



CASE STUDY

Deep Efficiency, Deep Affordability: One Hawaii Avenue NE, Washington, DC

One Hawaii Avenue NE is a four-story, new construction affordable apartment building coming to the Fort Totten neighborhood in Northeast Washington, D.C. in mid-2020. Wesley Housing, a nonprofit affordable housing developer, plans to develop, own, and operate the building. The development will replace an existing, 34-unit residential building on a triangular site nestled between Hawaii Avenue NE, Rock Creek Church Road NW, and Allison Street NE. For this project, Wesley partnered with Steven Winter Associates and Bonstra | Haresign Architects to explore the feasibility of achieving net-zero energy (NZE).

Q&A WITH KAMILAH MCAFFEE, WESLEY HOUSING DEVELOPMENT CORPORATION

How did the net-zero energy goal benefit the project?

Having NZE as a goal meant we all knew what we were aiming for from the start. NZE is something we will need to achieve in the not-so-distant future in DC, so we stepped up to the plate because we knew it could pay a lot of dividends. Our sustainability team's strategies and modeling showed a path toward NZE and proved to be very important early in the design process. Their analysis set a tone among the design team about how much we wanted to push the performance of the building.

Which technologies will enable One Hawaii Avenue NE to potentially achieve NZE?

Our NZE technology includes rooftop solar generation, all electric systems (with the likely exception of a central gas domestic hot water system), a variable refrigerant flow HVAC system, heat recovery, high-efficiency ventilation systems, and building envelope strategies including triple-pane windows, significant exterior insulation, and below-grade and under-slab insulation. Typically, many passive-house design features are part of achieving NZE.

—KEY STATS—

Square footage:
70,349 square feet

Unit count:
70 units

Unit size mix:
a mix of studios,
one-bedrooms,
two-bedrooms, and
three-bedrooms

Parking and amenities:
14 below-grade parking spaces, community room, indoor bicycle storage room, and shared outdoor gathering space

Anticipated budget:
\$34,500,000

Capital sources: first mortgage, Low-Income Housing Tax Credit, D.C. Housing Production Trust Fund, deferred developer fee

Targeted Site Energy Use Intensity (EUI):
currently projected to be 17.7 kBtu/ft²/year

We reduced energy loads, especially around domestic hot water, to make NZE possible. We achieved this by reducing run lengths as much as possible—making the entire system as compact as possible—to save money on materials and operation as a result of less hot water sitting in the pipes. Once the engineer fully designs the system, we will explore how to optimize it, but the goal is to have hot water fixtures as clustered as possible. The reason is that when hot water just sits in the walls, you're paying to heat that water. With a central system like the one we have planned for this project, you often have long lengths the water has to travel, and it's getting constantly heated throughout its journey.

Our team also weighed the carbon impact of materials in some cases. For example, the Rockwool cavity insulation we selected has a lower carbon footprint than other insulation strategies.

Which NZE scenarios did you explore, and how did you choose the one you did?

We explored modeling for five different scenarios, including two all-electric options. A few of the scenarios included gas options for major systems, including a gas-fired dedicated outdoor air system (DOAS) and domestic hot water. We looked at the overall site energy use intensity (EUI) for each scenario and the estimated annual operating costs, and we found that with this project, the lower upfront cost and operating costs of gas systems was hard to overcome, especially when developing an affordable housing rental project. Space constraints also drove our decision, as this is a tight site requiring a unique T-shaped layout and the units are compact. Therefore, having a central plant can be more efficient when unit space is limited. That being said, we're "future-proofing" it for the option to convert to all-electric in the future.

What challenges did you face, and what did you learn?

Broadly speaking, it's difficult to achieve NZE for a building of this height and density. Relative to the total building square footage, there is limited space for rooftop solar to serve the electrical load requirements of the property. In other words, there is higher energy use per square foot of solar panel for a project of this density and height than there would be for a single-family homes or smaller multifamily buildings. At the same time, pursuing NZE is worth it, because even if you fall short, you will be in a position to deliver an incredibly high-performing and resilient building, especially for long-term owners. Our biggest challenge so far

has been domestic hot water heating. Domestic hot water is a significant energy user, especially in a residential building serving larger families. While we could opt for a central electric hot water heater, the present cost is prohibitively high. Instead, we designed the project to accommodate conversion to a central electric hot water heater in the future when costs come down. We also had to juggle the desire for rooftop solar against local stormwater management mandates that effectively require a green roof on this building.

What are the anticipated benefits of going NZE for this project?

The big seller for us was projected operational savings, which help offset the upfront costs of NZE. We anticipate it will cost \$42,309 per year to operate this building. When compared to our typical baseline scenario, we anticipate saving \$9,169 in operating costs per year.

As a long-term owner and operator, we are in an ideal position to recoup the benefits of NZE. Our early estimate is that annual operational costs will be 10 to 12 percent lower. Lower operational costs help us carry a larger mortgage on the project and potentially reduce the amount of competitive affordable housing funds needed to build the project. This means the development will have a higher net operating income. We are deeply investing in the building envelope to "future-proof" it as much as possible. While it's crucial to choose high-performing mechanical systems now, they have a shorter lifespan than the building exterior, insulation, and windows.



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*VP for Real Estate
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“NZE gave us a goal to target throughout the design process. To be frank, NZE can feel scary, and it’s not easy in larger multifamily buildings. But we made some deliberate design decisions with the NZE goal in mind, and we relied on the results of our modeling.”

—PROJECT TEAM—

Wesley Housing
Developer

Steven Winter Associates
Sustainability Consultant

Bonstra | Haresign Architects
Architect

WCS Construction, LLC
Construction

Capitol Engineering Group, LLC
MEP Engineer

GRID Alternatives Mid-Atlantic
Solar