2021-2022 Better Buildings WEBINAR SERIES

Register Today: betterbuildingssolutioncenter.energy.gov/better-buildings-webinar-series
Roadmap to Carbon Reductions in Multifamily Housing

December 16, 2021
11:00 am – 12:00 pm EDT
Agenda

1. Welcome & Overview of HUD’s New Climate Action Plan
2. Speaker Presentations
3. Q & A
4. Wrap-up
Better Buildings – Multifamily Sector

Better Buildings Challenge:
• 90 partners
• Commit to improve the energy efficiency of portfolios by 20 percent over 10 years
• Receive technical assistance / peer exchange

Better Climate Challenge:
• Commit to reduce portfolio-wide GHG emissions (scope 1 & 2) by at least 50% within 10 years
• Receive technical assistance / peer exchange

https://www.hudexchange.info/programs/better-buildings-challenge/
Please go to www.slidol.com using your mobile device, or by opening a new window

Enter Event Code

#DOE
HUD’s Climate Action Plan

- Built on 3 goals:
  - Increase Climate Resilience
  - Reduce Greenhouse Gas Emissions
  - Pursue Environmental Justice

- The Better Buildings Challenge is integral to accomplishing reductions in carbon emissions in HUD’s portfolio

- Plan commits program offices to 105 distinct Climate Actions – including 12 specifically on Benchmarking and Data collection
Roadmap to Carbon Reductions in Multifamily Housing
Webly Bowles, NBI
The Five Foundations of Zero Carbon Building Policies

- Energy Efficiency
- Renewable Energy
- Grid Integration + Storage + EV
- Building Electrification
- Life-Cycle Impacts

© New Buildings Institute, 2021
# Carbon Neutral Definitions Vary

<table>
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<tbody>
<tr>
<td><strong>LIVING BUILDING CHALLENGE</strong></td>
<td>![Metric Symbol]</td>
<td>![Boundary Symbol]</td>
<td>NC: 70% EBB*   EB: 50% EBB (both w/ PV)</td>
<td>Highest efficiency</td>
<td>Yes. Using the off-site RE exception.</td>
<td>Must include on-site storage; 20% embodied carbon reduction.</td>
</tr>
<tr>
<td><strong>ZERO ENERGY CERTIFICATION</strong></td>
<td>![Metric Symbol]</td>
<td>![Boundary Symbol]</td>
<td>NC: 25% &lt; 90.1-2010 EB: 30% &lt; CBECS</td>
<td></td>
<td>Yes.</td>
<td>10% Embodied Carbon Reduction + Carbon offsets for the remainder</td>
</tr>
<tr>
<td><strong>LEED Zero ENERGY</strong></td>
<td>![Metric Symbol]</td>
<td>![Boundary Symbol]</td>
<td>No, but LEED Certified</td>
<td></td>
<td>Yes. See tiered structure for on- and off-site RE</td>
<td>Must be LEED-NC or EBOM certified. Performance in Arc. TOU option for LZC.</td>
</tr>
<tr>
<td><strong>LEED Zero CARBON</strong></td>
<td>![Metric Symbol]</td>
<td>![Boundary Symbol]</td>
<td></td>
<td></td>
<td>Yes. After on-site. Tiered structure applies discount factor to various</td>
<td>Off-site renewables are discounted</td>
</tr>
<tr>
<td><strong>ZERO CODE</strong></td>
<td>![Metric Symbol]</td>
<td>![Boundary Symbol]</td>
<td>Must meet ASHRAE 90.1-2019</td>
<td></td>
<td>Yes.</td>
<td>Embodied carbon may be included later</td>
</tr>
<tr>
<td><strong>WORLD GREEN BUILDING COUNCIL</strong></td>
<td>![Metric Symbol]</td>
<td>![Boundary Symbol]</td>
<td>Highly energy efficient building</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>AIA 2030 Commitment</strong></td>
<td>![Metric Symbol]</td>
<td>![Boundary Symbol]</td>
<td>Not allowed in 2030</td>
<td>70% better than CBECS 2003</td>
<td>Yes, but not counted</td>
<td>Seeking to incorporate refined carbon specific metrics</td>
</tr>
</tbody>
</table>

*NC: 70% EBB: 70% better than CBECS 2003*
GHG Protocol

Scope 1: Direct GHG Emissions
• Direct GHG emissions occur from sources that are owned or controlled by a company/city. (Boilers, furnaces, vehicles, etc.)

Scope 2: Electricity indirect GHG emission
• GHG emissions from the generation of purchased electricity. (Not source energy)

Scope 3: Indirect Emissions
• Consequential emissions from day-to-day activities. (Travel emissions, embodied emissions from purchased materials, refrigerants, waste, outsourced activities.)
Carbon Neutral Building Policies

**Renewable Energy**
- California residential code: solar-ready
- Santa Monica, CA: 1.5 watts/sf

**Grid Integration + Storage + EV**
- Washington state: new electric WH must include demand response capability

**Building Electrification**
- Berkeley, CA gas ban
- Brookline, MA

**Life-Cycle Impacts**
- Portland, OR: low carbon concrete procurement
- Vancouver, BC: whole building LCA
Carbon neutral buildings should incorporate as much as possible the additional components listed below. As grid-supplied resources get cleaner, building-grid integration will become necessary to address peak demand and enable load shifting. Reducing onsite GHG emissions through electrification and embodied carbon will become priorities for driving down the climate changing impacts of the built environment.

**Core Components:**
- Maximize energy efficiency
- Prioritize on-site renewables
- Utilize off-site renewables
- Measure and manage net zero operations

**Additional Components:**
- Electrification-ready and minimize/eliminate on-site fossil fuels
- Optimize building-grid integration and on-site storage
- Specify low GWP refrigerants
- Select low embodied carbon materials

Credit: New Buildings Institute
Carbon Neutral Buildings Co-benefits

Future Proof Against:
- Rising energy rates
- Designers: Market advantage
- Building codes and policies

Health Benefits
- Reduced air pollutants from gas equipment and refrigerants
- Improved ventilation limits health issues

Resilience
- Shelter in place
- Solar and storage

Occupant Comfort
- Less drafts
- Proper air flow
- Noise reduction

Safety
- Reduced gas leaks
- Limited fire potential
Carbon Neutral Resources

An insider’s guide to talking about carbon neutral buildings

https://gettingtozeroforum.org/resource-hub/
Thank you!

Webly Bowles, Project Manager
webly@newbuildings.org
Greg Hale
Senior Advisor for Energy Efficiency Markets and Finance / The New York State Energy Research and Development Authority (NYSERDA)
Decarbonizing New York’s Built Environment

Greg Hale
Senior Advisor for Energy Efficiency and Markets
Climate change is a reality.
New York State is fighting it.

- The most aggressive clean energy commitment and climate agenda in the country
- Climate Leadership and Community Protection Act (Climate Act) empowers every New Yorker to fight climate change at home, at work, and in their communities
Climate Leadership and Community Protection Act

35% of the benefits from clean energy investments must **go to disadvantaged communities** under the Climate Act.
~30% of NYS economy-wide emissions come from direct emissions from residential and commercial buildings through onsite fossil fuel combustion and HFCs.
Targeted, ambitious policy solutions with dates will send clear market signals

- Statewide Stretch Energy Code
- Codes for PV and electric readiness
- Benchmarking

- All-electric code for low-rise residential
- Point-of-sale energy disclosures
- Energy audits, lighting upgrades, submetering

- All-electric code for commercial/multifamily
- Prohibit gas replacement heat/hotwater in homes
- Building Performance Standard for large properties

- Prohibit replacement of fossil heat/hot water appliances in commercial and multifamily
- Prohibit gas replacement cooking/laundry in residential
New model **directly includes NYSERDA-funded solar, efficiency, and/or electrification grants and supplemental capital within HCR’s financing processes**

**NYSERDA Investment:** ~$20M annually through 2025

**Expected Outcomes:** 10,000-15,000 retrofitted units, with potential to expand as costs decline

- Updated HCR building performance standards
- Larger pool of owners and developers experienced with Passive House-style new construction and deep energy retrofits

**Achievements to date**

- $7.5M made available to HCR projects for carbon neutral ready new construction projects through 2021 4% and 9% Low Income Housing Tax Credit RFPs
- Includes support for integrated design to reduce project costs and enable scaling
- RMI to provide technical assistance in reviewing project proposals

**In progress/next steps**

- Next phase to introduce this model to existing building renovation projects
NYCHA Electrification Partnership

Innovation challenge to create a packaged window-mounted heat pump unit with cold-climate performance in partnership with NYC Housing Authority (NYCHA) and NY Power Authority (NYPa)

Objectives

- Establish a multi-year partnership with NYCHA to test, assess and scale adoption of proven electrification solutions
- Challenge heat pump manufacturers to deliver efficient, cold climate heat pump product that can be easily installed in existing buildings with minimum resident disruption
- Replication strategy

> NYCHA is the largest public housing authority in the US; owns and operates roughly 170,000 units in more than 2,200 buildings serving more than 365,000 residents

> In 2020, NYCHA made a public commitment to electrification as part of a portfolio-wide strategic plan to reduce emissions
NYCHA Electrification Partnership (cont'd)

**NYSERDA Investment:** ~$13M funding from the Regional Greenhouse Gas Initiative (RGGI)

**Expected Outcomes**
- Direct impact: 2-3 buildings, approx. 4,000 housing units, and 11,000 heat pump units
- New product will enable NYCHA to make significant future investments in efficient electrification portfolio wide
- NYPA could undertake bulk procurement, further reducing NYCHA's cost
- Potential to reduce cost of electrification across the multifamily sector at scale throughout the US Northeast

**Next Steps**
- NYPA to develop specifications with expert technical assistance, then release RFP to select manufacturers
- Commence pilot in 2022, demonstrating installation and performance
- Separate NYCHA deep energy retrofit pilot with NYSERDA's RetrofitNY initiative

Custom modification of a commercially available product
RetrofitNY: Supporting the Creation of Scalable Deep Energy Retrofit Solutions in NY
Offsite manufacturing model that enables scale

All electric, carbon neutral buildings at cost-effective prices

Precedent set by Netherlands in Energiesprong
• 5,700 completed units
• Includes new construction and renovations
• 14,400 units in the pipeline

Additional 7,255 in the pipeline in other European countries
Prefabricated High Performance Components
Cost Compression is Key

Key Achievements of the Energiesprong program

Cost reduction: Net Zero buildings at 45% of the Cost of Initial Pilots

- Current target: $40,000 per dwelling unit
Upstate New York Design Pilots

Location: Troy, NY
Project: Two-stories (18 Units)
Owner: Beacon Communities
Team: ICAST

Location: Phoenix, NY
Project: Two-stories (40 units)
Owner: Rock Property
Team: King + King Architects

Location: Portville, NY
Project: Two-stories (24 units)
Owner: Conifer Reality
Team: SWBR
NYC Design Pilots

**Project:** 300 E 162nd, Bronx  
**Owner:** Volmar  
(42 units)

**Project:** Casa Pasiva  
**Owner:** RiseBoro  
(46 units)

**Project:** 439 W 125  
**Owner:** Joe NYC  
(21 units)
RetrofitNY Program Learnings from Round-1

*Transitioning from emphasis on design to product development*

- High costs (50%+ incremental costs)
- Non-existent local supply chains
- Numerous markups in supply chain increasing costs
- Missing or underdeveloped technology
  - No suitable panelized envelope technologies to scale
  - Sub-optimal HVAC components
- Lack of trained labor force to scale deployments leading to high bid costs
- Demand aggregation needed to spur needed industry investments
RetrofitNY: Request for Qualifications

RFQLs create open transparent gateway for program participation

- **Solution Providers**
  Business model conducive to a scalable solution

- **Component Manufacturers**
  Deploy new integrated building components

- **Building Owners**
  Develop demonstration pilots and early demand

- Give manufacturers and solution providers incentives to collaborate on developing a cost effective NZE whole building solution
- Serve as a matchmaking vehicle between building owners and NZE solution providers
- Develop use cases of replicable whole building solutions to make adoption easier for building owners
Incremental Costs for Buildings of Excellence Projects

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.
The Buffalo Neighborhood Stabilization Company Inc (BNSC), the housing development arm of PUSH Buffalo, is developing 15 units of housing on Buffalo’s West Side.

The buildings will achieve Passive House Institute US (PHIUS) certification, 2020 Enterprise Green Communities, WELL Building Certification, and be net zero.

By coordinating housing and sustainability work, West Side Homes focuses on both human and ecosystem health, creates a resilient project that addresses future heat, precipitation, and drought events, and uses renewable energy sources to reduce greenhouse gas emissions.
Cooper Park Commons Building 2, is an all-electric, 100% affordable housing development.

When complete, it will be a leading example of sustainability and low-carbon design. The team is committed to achieving LEED for Homes v4 Gold and Passive House Classic certifications.

Building 2’s focus on sustainable design will achieve energy cost savings over typical new-construction affordable housing development, as well as provide enhanced indoor air quality, comfort, health, and resiliency for the tenant community.

The team is achieving these design features in a cost-efficient manner and maximizing operating savings. The project will utilize an array of available funding sources for mixed-use developments, creating a replicable model for sustainable affordable housing developments.
Court Square is a “super-tall” mixed-use building containing thirty-eight floors of luxury condominium dwelling units, nine floors of core and shell office space, a future city library, and future retail space.

The project embodies sustainable luxury re-imagined to meet today’s energy and climate-based challenges and serves a leading example of how this type of design can be realized seamlessly together.

Court Square will fully electrify its HVAC and DHW systems. The project will certify as LEED Gold and incorporate induction cooktops, heat pump dryers and smart-learning thermostats in all residential units. The project is actively evaluating additional cutting-edge measures to optimize energy performance.
Retrofit: Casa Pasiva, RiseBoro

RetrofitNY

> Revolutionizing how affordable multifamily buildings are renovated
> Innovative solutions to decarbonize buildings while limiting disruption for residents
> Increasing the comfort and health of residents

Casa Pasiva – low-carbon affordable housing retrofit in Brooklyn, NY

> Owner: RiseBoro
> Design and construction: Chris Benedict, R.A.
> 60-80% total energy reduction
> Improved resilience during utility outages
> Energy efficient heat pump heating and cooling
> Improved indoor air quality and comfort with active ventilation system
> Very high efficiency windows and added insulation on the exterior of the building
Thank you!
Market Adoption of Packaged Window Cold Climate Heat Pumps

• Program by NYCHA, NYPAG, and NYSERDA to kickstart a market for packaged cold climate heat pumps.
• **Goal:** Significantly reduce the cost of electrification while maintaining efficiency of existing cold climate heat pumps.
• **Next Steps:** Sign and email Letter of Interest to Jordon Bonomo at NYCHA: Jordon.Bonomo@nycha.nyc.gov
• **Timeline:**
  • NYPAG issues RFP: 12/17/21
  • Manufacturer award: March 2022
  • Development period: 18 months + demonstration period
  • First full purchase order of 24,000 units: Q2 2025
Magda Szymanska  
Sustainability Program Manager / Tenderloin Neighborhood Development Corporation

Mark Puchalski  
Director of Facilities / Tenderloin Neighborhood Development Corporation
Roadmap to Carbon Reduction
TNDC at a Glance

AT TNDC, WE BELIEVE HOUSING IS A HUMAN RIGHT.

Every day we provide people who are struggling to make ends meet in San Francisco with permanently affordable homes. Because when a person has a place to call home, they have the foundation for a better life.

3,280 of our 4,100 residents live on an annual income of less than $15,000

725 of our 3,450 homes are dedicated to the formerly homeless

56,000+ HOURS

Our onsite social workers dedicate 56,000+ hours a year to helping residents feel welcome and supported in their home

BUILDING HOMES AND COMMUNITY IN SAN FRANCISCO FOR OVER 35 YEARS

Our work began with a need for permanent affordable housing in the Tenderloin. As the need for more permanent affordable housing has grown, so have we.

43 BUILDINGS
11 BUILDINGS IN DEVELOPMENT
8 SF NEIGHBORHOODS

HOUSING COMES FIRST, IT’S NOT WHERE OUR WORK ENDS

Our work is grounded in our community’s needs and leads to programs such as:

TENDERLOIN AFTER-SCHOOL PROGRAM
240 kids (ages 7-18) learn and grow with free tutoring, cultural activities, and an annual College Tour program

TENDERLOIN PEOPLE’S GARDEN
3,000 lbs of free produce are distributed to Tenderloin residents every year to lessen the burden of food costs
### 2013-2018: Energy, Water

<table>
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<th>TNDC-BBC Approaches</th>
<th>Audits</th>
<th>Capital Improvement</th>
<th>Benchmarking</th>
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|                     | • Incentive opportunities  
|                     | • Financial analyses     | • Retrofits  
|                     |                        | • Renewables  
|                     |                        | • Design guidelines |
|                     |                        | • Performance Tracking  
|                     |                        | • ROI |

### 2018:

Energy, Water  
+ carbon reduction  
+ waste
Carbon Emission Inventory

Scope 1: GAS
Download Calculation tool: [https://ghgprotocol.org/ghg-emissions-calculation-tool](https://ghgprotocol.org/ghg-emissions-calculation-tool)

Scope 2: ELECTRICITY
Download Calculation tool: [https://www.epa.gov/egrid/power-profiler#/CAMX](https://www.epa.gov/egrid/power-profiler#/CAMX)
SOMA Case Study: Partial Electrification

ENERGY AND CARBON REDUCTION:
SOMA Studio & Family Apartments
1190 Howard St, San Francisco, CA
- Built in 2003
- 88 Studios, 74 Family Units; 162 units
- 5 floors (1st floor commercial)
- Boiler Room on ground floor

Energy Upgrade Pkg

Total cost: $1,062,000
Incentives: $900,300 (85%)

TNDC net cost: $161,700 (15%)
SOMA Case Study: Scope and Results

SCOPE OF WORK

- Low-flow aerators and showerheads
- In-unit LED lighting
- Common area and exterior LED lighting and controls
- High-efficiency washing machines
- Heat pump domestic water heaters
- Condensing hydronic heating boilers
- Heat exchanger for backup domestic hot water
- Variable-speed heating and domestic hot water pumps
- Hydronic and domestic hot water heating pipe insulation
- Replacement make-up air systems for common area corridors
- Variable speed rooftop exhaust fans
- Garage exhaust retro-commissioning

PROJECTED TOTAL ANNUAL SAVINGS

- 26.9% Estimated Annual Cost Savings $48,115
- 40.9% Estimated Site Energy Savings 3,178,326 kBtu

PROJECTED GHG SAVINGS & EQUIVALENCIES

- 186 Metric tons of CO₂ (projected reduction)
- 219 Acres of U.S. forest
SOMA Case Study: Scope and Results

SAVINGS WITHIN 12 M AFTER PROJECT COMPLETION:

- 355,800 kWh (51%)
- 16,500 therms (70%)

PROJECTED TOTAL ANNUAL SAVINGS:

- $52K (70%)
- 165 tCO2 (56%)

SCOPE OF WORK

- Low-flow aerators and showerheads
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Carbon Reduction Projects (2019-2022)

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<th>Category</th>
<th>Projects</th>
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<tr>
<td>1. Completed Retrofits</td>
<td>Soma, Curran House</td>
</tr>
<tr>
<td>2. Under Construction</td>
<td>Antonia Manor, Maria Manor, Rosa Parks</td>
</tr>
<tr>
<td>3. Planning Stage</td>
<td>Klimm, Clementina, Pierce</td>
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Incentive Programs:
- Energy Watch
- LIWP
- BayREN
- MASH
- Go Solar
- ESA
- ESA CAM
- BAAQMD
Challenges, Barriers & Lessons Learned

- Staff capacity and turn-over issues
- Reserved incentives and cash flow
- Budget
- Vendor management
- Data collection
- Time
What’s next?

**Electrification**
- Heat Pumps
- Electric stoves

**Battery Storage**
- PV+ storage

**Greening Our City**
- Plants
- Bees
Magda Szymanska
Sustainability Program Manager
mszymanska@tndc.org

Mark Puchalski
Director of Facilities
mpuchalski@tndc.org

Thank You!

"THE EARTH IS WHAT WE ALL HAVE IN COMMON."
- Wendell Berry
Q & A

Submit Questions
www.slido.com event code #DOE
2021-2022 Better Buildings WEBINAR SERIES

REGISTER TODAY: betterbuildingssolutioncenter.energy.gov/bbws
Since 2015, Better Buildings and Better Plants partners have showcased how water management can reduce cost, energy, and environmental impact, saving more than 10 billion gallons. However, additional benefits can include more efficient operations and increased resiliency. Join partners from multiple sectors to learn how they’ve realized the many benefits of water reduction and hear about what’s next from the Water Savings Network.
Interested in Learning More?

Download the Additional Resources PDF from the chat box.

- Better Buildings Solution Center resources
- Speaker-chosen content
- Accessible now

Learn more at energy.gov/betterbuildings