Buildings of Excellence Design Competition

Cost Data Presentation

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Overview

- Data Collection and Strategies
- Aggregated Cost Analysis
- Project Specific Analysis
- Observations
- Presentation of Appendices

Buildings of Excellence Design Completion Overview Presentation

Introductory overview is provided in a separate presentation

- **Program Goals**
- **Project Requirements**
- **Awarded Project Overview**

Cost Data Collection

Cost data being collected goes beyond just project budgets

Financials

- Overall building first cost
- Overall building incremental first cost
- Performance related tax credits
- NYSERDA incentives
- Project Soft costs vs. Hard Costs
- Performance related costs breakouts:
  - Space Conditioning
  - Lighting
  - Envelope
  - DHW
  - Appliances
  - Renewable Generation
  - Soft Costs

Building Attributes

- System types and classifications
- Performance path
- Construction methods
- Critical component identification
- Building Height
- Renewables
- # Units (Dwelling, sleeping, congregate, other)
- Total Building Area
- All Electric
- Net Zero

Market

- Energy Equity and Affordability
- Disadvantaged Communities
- Equity and Inclusivity
- Climate Justice
- Environmental Justice Area
- LMI/Market Rate
- Regional Economic Development Council (REDC)
- Building use

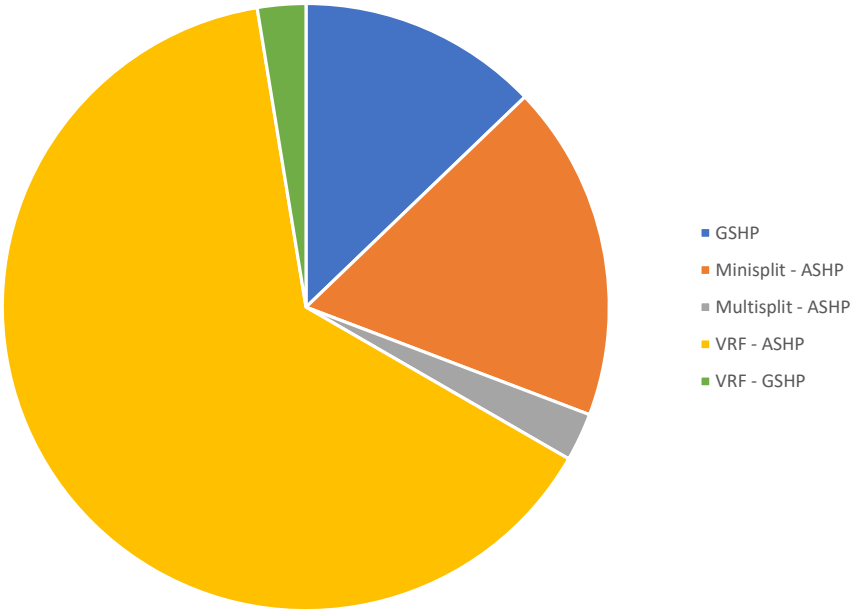
Building Performance

- Site energy with renewables
- Site energy without renewables
- Annual predicted energy cost
- Annual predicted demand charges
- Annual predicted operational cost

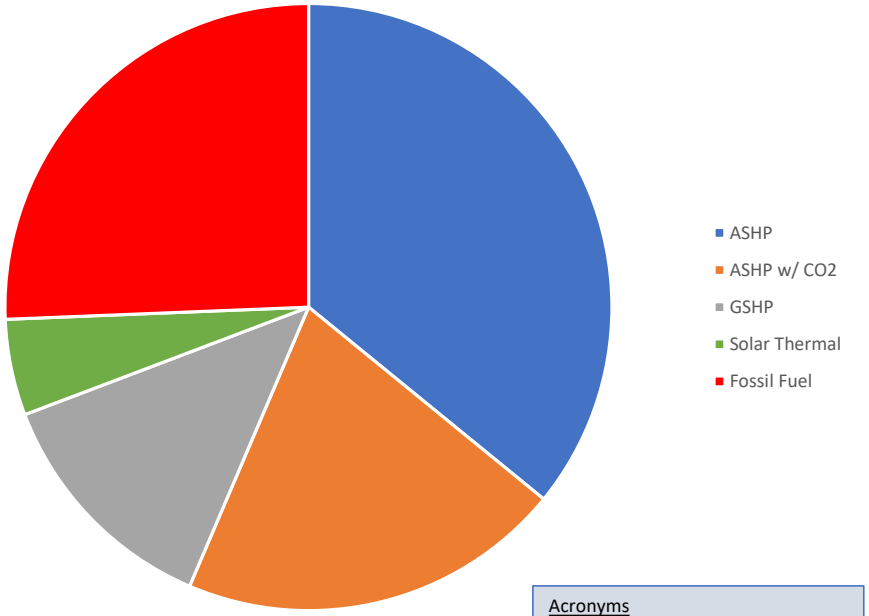
Cost data is updated monthly and published on the Buildings of Excellence Winners page

Building Systems by Project Count

Buildings of Excellence Space Conditioning Distribution



Buildings of Excellence DHW Distribution

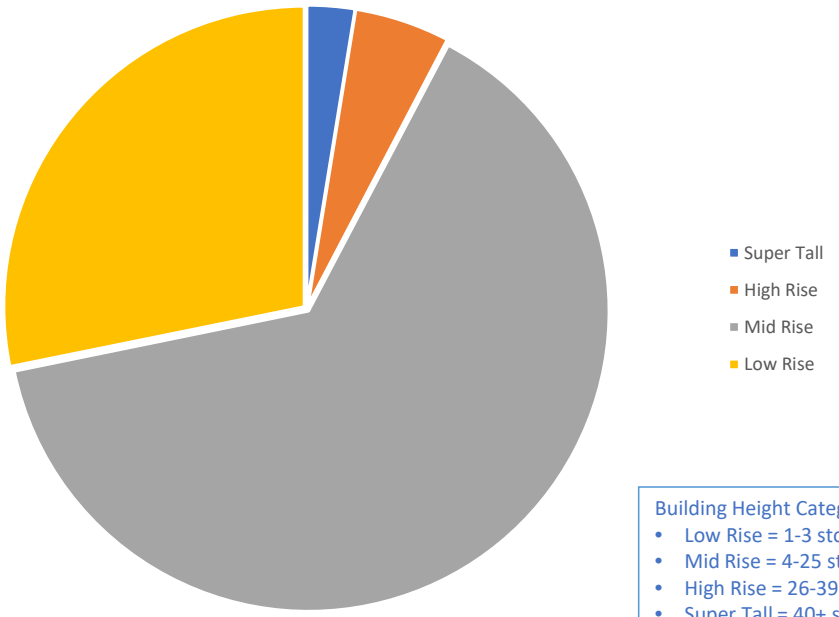


Note: Charts show Round 1 and Round 2 Projects

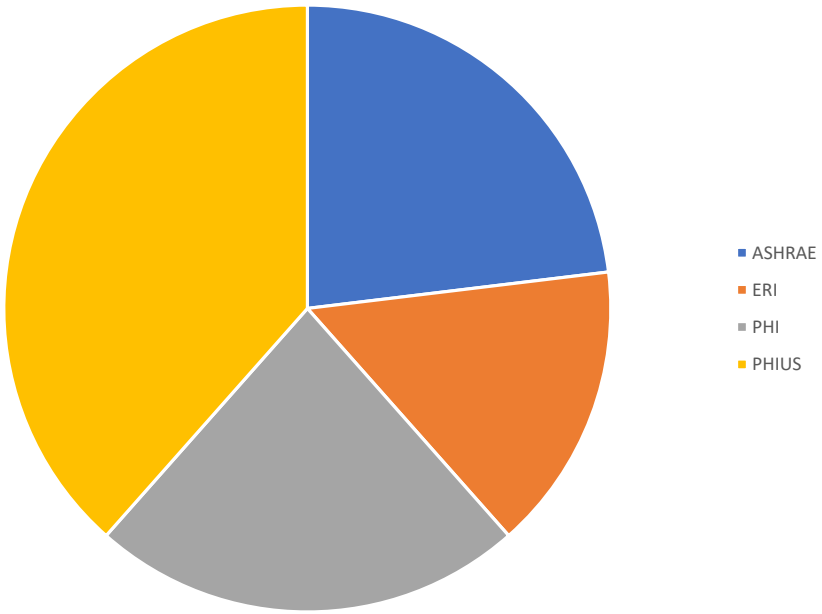
Acronyms
GSHP – Ground Source Heat Pump
ASHP – Air Source Heat Pump
VRF – Variable Refrigerant Flow
DHW – Domestic Hot Water
CO_2 – Carbon Dioxide

Building Attributes by Project Count

Buildings of Excellence Height Classification Distribution



Buildings of Excellence Performance Path Distribution



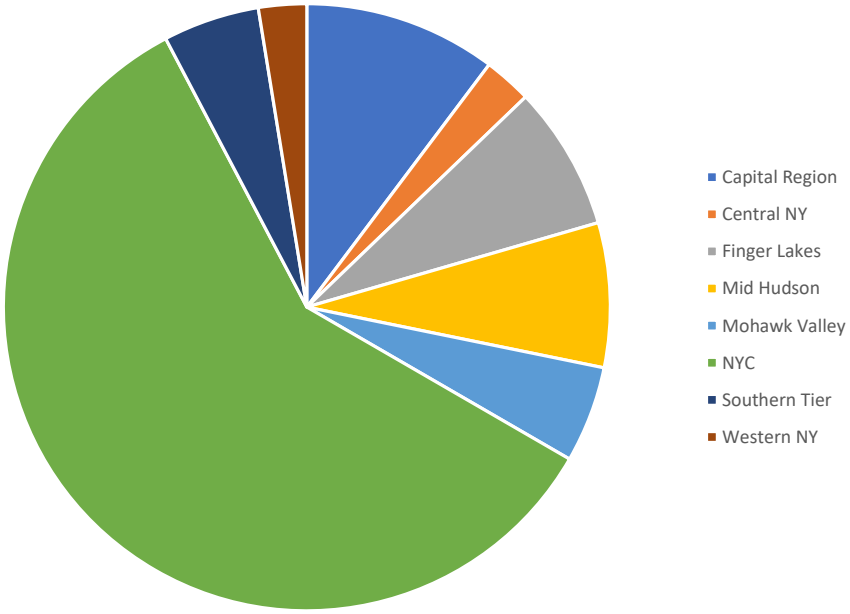
Building Height Categories:

- Low Rise = 1-3 stories
- Mid Rise = 4-25 stories
- High Rise = 26-39 stories
- Super Tall = 40+ stories

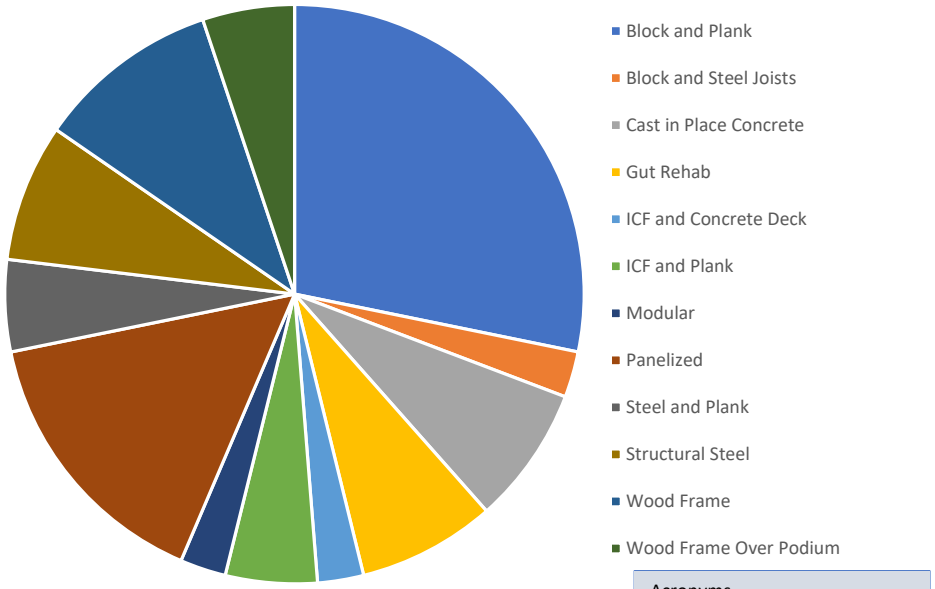
Note: Charts show Round 1 and Round 2 Projects

Building Attributes by Project Count

Buildings of Excellence Regional Distribution

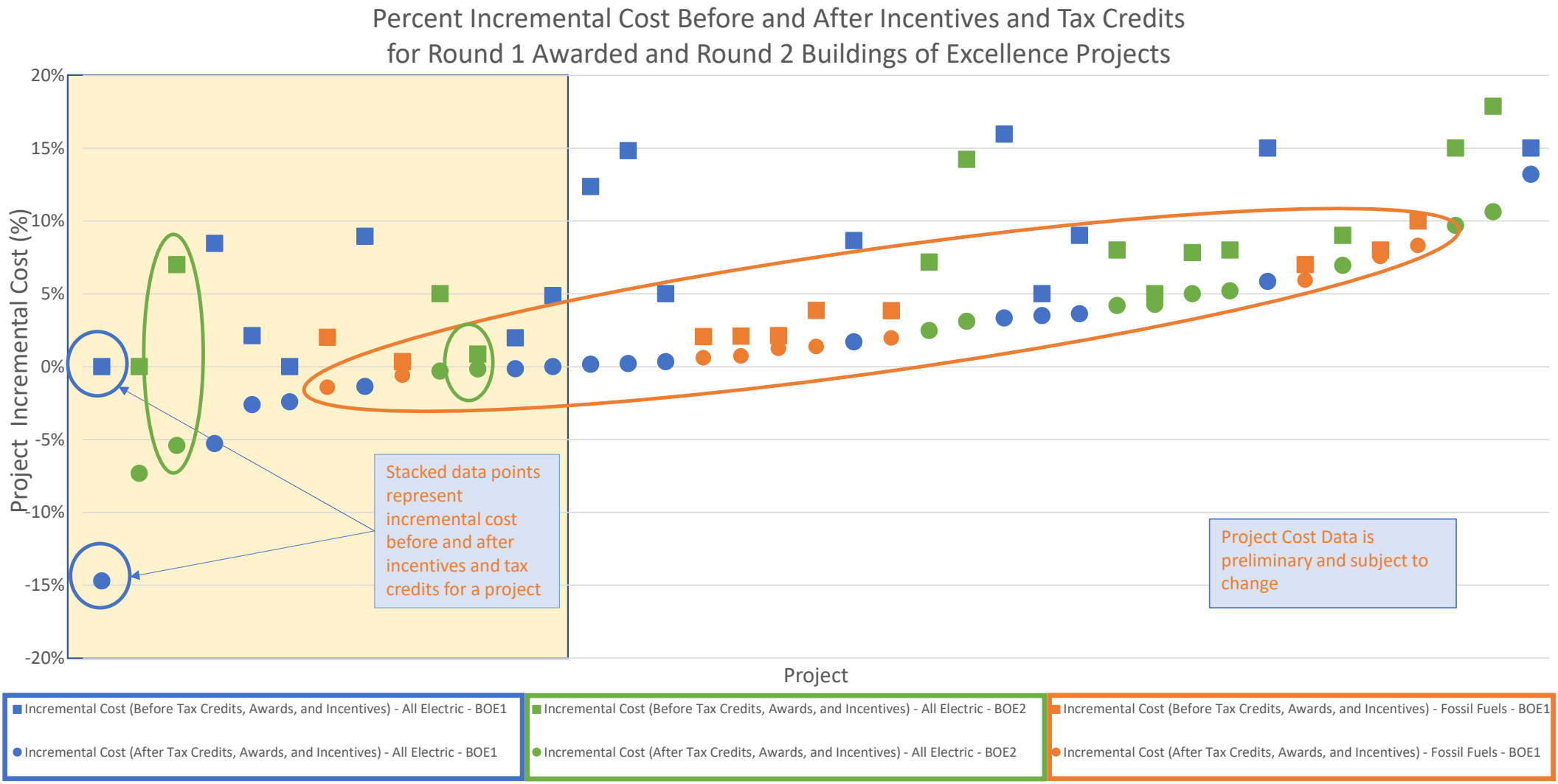


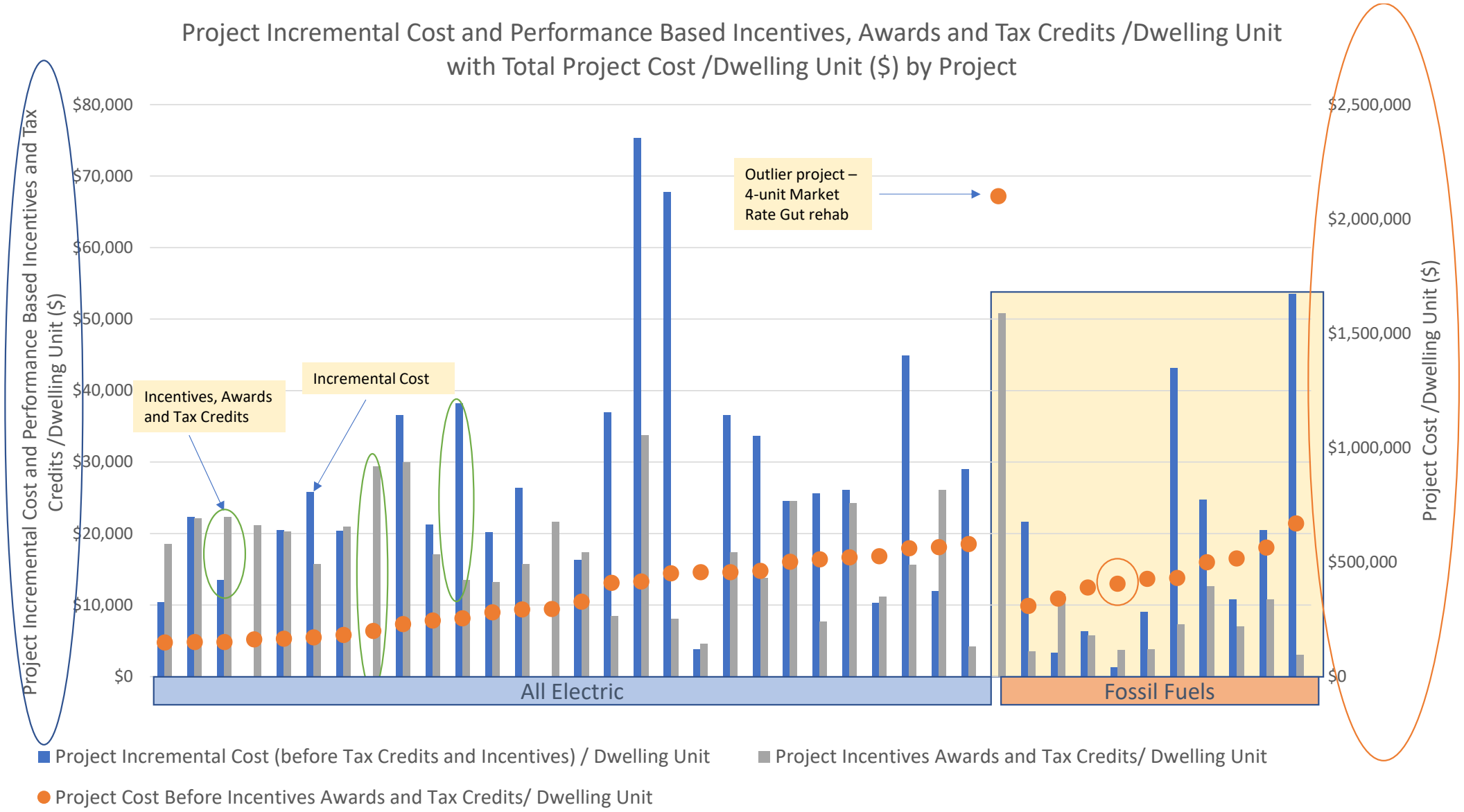
Buildings of Excellence Structural Envelope Distribution

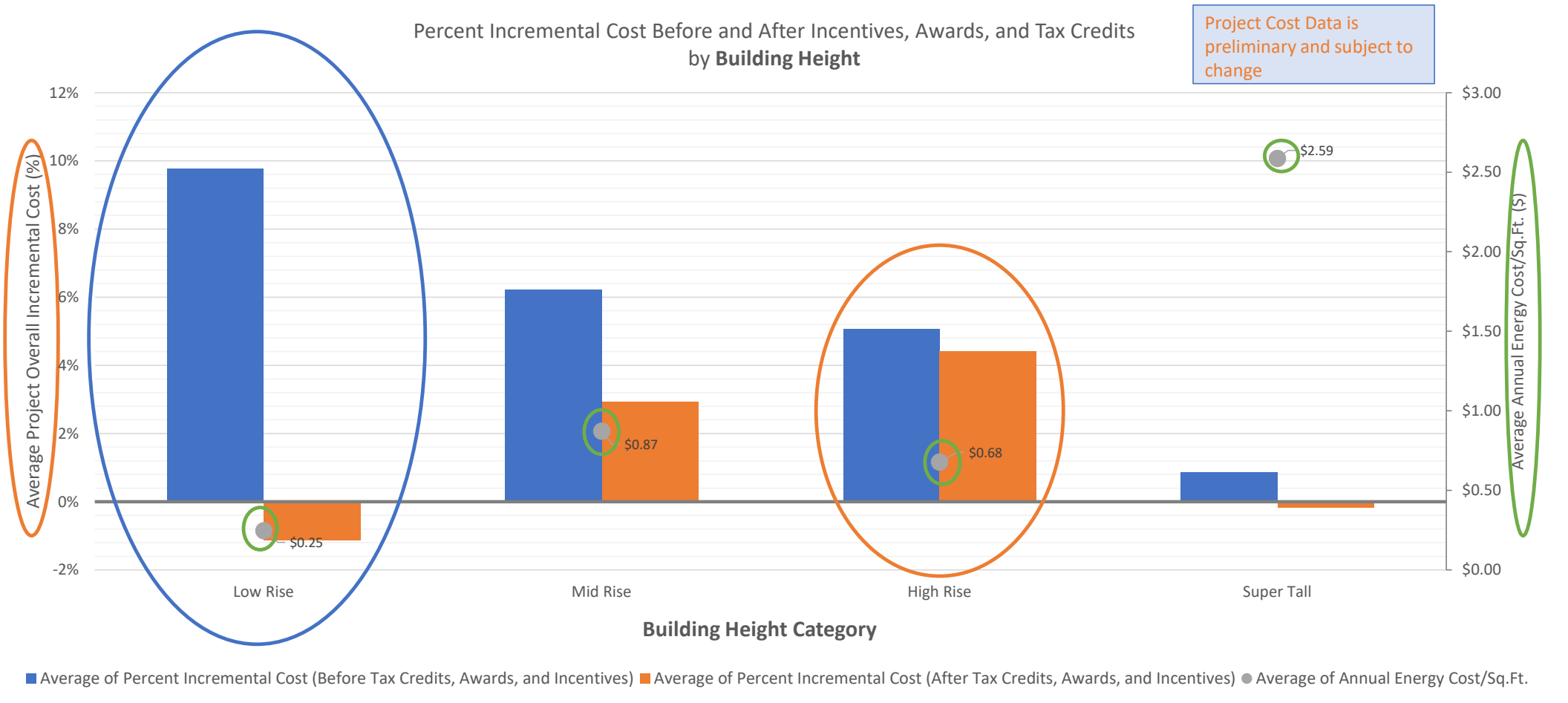


Acronyms
ICF – Insulated Concrete Form

Note: Chart shows Round 1 and Round 2 Projects


Percent Incremental Cost Before and After Incentives and Tax Credits
for Round 1 Awarded and Round 2 Buildings of Excellence Projects
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
Project Incremental Cost (%)
Project
Stacked data points represent incremental cost before and after incentives and tax credits for a project
Project Cost Data is preliminary and subject to change
Incremental Cost (Before Tax Credits, Awards, and Incentives) - All Electric - BOE1
Incremental Cost (After Tax Credits, Awards, and Incentives) - All Electric - BOE1
Incremental Cost (Before Tax Credits, Awards, and Incentives) - All Electric - BOE2
Incremental Cost (After Tax Credits, Awards, and Incentives) - All Electric - BOE2
Incremental Cost (Before Tax Credits, Awards, and Incentives) - Fossil Fuels - BOE1
Incremental Cost (After Tax Credits, Awards, and Incentives) - Fossil Fuels - BOE1

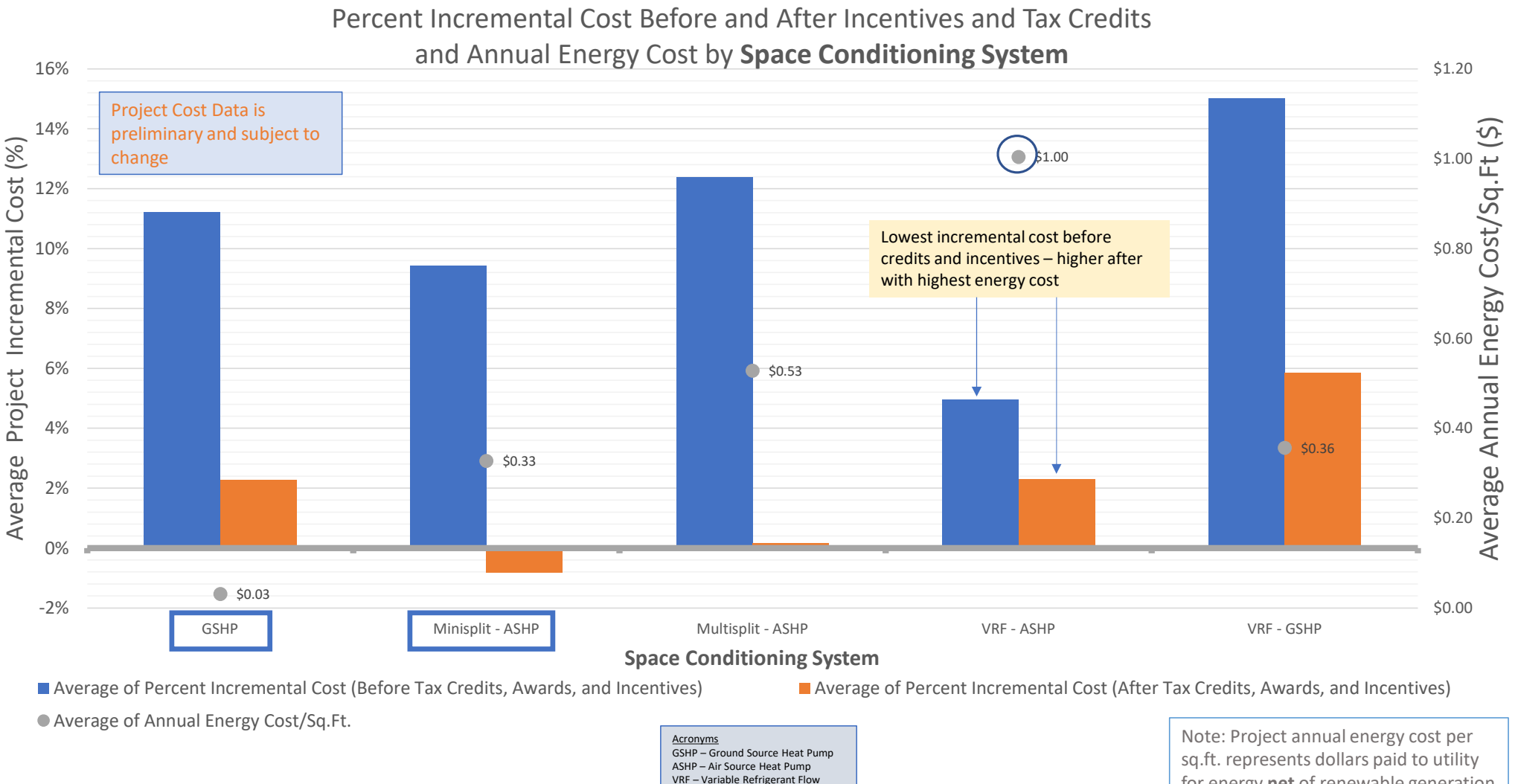

Project Incremental Cost and Performance Based Incentives, Awards and Tax Credits /Dwelling Unit with Total Project Cost /Dwelling Unit ($) by Project
Project Incremental Cost and Performance Based Incentives and Tax Credits /Dwelling Unit ($)
Project Cost /Dwelling Unit ($)
$80,000
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$0
Outlier project – 4-unit Market Rate Gut rehab
Incentives, Awards and Tax Credits
Incremental Cost
All Electric
Fossil Fuels
Project Incremental Cost (before Tax Credits and Incentives) / Dwelling Unit
Project Incentives Awards and Tax Credits/ Dwelling Unit
Project Cost Before Incentives Awards and Tax Credits/ Dwelling Unit



Building Height Categories:

- Super Tall = 40+ stories
- High Rise = 26-39 stories
- Mid Rise = 4-25 stories
- Low Rise = 1-3 stories

Note: Project annual energy cost per sq.ft. represents dollars paid to utility for energy **net** of renewable generation

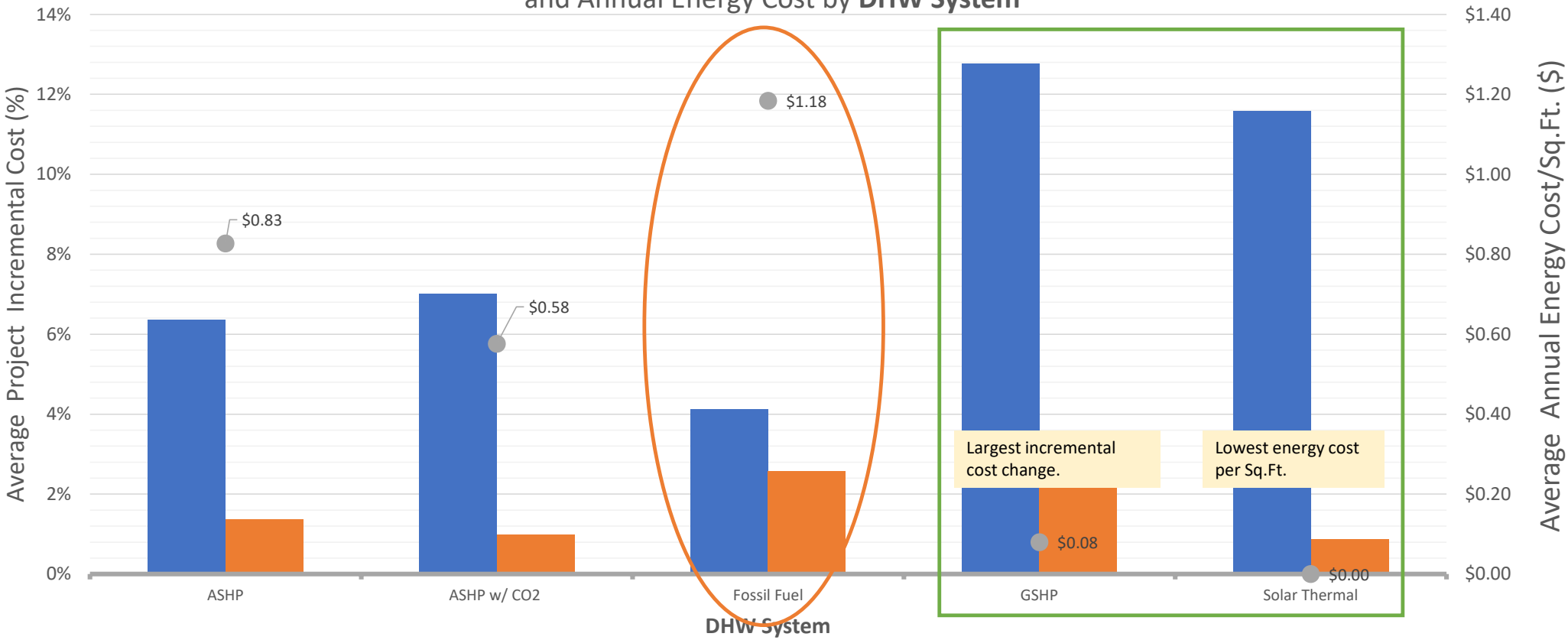


Acronyms
GSHP – Ground Source Heat Pump
ASHP – Air Source Heat Pump
VRF – Variable Refrigerant Flow

Note: Project annual energy cost per sq.ft. represents dollars paid to utility for energy **net** of renewable generation

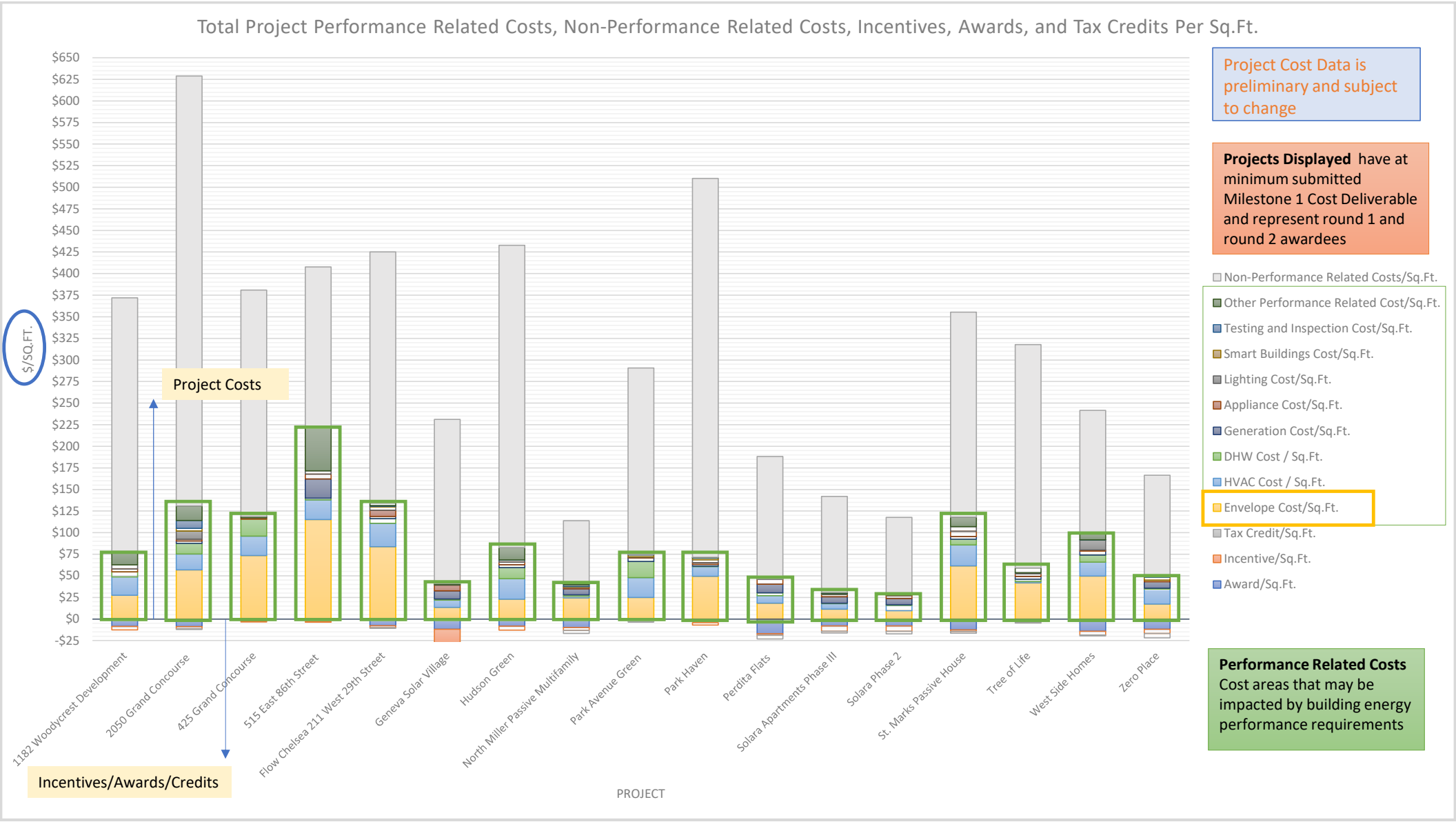
Project Cost Data is preliminary and subject to change

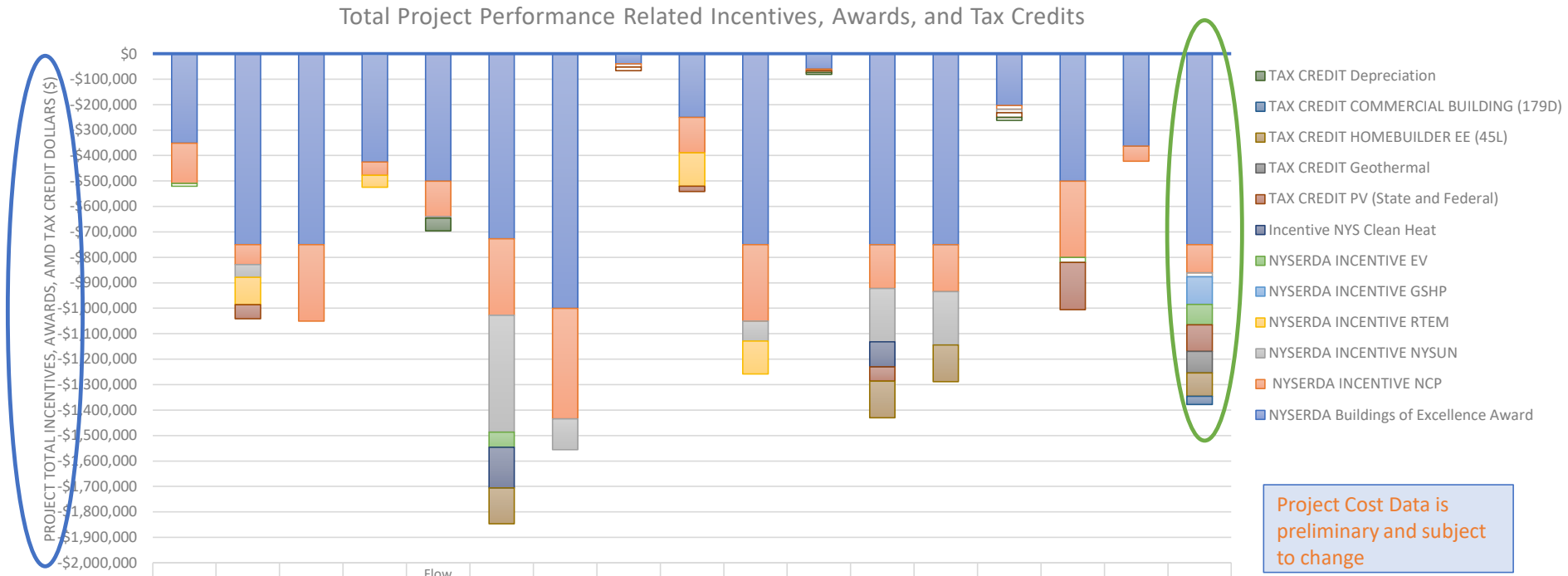
Percent Incremental Cost Before and After Incentives and Tax Credits and Annual Energy Cost by **DHW System**



Acronyms
GSHP – Ground Source Heat Pump
ASHP – Air Source Heat Pump
VRF – Variable Refrigerant Flow
DHW – Domestic Hot Water
CO2 – Carbon Dioxide

Note: Project annual energy cost per sq.ft. represents dollars paid to utility for energy **net** of renewable generation

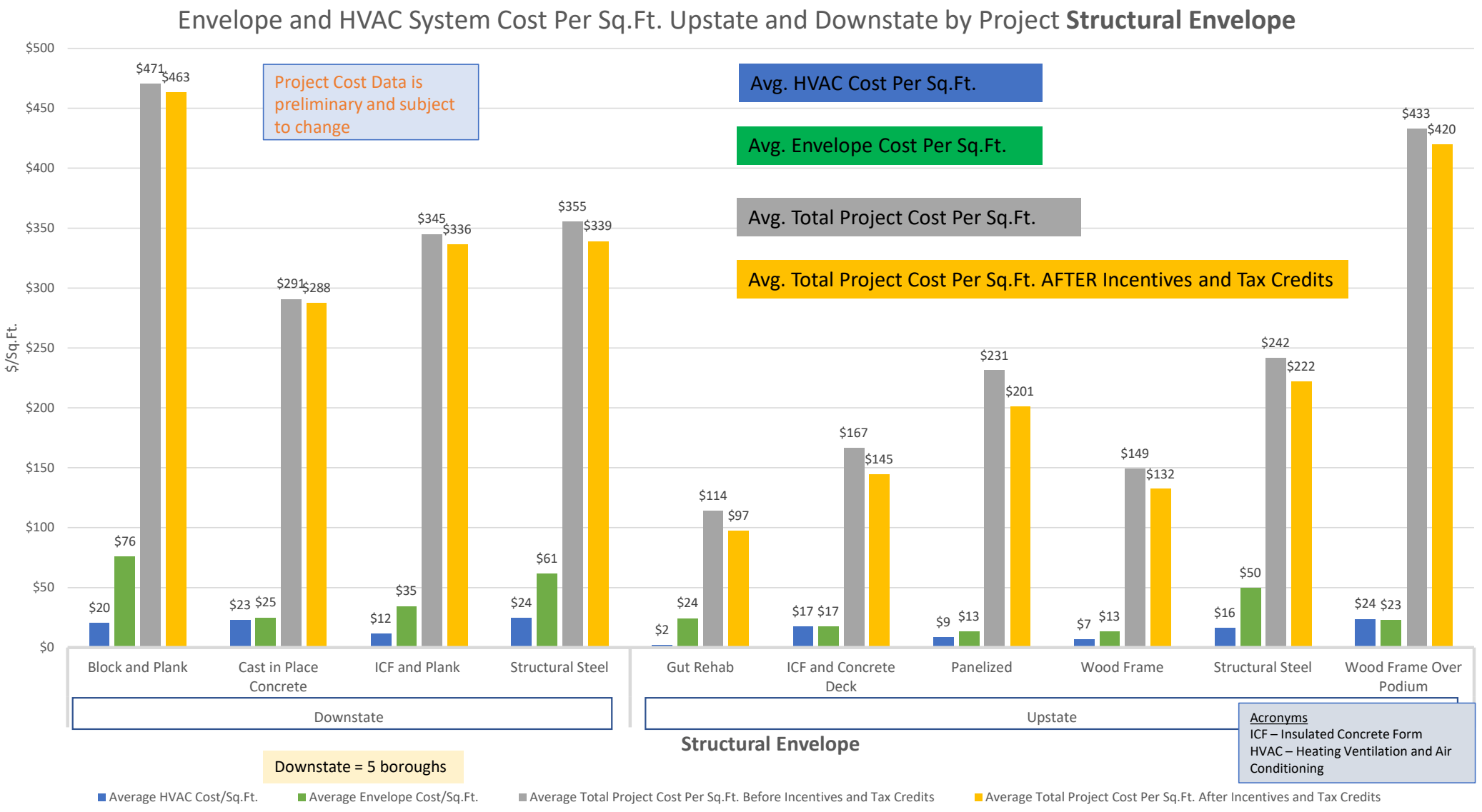

Total Project Performance Related Costs, Non-Performance Related Costs, Incentives, Awards, and Tax Credits Per Sq.Ft.
$650
$625
$600
$575
$550
$525
$500
$475
$450
$425
$400
$375
$350
$325
$300
$275
$250
$225
$200
$175
$150
$125
$100
$75
$50
$25
$0
-$25
$/SQ.FT.
Project Costs
Incentives/Awards/Credits
1182 Woodycrest Development
2050 Grand Concourse
425 Grand Concourse
515 East 86th Street
Flow Chelsea 211 West 29th Street
Geneva Solar Village
Hudson Green
North Miller Passive Multifamily
Park Avenue Green
Park Haven
Perdita Flats
Solara Apartments Phase III
Solara Phase 2
St. Marks Passive House
Tree of Life
West Side Homes
Zero Place
PROJECT
Project Cost Data is preliminary and subject to change
Projects Displayed have at minimum submitted Milestone 1 Cost Deliverable and represent round 1 and round 2 awardees
Non-Performance Related Costs/Sq.Ft.
Other Performance Related Cost/Sq.Ft.
Testing and Inspection Cost/Sq.Ft.
Smart Buildings Cost/Sq.Ft.
Lighting Cost/Sq.Ft.
Appliance Cost/Sq.Ft.
Generation Cost/Sq.Ft.
DHW Cost / Sq.Ft.
HVAC Cost / Sq.Ft.
Envelope Cost/Sq.Ft.
Tax Credit/Sq.Ft.
Incentive/Sq.Ft.
Award/Sq.Ft.
Performance Related Costs
Cost areas that may be impacted by building energy performance requirements

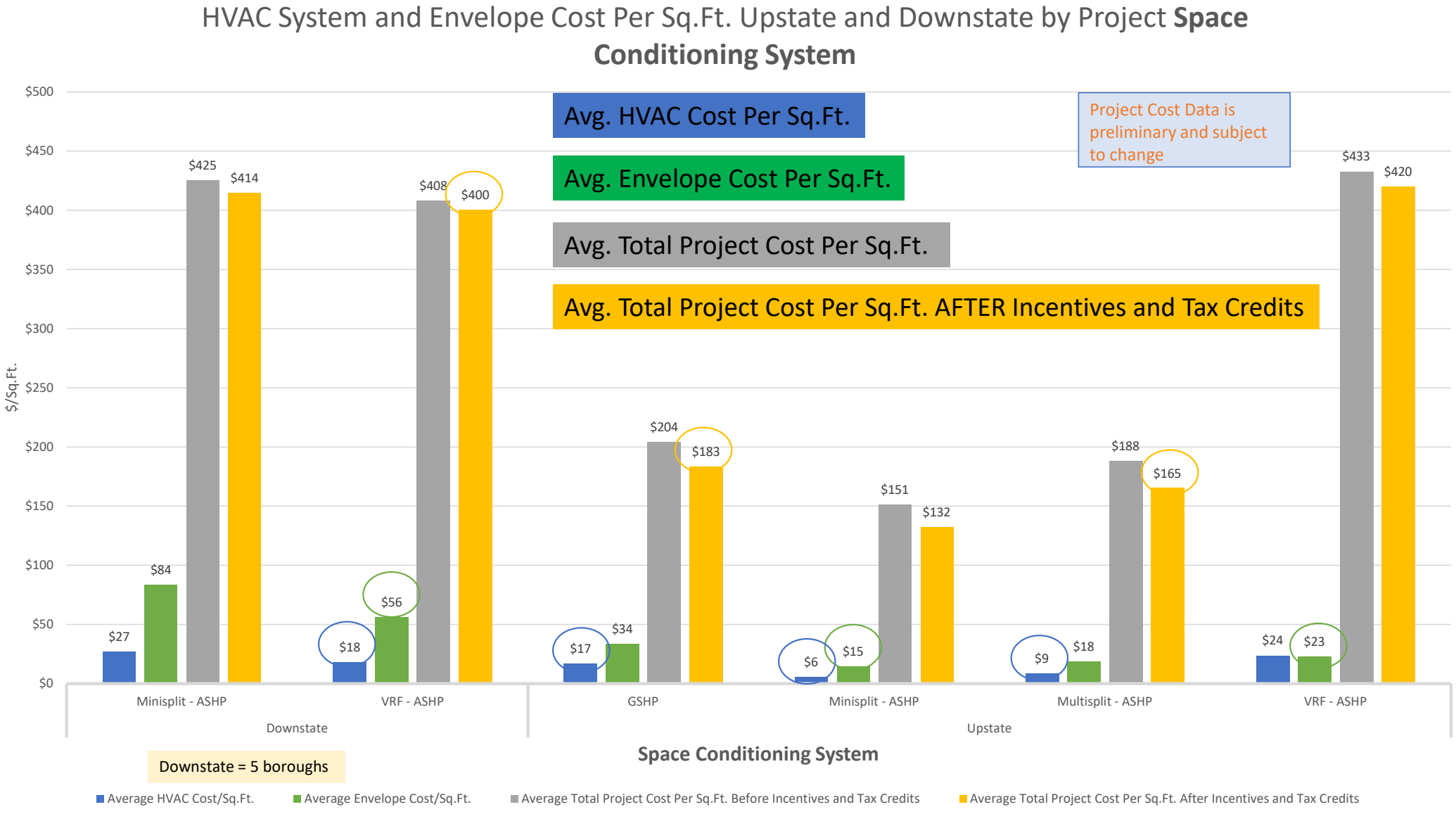


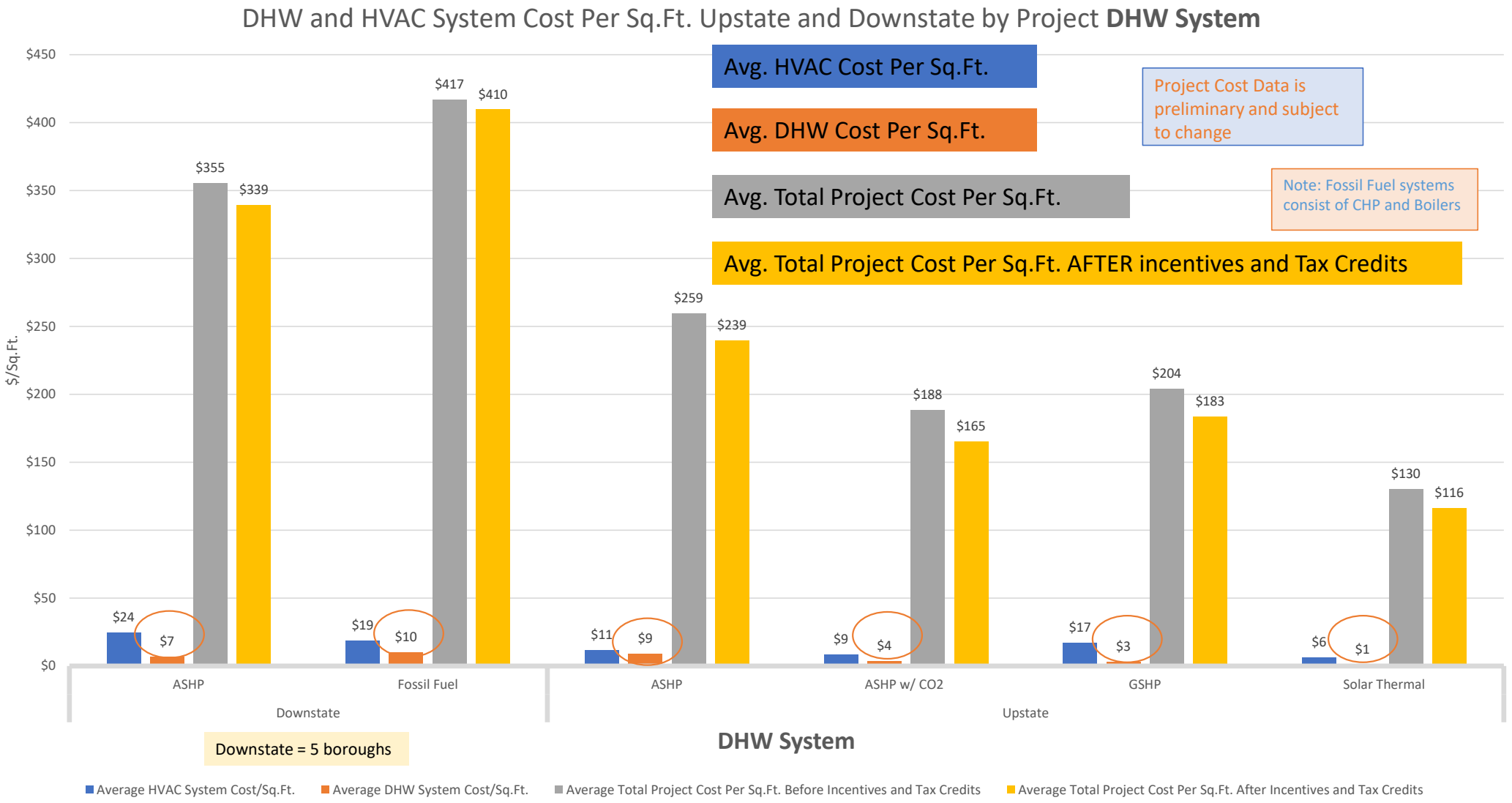
Project Cost Data is preliminary and subject to change

	1182 Woodycrest Development	2050 Grand Concourse	425 Grand Concourse	515 East 86th Street	Flow Chelsea 211 West 29th Street	Geneva Solar Village	Hudson Green	North Miller Passive Multifamily	Park Avenue Green	Park Haven	Perdita Flats	Solara Apartments Phase III	Solara Phase 2	St. Marks Passive House	Tree of Life	West Side Homes	Zero Place
TAX CREDIT Depreciation	$0	$0	$0	$0	-$49,394	$0	$0	$0	$0	$0	-$7,500	$0	$0	-$11,156	$0	$0	$0
TAX CREDIT COMMERCIAL BUILDING (179D)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	-$32,400
TAX CREDIT HOMEBUILDER EE (45L)	$0	$0	$0	$0	$0	-$140,885	$0	$0	$0	$0	$0	-$144,000	-$144,000	$0	$0	$0	-$92,000
TAX CREDIT Geothermal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	-$85,000
TAX CREDIT PV (State and Federal)	$0	-$55,599	$0	$0	$0	$0	$0	-$14,255	-$20,400	$0	-$7,433	-$55,800	$139,035	-$18,750	-$185,526	$27,878	-$104,000
Incentive NYS Clean Heat	$0	$0	$0	$0	$0	-$159,000	$0	$0	$0	$0	$0	-$99,000	$99,000	$0	$0	$0	$0
NYSERDA INCENTIVE EV	-$12,000	$0	$0	$0	$0	-$60,000	$0	$0	$0	$0	$0	$0	$0	$0	-$20,000	$0	-$80,000
NYSERDA INCENTIVE GSHP	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	-$109,340
NYSERDA INCENTIVE RTEM	$0	-$108,000	$0	-$47,118	$0	$0	$0	$0	-$132,000	-$130,000	$0	$0		$0	$0	$0	$0
NYSERDA INCENTIVE NYSUN	$0	-$50,024	$0	$0	-$6,610	-$459,000	-$121,000	$0	$0	-$78,200	$0	-$209,250	-$209,250	-$13,608	$0	$55,819	-$15,000
NYSERDA INCENTIVE NCP	$157,700	-$77,600	-$300,000	-$52,500	-$139,050	-$300,000	-$434,000	-$12,600	-$138,600	-$300,000	-$6,400	-$172,000	-$184,800	-$14,400	-$300,000	-$60,000	-$110,700
NYSERDA Buildings of Excellence Award	$350,931	-$750,000	-$750,000	-$425,000	-$500,000	-$727,236	-$1,000,0	-$39,467	-$250,000	-$750,000	-$59,976	-$750,000	-$750,000	-$203,082	-$500,000	-$362,620	-$750,000

LIHTC, historic tax credits, property tax abatements, and other non-performance based financial benefits are EXCLUDED from this presentation


Envelope and HVAC System Cost Per Sq.Ft. Upstate and Downstate by Project **Structural Envelope**
Project Cost Data is preliminary and subject to change
Avg. HVAC Cost Per Sq.Ft.
Avg. Envelope Cost Per Sq.Ft.
Avg. Total Project Cost Per Sq.Ft.
Avg. Total Project Cost Per Sq.Ft. AFTER Incentives and Tax Credits
$/Sq.Ft.
$500
$450
$400
$350
$300
$250
$200
$150
$100
$50
$0
$20 $76 $471 $463
$23 $25 $291 $288
$12 $35 $345 $336
$24 $61 $355 $339
$2 $24 $114 $97
$17 $17 $167 $145
$9 $13 $231 $201
$7 $13 $149 $132
$16 $50 $242 $222
$24 $23 $433 $420
Block and Plank
Cast in Place Concrete
ICF and Plank
Structural Steel
Gut Rehab
ICF and Concrete Deck
Panelized
Wood Frame
Structural Steel
Wood Frame Over Podium
Downstate
Upstate
Structural Envelope
Downstate = 5 boroughs
Acronyms
ICF – Insulated Concrete Form
HVAC – Heating Ventilation and Air Conditioning
Average HVAC Cost/Sq.Ft.
Average Envelope Cost/Sq.Ft.
Average Total Project Cost Per Sq.Ft. Before Incentives and Tax Credits
Average Total Project Cost Per Sq.Ft. After Incentives and Tax Credits


HVAC System and Envelope Cost Per Sq.Ft. Upstate and Downstate by Project Space Conditioning System
Avg. HVAC Cost Per Sq.Ft.
Avg. Envelope Cost Per Sq.Ft.
Avg. Total Project Cost Per Sq.Ft.
Avg. Total Project Cost Per Sq.Ft. AFTER Incentives and Tax Credits
Project Cost Data is preliminary and subject to change
$/Sq.Ft.
$500
$450
$400
$350
$300
$250
$200
$150
$100
$50
$0
$27
$84
$425
$414
$18
$56
$408
$400
$17
$34
$204
$183
$6
$15
$151
$132
$9
$18
$188
$165
$24
$23
$433
$420
Minisplit - ASHP
VRF - ASHP
GSHP
Minisplit - ASHP
Multisplit - ASHP
VRF - ASHP
Downstate
Upstate
Space Conditioning System
Downstate = 5 boroughs
Average HVAC Cost/Sq.Ft.
Average Envelope Cost/Sq.Ft.
Average Total Project Cost Per Sq.Ft. Before Incentives and Tax Credits
Average Total Project Cost Per Sq.Ft. After Incentives and Tax Credits


DHW and HVAC System Cost Per Sq.Ft. Upstate and Downstate by Project DHW System
Avg. HVAC Cost Per Sq.Ft.
Avg. DHW Cost Per Sq.Ft.
Avg. Total Project Cost Per Sq.Ft.
Avg. Total Project Cost Per Sq.Ft. AFTER incentives and Tax Credits
Project Cost Data is preliminary and subject to change
Note: Fossil Fuel systems consist of CHP and Boilers
$/Sq.Ft.
$450
$400
$350
$300
$250
$200
$150
$100
$50
$0
$24
$7
$355
$339
$19
$10
$417
$410
$11
$9
$259
$239
$9
$4
$188
$165
$17
$3
$204
$183
$6
$1
$130
$116
ASHP
Fossil Fuel
ASHP
ASHP w/ CO2
GSHP
Solar Thermal
Downstate
Upstate
Downstate = 5 boroughs
DHW System
Average HVAC System Cost/Sq.Ft.
Average DHW System Cost/Sq.Ft.
Average Total Project Cost Per Sq.Ft. Before Incentives and Tax Credits
Average Total Project Cost Per Sq.Ft. After Incentives and Tax Credits

Observations

- **Climate Zones and Regions**
  - Successful awarded projects across 8 NYS regions and in climate zones 4, 5, and 6
- **Incentives and tax credits are more impactful for projects with certain building attributes**
  - Low Rise
  - All Electric
  - Geothermal
- **Space Conditioning**
  - VRF - ASHP are overwhelmingly the most popular space conditioning solution
  - Projects using VRF-ASHP show:
    - Highest annual energy cost per sq.ft. of HVAC options
    - Lowest incremental construction cost **before** incentives and tax credits
    - Higher incremental construction cost **after** incentives and tax credits
  - GSHP
    - GSHP projects are more cost effective **after** incentives and tax credits
    - Projects average the lowest annual energy cost per sq.ft.
- **Observations on incremental construction costs after tax credits and incentives**
  - Approximately one-half of all BoE projects resulted in <1% incremental cost
- **Electrified DHW**
  - Contrary to frequent perception, fully electrified projects are still able to achieve a <1% incremental construction cost after tax credits and incentives
  - Electrified DHW projects see lower average cost of energy for building operation when renewables are factored into the cost
  - Solar Thermal, and GSHP systems have the lowest DHW system Cost per Sq.Ft across projects with detailed cost submittals

Acronyms
GSHP – Ground Source Heat Pump
ASHP – Air Source Heat Pump
HVAC – Heating Ventilation and Air Conditioning
VRF – Variable Refrigerant Flow
DHW – Domestic Hot Water
CO_2 – Carbon Dioxide

Appendices

- Appendix A – Awarded Project Cost Detail
- Appendix B – Awarded Project Summaries
- Appendix C – Building Systems Illustrations and Definitions
- Appendix D – Understanding the Data

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Appendix A

Awarded Project Cost Detail

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

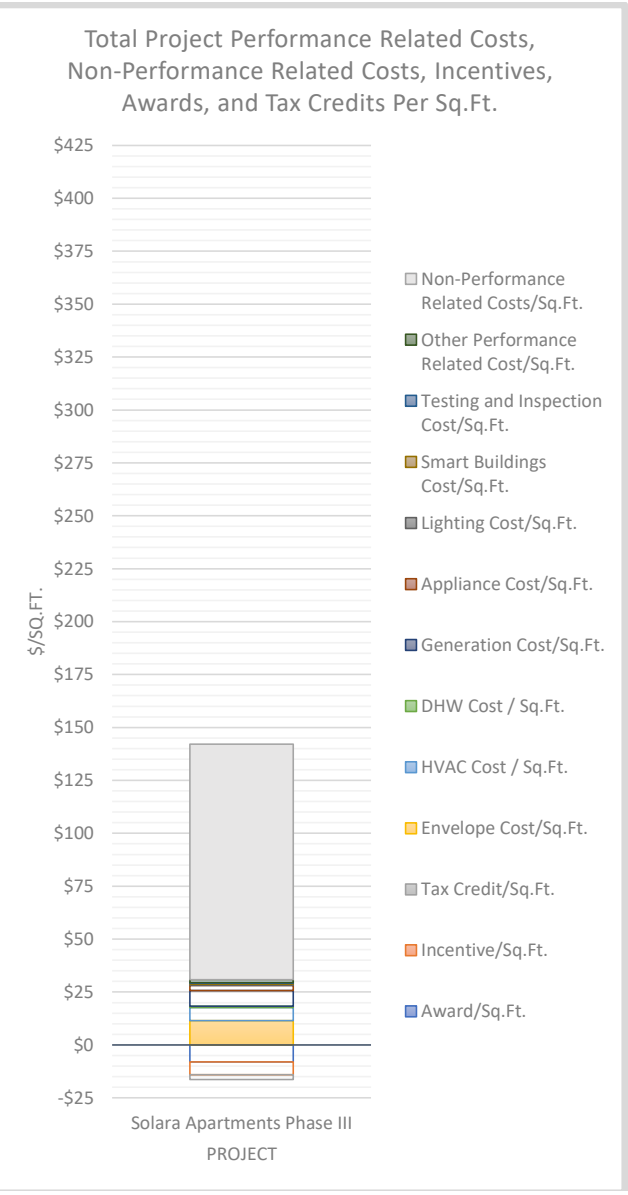
Solara Phase III

Rotterdam, NY

Technical attribute summary:

- 3 Stories, 72 Dwelling Units
- Market Rate
- Solar thermal DHW
- Minisplit ASHP Space Conditioning
- Wood Frame
- ERV
- HP clothes dryers
- EV Charging
- Advanced controls/monitoring
- 100% Renewable Energy
- All Electric

$750,000 Award



Appendix B

Awarded Project Summaries

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Great Oaks Mixed Use Eco-Park

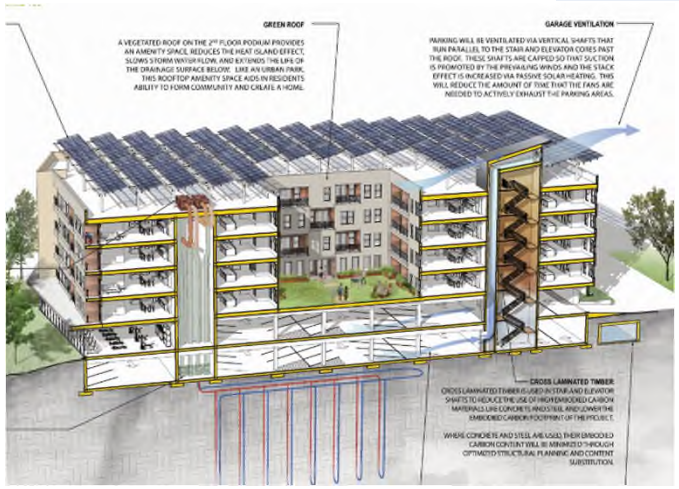
Albany, NY

Early Design
$1,000,000 Award

Rosenblum Development Corporation
Re:Vision Architecture

# of Dwellings	# of Buildings	# of stories	New or GutRehab	Total SF	Residential SF	Electric Utility	Gas Utility	REDC	DEC Env.Justice	Downtown Revitalization Initiative
96	1	5	New	158,271	97,271	Nat'l Grid	NA	Capital Region	No	No

Space Conditioning	Ventilation	DHW	Building Envelope	All Electric	Urban or Suburban	Net Zero	Mixed Use	Performance Path	Other 3rd party certs.	Occupancy
GSHP	ERV	CO2 GSHP	Wood fiber insulation under consideration by design team.	Yes	Suburban	Yes	Yes	PHIUS	PHIUS+ 2018, PHIUS+ Source Zero, Well Certification, EGC 2020 Plus	Market Rate



Proposer's summary: Building 150 will be constructed at RDC's Great Oaks Office Park, which is ideally situated in an urban adjacent location on the border of the City of Albany and Town of Guilderland in New York's Capital Region. Great Oaks is currently comprised of three office buildings in a natural, park-like setting that are impeccably maintained to retain a first class appeal inside and out. The proposed +/ 160,000 sqft., five-story mid-rise building will provide 96 residential units and robust amenity space including a café/market space, fitness center, indoor bicycle storage, and elevated courtyard. Tenants of Building 150 will also enjoy access to the park's groomed trail, picnic areas, immediate mass transit, and walkability to shopping, dining and other conveniences. By maximizing onsite solar PV and the prescribed benefits from planned Passive House (PHIUS+ 2018) and PHIUS+ Source Zero certifications, Building 150 will achieve lower embodied carbon, superior comfort, net zero energy use, and resiliency for future climate hurdles. Particularly relevant post-COVID 19, the air-tight envelope coupled with continuous filtered ventilation makes Building 150 more resilient to airborne disease. Furthermore, the new residential development activates underutilized landscape and parking areas while maintaining the current level of green space, which comprises over 30% of the property.

Technical attribute summary: All Electric, Solar PV, Ground Source Heat Pump, Heat Pump based Domestic Hot Water, Heat Pump Dryers, Induction Cooktops

Appendix C

Building System Illustrations and Definitions

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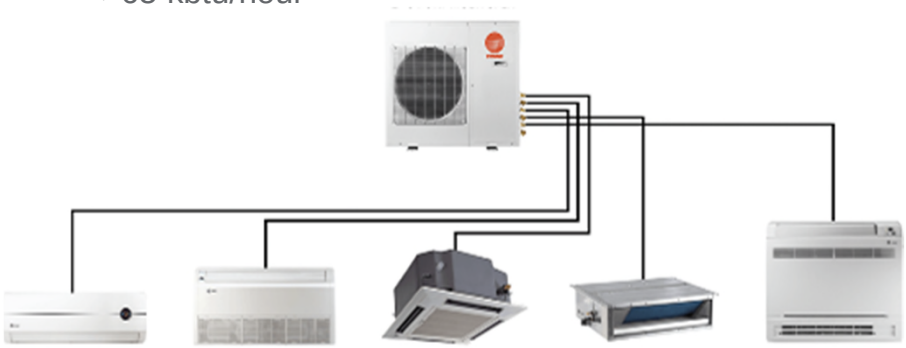
ASHP Space Conditioning System Types

- Minisplit
  - One Condenser – One Line Out – One Head
  - <65 kbtu/hour
- Multisplit
  - One Condenser – Multiple Lines Out – Multiple Heads
  - <65 kbtu/hour
- VRF
  - Multiple Condensers – Multiple Lines Out – Multiple Heads
  - >65 kbtu/hour



Appendix D – Understanding the Data

All project data included is preliminary and subject to change. As projects progress, data will be updated and shared on NYSERDA's Building of Excellence web page.

- Project information stage is a reference to completeness of project submittals.
- Where projects claimed incremental cost within a range, the high end of that range was selected for analysis.
- "Incremental Cost" is defined as the dollar amount differential to a project's budget related to carbon neutral and net zero construction practices when compared to that projects stated baseline construction code per the developer submitted data.
- Building of Excellence project baseline construction code is defined as the NYS Energy Conservation Construction Code (ECCC) for the year that the project was permitted.
- Incremental cost values have been provided by the project teams as estimates related to their understanding of the project baseline.
- Incremental cost % after incentives and tax credits is calculated:
- =(estimated incremental cost $ - anticipated NYSERDA incentive $ – anticipated project tax credits $) /estimated building cost $
- Where % incremental cost is negative, incentives and tax credits exceed the dollar amount of estimated incremental cost
- Cost and incremental cost data being collected for Buildings of Excellence projects is preliminary and based on project estimates.
- All Buildings of Excellence projects utilize Electrified Space Conditioning despite being identified as not all electric.
- Energy Costs identified are pulled from project model values – NOT building measurements.
- Where provided, Low to Moderate Income (LMI) Tax Abatements have been excluded from this analysis.
- If a field is blank the project has not yet provided that information to NYSERDA.

Reminder!

Cost data is updated monthly on the Buildings of Excellence Winners page

Thank You

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