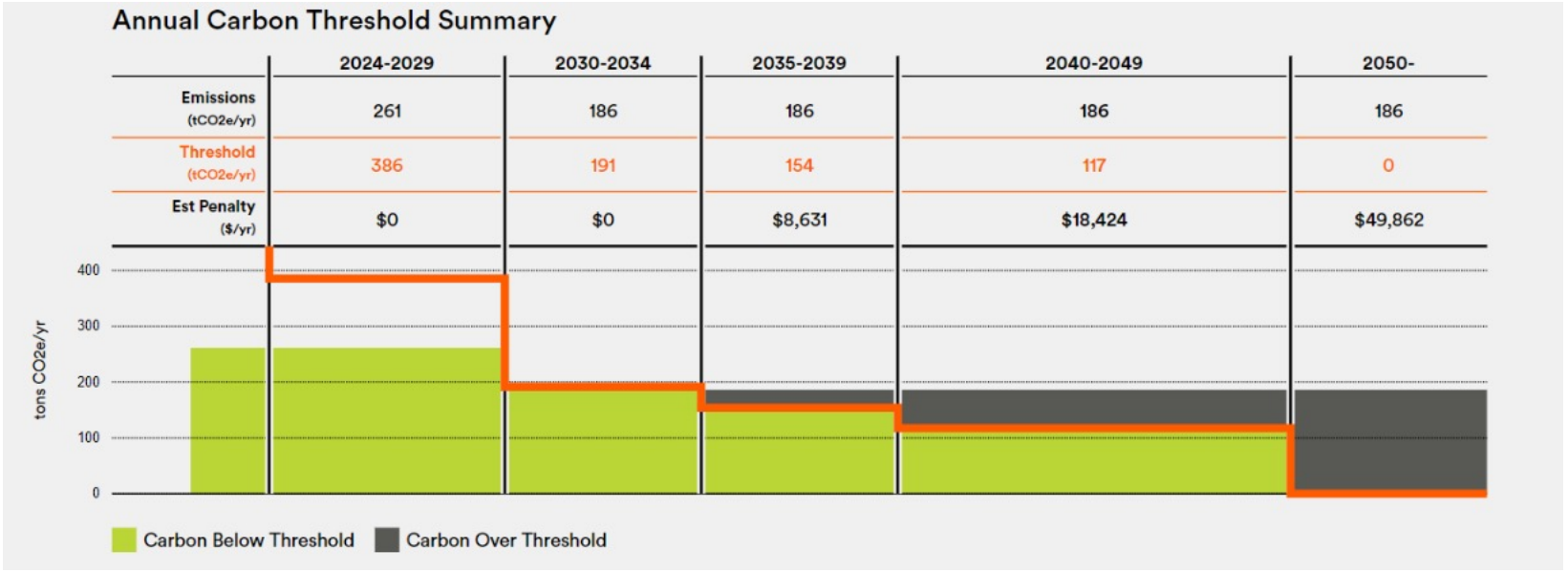
Pre retrofit carbon emissions

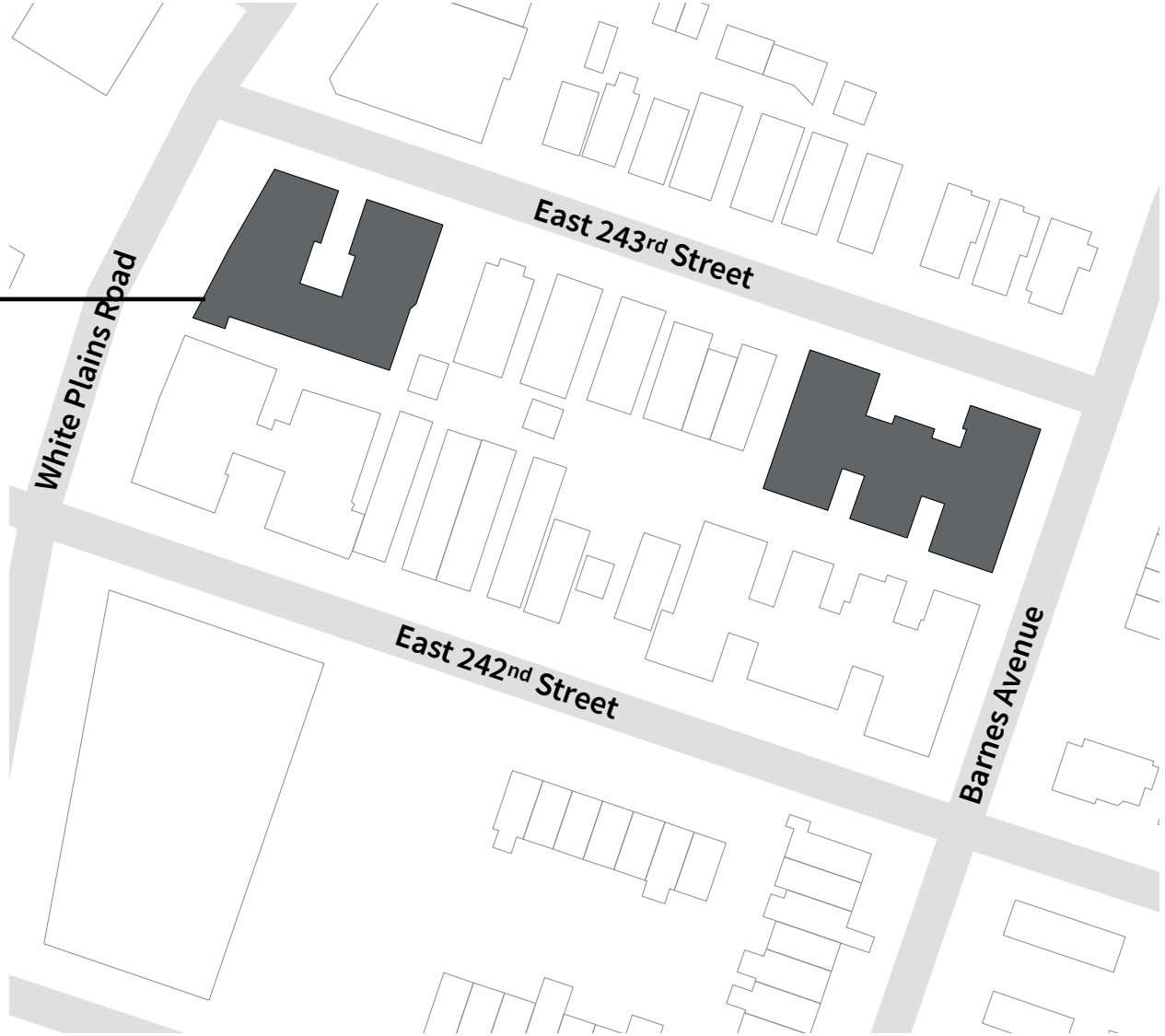


Post retrofit carbon emissions with VRF heating/cooling, electric cooking, and high efficiency gas boiler



Electrification: stoves and indoor air quality

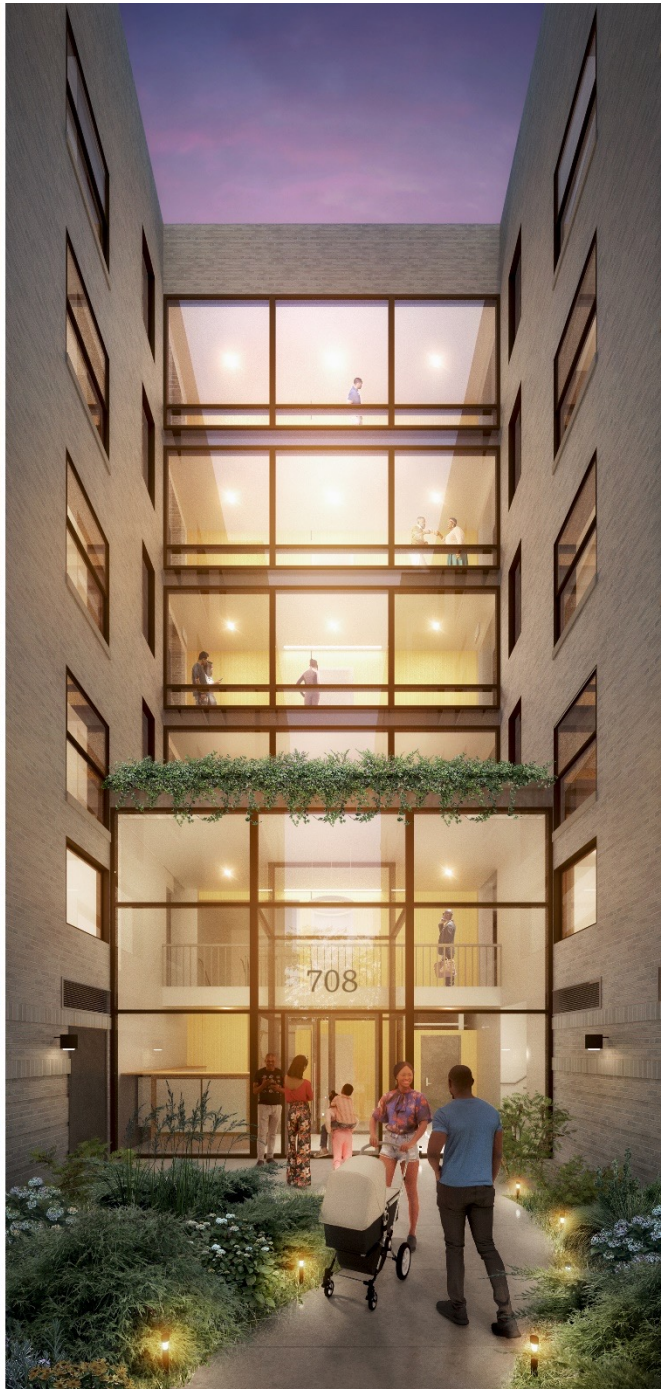
Electrification: Wakefield Apartments



Sustainability, health and inclusivity

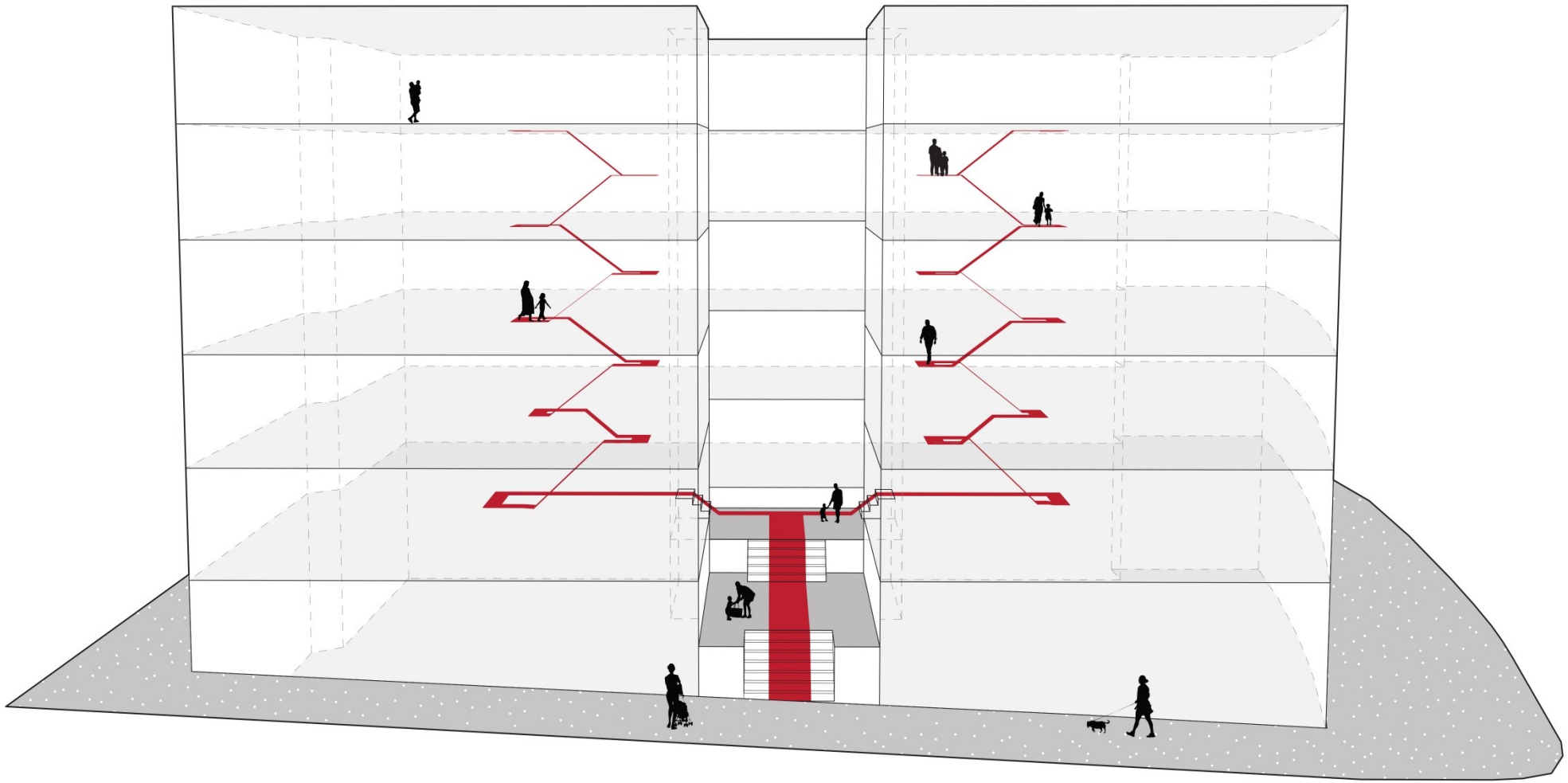
Wakefield Apartments

Existing entry on the left and proposed entry on the right .



Cluster 1

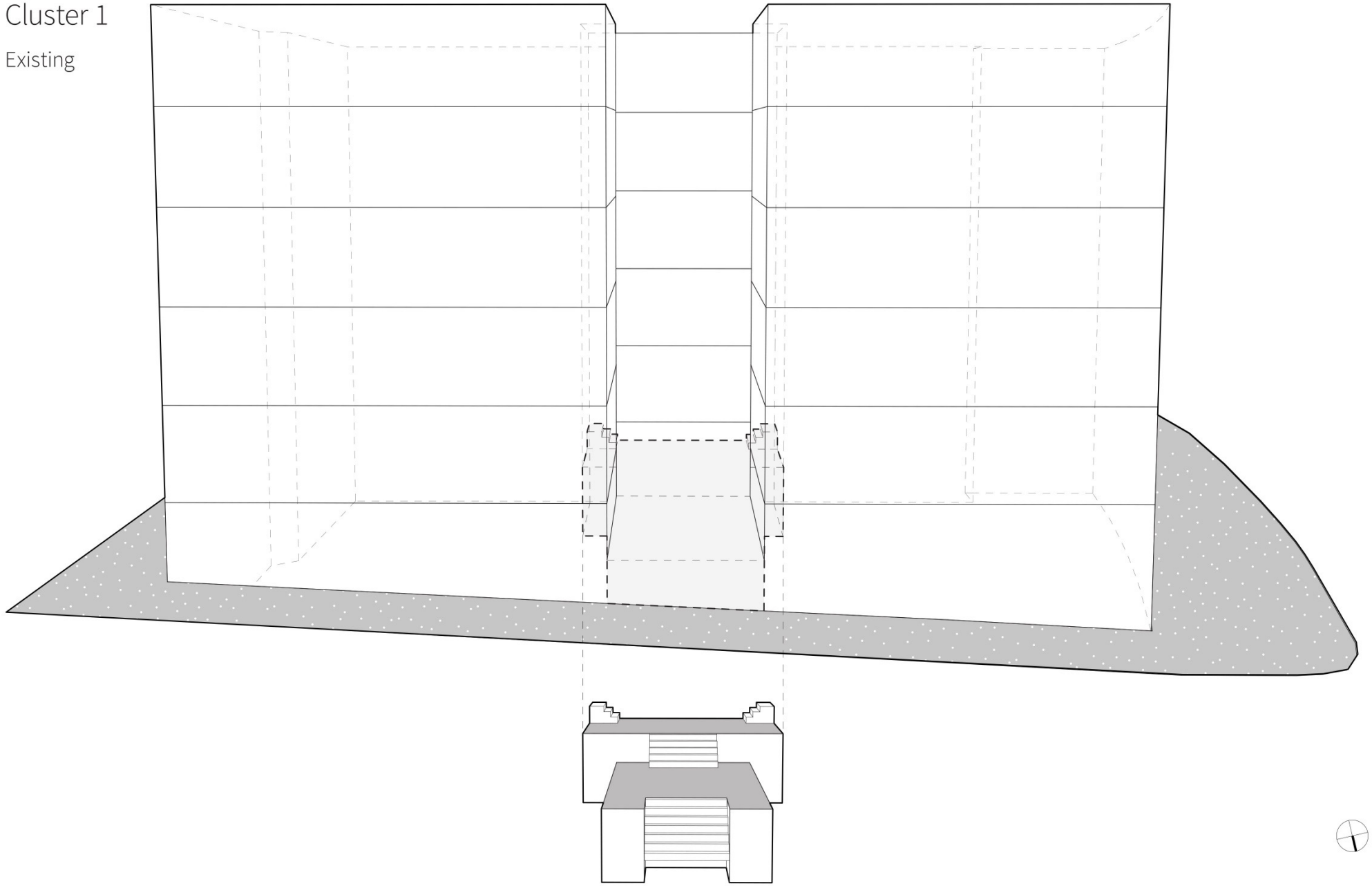
Existing



N

Cluster 1

Existing



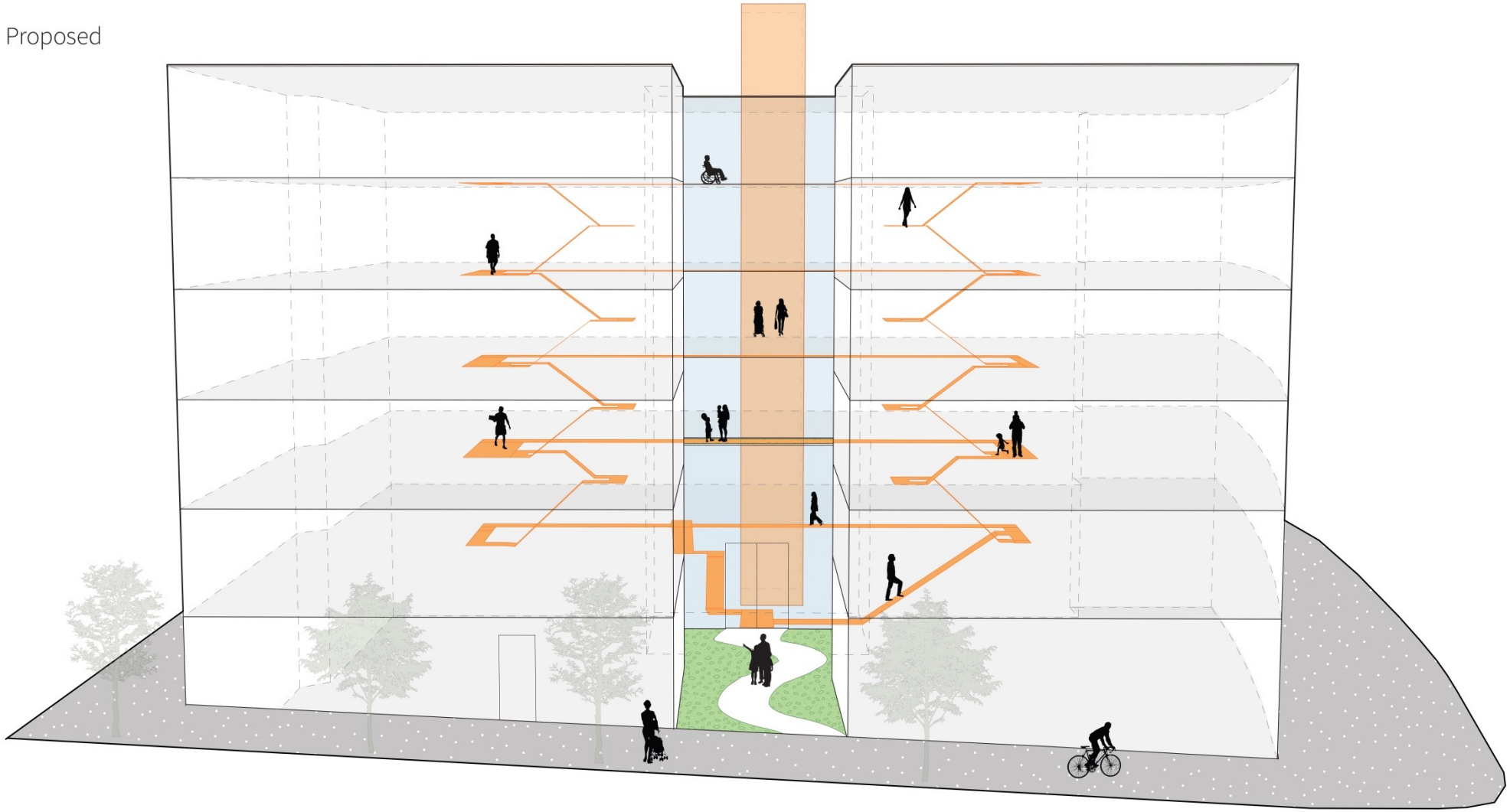
Cluster 1

Proposed

N

Cluster 1

Proposed



N

Existing
Ground Floor

1. Entry Courtyard
2. Residential Entrances
3. Residential Utility & Storage Rooms
4. Retail 1
5. Retail 2
6. Retail 3
7. Retail 4
8. Super's Unit
9. Existing Fuel Oil Boiler Room
10. Existing Fuel Oil Tank Room
11. Existing Meter Room

Proposed Ground Floor

1. Residential Courtyard
2. Residential Entrance
3. Residential Lobby
4. New Elevator
5. Management Office
6. Laundry Room
7. Bike Room
8. Community Room
9. Existing Retail
10. Social Serivces Offices
11. Super's Unit
12. New Compactor Room
13. New Tank Room
14. New Electric Meter Room

discuss.

moderator
Katie Schwamb, Director, Educational Resources, Building Energy Exchange

panelists
Jennifer Leone, Chief Sustainability Officer, NYC HPD
James Henshaw, Manager, Sustainability Services, Bright Power
Tony Piscopia, Director of Housing Preservation, Senior Associate, Magnusson Architecture & Planning, PC
Jerry Mascuch, Vice President of Real Estate, Samaritan Daytop Village

thank you.