Comparing Two Adjacent Multi-Family Passive Buildings in NYC

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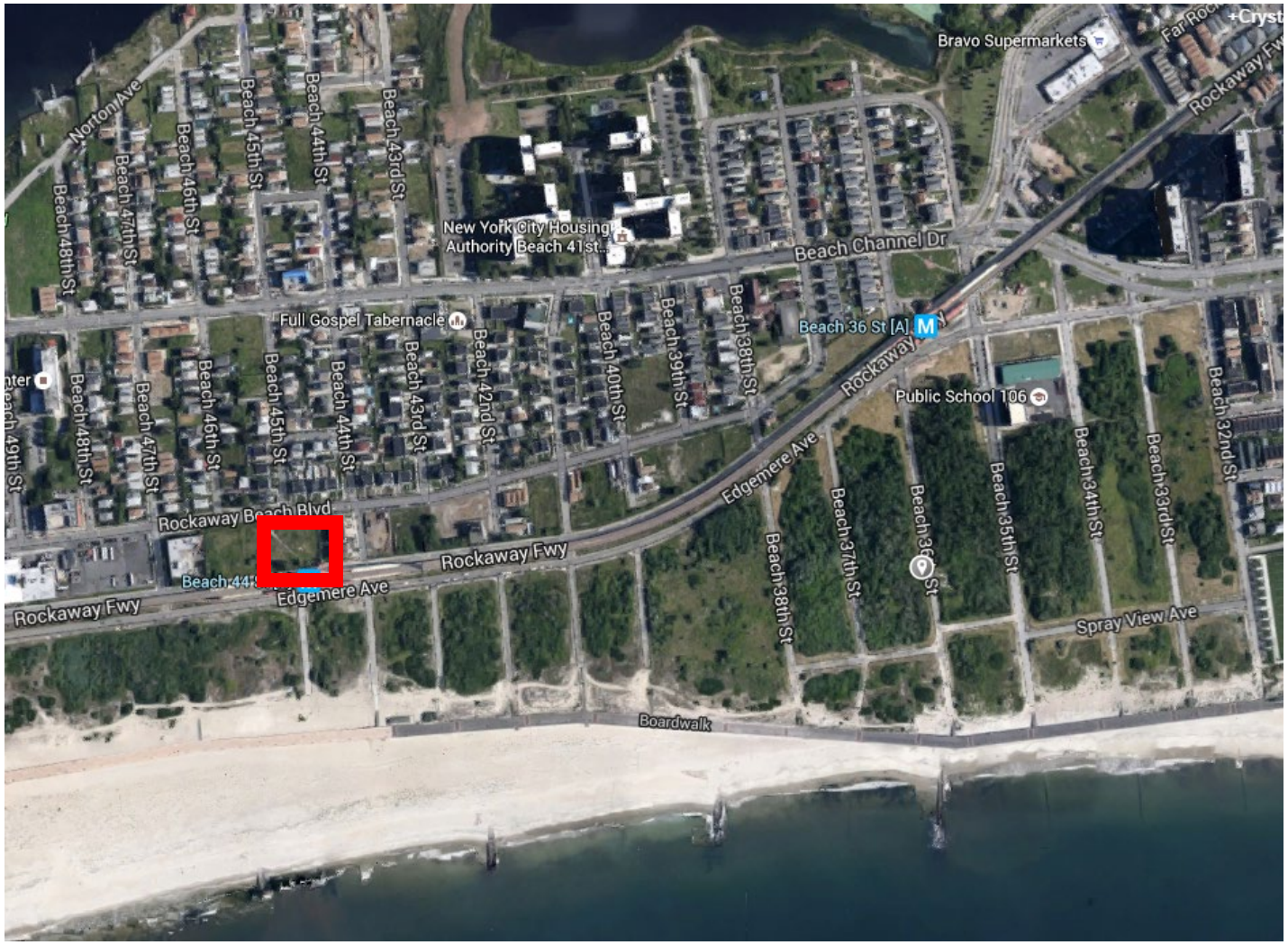
Site Location



Thank you to our clients: The Bluestone Organization / L & M Development Partners / Triangle Equities

Data

	BGDII	BGDI
Square Feet -Gross	121,433.34	108,979
Square Fee - Zoning	97,058	94,869
Number of Units	127	101
Floor area / Unit	874	1,055
Commercial Space -SF	3,007	523
Number Parking Spaces	49	35
Indoor Parking area	7,482	1,852

Exterior

BGD-II

BGD-I

Unit Distribution

	BGDII		BGDI	
Studios	20 units	16%	8 units	8%
One Bedrooms	59 units	46%	50 units	50%
Two Bedrooms	36 units	28%	26 units	26%
Three Bedrooms	12 units	9%	17 units	17%
Total	127 units		101 units	

Interior

BGD-II

BGD-I

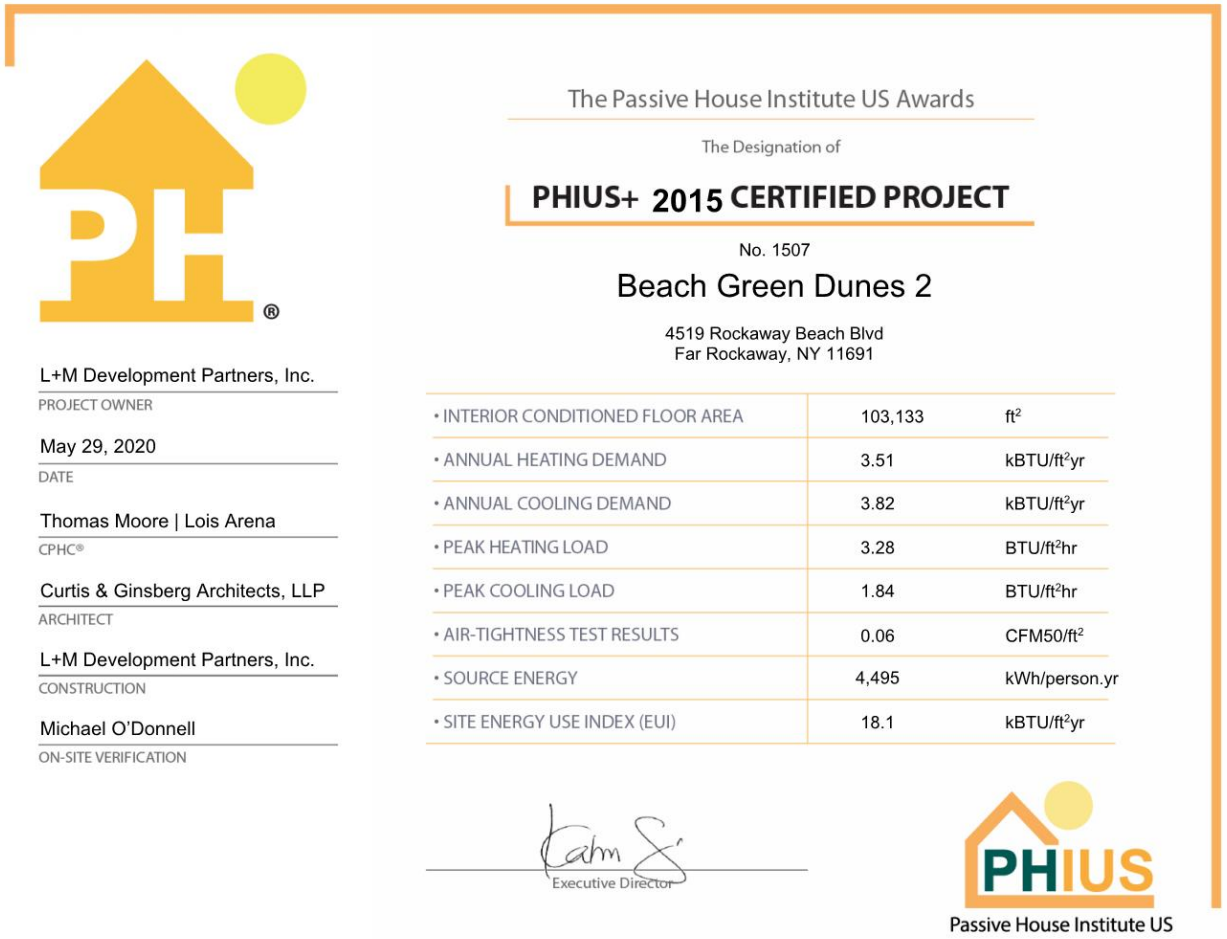
Resiliency

	BGDII	BGDI
Grade Elevation	5.69	6.47
Flood Elevation	10’	10’
Habitable Floor Height above Flood Elevation	8.53’	4.5’
Lobby Elevation	7.02	6.66
Egress During Flood	Exterior Stair	Raised recreation space

Zoning / Codes

	BGDII	BGDI
Code	2014 NYC Code	2014 NYC Code
Zoning Floor area	97,058	94,870
Zoning for Quality and Affordability	Yes	No
HPD Guidelines	2020	2016
Height	69’-3 ¾” (above base plane)	69’1
Floors	8	7

Passive House Data



L+M Development Partners, Inc.
PROJECT OWNER

May 29, 2020
DATE

Thomas Moore | Lois Arena
CPHC®

Curtis & Ginsberg Architects, LLP
ARCHITECT

L+M Development Partners, Inc.
CONSTRUCTION

Michael O'Donnell
ON-SITE VERIFICATION

The Passive House Institute US Awards

The Designation of

PHIUS+ 2015 CERTIFIED PROJECT

No. 1507

Beach Green Dunes 2

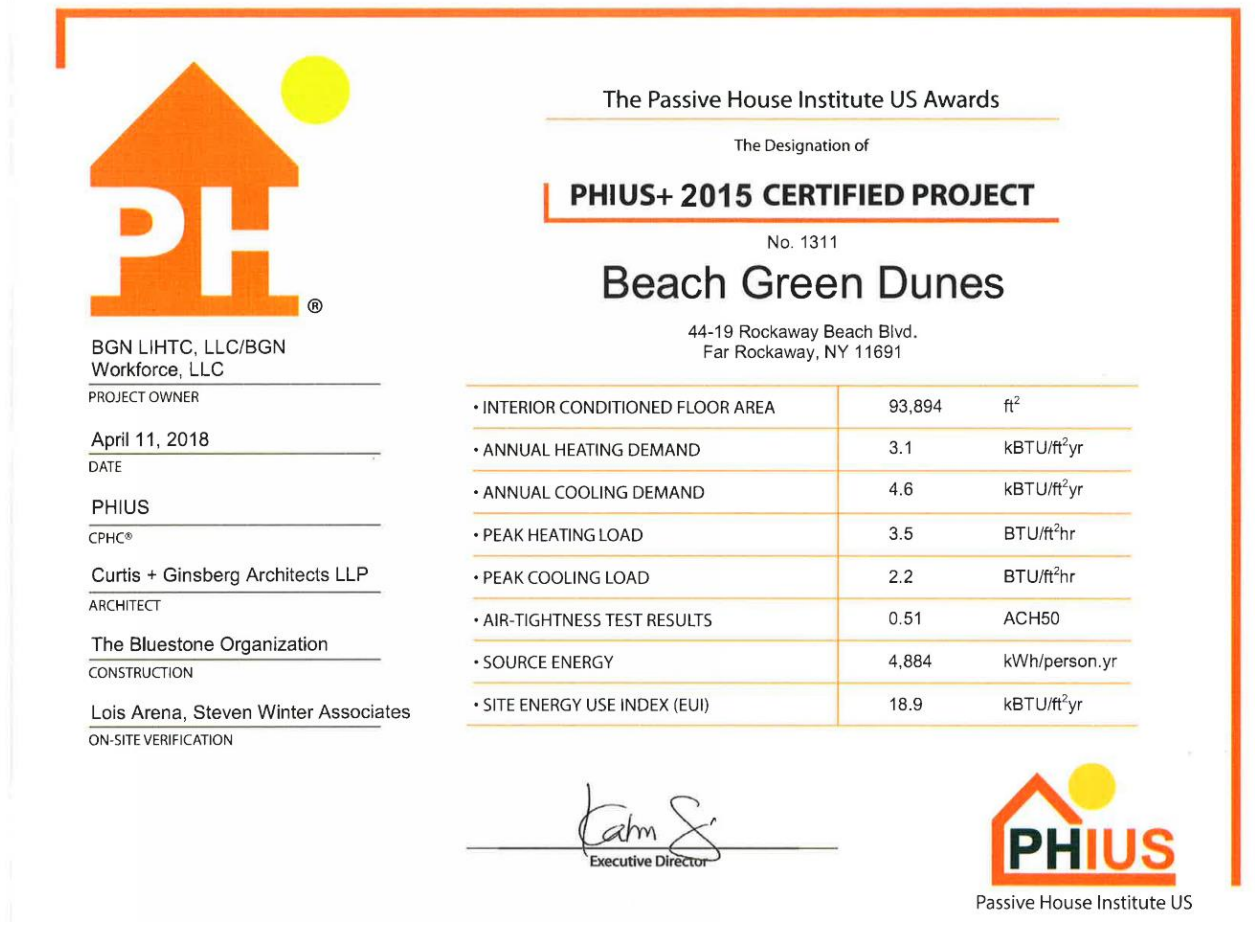
4519 Rockaway Beach Blvd
Far Rockaway, NY 11691

• INTERIOR CONDITIONED FLOOR AREA	103,133	ft^2
• ANNUAL HEATING DEMAND	3.51	$kBTU/ft^2yr$
• ANNUAL COOLING DEMAND	3.82	$kBTU/ft^2yr$
• PEAK HEATING LOAD	3.28	BTU/ft^2hr
• PEAK COOLING LOAD	1.84	BTU/ft^2hr
• AIR-TIGHTNESS TEST RESULTS	0.06	$CFM50/ft^2$
• SOURCE ENERGY	4,495	kWh/person.yr
• SITE ENERGY USE INDEX (EUI)	18.1	$kBTU/ft^2yr$

Executive Director

PHIUS
Passive House Institute US

BGD-II



BGN LIHTC, LLC/BGN Workforce, LLC
PROJECT OWNER

April 11, 2018
DATE

PHIUS
CPHC®

Curtis + Ginsberg Architects LLP
ARCHITECT

The Bluestone Organization
CONSTRUCTION

Lois Arena, Steven Winter Associates
ON-SITE VERIFICATION

The Passive House Institute US Awards

The Designation of

PHIUS+ 2015 CERTIFIED PROJECT

No. 1311

Beach Green Dunes

44-19 Rockaway Beach Blvd.
Far Rockaway, NY 11691

• INTERIOR CONDITIONED FLOOR AREA	93,894	ft^2
• ANNUAL HEATING DEMAND	3.1	$kBTU/ft^2yr$
• ANNUAL COOLING DEMAND	4.6	$kBTU/ft^2yr$
• PEAK HEATING LOAD	3.5	BTU/ft^2hr
• PEAK COOLING LOAD	2.2	BTU/ft^2hr
• AIR-TIGHTNESS TEST RESULTS	0.51	ACH50
• SOURCE ENERGY	4,884	kWh/person.yr
• SITE ENERGY USE INDEX (EUI)	18.9	$kBTU/ft^2yr$

Executive Director

PHIUS
Passive House Institute US

BGD-I

Systems

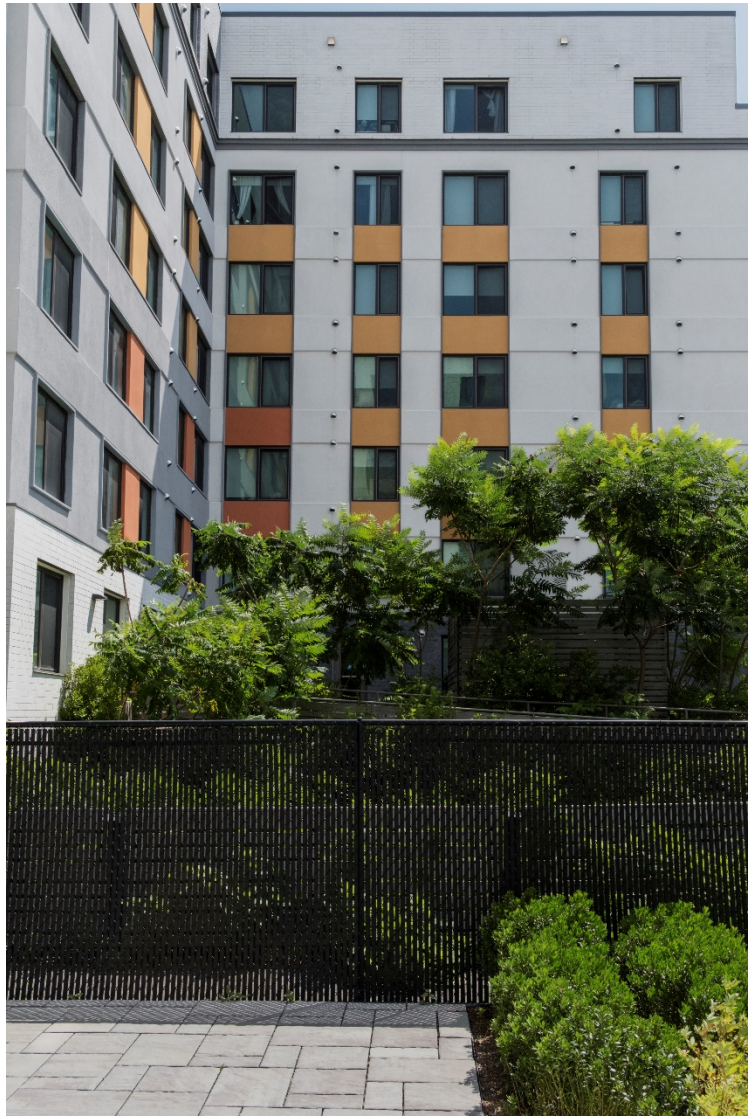
	BGDII	BGDI
Exterior	Block and Insulation	ICF
Heating / Cooling	Ground Source Heat Pumps	VRF
Ventilation	Central ERV’s	Unitized ERV’s
Hot Water	Gas Fired	Co-Gen / Gas Fired

Exterior Wall

	BGDII	BGDI
Solid	R = 24.8	R = 24.1
Windows	U = 0.24	U = 0.22
Roof	R = 30	R = 26
Air Infiltration	0.62 ACH50	0.51 ACH50

Bio Swales

BGD-II



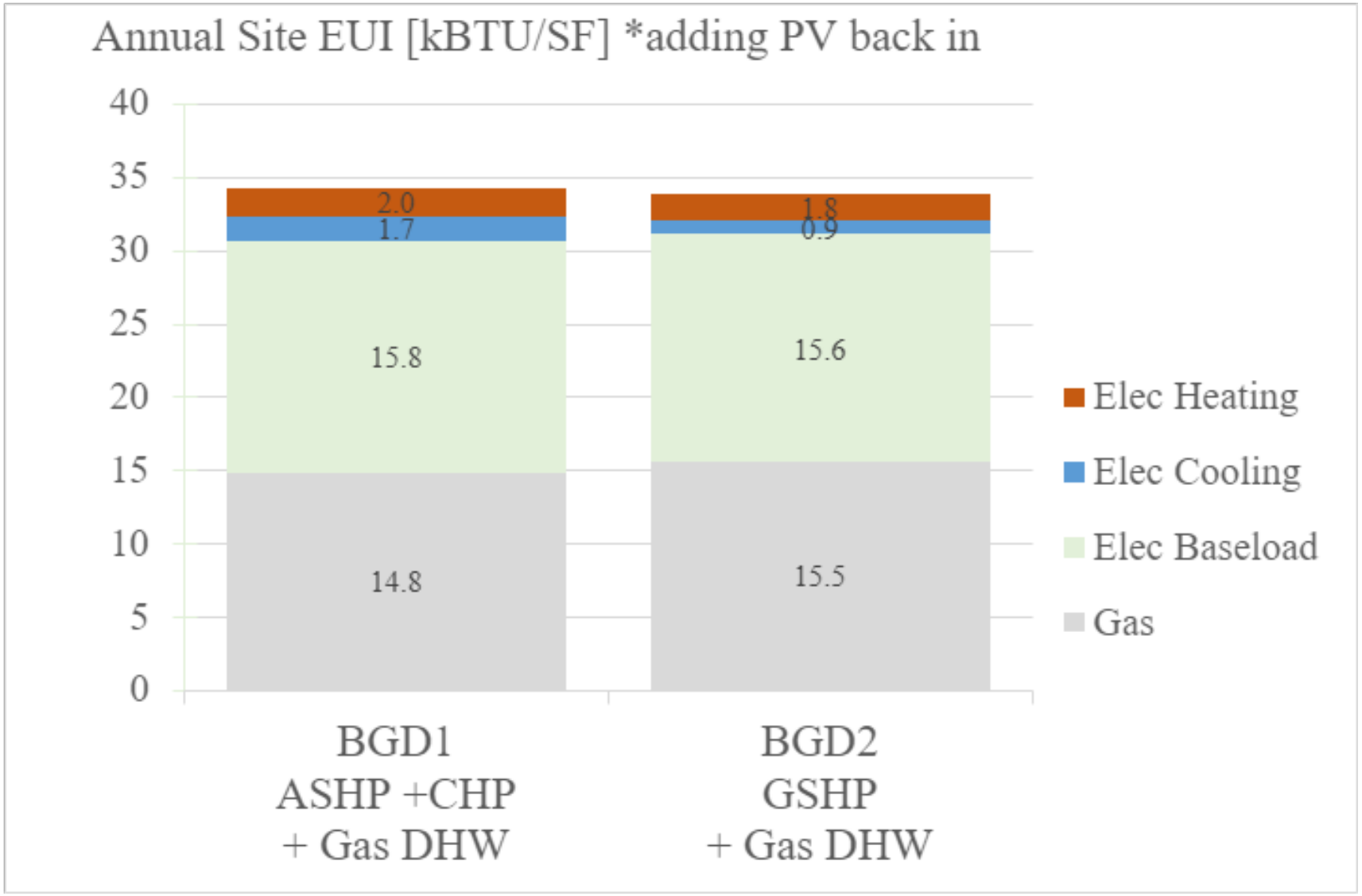
BGD-I

Solar Arrays

	BGDII	BGDI
Size (ft2)	10,200	8,000
Capacity (kW)*	≈ 180	≈ 144
Potential Output (kWh)	78,000	120,000
% Difference	Still commissioning system	

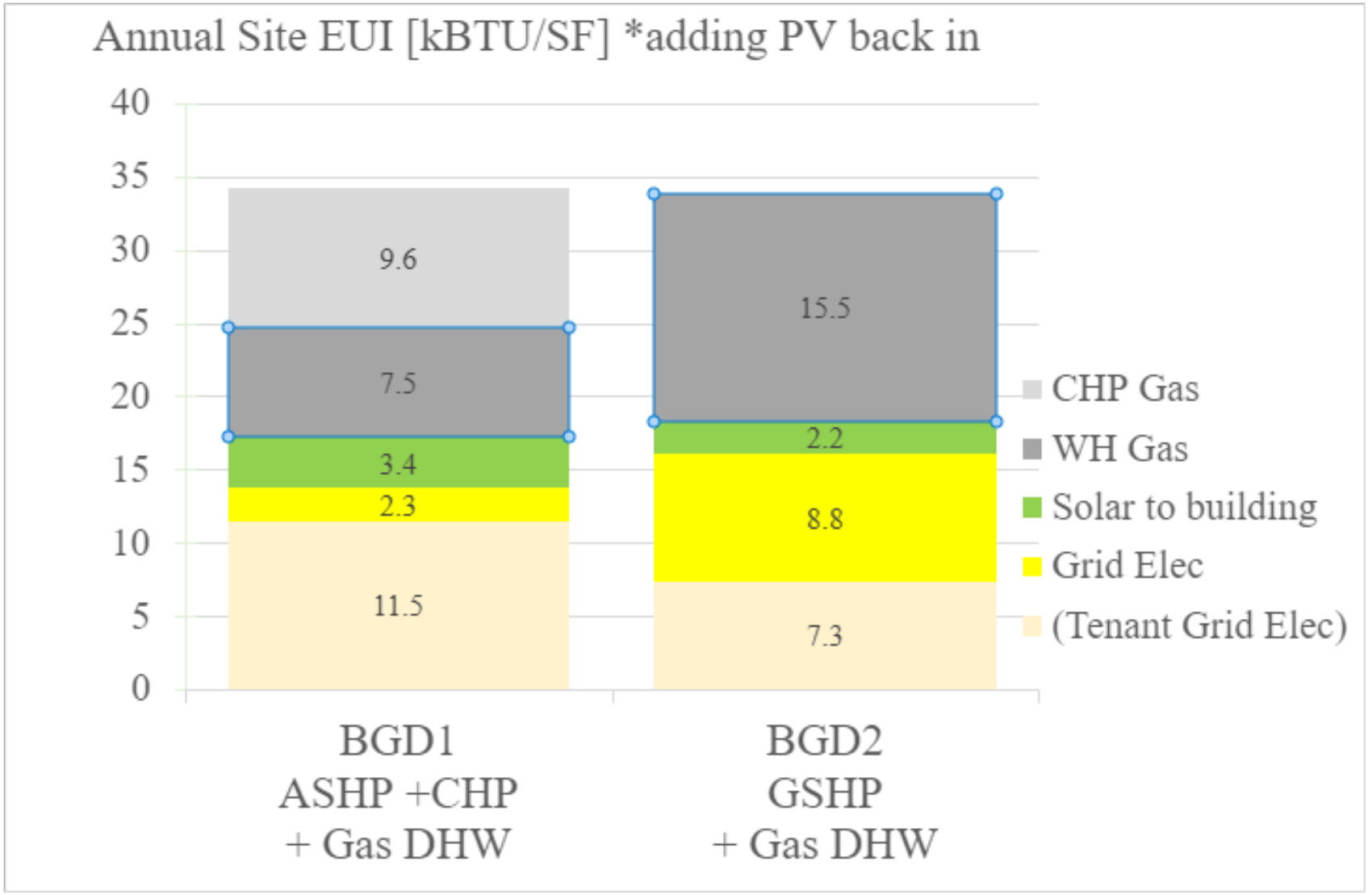
* Approximated based on array area x 18W/ft2

Site EUI Comparison



Site EUI Comparison

- Major differences
  - CHP
  - Solar PV array size
  - # of apartments



Site Energy Consumption [kBtu/yr · ft^2]

	BGDII	BGDI
Heating	1.8	2.0
Cooling	0.9	1.7
DHW	15.5	14.8
Lighting & Plug Loads	15.6	15.8
Totals	33.8	34.2

BG I Site Energy Consumption [kBtu/yr · ft^2]

	Predicted	Actual
Heating	1.2	2.0
Cooling	1.5	1.7
DHW	6.4	14.8
Lighting & Plug Loads	13.9	15.8
Total	23.0	34.2

BG II Site Energy Consumption [kBtu/yr · ft^2]

	Predicted	Actual
Heating	1.0	1.8
Cooling	0.8	0.9
DHW	6.8	15.5
Lighting & Plug Loads	13.6	15.6
Total	22.2	33.8

ENERGY USE: MODELLED VS. ACTUAL

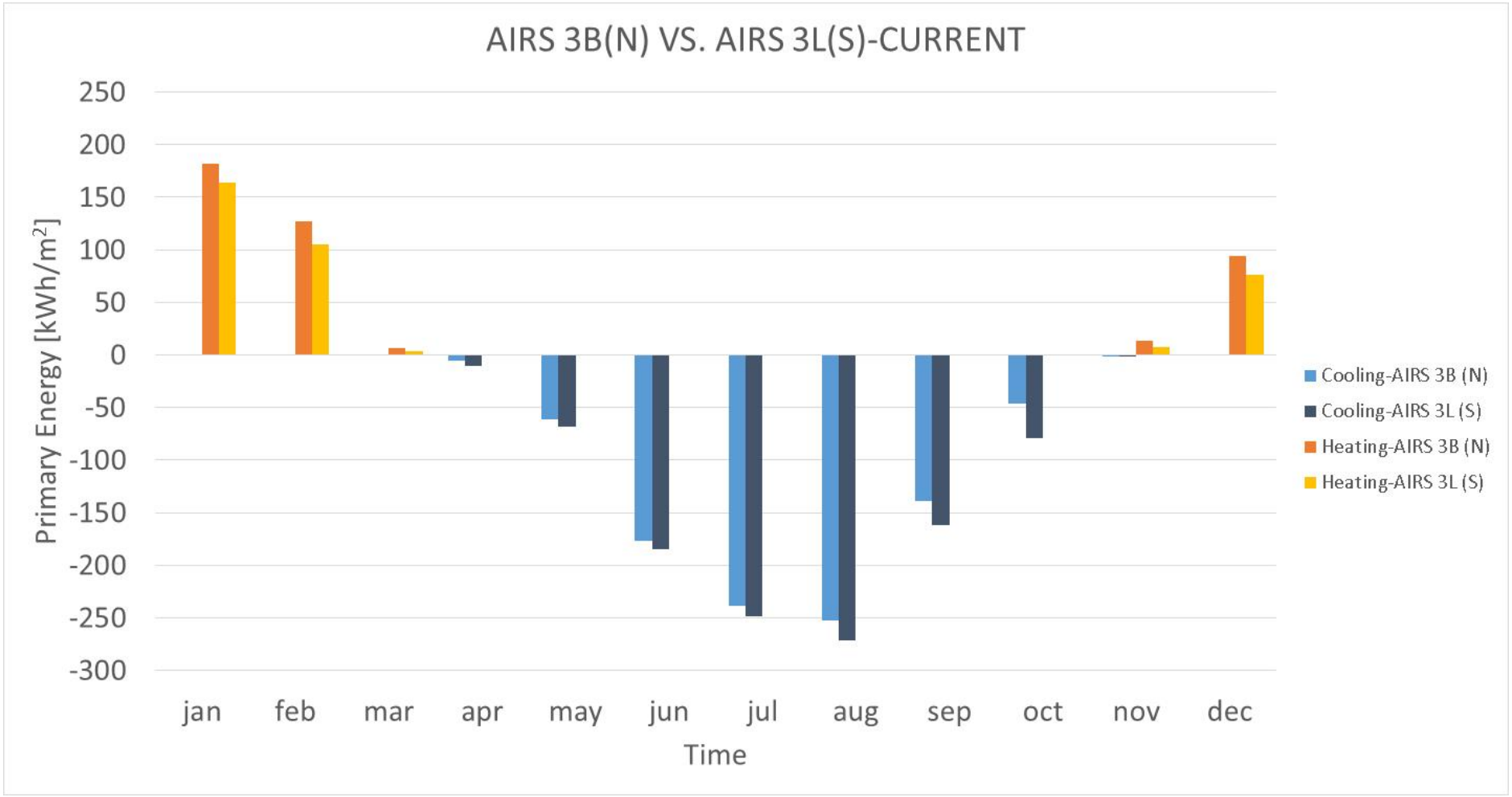
ENERGY MODEL

Informed estimate based on defaults + operational assumptions

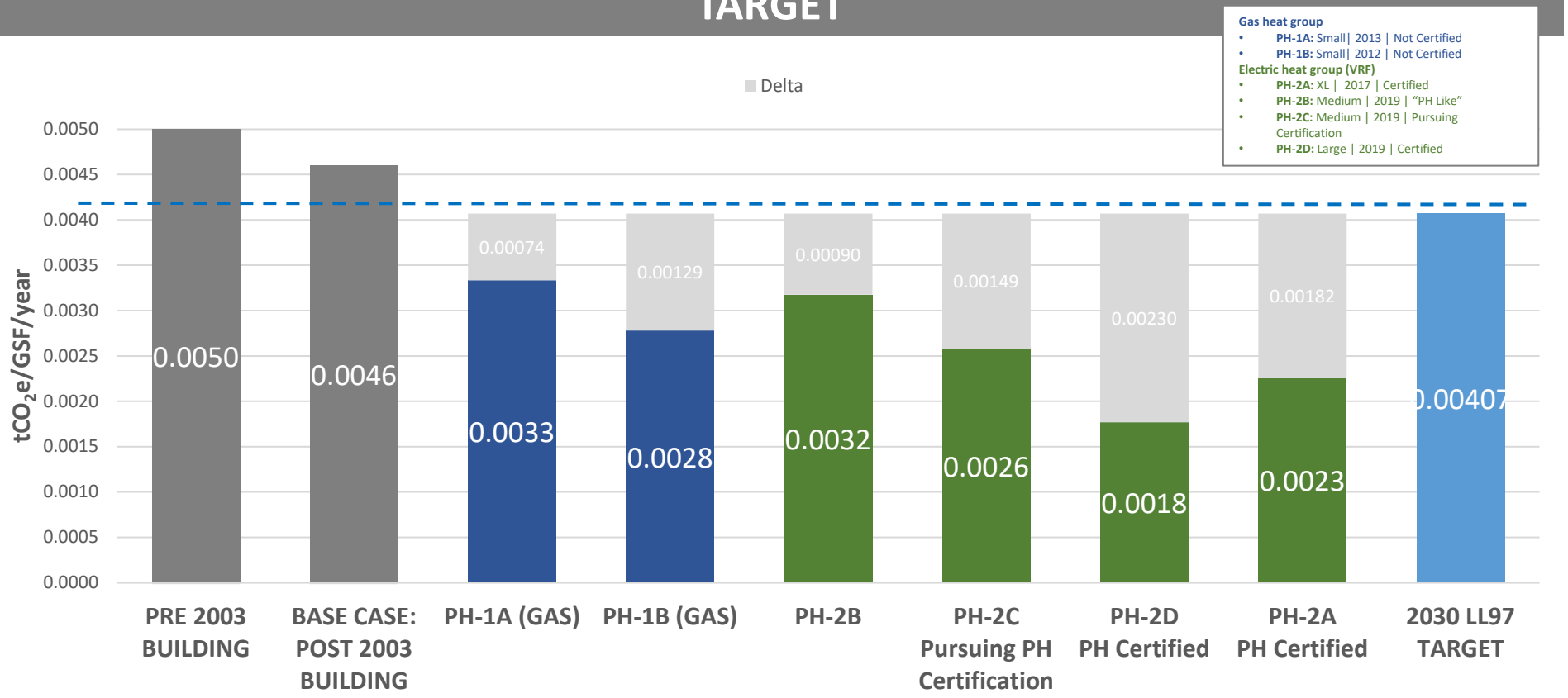
REALITY

Occupant behavior + true operation

When do you heat / When do you cool?



WHOLE BUILDING GREENHOUSE GAS EMISSIONS: RELATIVE TO LL97 2030 TARGET



1. GHG emissions use 2024-2029 emissions coefficients outlined by Local Law 97 of NYC. Note that the emissions factors for 2030 have not yet been established. There is a strong likelihood that the combination of Indian Point closing and gains made as part of the CLCPA, the coefficient will be similar to the one set for 2024-2029.

Conclusions

Super SW to fill in

Resident survey C+GA to fill in

Conclusions:

- Many ways to meet Passive House and get similar results.
- Heating and Cooling are a small part of the load. So, spending a lot of money on those systems does not make sense but making buildings electric does.
- Ground source may give greater resident comfort.
- Ground Source Heat pumps higher first cost and lower operating cost – slightly.
- Unitized vs. Centralized ERV, similar operation costs, different first costs and maintenance cost.
- ICF’s have many advantages but need more sub contractors who want and know how to do.
- Waste Water heat recovery systems / Ground Source heat pump for hot water are the next frontier

Thank You!

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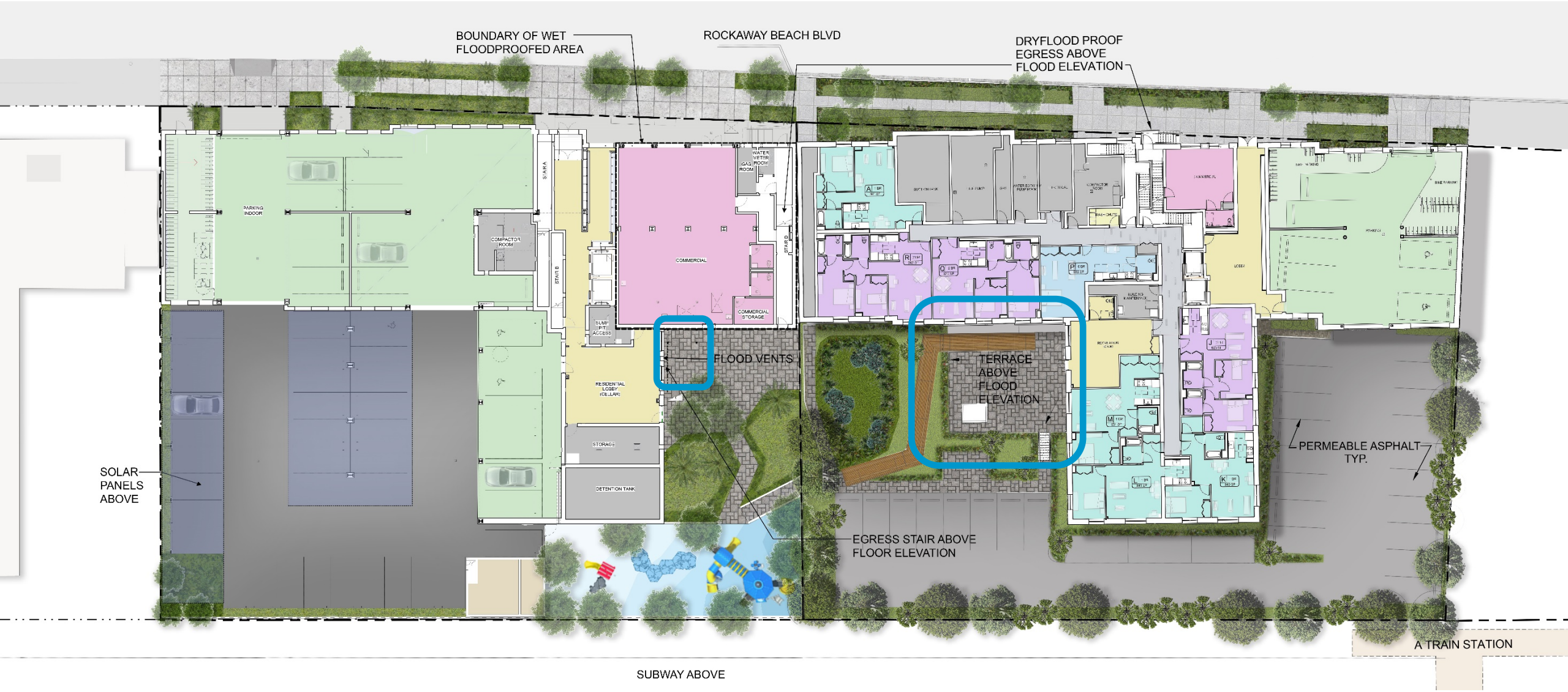
Mark Ginsberg FAIA, LEED^{AP} mark@cplusga.com

Old beyond

Funding

BGDII	BGDI
Tax Exempt Bonds	Tax Exempt Bonds
Subsidy loans from NYC Housing Development Corporation and NYC Department of Housing Preservation and Development	Subsidy loans from NYC Housing Development Corporation and NYC Department of Housing Preservation and Development and Department of Justice
Tax Credit Equity.	Tax Credit Equity.
LIPA no energy funding	LIPA no energy funding

Resiliency - Egress



BGD-II

BGD-I

Flood Mitigation for Residential Spaces

- All residential units will be located BGD-I: 4.5’ and BGD-II: 8.53’ above current FEMA Base Flood Elevation
- Lobby, Parking, and Crawl space will have flood vents to relieve water pressure
- Elevator will have automatic control to prevent cab from descending into flood waters, Elevator Machine room is located above the flood plane
- All mechanical spaces are located above the flood plane
- Ground floor finishes will be designed to be flood damage-resistant materials

BGD-II

BGD-I

Flood Mitigation for Residential Spaces - Differences

- Emergency Egress and Area of Rescue from Laundry Room is above the Base Flood Elevation
- Photovoltaic System
- Daylight corridor provide light in case of power outage

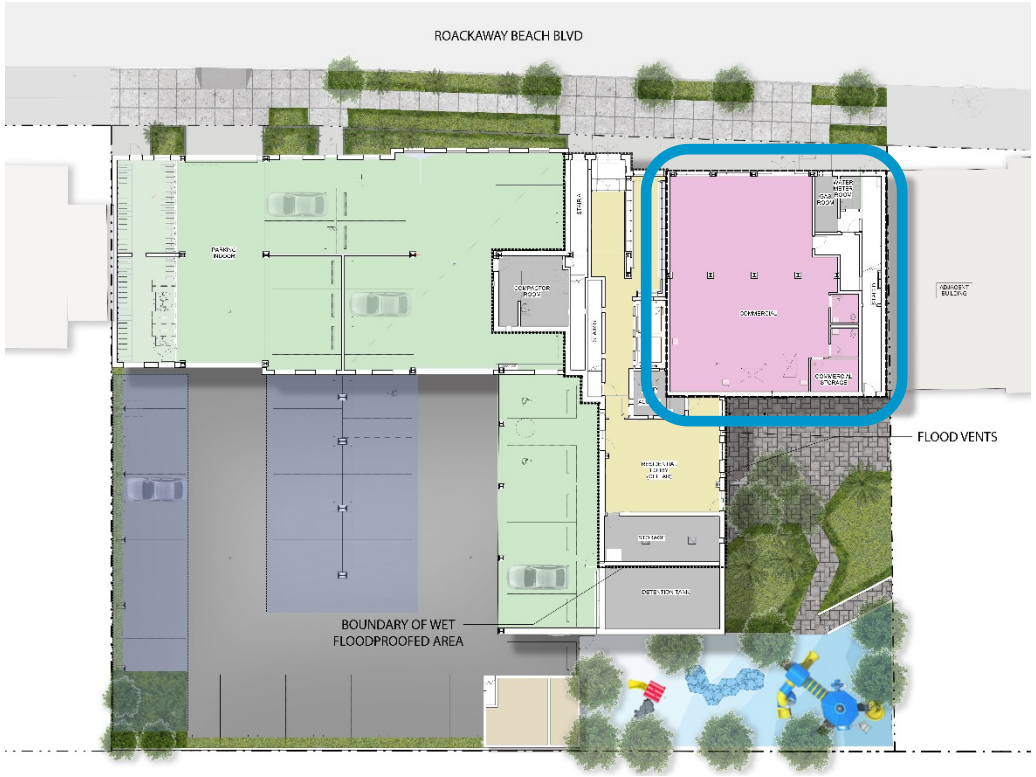
BGD-II

- Emergency Egress and Area of Rescue is on the community Terrace which is above the Base Flood Elevation
- Photovoltaic System and Co-generation hot water that can provide for Emergency Power
- Daylight corridor and stairwells provide light in case of power outage

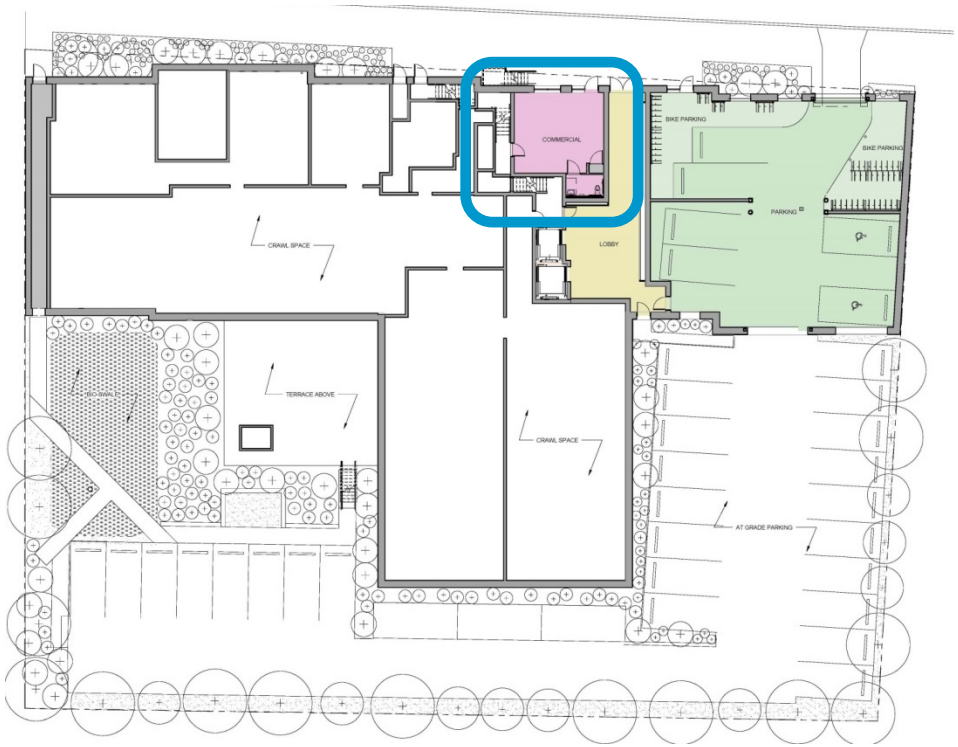
BGD-I

Flood Mitigation for Commercial Space

- Flood Barrier will be provided at openings
- Structure will be designed to withstand hydrostatic pressure
- Emergency Egress will be provided above the flood plane
- Sump Pump will be provided to drain accumulated vapor and seepage
- Finishes will be designed to be flood damage-resistant materials

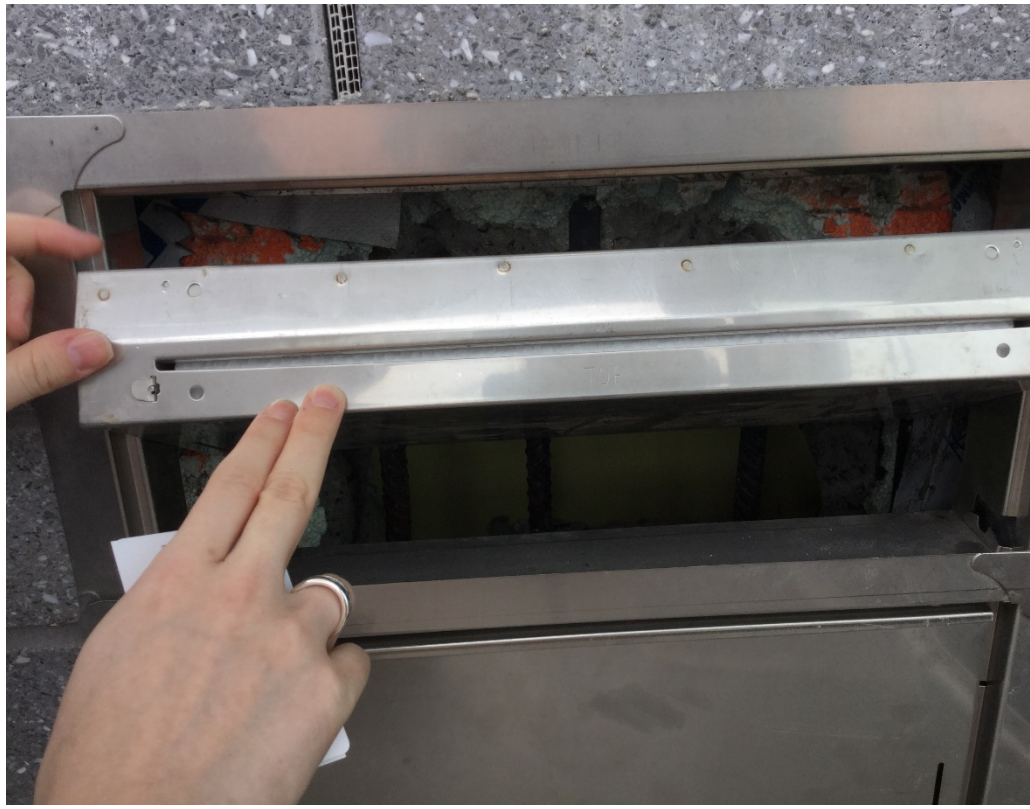


BGD-II

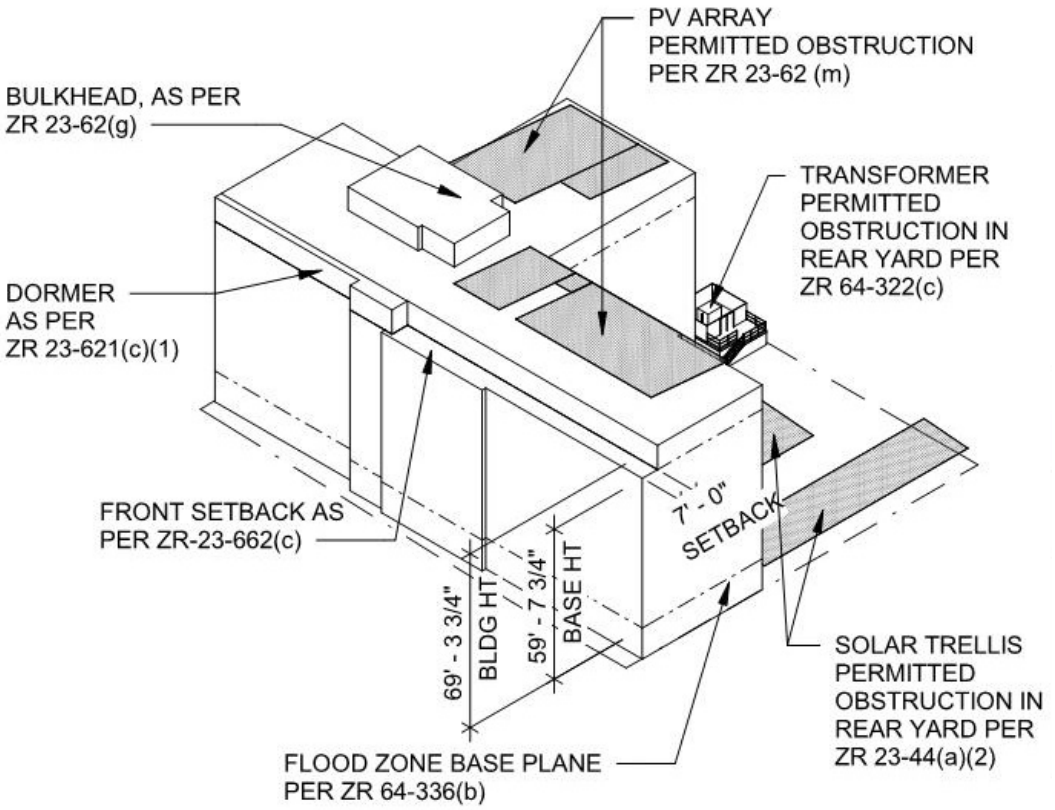


BGD-I

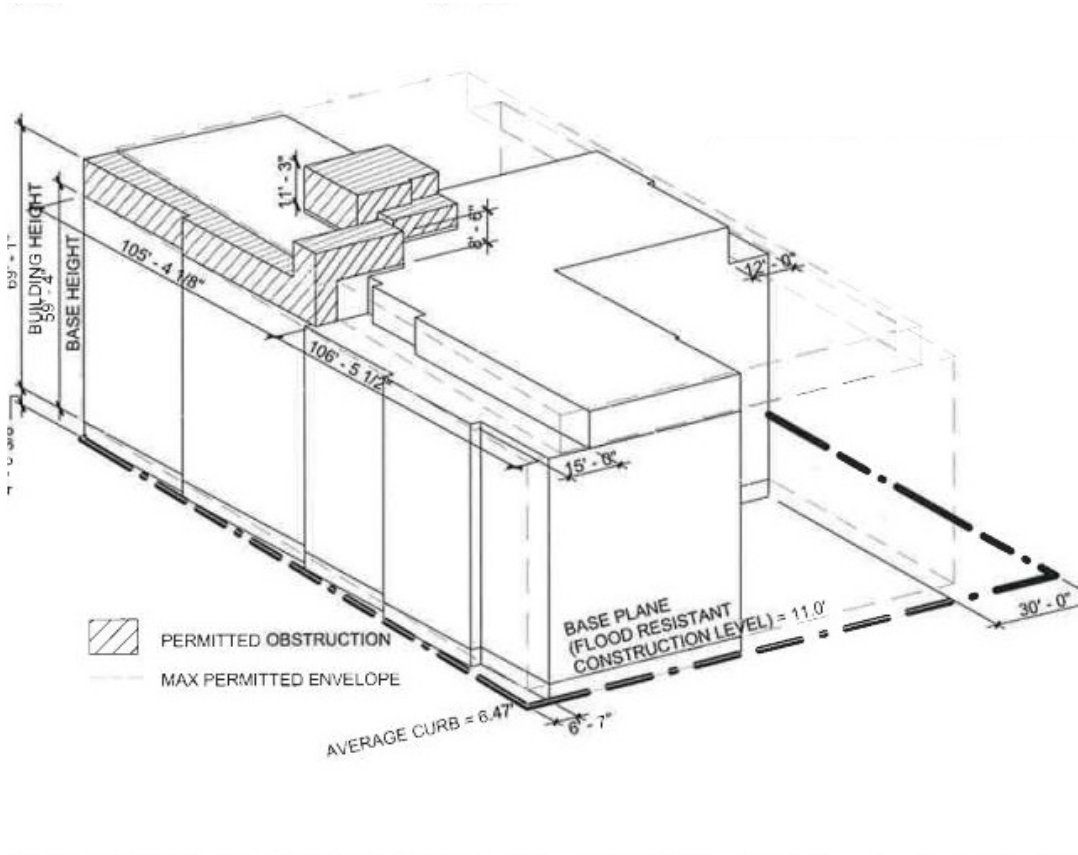
Flood Mitigation - Details



Zoning setbacks



BGD-II



BGD-I

HPD Design Requirements

Space	BGD-II (2016 Standard)		BGD-I (2000 Standard)	
	Area	Minimum Dimension	Area	Minimum Dimension
Studio	200 sf	9’—0”	250 sf	11’-0”
Living Room	170 sf	10’—0”	160 sf*	11’-0”
Primary Bedroom	110 sf	9’—6”	130 sf	10’-0”
Secondary Bedroom	100 sf	9’—0”	110 sf	9’-4”

* = 170 for Three Bedroom

The 2016 standards reduced closet and kitchen requirements from the 2000 standards and typically units were 10% smaller

Achieving Passive House

- Super insulated Building Envelope
- uPVC window has better energy performance
- All LED fixtures
- Energy Star/Water sense fixtures

BGD-I

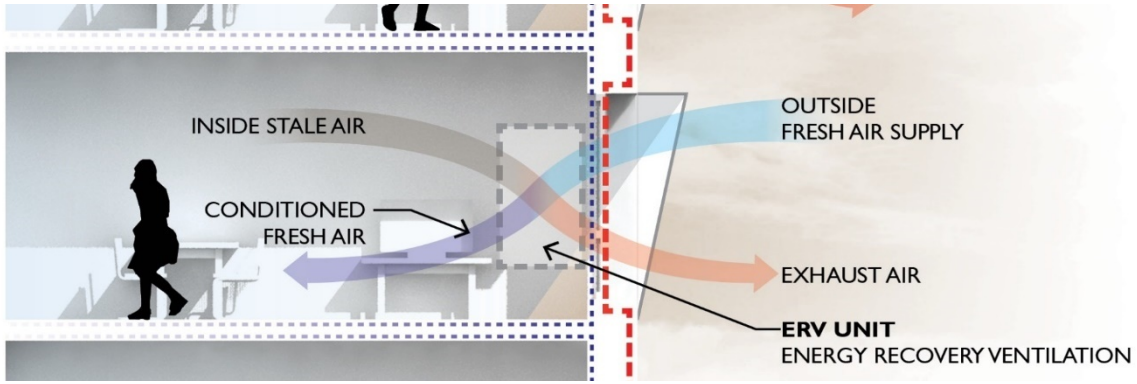
- Cogen provide power and hot water
- Air to air heat pumps
- Unitized EVRs

BGD-II

- Ground Source heat pump
- Centralized ERVs

Ventilation

Unitized ERV BGD-I



Performance

- Boost flow more easily achievable in apartments
- Better heat recover efficiency, in general
- Better compartmentalization of apartments
- Preheater recommended in cold climates
- Conditioning supply air more difficult

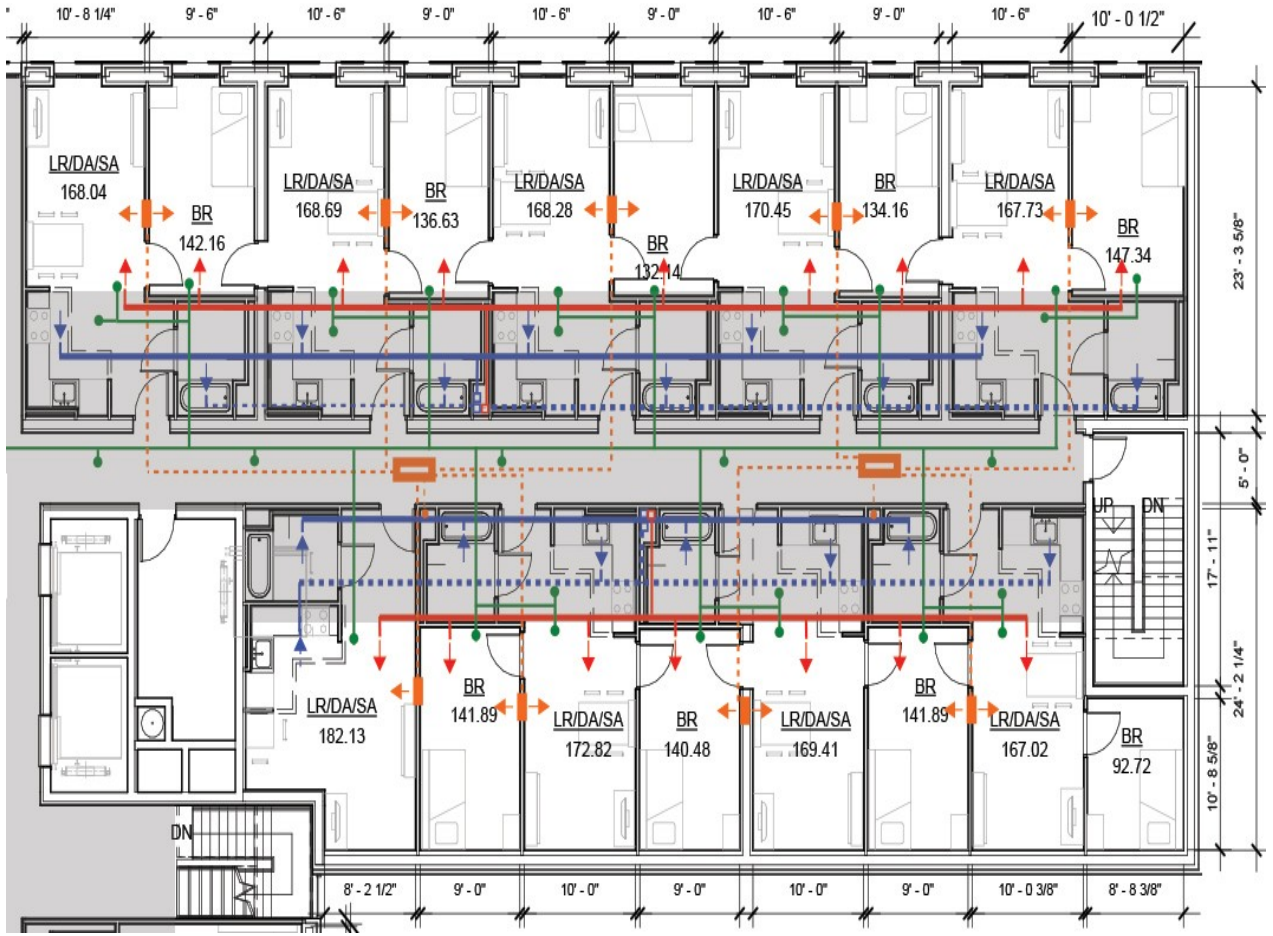
Design

- Two penetration in each apartment requires additional focus on air sealing

Maintenance

- Needs access to apartment to change filter periodically

Central ERV BGD-II



Performance

- Easier to precondition Supply Air
- Little to no control for individual apartment boast

Design

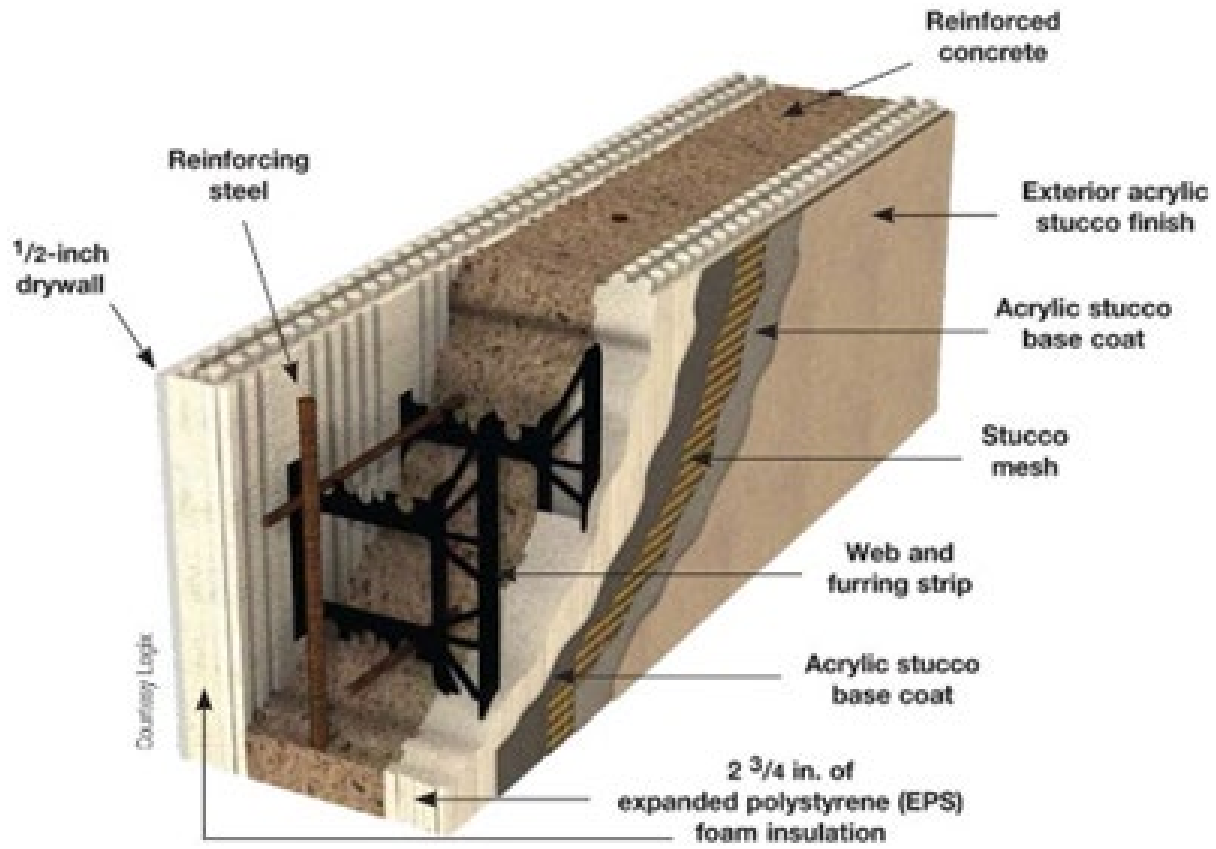
- Increase shafts/ducts and firestopping penetrations. Clus ter ducts to reduce runs.
- Aeroseal of duct systems to branches

Maintenance

- Reduce number of filters and access to apartment
- Balancing is more challenging

Exterior Walls

Block vs. ICF



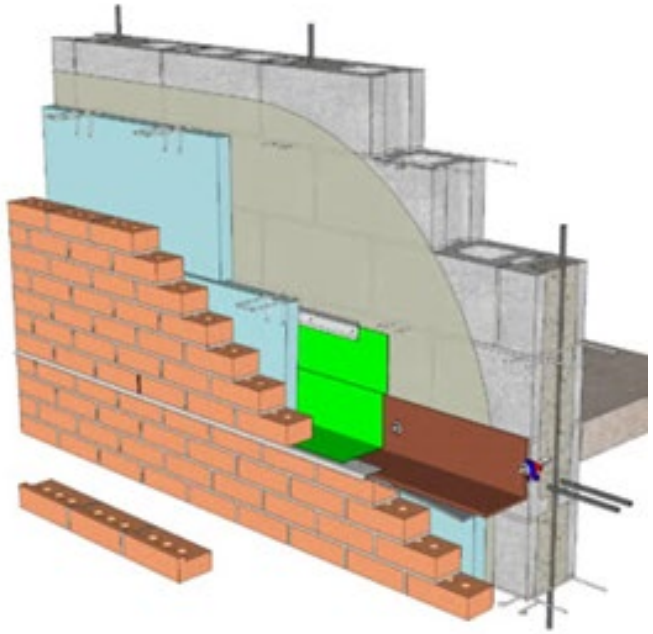
Pros

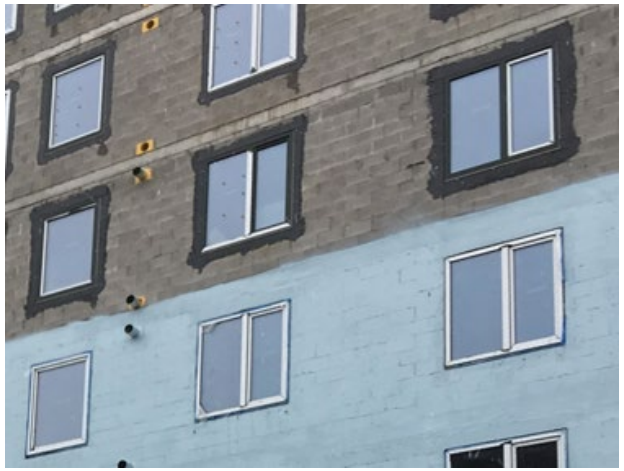
- Reduces Trades/More done with one system
- Watertight Quickly
- Greater Design Flexibility • Great Sound Isolation (OITC 41 to 65)
- Energy Efficiency System with high R-value and integrated air barrier

Cons

- Unfamiliar construction technology and limited sub contractor
- Implementation crucial to maintain vapor/air barrier continuity

Block vs. ICF





Pros

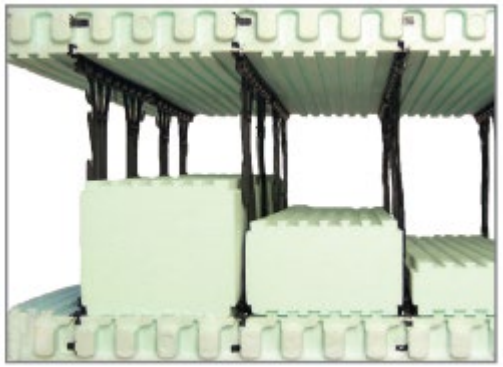
- Ease and knowledge of construction method

Cons

- Need more diligence on air tightness
- May require more structural thermal break for façade elements

Beach Green Dune I

Beach Green Dune I – Thermal Bridg



Integral cast insulated jamb are cleanest tightest detail

Avoid Panel Joint at Opening, which allow water/air infiltration

Min. Thermal bridge of Brick Angle

Coordination of Min. Penetration Sleeve

Provide reinforcement at floor edge to prevent gaps

BGD-II

Windows

BGD-II

BGD-I

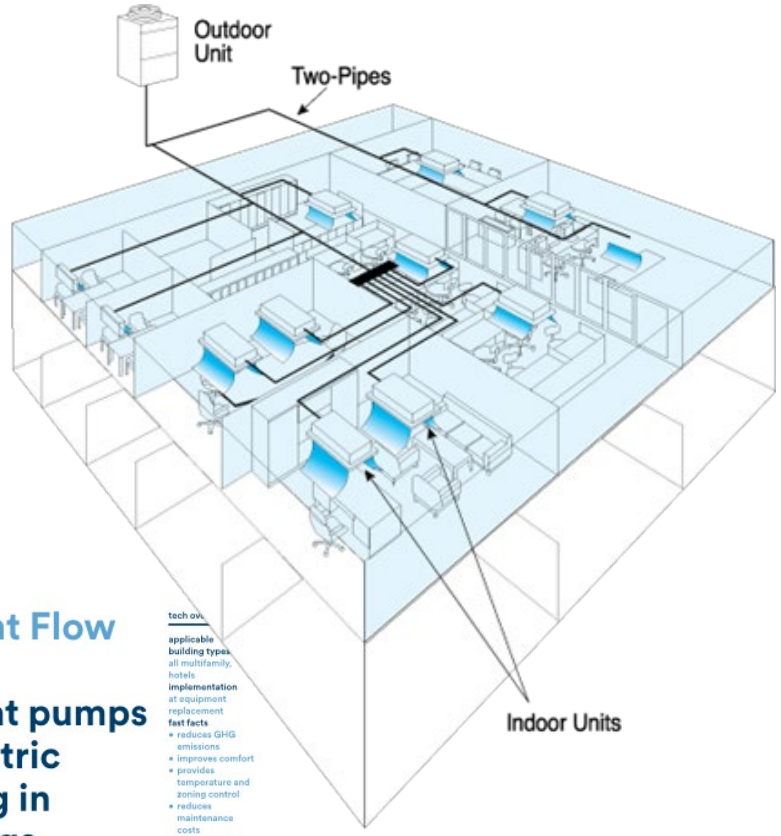
Details

BGD-II

BGD-I

Heating and Cooling

Heat Pump/VRF – BGD-I




tech primer

Variable Refrigerant Flow (VRF) Systems

Highly efficient heat pumps for centralized electric heating and cooling in multifamily buildings.

tech ov...

applicable building types
all multifamily, hotels

implementation
at equipment replacement

fast facts
- reduces GHG emissions
- improves comfort
- provides temperature and zoning control
- reduces maintenance costs
- provides both heating and cooling
- offers design flexibility

costs & benefits*

GHG Savings

Tenant Experience Improvements

Utility Savings

Capital Costs

Maintenance Requirements

*ratings are based

Selection Considerations

- Refrigerant leaks
- Larger buildings require design compliant with ASHRAE 15
- Smallest unit 4,500 BTU, could really use a 2,000 BTU unit
- How you have tenants pay for cooling and owner pay for heating?
- Where to run condensate drains?
- Can be coupled with many terminal units.

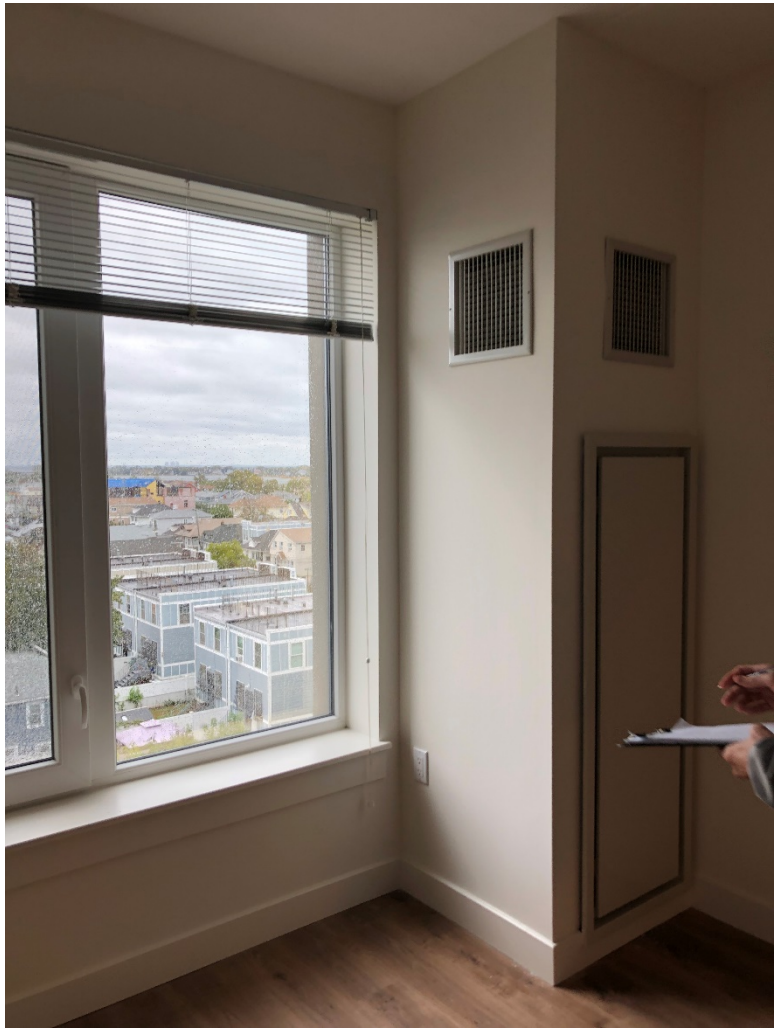
VRF BGD-1

Ground Source Heat Pump – BGD-II

Maintenance Operation

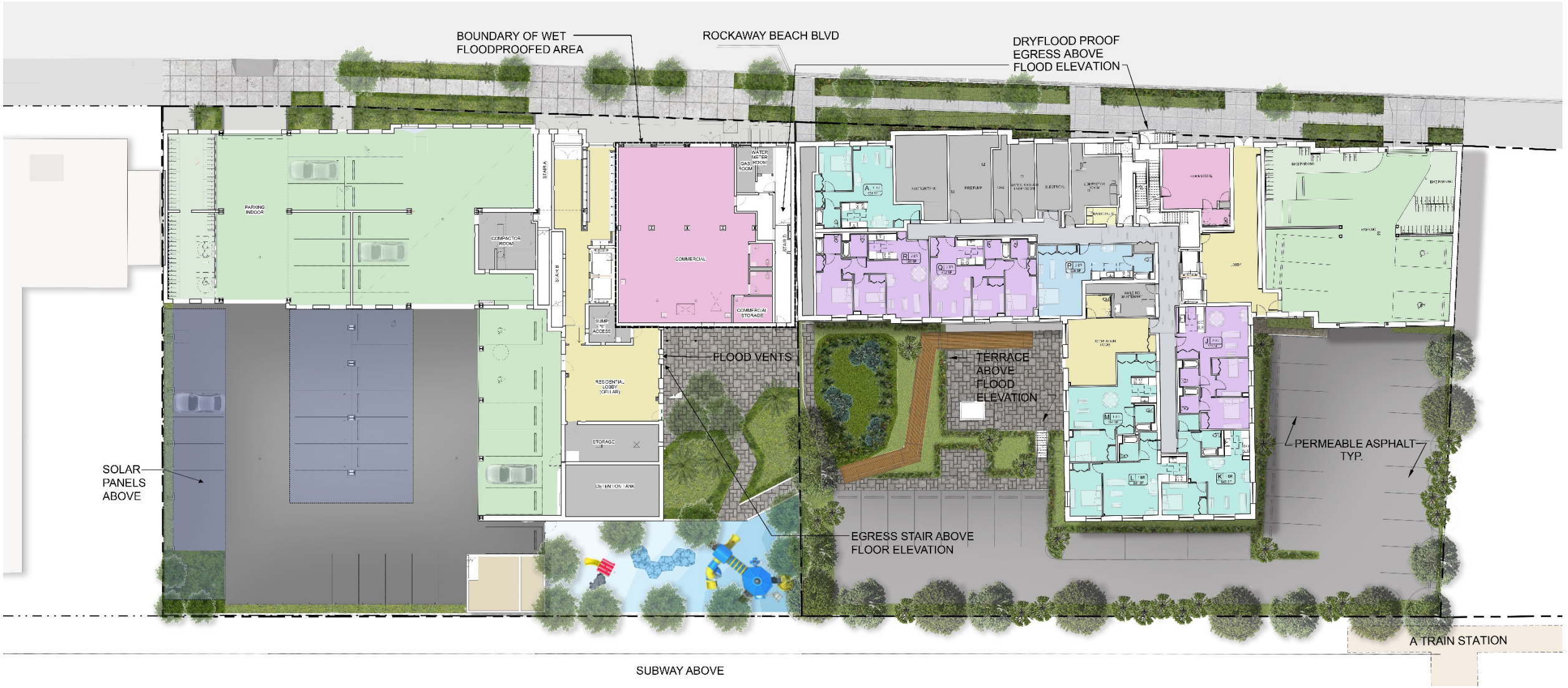
- If WSHPs in units, potential for noise from compressor
- Allows for simultaneous heating and cooling
- Can be coupled with many terminal units.

Ground Source Heat Pump BGD-II



Site

Site Design



BGD-II

BGD-I

Site

BGD-II

Blower Door Testing

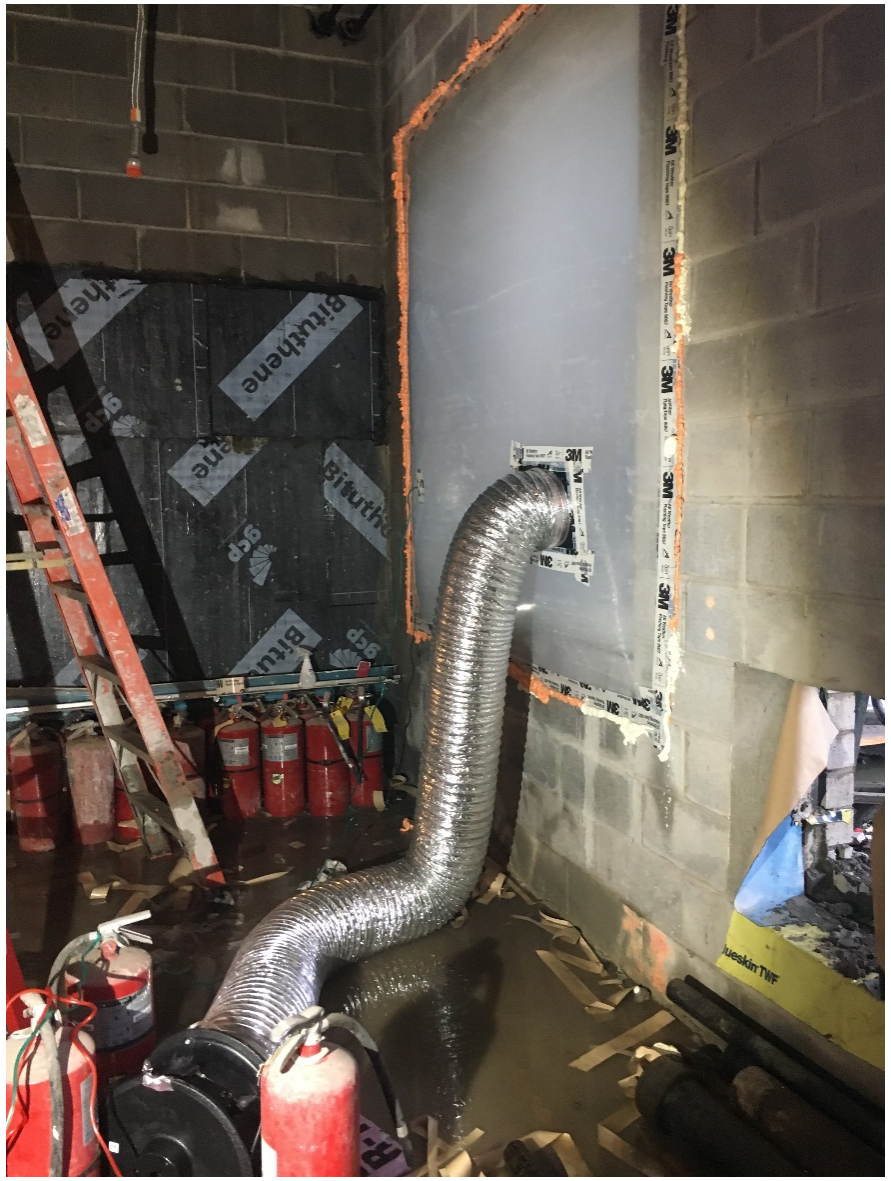
BGD I – Intermediate Testing

BGD I – Final Testing

- ✓ Method A test: **7,626 cfm50**
- ✓ Method B test: **5,518 cfm50**

  < 6,309 cfm50 target
- ✓ **Determination = PASS**

BGD II – Intermediate Testing



BGD II – Final Testing

- ✓ Method A test: **7,941 cfm50**
- ✓ Method B test: **4,854 cfm50 <**

  6,064 cfm50 target
- ✓ **Determination = PASS**

Other Systems

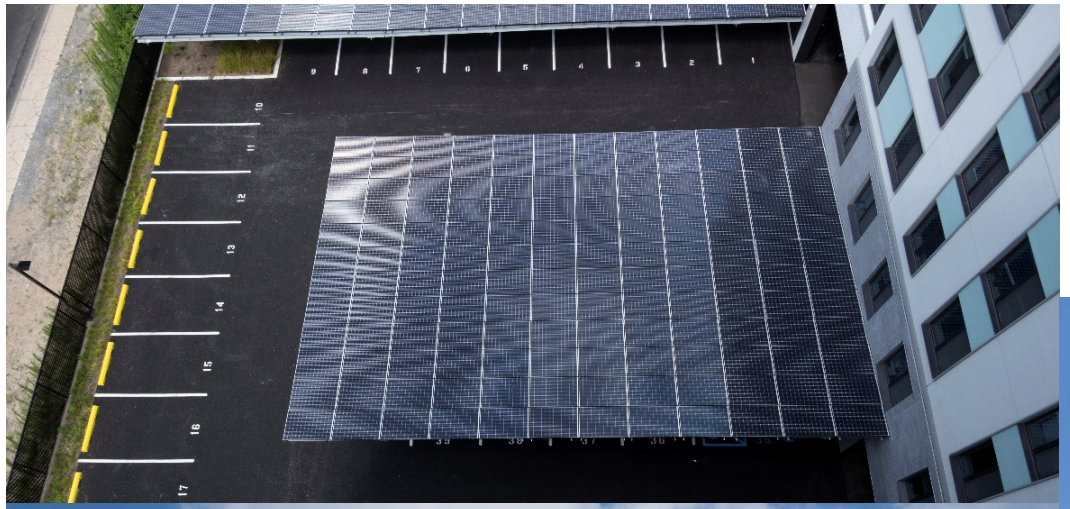
BGD I – water metering…a meter too far?

- All fixtures need to be within 15’ – Building was designed to meet.
- Unit water meters would save 15% to 20% of water consumption.
- Rent regulations do not permit.

Cost

What were the glitches in BFGD-II PV?

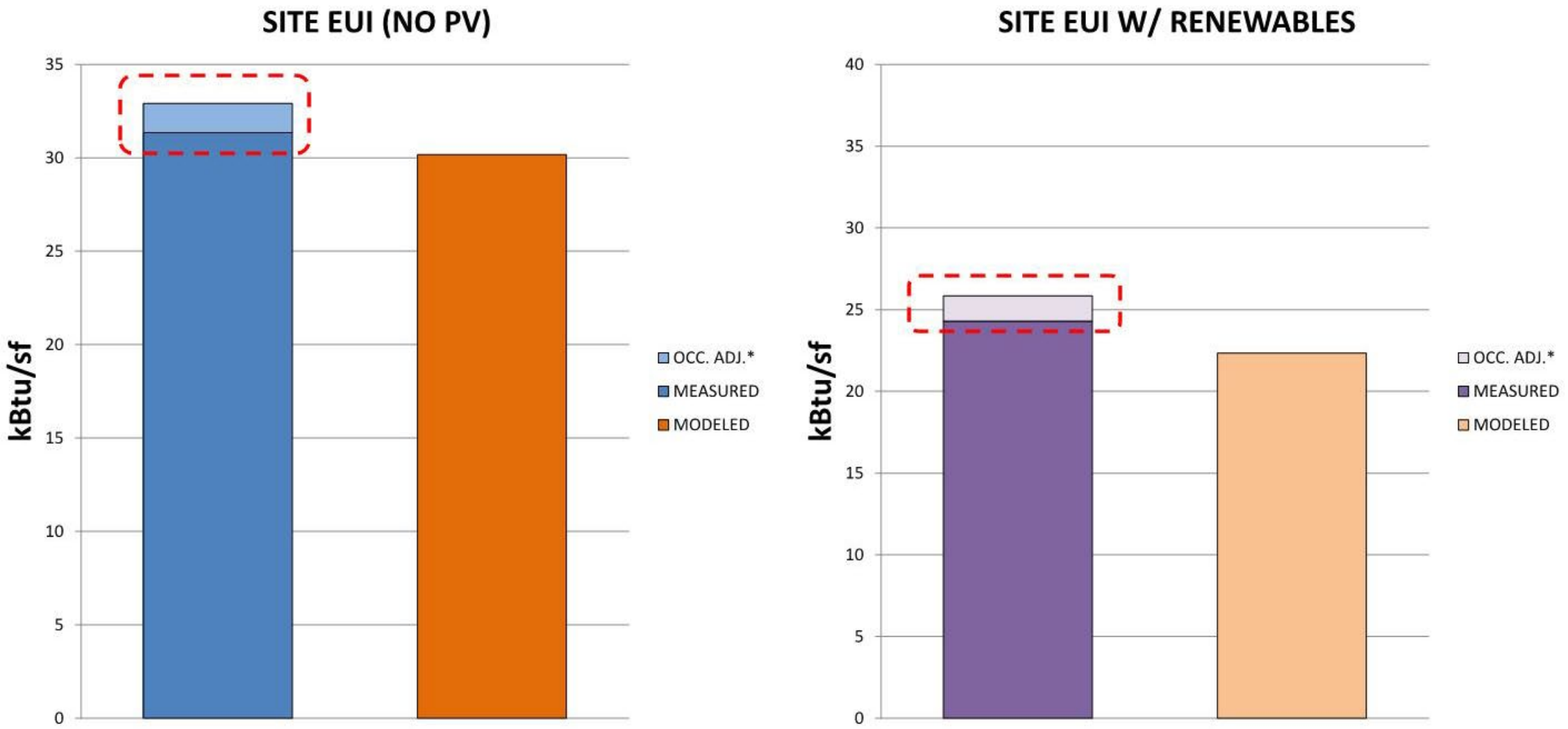
Photo Voltaic



Lessons Learned

BEACH GREEN DUNES

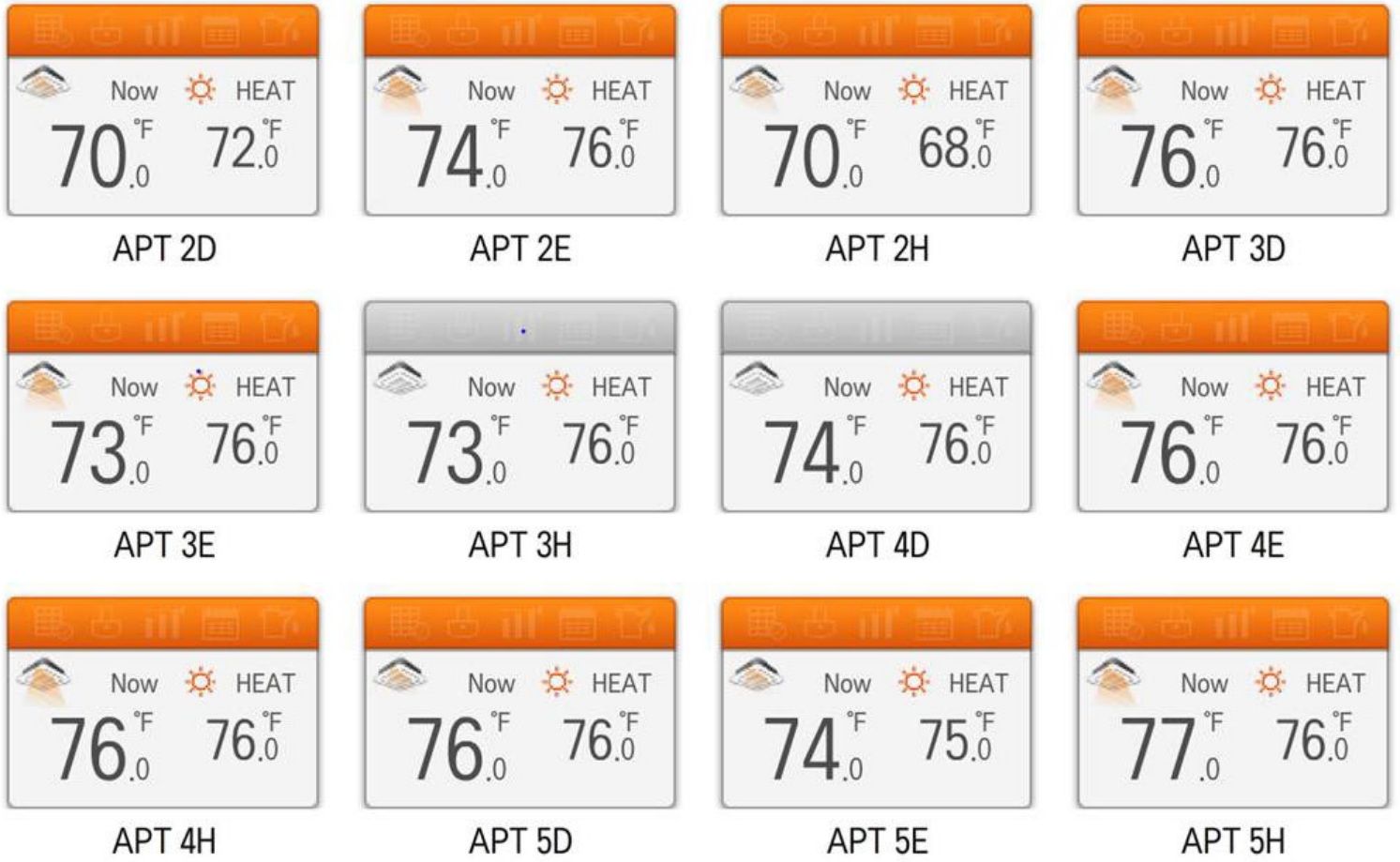
89% Modeled vs Actual



BGD-I

Why?

Thermostat Settings



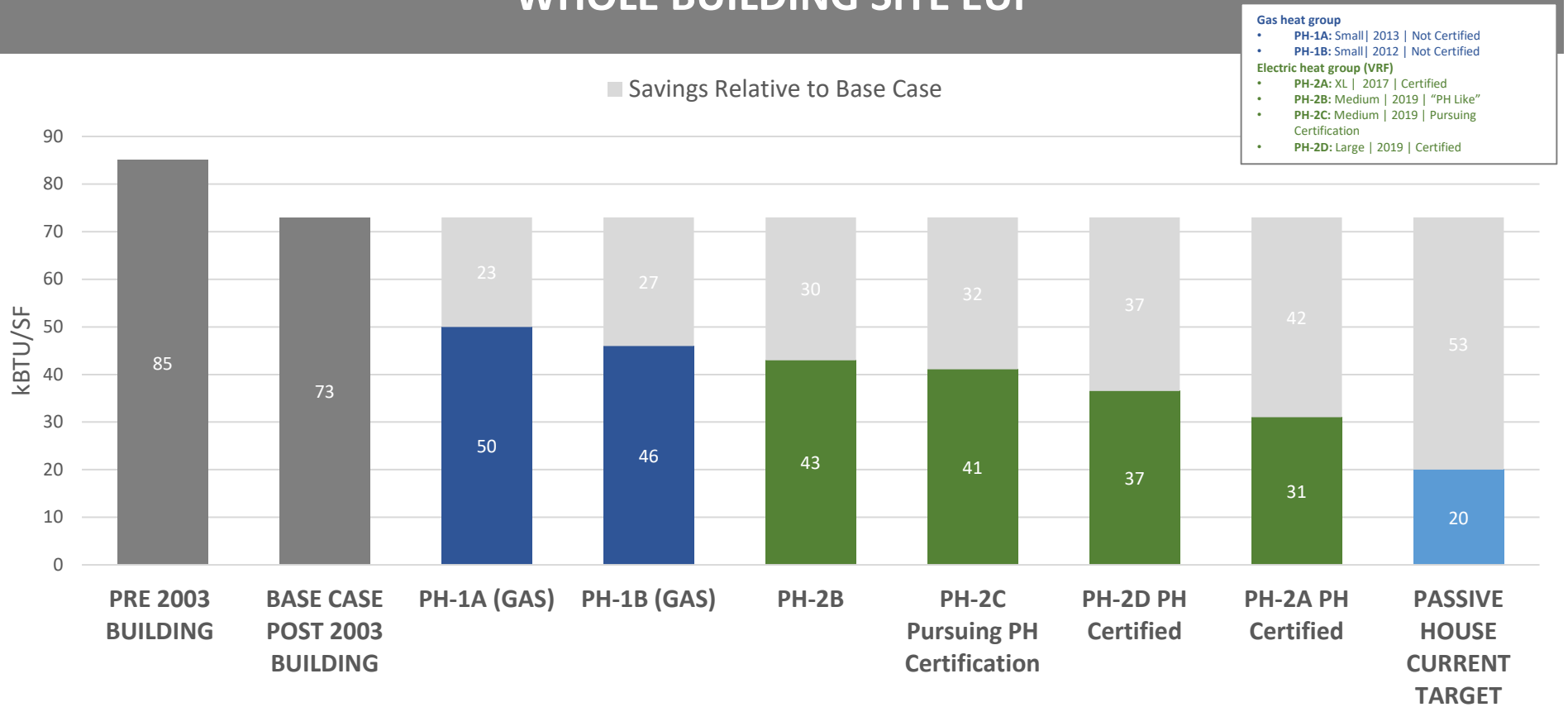
BGD-I

Why?

Co-Gen Valve

BGD-I

WHOLE BUILDING SITE EUI



1. Post 2003 Building sample is made up of NYC buildings with at least one full year of consumption data and includes approximately 94% buildings with gas heating, 6% with electric heating.
2. PH-1A & PH-1B have gas heating and hot water. The remaining projects have electric heating (VRF)
3. PH current target based on PHI standard 38 kBtu/sf/yr. Ranges from 20 (model) upper 20's-low 30s (25% gas + 75% electric fuel mix – typ. of gas DHW + elec heat) when building commissioned.

Energy Consumption / Generation

BG I: Combined Heat & Power (CHP)

- Sized for: DHW demand
- Offsets ~50 % of DHW
- Provided ~70,000 kWh in 2020
- Total gas usage: 10,409 therms for CHP
    - Building total 18,568 therms

Cost

	BGDII	BGDI
Cost per Square Foot	$ 318.00	$ 233.00
Envelope (ICF V Block & insulation)	8.62%	7.99%
Air Sealing	0.26%	0.24%
Ground Source Heat Pump / VRF	4.45%	4.31%
ERV's	2.2%	0.31%
Solar	2.17%	2.20%
Co-Gen	0%	0.56%

BGD-I completed 2017
BGD-II completed 2019

Passive House buildings are more resilient