

Making Naturally Occurring Affordable Housing More Efficient: Outreach to Upgrade

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ABSTRACT

Naturally occurring affordable housing (NOAH), also referred to as the "forgotten stock," represents 80% of the available affordable housing stock nationally and is a critical part of our nation's housing that is available to families earning at or below 80% of the area median income. Because of the large number of these homes, addressing NOAH housing is critical to scaling deep retrofits in affordable housing. NOAH housing is non-rent restricted housing and is unsubsidized affordable housing, putting it highly at risk of remaining affordable in many markets. For this paper, we will use the term unsubsidized affordable housing to refer to all forms of naturally occurring affordable housing. Preserving this stock as affordable is critical to solving our housing shortage while making this stock more efficient and resilient is important to climate change and equity because of the large number of NOAH buildings. Despite the importance of unsubsidized affordable housing, it is considered hard to find- much of this housing is privately owned- and little attention has been given to upgrading and improving this stock. To engage and make the unsubsidized affordable stock more efficient and resilient a comprehensive approach to building upgrades that includes thoughtful outreach, deep technical assistance, contractor engagement, and access to financial resources is needed. This paper will discuss successful program models being implemented in Wisconsin by Elevate and Sustain Dane and in Delaware by New Ecology that is making unsubsidized affordable housing more efficient and resilient through energy and water efficiency and the addition of renewable energy.

Introduction

Naturally occurring affordable housing, also known as non-rent restricted housing or unsubsidized affordable housing, is characterized as small to medium multifamily rental or owner-occupied homes occupied by residents at or below 80% of the area median income. The unsubsidized affordable housing sector represents 30% of the total available housing stock and 88% of the available affordable housing stock nationally (Elevate 2022). These percentages are similar in Dane County, Wisconsin where 67% of the affordable housing stock in the county is unsubsidized. In Mid-Atlantic cities including Philadelphia, Pennsylvania, Baltimore, Maryland, and Wilmington, Delaware, this rate ranges from 78% to 91% (Elevate 2022). Issues that are common to this housing stock across geographies include the lack of capital investments resulting in deferred maintenance and poor housing quality and the need for preservation to reduce the loss of yet more affordable housing. But local markets can have stark differences. In Dane County, for example, a pressing need exists to preserve the affordability amid a rising real estate market and a lack of affordable housing. In the Wilmington neighborhood discussed in this paper, there is a need for housing stabilization and community revitalization after decades of disinvestment. Regardless of the local market circumstances, because of the large number of

homes in this sector, upgrading the unsubsidized affordable housing stock is an important strategy to meet Federal, state, and local climate goals.

Efficiency programs that include weatherization, electrification and clean energy upgrades, such as those launched in Dane County, WI and Wilmington, DE, are critical to improving this important sector of affordable housing as much of the sector has been left out of energy efficiency and clean energy programs. Both programs are public-private partnerships, versus a contract with a public agency or utility, as Elevate, Sustain Dane, and New Ecology – all 501(c)3 not for profit organizations – have contributed organizational resources to the programs. It is these types of partnerships that will facilitate implementation of innovative and flexible programs for hard-to-reach customers. This paper discusses the opportunities and challenges of the two programs and provides reflections and considerations for future efficiency program design.

Definition of Unsubsidized Affordable Housing

A single definition of unsubsidized affordable housing is not well established and can vary by location and program. The single defining attribute between programs is that, by definition, unsubsidized affordable housing is not supported by state tax credit programs or through Federal operating subsidies administered by HUD. Since they are not supported through state tax credits or other subsidies these homes are not rent-restricted and more readily identifiable by resident incomes levels, rents levied, or sales prices in the case of owner-occupied homes. Even though HUD defines low income as at or below 80% of area median income, some programmatic definitions for upper levels of incomes for residents living in unsubsidized affordable housing can range up to 120% of area medium income which includes what is sometimes referred to as workforce housing. Because of this variability by program, a working definition of income levels for residents living in unsubsidized housing should be established by geography and the current housing environment to be inclusive of the greatest number of units in need as well as to be responsive to the local housing market (i.e., gentrifications versus community stabilization).

Other attributes that define unsubsidized affordable housing include the number of units in a building, rental versus owner occupied, and rent charged based on unit size. A dataset developed by CoStar shows that the majority of unsubsidized affordable housing, defined by CoStar criteria according to housing stock quality, primarily consists of multifamily buildings (UII 2016). Yet in the Mid-Atlantic region including Philadelphia PA, Baltimore MD, and Wilmington DE, up to 65% of the unsubsidized affordable housing are single-family attached row homes. Therefore, unsubsidized affordable housing typologies should not be considered static from location to location and the definition of unsubsidized affordable housing should remain flexible based on the local housing typology and needs of the community as evidenced by completion of a landscape analysis of local housing stock and occupants.

For the programs discussed herein, unsubsidized affordable housing is considered affordable to residents who are at or below 80% of the area median income, which aligns with the HUD definition of low income, and typically have the resources to pay no more than 30% of their income on housing and utilities. Because income information is difficult to access, local fair market rents and home sale levels are used as a proxy for eligibility combined with a geographic review of building location using income levels from the American Community Survey (ACS) data tracked by census block (Elevate 2021). Therefore, unsubsidized affordable housing for the purposes of the Dane County WI program is occupied by renters, as opposed to owner occupied,

where the building size is two units or larger while for the Wilmington DE program, unsubsidized affordable housing includes single family homes that are renter or owner occupied. These working definitions were established through local landscape analyses that included a review of available housing data, interviews with key stakeholders, and building assessments.

Need

Elevate's analysis of ACS data shows the number of unsubsidized affordable housing to be over 19 million units nationally (Elevate 2022). The sheer number of units represents a significant contribution to the US affordable housing stock and should be the focus of future upgrade and clean energy investment as one strategy to preserve this stock as affordable. Upgrading and preserving this stock has implications for:

Housing resilience. It is critical that we find opportunities to preserve and invest in all our affordable housing stock even as we continue to build new units. Over 40% of rental properties need to be upgraded with the greatest number of units occupied by low-income renters (Divringi, E. et.al 2016). Future investment in these properties, including efficiency and clean energy upgrades, will help maintain quality affordable homes. Not only will upgrades save the residents money and make their homes more comfortable it will reduce operating costs for the owner and improve the quality of their asset.

Equity. Research shows that for working families, utility costs are amongst the highest monthly expenses (Cohen 2019). Reducing the energy burden allows low- and medium-income families to spend less money on utilities. Over 46% of renters pay more than 30% of their income towards housing and utilities with high percentage of black and brown renters having a greater cost burden as compared to white renters (JCHS 2021). Most of the unsubsidized affordable housing is in marginalized, environmentally burdened communities (Drehobl 2020). With a history of actively excluding communities of color and of placing environmentally detrimental activities in communities of color, these communities ought to have first access to the benefits of clean energy investments.

Climate change. Affordable housing consumes on average 39% more energy per square foot than market rate housing because it is generally older (Cohen 2019). Investing in energy efficient technologies will result in 10-20% in energy savings across proposed units. Energy efficiency measures and the addition of solar when appropriate, can result in 50%-75% energy savings (Elevate 2021a).

Access. A significant amount of the unsubsidized stock is owned and managed by small, privately owned businesses that have limited time and resources. They often need technical and, in some cases, coordination and financial support to complete the types of upgrades needed to make the unsubsidized affordable stock efficient and resilient.

Program Start-up

Design parameters for programs focused on improving unsubsidized affordable housing will vary by location because of differences in housing typologies, population demographics, and/or housing market. Therefore, a program design process that takes a community-asset based

approach is needed to ensure that the needs and concerns of the community are incorporated into the program. A community-asset based approach includes seeking the input and partnership of community-based organizations as part of the program design and delivery. To this end, program designs in Dane County WI and Wilmington DE look somewhat different. Figure 1 highlights the differences in stock types between the two locations that informed the respective final program designs. Of note is the large percentage of single-family homes in Wilmington DE as compared to Madison WI. As the largest city in Dane County, Madison was used as a proxy due to limitations in ACS data.

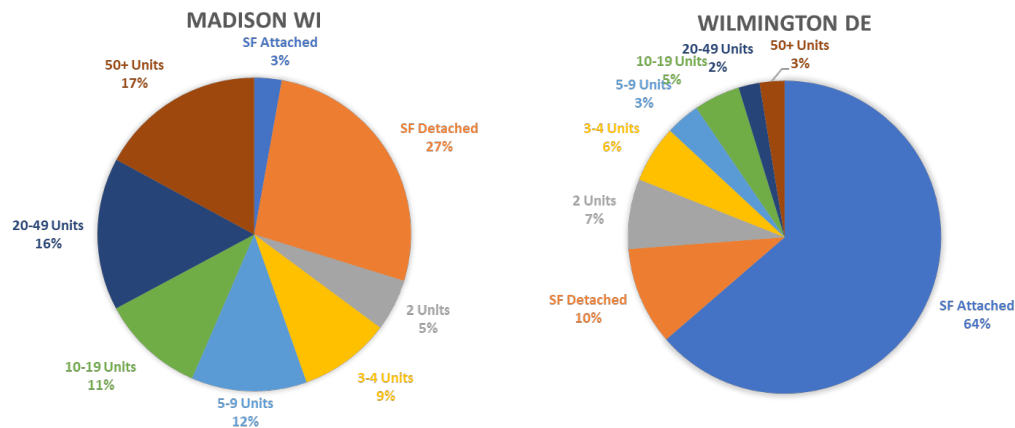


Figure 1 Summary of unsubsidized affordable housing stock by buildings size for Madison WI and Wilmington DE (Elevate 2022)

Wilmington DE Program

In Wilmington, community-based organizations, city government, affordable housing advocates and service providers have been working collaboratively to address the housing challenges in the Eastside neighborhood. These partners, and others, have been working on a multifaceted community revitalization plan for years to address the high poverty rates, high rates of rental housing, property abandonment, and crime. In terms of housing, such activities included the creation of a local land bank to facilitate control and disposition of problematic properties and support for significant rehabilitation and new construction of affordable and market rate housing. In this context, mission-driven organizations develop affordable housing to provide stability for both households and the surrounding neighborhood in many low- and moderate-income communities. Inherent to such efforts, where home sales prices and rents must be low, developers assemble resources outside of conventional sources. The discriminatory lack of historic investment and high poverty rates in many of these neighborhoods creates ineffective real estate markets where there are often few, if any, sales of comparable homes, which erases the critical benchmarks needed to secure financing. Therefore, developers must structure byzantine capital stacks, on a timeline necessarily longer than market rate or luxury projects, using city, state, federal, philanthropic, and private resources. In this context of severe constraint and complexity, homes are built at the lowest cost possible. From the energy performance perspective, this approach delivers projects built to the minimum requirements of the energy code, and where there is a natural gas infrastructure, with gas-fired heating and domestic hot water.

New Ecology had the advantage of joining this coalition of actors with the intention of expanding their capacity by leveraging additional funding and technical assistance to integrate

energy efficient, high-performance elements into their housing efforts. Thus the Climate Smart Homes (CSH) initiative was developed in collaboration with representative development opportunities presented by four non-profit or mission-based developers (Central Baptist Community Development Corporation, Cinnaire Solutions, Habitat for Humanity of New Castle County, and Woodlawn Trustees), as well as the guidance and context presented by aligned parties, such as the City of Wilmington's Department of Real Estate and Housing, the Wilmington Neighborhood Conservancy Land Bank, the Delaware State Housing Authority, and Cinnaire, the largest community development finance institution in the state. In this endeavor, New Ecology was fortunate to find a willing partner, the Energize Delaware Empowerment Grant, with aligned objectives and the ability to provide the necessary financial resources.

To better understand the conditions of existing properties slated for rehabilitation, as well as the development and construction approaches of local developers and contractors, New Ecology performed walk-throughs of nearly a dozen rowhomes. Some were long vacant while others were in a construction phase by local contractors. We also discussed typical design and development approaches and project costs with architects and developers. With this due diligence, we identified opportunities for building performance through incremental changes that would result in high-performance, all-electric, healthy homes- well beyond what is required by local building codes. Figure 2 highlights the planned upgrade measures for each home.



New Construction		Gut Rehabilitations
<ul style="list-style-type: none"> ENERGY STAR and ZERH certification Envelope: <ul style="list-style-type: none"> Continuous exterior wall insulation Above the deck & roof cavity insulation Above-code air tightness ENERGY STAR Windows $U = 0.25$; $SHGC = 0.23-0.36$ HVAC: <ul style="list-style-type: none"> ASHP: ≥ 18 SEER; 10.5 HSPF; prefer ducted Heat Pump Hot Water Heater: $UEF \geq 3.5$ Energy Recovery Ventilation Slab on grade (wherever possible) 	 	<ul style="list-style-type: none"> ENERGY STAR and ZERH protocols to extent practical Envelope: <ul style="list-style-type: none"> Continuous wall insulation Above the deck & roof cavity insulation Above-code air tightness ENERGY STAR Windows $U = 0.25$; $SHGC = 0.23-0.36$ HVAC: <ul style="list-style-type: none"> ASHP: ≥ 18 SEER; 10.5 HSPF; prefer ducted Heat Pump Hot Water Heater: $UEF \geq 3.5$ Energy Recovery Ventilation Foundation water proofing

Figure 2 Efficiency Upgrades for CSH Program (New Ecology 2022)

This market research and analysis resulted in a CSH design template that emphasized an extremely well insulated and air-sealed building envelope to both downsize the mechanical equipment and mitigate the possibility of higher operating expenses relative to code-built convention of fossil-fuel fired systems. These conditions and objectives also required high-efficiency ventilation through an ERV and a focus on moisture management, particularly in the damp basements of 100-year-old masonry homes, to prevent future indoor air quality and health issues.

Dane County, WI Program

Data analysis was completed to understand the volume and size of the unsubsidized affordable housing stock. ACS and National Housing Preservation Database data were used to disaggregate the unsubsidized affordable housing stock volume from market rate volume. Data

from the market characterization was used to engage key stakeholders in a series of interviews intended to ground truth the information, gather feedback on the need for programming to address the unsubsidized stock, and assess the level of engagement they, as stakeholders, could provide throughout program design and implementation. In Dane County alone, we conducted over 25 interviews including: municipal leaders representing local government, water authority, sewage authority, utility, and state agencies; building owners and building managers; and community-based organizations such as the Urban League and Latino Academy of Workforce Development (LAWD). Most interviewees were surprised by the large volume of unsubsidized affordable stock in the region while acknowledging the need to better engage with building owners. In general, there was support for programming but caution on the difficulties of reaching owners and the need for funding of building upgrades to persuade owners to complete efficiency upgrades.

The interviews yielded a smaller group of stakeholders that were interested in engaging in a nine-month program design process. The stakeholder advisory group included: Dane County, Cities of Madison, Sun Prairie, and Middleton, WPPI utility, Madison Gas & Electric, Focus on Energy, Metropolitan Sewage Authority, Madison Water Authority, LAWD, and two building owners. The group met every other month to respond to program design questions. The result of the work was the *Efficiency Navigator* program that provides one stop shop services to owners of small to medium size unsubsidized affordable housing. Key program attributes developed through the advisory group process included: defining building size eligibility for two or more units that is renter occupied; using a focused neighborhood approach to conduct outreach; obtaining a pool of funds to subsidize the upgrades; centering resident needs to reduce energy burden ; creating a public-private partnership; obtaining an owner commitment to keep housing affordable for at least three years; and taking a holistic approach that includes health and safety measures and renewables.

Three energy and water assessments were completed as part of the design process to better understand the building typologies and upgrades needed in the small and medium size multifamily stock. Results from the pilot assessments highlighted the opportunities for significant cost savings for both owners and residents. It also provided critical data for understanding the resources needed to complete the building upgrades. Table 1 provides a summary of the costs and efficiency conservation measures identified in the buildings included in the pilot assessments.

Table 1. Pilot assessment efficiency measures and costs

Bldg	Square feet	Units	Year built	Measures	Est. savings (kWh)	Est. savings (therms)	Cost to upgrade
1	12,734	8	1973	Boiler replacement, insulation, air sealing, lighting, water heater replacement, refrigerators	8,014	2,102	\$28,467
2	6,758	7	1964	HVAC replacement, insulation, lighting, water heater replacement, plug load	1,979	1,338	\$16,759
3	7,794	8	1964	Air conditioning replacement, insulation, plug load	6,249	777	\$14,974

Note: Average in-unit resident savings ranged from 20% to 25%

Program Implementation

The *Efficiency Navigator* program launched in 2021 with the goal of upgrading 100 units of unsubsidized housing to make it more efficient, affordable, and resilient while reducing operating costs for owners and energy cost burden for residents. Using a mix of philanthropic funds and funding through the City of Madison from the Wisconsin Public Service Commission Office of Energy Innovation Grant Program (EIGP) to pay for service delivery and building upgrades the total budget for the program is approximately \$400,000 with \$250,000 from the EIGP for building upgrades and the remaining funds for high touch program delivery.

In Delaware, the CSH initiative also started in 2021 with four development partners constructing 36 affordable homes. All funding came through the Energize Delaware suite of programs, with most of the funds from the Empowerment Grant, by a utility settlement. Additional funding for solar photovoltaic (PV) on four homes came from a research initiative of the Delaware Sustainable Energy Utility. With a total program budget of \$843,000, \$720,000 of which covers the upgrades, CSH provides grants and technical assistance to support unsubsidized affordable housing development that achieves high levels of energy performance, climate-readiness, and improved indoor air quality through all-electric homes for low- to moderate-income households.

CSH funds are being used to offset the incremental cost of higher efficiency materials, equipment, and approaches to deliver all-electric, healthy, climate-resilient homes and the required technical assistance costs, with a detailed focus on building design and diagnostic testing throughout construction for quality assurance. These homes deliver high-performance, stabilize and lower utility costs, and improve indoor air quality to provide occupants health, safety, and comfort benefits. This initiative does so with a focus on equity whereby the homes and households served would otherwise likely, at best, be last to benefit from the transition to this high-performance. The following describes the elements of these programs.

Eligibility

Existing unsubsidized rental housing of two or more units are eligible for the *Efficiency Navigator* program. Grant funding for the building retrofits is, however, limited to the pilot demonstration buildings on the Southwest side of the City of Madison shown in Table 1 and a new cohort of buildings located on the Northside of the City of Madison. Taking a neighborhood approach, the Northside of Madison was chosen based on the income and racial demographics of the area and the large number of rental units. In Dane County, WI income eligibility for the *Efficiency Navigator* program is defined at 80% of area median income which in Madison is \$55,950 for a 1-person household and \$79,900 for 4-person household (City of Madison 2021). As an implementation consideration it is not practical to collect income data from residents; therefore, the HUD fair market rents for Dane County coupled with a review of income demographics for the census block are used as proxies for building eligibility (Elevate 2021; City of Madison 2021). Income data from the ACS was mapped at the census block level and, via an interactive GIS map, is used by the team to check eligibility based on building location. Applicant rental levels were compared to the HUD fair market rents for Dane County at the time of application. A formal certification by the owner that they would keep the building rents at or below the HUD fair market rents for at least three years was an additional eligibility requirement. To date, no owner that has signed up for the program has questioned that requirement. The

eligibility standards of CSH were developed to meet the market needs and to fill a gap in existing energy program service delivery. CSH is available to serve affordable housing consisting of:

- New construction or gut-rehabilitations of existing buildings
- Fewer than 5 units
- Offer rents or home sales at prices affordable to households no greater than 80% of the AMI.

Building on the collaborative community revitalization efforts described above, the initiative has thus far focused on development in Wilmington's Eastside with plans to scale statewide in the next year. Of the initial 36 homes served through CSH, 24 of these homes will be sold as affordable homeownership units with the remainder providing affordable rentals.

Outreach

Outreach to owners was and is the most difficult yet critical part of the programs and was highlighted repeatedly during the pilot phase of the program as a potential program implementation barrier. A national review of utility programs completed by Elevate that serve the unsubsidized multifamily stock confirmed that outreach was not only the heaviest lift for those programs but also the limiting factor in program size (Elevate 2020). Reasons for this include:

- Unlike subsidized housing, a central repository of unsubsidized housing generally does not exist and when one does, such as a rental database hosted by a municipality, it is not publicly accessible.
- Associations for property owners, often used in gentrifying neighborhoods, don't always exist and when they do, they are difficult to access membership.
- Many building owners live outside of the municipality or state where their property is located so are hard to contact.
- Owners are small businesses with limited time and resources and can be difficult to connect and continue ongoing engagement to complete implementation.

To address these barriers, a three-step approach for outreach to building owners was deployed in the Northside neighborhood of Madison that included: coordination with a neighborhood-based local community organization, engagement with council members whose districts included the Northside neighborhood and use of personal connections with property owners, thereby building trust through intake processes and quality customer service. The CSH program worked directly with several developers as part of the coalition so identifying homes for potential upgrade was less time consuming and more straightforward. This difference highlights the differing approaches needed in a gentrifying neighborhood versus one that seeks to transition from disinvestment.

Operating Models

The *Efficiency Navigator* and the CSH programs address barriers to entry for efficiency programs in the unsubsidized affordable housing market such as: fragmented program management, limited property owner awareness to incentives programs, lack of energy use data,

lack of knowledge of cost-effective upgrades, financial roadblocks, and lack of communication about energy efficiency upgrades with residents. To address these barriers, a one stop shop model for owners was adopted as the operating structure for both programs with owners and developers being provided with a single point of contact that enabled access to a suite of services including:

- Individual attention for intake and alignment of owner needs with efficiency measures
- Efficiency assessment and roadmap to help understand efficiency potential
- Contractor coordination and upgrade implementation support
- Incentives and financing coordination
- Tenant engagement, as needed.

Because the CSH initiative is focused on new construction and gut rehabs it provides developers with an expanded suite of one stop shop assistance. Like *Efficiency Navigator's* “single point of contact” approach, CSH provides project developers and their design and construction team members with technical assistance from project conception through construction and occupancy. Coupled with an early-stage commitment of funding to offset the incremental construction costs of these homes, this approach is necessary to ensure all critical project development team members understood the project goals and incorporated the necessary elements and practices. For example, architects need to design appropriate, high-efficiency wall assemblies, oftentimes in challenging conditions like existing masonry structures, and provide clear guidance to contractors, who themselves may need support in the field to fulfill the design intent. Upon occupancy, the new renters or homebuyers are provided with educational materials and training that illustrate the unique features of these homes and the maintenance required.

Efficiency measures. A comprehensive efficiency assessment is completed for each property to identify opportunities and quantify savings. Its primary use, however, is as a communication tool to motivate owners to act. Efficiency measures included HVAC replacement, insulation, air sealing, lighting, water heater replacement, refrigerators, and, in some cases, air source heat pump systems.

Contracting. Implementation by a qualified pool of contractors is critical to achieving efficiency savings. Through the *Efficiency Navigator* program, owners have access to a pool of contractors managed by Elevate. Because the *Efficiency Navigator* program provides up to \$25,000 in grant funds for upgrades to the building, the owner, contractor, and Sustain Dane enter into a three-party agreement. The agreement allows access to the building, explicitly outlines the scope of work to be completed in the building by the contractor on behalf of the owner and creates a method of payment to the contractor from Sustain Dane. Upon completion of the work, Elevate visits the property and accepts the work allowing Sustain Dane to release funds directly to the contractor usually within two-weeks of completing the work.

A recently completed project in Madison, WI included adding dense-packed cellulose insulation to the exterior sidewalls from the interior. This 4-unit 1946 brick clad building had adequate attic insulation, yet residents complained of being cold in the winter. The existing wall insulation was one-inch rockwool insulation. Tenants immediately felt comfort improvements. Further, the building owner, who pays the space heating costs, is estimated to save 500 therms or over \$400 annually with a reduction of 3,153 kg/year of carbon savings. Job cost was just under \$7,000 and it took the crews one long day to finish. The residents pay their own electric costs

and upcoming improvements include lighting and refrigerator upgrades to reduce electric costs for the occupants.

Developers using the CSH resources select their own contractors to complete the construction. By deep and long-term engagement through the design process, the CSH requirements are reflected in the construction documents, which become part of the contractor's scope of work. At the start of construction, New Ecology provides a contractor coordination and kick-off meeting to review the CSH objectives, highlight aspects of the project that are unique or likely challenging to build, and discuss the implementation approach with the contractors. Throughout construction, New Ecology staff make regular and strategically timed visits to the project to monitor and document the project's progress and troubleshoot.

Incentives and financing. The *Efficiency Navigator* program is designed to leverage available incentives through the statewide energy efficiency program, Focus on Energy, as well as other grants and incentives such as the toilet upgrade rebates through the water utility and water softener tune-up through the sewage authority. Available incentives cover approximately 20% of the upgrades for energy measures requiring the remainder of the upgrade to be covered by other funds such as building reserves, grants, or loans. An integral role of the program is to braid multiple funding sources- up to 10 available sources for some buildings- to achieve the deepest retrofit possible at the lowest first cost to the owner.

Providing grant funding for the upgrades to the owners has increased the number of owners engaged in the program and has served as a catalyst for expanding the program by balancing grant funds with a higher percentage of building owner financial resources. However, even with significant funding assistance, owners still have not elected to move forward with some measures that require out of pocket contributions because of the need to preserve reserves for potential emergency repairs. We have also had positive conversations about interest in solar and heat-pumps, but those items, even with additional incentives, still often leave a funding gap in the range of \$10,000 to \$30,000. To this end, there is a need for support to building owners to identify the best funding mix- grants, loans, and incentives- for their situation. An ancillary finding from this work has been the need for a micro-loan product for efficiency and clean energy in buildings that fills the cost gap between grants and incentives and the final cost of the upgrade. Early research shows that building owners are receptive to a short term, non-recourse product with a low interest rate.

Funding for CSH comes from the Energize Delaware Empowerment Grant and a research fund of the Delaware Sustainable Energy Utility. As noted above, there are no other programs in the state that offer energy efficiency resources to support the type of projects CSH serves. The CSH grants are sized to cover the incremental cost of construction to achieve all-electric homes with utility expenses modeled to be no more than a conventional home, built to code, with natural gas for heating and domestic hot water.

Resident engagement. Working with owners who value resident engagement and communication is highly important for successful completion of building efficiency measures that require work in-unit. Prior to any work occurring in-unit, we assist the owner with sharing information with the residents about the contractor process and the intended benefit. We give the residents the opportunity to ask questions and ask for their support, working around their special considerations.

For example, one apartment building needed sidewall insulation in the exterior walls. Because the outside of the building has brick cladding, the contractor had to drill through the

walls from inside the apartment units to install the insulation. The project was estimated to take two full days to complete (and was completed on time). The owner was conscientious of coordinating workdays that limited interference with residents. One of the residents had several young children and asked for the contractor to wait until after the kids had left for school before starting work in their unit. The owner made it clear to residents that furniture would need to be moved, and the intensive nature of the work could make it loud or disruptive. Even with the disruptions, all the residents were receptive to the weatherization measures to improve comfort and energy bills.

Lastly, when making energy-saving improvements to a building it is important to take a whole building approach with health and safety considerations ensuring that any change doesn't create future problems for the residents. Each building is unique and when insulating or reducing air infiltration, it is important to design an energy conservation strategy that includes managing and or mitigating existing moisture related concerns. For example, many unsubsidized units lack ventilation fans. The *Efficiency Navigator* program includes addressing ventilation along with the improved energy efficiency measures to ensure the health of home and residents.

Program Delivery Costs

Effective program delivery is the linchpin in a successful one stop shop model particularly for the hard-to-reach owners in the unsubsidized affordable housing sector. Program delivery includes:

- Owner outreach and ongoing engagement
- Efficiency assessments
- Architectural and MEP design support for new construction and gut rehabs
- Contractor support, management, and diagnostic testing
- Owner and / or resident engagement
- General program administration.

While critical to program success, program delivery, which is in addition to the cost of the retrofit, is hard to consistently fund. Estimated costs for program delivery per unit range from \$2,500 to \$4,000 per unit based on the depth of the retrofit. For example, electrification retrofits require higher levels of technical assistance such as design support and building modeling and are, therefore, at the upper end of the cost range. Despite the program delivery costs, retrofitting existing units can be more cost effective as compared to new construction. Early analysis of upgrade costs is shown in Table 2.

Table 2. Retrofit costs per unit

Retrofit Activity	Dane County estimated per unit cost	Wilmington estimated per unit cost
Energy and water efficiency	\$2,500 to \$5,000	\$6,500 to \$9,500
Electrification	\$10,000 to \$15,000	\$5,500 to \$7,500
Rooftop Solar	\$7,500 to \$10,000	\$12,000
Moisture Management	Not available	\$4,000
TOTAL Estimated per Unit without rooftop solar	\$12,500 to \$20,000	\$16,000 to \$21,000

TOTAL Estimate Per unit with rooftop solar	\$20,000 to \$30,000	\$28,000 to \$33,000
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Considering the cost for new construction can range from \$150,000 to \$400,000 for a 1,000 square foot unit, upgrade programs such as the *Efficiency Navigator* and CSH program are cost conscious and should be part of all housing strategies at the state and local levels (Hoyt and Schuetz 2020).

Program Design Recommendations

Outreach and owner engagement

Finding owners was and continues to be one of the most difficult aspects of the *Efficiency Navigator* program. Access to a rental database, available in some municipalities, could serve as a targeting and outreach strategy for the program. Additionally, connecting with owners at defined points of entry such as acquisition or refinance by coordinating with a local financial institution could reduce the likelihood that owners will drop out of the program before the building upgrade is even started and/or completed. However, the availability of grant funds and technical assistance have been the greatest drivers of owner participation. Similarly, the CSH program in Wilmington also saw the need for alignment with financial and government agencies funding these projects as well as the need for ample program funding to make commitments to projects on a rolling basis with the ability to withstand delays in project developments.

Preservation

Programs focused on unsubsidized affordable housing need to include preservation covenants that align with the needs of the community. Unsubsidized affordable housing does not include the preservation requirements of typical regulated and subsidized housing programs. These programs have high standards of tenant protections and anti-displacement strategies embedded into the financing. Hence, unsubsidized buildings remain vulnerable in gentrifying areas to investors interested in upgrades and raising rents to increase operating cash flow. Several efficiency programs that include unsubsidized affordable housing include rental agreements that require owners to retain affordability for a period to access incentives. Oregon's OR-MEP program managed by the Oregon Housing and Community Services, the state housing financing agency, is one such program. OHCS requires a 10-year preservation requirement for all buildings that access funding through OR-MEP (OHCS 2019). Similarly, the low-income weatherization program in California has comparable affordable requirements. Buildings that come through the *Efficiency Navigator's* Northside program commit to preserving rents in good faith for three years with a community benefit agreement because the program offers incentives in the form of grants reinforcing the need for flexible grant money for efficiency and clean energy programs focused on the unsubsidized housing stock. The CSH program also had a commitment to affordability for 5-years after initial occupancy. In the Wilmington market, however, there is tension with long-term affordability in perpetuity and stimulating a functional real estate market. Currently, there is a considerable appraisal gap, and one of the Eastside Coalition's objectives is to spur higher property sales prices so projects are less reliant on grants to fill these development gaps.

Financing and Funding

Current funding for the *Efficiency Navigator* in Dane County, WI and the Wilmington, DE programs were catalyzed by philanthropy and leverage public sources of funding. However, instead of placing funds in public programs, establishing a public-private partnership to administer the funds provides the flexibility needed to deliver the programs to unsubsidized owners and renters as well as attract alternative forms of funds in the form of grants or program related investments. It is worth noting that both programs discussed herein are essentially a public-private partnership, versus a contract with a public agency, as Elevate, Sustain Dane, and New Ecology – all 501(c)3 not for profit organizations – have contributed organizational resources to the programs.

Financing continues to be a needed component of the overall program, but it is neither the driver of program uptake by owners nor is it sufficient. Feedback from owners shows that a financial product, not currently available in the market, that would not place a lien on the building would be attractive and could support further uptake of efficiency and clean energy measures. Additionally, long term funding of programs must also cover direct incentives for building upgrades and program delivery costs. From a more strategic perspective, permanent funding solutions need to match the breadth and scope of the need for affordable housing upgrades *and* preservation *and* climate change solutions. Dedicated programmatic funds, similar to block grant funding, that is administered through public-private partnerships could provide one possible solution to these challenges.

Building Decarbonization

Building decarbonization is a significant opportunity for many buildings in these programs that should be included in building upgrades whenever possible. Overall, decarbonizing the unsubsidized stock represents a unique opportunity to meet local climate goals considering the large number of units and buildings. Over 50% of buildings in the Northside initiative were without cooling and many of these presented opportunities for installing more efficient cold climate heat pump technology because the building existing HVAC equipment was at end of life, the building had older inefficient electric resistance heat, or the owner had a specific interest in the upgrade because it added cooling. Program considerations include completing insulation and air sealing ahead of upgrading the HVAC systems, not increasing resident electric bills and providing education about heat pump technology.

All buildings in CSH program will be all-electric. These homes will be significantly more energy efficient and result in fewer carbon emissions than a comparable home built to the energy code requirements with gas-fired equipment. However, the relatively less expensive cost per Btu of heating with gas vs. electricity results in comparable annual utility costs. New Ecology estimates the annual utility cost of both the average CSH-home and the code-built, gas-fired home to be \$1,500. With the addition of an average-sized solar PV system, which is the CSH-intent, this annual utility bill would decrease roughly \$530, or 30% of the annual utility cost. Obviously, the conventional home would not provide solar PV.

New Ecology estimates that the average CSH-supported home will have an energy use intensity (EUI) that is 60% less than the EUI of a home built with natural gas and to code minimums and that the pre-solar EUI for the all-electric home to be 25 kBtu / square foot / year. The EUI for the code-built home with natural gas equipment would be 62. Similarly, we project the carbon emissions to be lower in Empowerment Grant supported homes. We estimate

emissions to be 3,513 kg of CO₂ per year, pre-solar as compared to 5,803 kg of CO₂ for the home built with natural gas and to code minimums. With the addition of solar, the CSH estimates decrease approximately 30%, or another 1,237 kg of CO₂ per year, to emit only 39% of the CO₂ of the base case.

Contractor Diversity

Because of the large volume of unsubsidized affordable buildings, prioritizing diverse contractors to complete the in-building work provides an opportunity for small business growth in the trades. As the programs are being implemented, identifying and engaging contractors to complete the upgrades is difficult because of competing projects and general upswing in construction. Identifying minority- and women-owned business enterprise (MWBE) contractors is even more difficult due to lack of diversity in the trades in Dane County. It is important to the program to engage MWBE contractors as these small businesses often face numerous barriers to growing their business across the trades. These barriers are grounded in the long history of institutional racism, sexism, and other forms of oppression and result in a deep lack of trust and many hurdles to access information, business support, training, networks, and financing. As a result, the proportion of participating MWBE contractors working in efficiency and other publicly sponsored programs has been lower compared to non-MWBE contractors. For MWBEs to grow their businesses within the clean energy sector, intentional investment in MWBE contractors and the communities they serve is key.

To this end, Elevate and Sustain Dane team in close partnership with the Latino Academy of Workforce Development have established a cohort-based “Contractor Accelerator” program to provide existing MWBE contractors with business strategy and technical support to complete projects in the energy sector. However, the Contractor Accelerator can only address a small portion of the need for a well-trained workforce particularly for HVAC upgrades such as electrification. Modeling completed by NREL predicts the energy efficiency market shows 3-4% annual growth through 2025 yet there is difficulty hiring because of a lack of technical skills and industry knowledge (Truitt, et.al. 2020). If we are going to address the housing problem, particularly in the unsubsidized affordable sector, we will need to couple funding with contractor and work training.

Wealth Building

Upgrading unsubsidized affordable housing provides unique opportunities for home ownership and generational wealth building for Black and Brown families. Working with small businesses provides opportunities to assist owners to grow and evolve their businesses that could build generational wealth for families and, by extension, communities. As part of this program, we continue to explore strategies and models for Black and Brown building ownership. Early modeling indicates that ownership opportunities for Black and Brown families of small multi-unit buildings could provide needed living space for families and a rental income for the building owners. Similarly, providing access to Black and Brown contractors to clean energy projects provides those small businesses with the option to expand the number of projects, and therefore crews, they are engaging.

Conclusion

This paper outlines two program models seeking to make unsubsidized affordable housing more efficient and resilient, within a climate and equity framework, that advances affordable housing preservation, workforce development, decarbonization, and wealth building. This market sector differs in critical ways from affordable housing that is subsidized and regulated by state and federal housing programs. For these reasons, experience thus far suggests that while some of the strategies that have been effective in the subsidized and regulated market are transferable, such as the use of comprehensive one stop shop technical assistance, new strategies are needed. For example, new outreach methods and data sources are required to identify and engage with property owners. A different mix and deployment of financial incentives, without the required capital planning and regulatory oversight performed in the subsidized and regulated market, may be appropriate given the extremely tight margins of unsubsidized affordable housing operations. This need may be especially acute to mitigate speculative investment and overleveraging of properties, which would exacerbate the pressures on property owners and renters in gentrifying markets. Furthermore, from a beneficial electrification perspective, and considering that all-electric buildings may be more costly to operate than buildings burning natural gas in many areas of the country, such initiatives suggest a need to approach this market in a more comprehensive manner rather than from the historic energy efficiency program mindset.

Indeed, the scale of the need invites new means and methods of intervention to address our societal and climate challenges. The Federal government, perhaps, may be the most capable entity to harness and drive the required investment, but as described above, the diversity and complexities of local markets shows the need for close partnership with state and local government agencies. The entwined issues at play here – from housing to workforce to climate – suggests that any such effort among aligned parties must be multifaceted to comprehensively address the breadth of the challenge rather than “housing” or “energy” programs that are too limited in their conception of legitimate “housing” or “energy” expenses. The initiatives described here, and hopefully many others, will help our industry to evolve new ways that facilitate such braided investment in the built environment to advance energy, climate, and equity objectives.

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