Buildings of Excellence: Cost Trends in New York State Clean and Resilient Multifamily Construction
Agenda

1. BOE Competition and Projects Overview
   - NYS & NYSERDA
   - BOE Overview
   - Project Locations
   - Project Sizes
   - All Electric and ZNE Trends

2. Qualitative Analysis and Results
   - Planning & Design Approach
   - Design Quality
   - Non-Energy Benefits
   - Occupant Health, Comfort, and Productivity
   - Resiliency

3. Quantitative Analysis and Results
   - Modeling Pathways
   - Design Energy Use Intensity

4. Cost Implications
   - Incremental Costs
   - Energy Costs
   - Cost Reduction Strategies
The Climate Act:

• Zero-emission electricity sector by 2040
• 70 percent renewable energy generation by 2030
• Reducing greenhouse gas emissions by 85 percent from 1990 levels by 2050
• Reducing on-site energy consumption by 185 trillion BTUs of end-use energy savings by 2025
• At least 35 percent, with a goal of 40 percent, of the benefits of clean energy investments are directed to disadvantaged communities

NYSERDA:

• Serves as state energy office
• Promotes energy efficiency, renewable energy, and emissions reduction across New York’s economy and energy system
• New Construction Program: advancing high performance carbon neutral buildings across residential and commercial sectors
Buildings of Excellence Competition

Overview

**Competition and Program:**

- Launched in 2019
- First three rounds of Competition have awarded $48 million to 56 projects
- 70 percent of award winners provide affordable housing
- Collaboration between architects and developers
- Create clean, resilient, and carbon neutral multifamily buildings that are healthy and safe for occupants at predictable costs
- Innovation, replicability, and scalability
- Blue Ribbon for Design Excellence Award
  - Materiality, structural systems, construction technology selections, building design function, site context, and ways to make the spaces comfortable and pleasing for the occupants

Bethany Terraces Senior Housing, Brooklyn, NY - Imagery Credit: Paul A. Castrucci, Architects PLLC
Buildings of Excellence Competition
Current Activities

Overview:

- BOE Round 4 closed in Sept 2023
- Anticipate announcing winners in Q1 2024
- Early Design Stage Funding RFP
  - Seeks to build the practice and proficiency of design firms in the carbon neutral space.
  - Reduces barriers and soft costs that design firms may face
  - Open Enrollment Program available through June 2024

Solara Apartments, Rotterdam, NY – Imagery Credit: Photo Courtesy of Harris A. Sanders Architects, P.C., and Black Mountain Architecture
The Buildings of Excellence (BOE) Competition was initiated by NYSERDA in 2019 to recognize and reward the design, construction, and operation of clean and resilient multifamily buildings that are healthier, more comfortable, and more resilient.

425 Grand Concourse, Bronx, NY
Rendering by Dattner Architects / Synoesis, LLC
BOE Project Overview
NYC and Upstate BOE Projects

Dekalb Commons, Brooklyn, NY
Rendering by Nightnurse Images courtesy of Magnusson Architecture and Planning

Bushwick Alliance, Brooklyn, NY
Rendering by STAT Architecture

425 Grand Concourse, Bronx, NY
Rendering by Dattner Architects / Synoasis, LLC

Park Avenue Green, Bronx, NY
Rendering courtesy of Curtis + Ginsberg Architects

Village Grove, Trumansburg, NY
Rendering by HOLT Architects PC and Ithaca Neighborhood Housing Services, Inc.

West Side Homes, Buffalo, NY
Rendering by Stieglitz Snyder Architecture – A LaBella Company

Baird Road Apartments, Fairport, NY
Rendering by SWBR Architecture, Engineering & Landscape Architecture PC
BOE Project Size

Project Height (Number of Stories)

Project Area (Gross Square Feet)
All-Electric and Net Zero Energy Trends

All-Electric and Net Zero Energy Trends by Category

- New York City (24)
  - Net Zero Energy (NZE) & All-Electric: 14
  - All-Electric: 10
  - Mixed Fuel: 3

- Upstate (18)
  - Net Zero Energy (NZE) & All-Electric: 18
  - All-Electric: 14
  - Mixed Fuel: 1

- Market Rate (9)
  - Net Zero Energy (NZE) & All-Electric: 24
  - All-Electric: 12
  - Mixed Fuel: 9

- LMI (33)
  - Net Zero Energy (NZE) & All-Electric: 32
  - All-Electric: 17
  - Mixed Fuel: 10

- All (42)
  - Net Zero Energy (NZE) & All-Electric: 32
  - All-Electric: 17
  - Mixed Fuel: 10

All-Electric and Net Zero Energy Trends by Modeling Approach

- ASHRAE (9)
  - Net Zero Energy (NZE) & All-Electric: 67%
  - All Electric: 33%

- PHI (10)
  - Net Zero Energy (NZE) & All Electric: 50%
  - All Electric: 20%
  - Mixed Fuel: 30%

- PHIUS (18)
  - Net Zero Energy (NZE) & All Electric: 56%
  - All Electric: 22%

- RESNET 301 (ERI) (5)
  - Net Zero Energy (NZE) & All Electric: 100%
Qualitative Analysis

- **Planning and Design Approach**: Goals and motivations, project team compositions, design considerations, and replicability.

- **Energy Efficient, Carbon-neutral Design**: All-electric systems, building envelope, lighting, and renewable energy and storage.

- **Building Operations**: Installation and commissioning, occupant engagement, and smart building technology and energy management.

- **Design Quality and Non-Energy Benefits**: Target occupants, adaptive reuse, occupant health, comfort and productivity, and resiliency.

Johnson Park Green, Utica, NY
Rendering by SWBR Architecture, Engineering & Landscape Architecture PC
Planning & Design Approach Takeaways

1. Goals and Motivations
   The most frequently stated goals were to create a building that enhances the lives of residents and provide more affordable housing.

2. Integrated Teams
   Integrated and experienced project teams are critical to the success of high-performance design and construction.

3. Design Feasibility
   Passive House design is possible in urban areas and high-rise construction, and is a feasible practice for the LMI rental market.

4. Replicability
   Project teams with a focus on replicability note the importance of creating models for future developments to create a pathway for others to follow.
<table>
<thead>
<tr>
<th></th>
<th>Design Quality &amp; Non-Energy Benefits Takeaways</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Occupant Demographics</strong></td>
</tr>
<tr>
<td>2</td>
<td><strong>Adaptive Reuse</strong></td>
</tr>
<tr>
<td>3</td>
<td><strong>Site Context</strong></td>
</tr>
<tr>
<td>4</td>
<td><strong>Occupant Health, Comfort, and Productivity</strong></td>
</tr>
<tr>
<td>5</td>
<td><strong>Resiliency</strong></td>
</tr>
</tbody>
</table>

**1. Occupant Demographics**

Many design teams aimed to support specific disadvantaged communities, such as formerly housing challenged, low-income seniors, and people with chronic illnesses.

**2. Adaptive Reuse**

Teams noted the importance of including a Passive House consultant and a properly trained general contractor in the early design phases.

**3. Site Context**

Most projects are located within walking distance of public transportation and/or provide access to community amenities and resources.

**4. Occupant Health, Comfort, and Productivity**

All projects were designed to deliver a higher indoor environmental quality of living.

**5. Resiliency**

Resiliency features include maintaining stable internal temperatures, planning for electrical power outages, providing continuous access to clean water, and more.
Occupant Health, Comfort, and Productivity

Key Design Benefits:

• **Thermal Comfort**: Teams noted that superior envelope construction and HVAC systems work together to provide balanced temperatures within each unit.

• **Daylighting and Visual Comfort**: NYC mid- or high-rise buildings stressed improved daylighting strategies in their designs.

• **Indoor Air Quality/Health**: A key component to increasing indoor air quality is eliminating combustion equipment within the conditioned spaces.

• **Active Lifestyles**: Projects include bike storage, and are near public transit and other services.

• **Mental Health**: Green spaces especially in dense urban sites can have a positive impact on mental health.
# Resiliency

## Resiliency Strategies

<table>
<thead>
<tr>
<th>Category</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Common Strategies</td>
<td>Reduced mold risk</td>
</tr>
<tr>
<td></td>
<td>Durability / extended useful life</td>
</tr>
<tr>
<td></td>
<td>Urban heat Island reduction</td>
</tr>
<tr>
<td>Flood and Stormwater Management</td>
<td>Onsite stormwater management</td>
</tr>
<tr>
<td></td>
<td>Building above floodplain</td>
</tr>
<tr>
<td></td>
<td>Critical systems above floodplain</td>
</tr>
<tr>
<td>Support During Grid Outages</td>
<td>Access to potable water during emergencies</td>
</tr>
<tr>
<td></td>
<td>Battery storage</td>
</tr>
<tr>
<td></td>
<td>Backup generation</td>
</tr>
<tr>
<td></td>
<td>Passive survivability (e.g. safe temp during outage)</td>
</tr>
<tr>
<td></td>
<td>Located near public transit</td>
</tr>
<tr>
<td></td>
<td>High-performance / passive envelope</td>
</tr>
</tbody>
</table>

### Example Strata

- **Upstate**
- **NYC**

---

*West Side Homes, Buffalo, NY*  
*Rendering by Stieglitz Snyder Architecture – A LaBella Company*
Quantitative Analysis

- **Design Energy and Carbon Emissions**: Analyze design performance from an energy and a carbon perspective.
- **Measured Energy and Carbon Emissions**: Analyze measured performance for completed and occupied buildings where available.
- **Economic Performance**: Examine projected or, if available, actual economic performance metrics such as project and measure costs, energy savings, full payback, and return on investments (ROIs).
Modeling Pathways

Certification Path by Building Height

- RESNET 301 (ERI): 1 Low-Rise, 4 Mid-Rise, 2 High-Rise
- Phius: 6 Low-Rise, 8 Mid-Rise
- PHI: 5 Low-Rise, 5 Mid-Rise
- ASHRAE: 7 Low-Rise, 2 Mid-Rise

Building Height:  
- Blue: Low-Rise  
- Green: Mid-Rise  
- Dark Green: High-Rise
Design Energy Use Intensity

Predicted Site EUI Compared to New Building Population

NYS CODE EUI VALUES:
- High Rise: ASHRAE 90.1 2016 – 49 kBtu/ft²⋅yr
- Mid-Rise: ASHRAE 90.1 2016 – 48 kBtu/ft²⋅yr
- Low-Rise: 2018 IECC Res. – 47 kBtu/ft²⋅yr

Zero Net Energy (ZNE) Projects
Non (ZNE) Projects
Cost Implications

**Economic Analysis:**

- Project teams self reported project costs and incremental costs.
- Cost baselines were determined by project teams based on their cost estimates.
- The report team attempted to align or qualify the way the design teams estimated total and incremental costs and compare them to other methods and standards to add context to the economic performance metrics.
- Energy cost can vary by time of use or demand charges. The report team qualified, where available, how projected energy costs were estimated by project.
Project Incremental Costs

Incremental Cost Compared to Baseline

- Incremental Cost Above Baseline ($/ft²)
- Pre-Incentive
- Post-Incentive

- Upstate Low-rise
- Upstate Mid-rise
- NYC Mid-rise
- NYC High-rise
- All-Electric
- NZE
- LMI
- Market
<table>
<thead>
<tr>
<th>Component</th>
<th>Upstate Low-rise</th>
<th>Upstate Mid-rise</th>
<th>NYC Mid-rise</th>
<th>NYC High-rise</th>
<th>All-Electric</th>
<th>NZE</th>
<th>LMI</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appliances</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DHW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Envelope</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart Tech</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Incremental Cost Above Baseline ($/ft²)
Incremental Costs of Phius Projects

Incremental Cost by Component - BOE Average vs. Phius

- Lighting
- Appliances
- HVAC
- DHW
- Generation
- Envelope
- Smart Tech
- Testing
- Other Performance

Incremental Cost Above Baseline ($/ft²)
Cost Reduction Strategies

Economic Performance and Understanding Tradeoffs:

- **Integrated teams** iteratively designed a package that prioritizes investments in energy and carbon reduction.
- Cost premiums were kept small, largely because of the project teams’ prior collective experience with high-performance design and construction, allowing them to make intelligent, cost-effective package tradeoffs without sacrificing performance.
- Cost reduction strategies included shortening learning curves, opting for simple, replicable designs, and using prefabricated materials.
- Solar PV systems, envelopes, and HVAC systems drove incremental costs, while DHW was not a significant incremental cost in any project.
Thank you!

Contact:

Gwen McLaughlin
Project Manager
NYSERDA
gwen.mclaughlin@nyserda.ny.gov

Nate Heckman, AIA
Associate Technical Consultant
Resource Refocus
nate@resourcerefocus.com

Buildings of Excellence Case Studies:

https://www.nyserda.ny.gov/All-Programs/Multifamily-Buildings-of-Excellence/Winners/Resources

Photo of Solara Apartments, Rotterdam, NY
Courtesy of Harris A Sanders Architects, P.C., and Black Mountain Architecture