Braiding utility, state, and federal funding with comprehensive energy efficiency projects to drive carbon reduction goals in low-income multifamily housing.

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ABSTRACT

Low-income multifamily properties face a pressing challenge in reducing their carbon footprint and energy consumption due to limited resources and financial constraints. Adoption of carbon reduction solutions within this segment is possible when braiding utility incentives with state and federal funding and addressing comprehensive, whole-building energy efficiency projects.

Concord Meadows, a 90-unit low-income property located in Connecticut, is a prime example of leveraging $1.7 million of funding with technical assistance and comprehensive energy solutions to achieve carbon reduction goals. Through a whole-building lens, the project incorporated nine energy efficiency measures, including the installation of ductless air source heat pumps with integrated controls in all the units. Combining these measures allowed Concord Meadows to achieve dual benefits of optimizing energy savings while capitalizing on financial incentives through a unique partnership with the local utility, state, and federal agencies. With the energy savings generated, the residents are expected to save an estimated 2,000 kWh or $374 per unit, annually.

Introduction

Multifamily buildings comprised of five or more units face a challenge in reducing their carbon footprint related to energy use emissions, with income-eligible qualified properties disproportionally difficult to address. This challenge grows in tandem with sustainable multifamily housing needs, gaining traction in states adopting rigorous environmental policies, building codes, and new green loan requirements at the same time new federal and state funding streams are making headlines. As such, there is a dire need to address building decarbonization to meet these new objectives, keeping in mind equity, affordability, and tenant wellbeing. One way to address these metrics is to implement air source heat pumps within dwelling units and common areas of multifamily properties, relying on electrification as a means to decarbonize the building stock. With the state's policy backing fuel switching, it is now that much easier to consider this option across buildings heated with oil, propane, electric resistance, and even in some cases, natural gas. This paper will further explain the challenges to decarbonize and explore viable solutions in Connecticut that may be implemented elsewhere when possible, calling out a specific affordable housing project as a success story.

The opportunity to decarbonize is significant where approximately 18 percent of Connecticut's population resides in multifamily dwelling units, within both affordable and market rate segments (Bolger, A., Giordano, K., and Smith, M., 2023). Dwelling units are defined as apartments or condominiums and come in all shapes and sizes from low to high rise structures, to complexes made up of several buildings. According to the Department of Energy, the first step to decarbonization should be energy efficiency, as it is an easy and cost-effective

strategy to reduce building emissions and energy use and will be the focus of this paper moving forward. Through a whole-building lens, energy efficiency efforts can be addressed within the individual dwelling units, common areas, and exterior areas of the building(s), improving the thermal envelope of the entire building while optimizing the heating, cooling, and ventilation systems. This way, the building's energy usage is improved as a whole and furthermore, the individual residents and building owners can take advantage of these benefits regardless of whether the property is individually metered, or master metered for centralized systems.

Leveraging technical assistance and financial resources from local energy efficiency programs, as well as state and federal funding streams, presents viable opportunities in taking steps to address possible barriers to decarbonize. Although the availability of funding across these streams may seem abundant due to the recent federal program activity, it may still be challenging to access these programs without proper resources in place. This is precisely where project timing and stakeholder engagement make a difference. It is imperative that project teams – which may include the property ownership and management, contractor(s), architect, consultant(s), or financing partner(s) – establish a line of communication with key stakeholders as soon as a need for energy improvements is identified. The earlier these conversations begin, the potential for available resources may be greater, minimizing barriers to implement and realizing savings that much sooner.

Building Decarbonization Challenges and Solutions

The low-income multifamily segment faces several barriers to implementing energy-saving strategies including outdated housing stock, high energy burdens and behaviors of the contributing stakeholders. Connecticut has the sixth oldest housing stock in the United States, with original building design and outdated equipment going back decades, with an average year built of 1966 compared to the national average of 1980 (Bolger, A., Giordano, K., and Smith, M., 2023). Figure 1 below is a map of the State of Connecticut and shows the concentration of housing units built before 1960 by zip code, or furthermore, where the greatest opportunities for energy efficiency improvements may be located, if not previously addressed. Interestingly, some of the major cities and sizable towns identified by this map also follow the pattern of fossil fuel reliance on oil, propane, or natural gas for space and domestic hot water heating, making these areas worthwhile to address first.

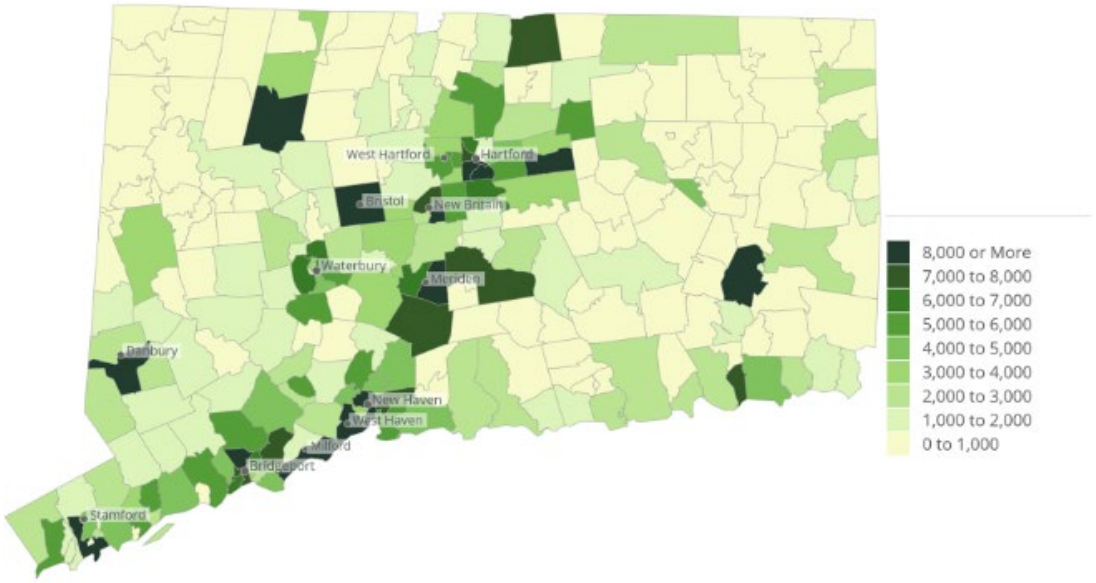

Figure 1 Total Residential Units Built Before 1960 by Zip Code
Source: *2023 Housing Needs Assessment*

Additionally, a 2020 study conducted by the American Council for an Energy-Efficient Economy (ACEEE) found that low-income multifamily, Hispanic, and black households face disproportionately higher energy burdens than any other household segment. In low-income multifamily households, energy costs can account for over 6-10 percent of a resident's income, compared to the national average of 3.1 percent. (Ayala, R., Drehobl, A., & Ross, L., 2020). Figure 2 below defines the results of the ACEEE study, outlining the energy burden across household segments.

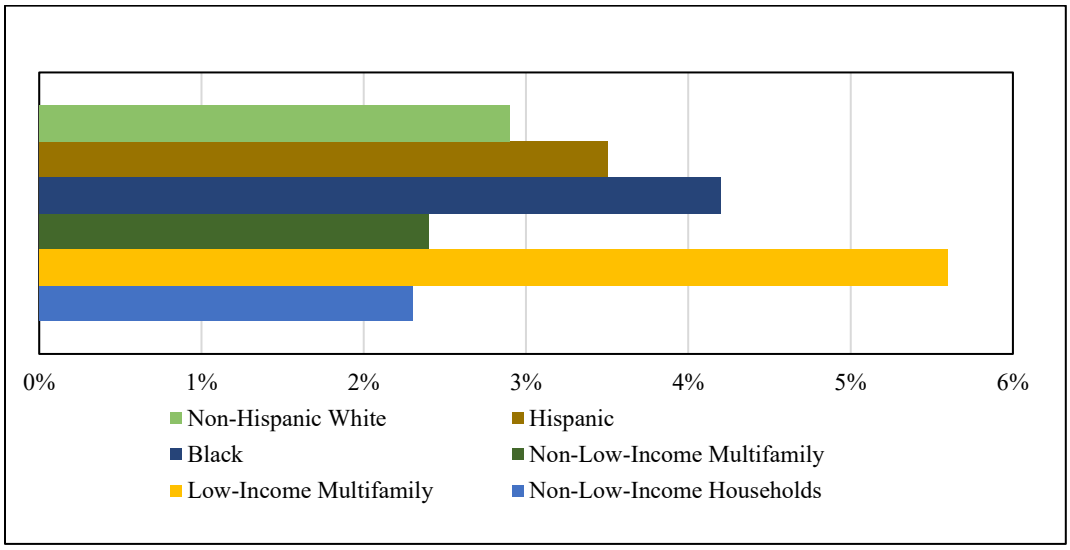

Figure 2. Energy Burden by Residential Households
Source: Ayala, R., Drehobl, A., & Ross, L., 2020

These results present a significant issue as the disproportionately high energy burden for low-income households further exacerbates financial hardship, perpetuating cycles of poverty and contributes to energy insecurity, increasing the risk of utility disconnections or evictions. Additionally, high energy costs can force tenants to make trade-offs between heating or cooling their homes and other necessities. Living in homes with inadequate heating or cooling may have adverse effects on health, particularly for vulnerable populations. In other words, high energy costs can impede economic mobility and upward mobility for low-income individuals and families. The low-income multifamily segment also faces barriers with the behaviors of property managers, owners, and even tenants, making it difficult to find a single solution that fits all. This challenging dynamic between property owners owning the building and many low-income tenants paying their own utility bills can create a disincentive for property owners to fund energy efficiency measures. While tenants bear the direct cost of energy usage, property owners may not perceive energy efficiency investments as financially beneficial, especially if the benefits primarily accrue to the tenants in the form of reduced utility bills.

Furthermore, implementing energy efficiency measures may inadvertently increase the energy burden on tenants. For example, if property owners pass on the costs of energy efficiency upgrades, such as energy efficient refrigerators or improvements to the building's thermal envelope, to tenants through rent increases or surcharges, this can further intensify the financial strain on low-income households. While these upgrades can lead to long-term energy savings and environmental benefits, the immediate impact may be felt by tenants in the form of higher rental costs and lead to unintended consequences for both parties, such as vacancies. For low-income households already struggling to make ends meet, any small increase in living expenses can significantly strain their finances, leaving tenants with less disposable income for other essential needs. Consequently, low-income tenants may be less inclined to take advantage of local energy efficiency programs aimed at promoting energy efficiency measures, even if they stand to benefit from lower utility bills in the long run. The alignment of incentives between property owners and tenants is crucial for the successful implementation of energy efficiency initiatives in low-income multifamily properties (National Action Plan for Energy Efficiency, 2006).

A significant barrier explored across the low-income community in implementing decarbonization measures, specifically energy efficiency projects, is funding. All building owners face some challenges when seeking funding for energy efficiency initiatives, but low-income properties are especially impacted. These properties often have constrained budgets, making it difficult to allocate funds towards energy efficiency upgrades and may lack the capital necessary for these improvements, which often require significant upfront investment. A market rate property such as condominiums, on the other hand, may have built up reserves from the continuous homeowner association fees, making investments easier. Addressing funding challenges requires a combination of targeted financing solutions, supportive policies, stakeholder engagement and education efforts to help low-income multifamily properties overcome barriers and implement energy efficiency initiatives effectively.

The electrification efforts underway in Connecticut, through the established energy efficiency programs, seek to provide a solution that supports building decarbonization by reducing greenhouse gas emissions from the multifamily sector. Now and over the next three-year plan, program administrators are continuously identifying more energy-efficient, load-flexible electric solutions for the multifamily sector, exploring new and emerging technologies and coupling various measures together. The focus of building decarbonization is on

electrification solutions, whether in the built environment or switching new construction programs to all-electric packaged. By switching to energy efficient electric heating, cooling, and appliances, low-income multifamily buildings can significantly reduce their carbon footprint, contributing to carbon reduction goals and improving air quality. Additionally, electrification enhances the resilience of low-income multifamily buildings by reducing dependance on finite resources. Electric heating systems can also be integrated with renewable energy sources, further enhancing resiliency and sustainability.

The recent adoption of fuel switching leads to fuel optimization efforts in the state to allow fuel switching between fossil fuels (oil, propane, natural gas) and electric resistance heating systems. Connecticut has over 1.39 million occupied housing units. More than 1.1 million of those currently utilize natural gas (505,000), fuel oil (544,000), or liquid propane (68,000) for space heating. Many of the homes using electric heating (237,000) currently rely on electric resistance heating, such as baseboards (Connecticut Energy Efficiency and Demand Management Plan). Through extensive industry-wide studies as well as internal studies and evaluations, we learn that electric resistance is not only inefficient but the costs to run this type of space heating, or even domestic hot water heating, can greatly influence residents' ability to pay for heat and, in some cases, can be another attributing factor to vacancies, as mentioned earlier. The owners and property managers of multifamily buildings have the potential to reduce the buildings' environmental impact while improving property value, increasing tenant comfort, and in some cases, reduce operating costs of the buildings all due to energy efficiency upgrades.

Braiding Programs and Funding

To advance the State of Connecticut's carbon reduction goals and develop sustainable programs for new and existing multifamily developments, several stakeholders have partnered to develop the possibility to stack funding sources. Within the multifamily segment, Conservation and Load Management programs, also referred to as energy efficiency programs, are administered by the Sponsors of Energize Connecticut^{SM}, Eversource and Avangrid, Inc. subsidiaries United Illuminating, Southern Connecticut Gas and Connecticut. These Companies work together to cross-promote the energy efficiency, electric mobility, solar, and battery storage programs and accelerate participation by the low-income multifamily community. The Sponsors continue to secure additional funding sources specifically for the energy efficiency programs, coordinating activity with federal funding, including the Weatherization Assistance Program (WAP) through cost sharing, integration of the Inflation Reduction Act (IRA) rebates, and other available tax incentives. The common goal is to bring together the available resources and present them in a manner that is accessible to customers. Furthermore, these stakeholders work towards a shared goal with the Department of Housing, Connecticut Housing and Finance Authority, and local green banks, to name a few, to identify the hardest to reach affordable housing communities and viable projects needing financial help.

Utility Programs

Operating with a focus on equity, decarbonization, and energy affordability, energy efficiency programs are bringing sustainable savings to the residential and commercial sectors in Connecticut. Energize Connecticut is an initiative of the Connecticut Energy Efficiency Fund, the Connecticut Green Bank, the State, and the local electric and gas utilities. The initiative has funding support from a charge on customer's electric and natural gas bills. Eversource, a Sponsor

of Energize Connecticut, is helping to bridge the gap between attaining energy savings in a sustainable manner, and reducing buildings' carbon equitably and affordably through energy efficiency programs like the Multifamily Initiative which provides customized solutions for multifamily properties in the state. Any existing multifamily property with five or more dwelling units is eligible to participate in the program.

Through the Multifamily Initiative, Connecticut multifamily properties have access to assistance with energy efficiency upgrade projects, comprehensive property assessments of a building's energy-saving opportunities, as well as incentives and financing mechanisms for energy-saving upgrades. It includes solutions through two segments: Market Rate (MR) and Income Eligible (IE), with income eligible serving the largest number of customers as depicted by Figure 3 below. The below graph represents a three-year trend of program participation derived directly from the program's internal tracking and reporting system, where the income-eligible segment sees more participation and is also therefore funded at higher rates than the market rate segment. The ability to accurately track participation is made possible by the utilities' access to customer accounts and building out multi-year projects on those accounts.

A multifamily property will be evaluated as income eligible if two-thirds of its residents meet the limited-income criteria of gross annual income at or below 60 percent of the state median income (SMI), customers who reside within Community Reinvestment Act areas and their eligible census tracts; or customers who live in residential dwellings or facilities that provide beneficial services to residents. These include disabled veterans' groups, group homes, halfway homes, not-for-profit agencies who offer housing to disadvantaged residents, residential treatment facilities, and shelters. If a property does not meet the SMI requirement, it will simply revert into the market rate segment and receive the same assistance with lower financial incentives.

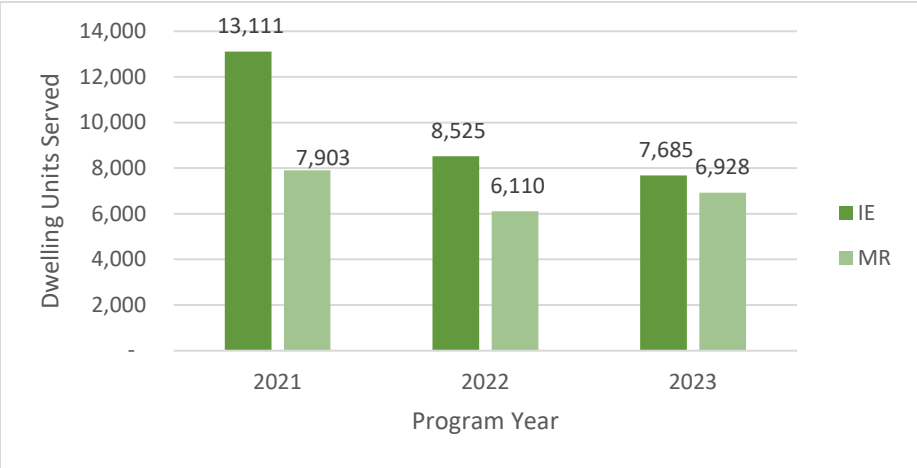

Figure 3. Program Participation by Segment

Comprehensive energy efficiency projects in multifamily buildings offer a range of benefits for both building owners and occupants, encompassing economic and environmental sustainability advantages. These projects aim to implement a series of upgrades and improvements to a building's systems and thermal envelope with the goal of maximizing the building's energy savings. This typically includes a combination of measures such as lighting, weatherization, heating, ventilation, air conditioning (HVAC) systems, domestic hot water

(DHW) heating, and optimized building controls. Although implementing a single energy efficiency measure such as new boiler equipment can yield positive savings, the full benefits of the investment may not be realized if, for instance, there are leaks in the thermal envelope of the building.

As mentioned earlier, the Multifamily Initiative can provide comprehensive energy efficiency upgrades by looking at the property holistically throughout the building's dwelling units, common areas, and exterior spaces. This encourages customers to pursue comprehensive projects that deliver lasting benefits. This program also provides a comprehensive incentive for projects that install two or more measures with different energy-saving end uses (i.e., heating, cooling, refrigeration, domestic hot water, and lighting). In addition to this requirement, to be eligible for a comprehensive incentive, no one measure may exceed 85 percent of the overall MMBtu projected savings. This underscores the importance of each measure working together synergistically to maximize energy savings. Typically, the comprehensive incentives provided significantly impacts the total project financials and influences the need for additional funding to meet a project's cost-effectiveness. By incentivizing comprehensive projects, the program helps building owners and occupants realize substantial energy savings while promoting decarbonization, improving the overall quality of multifamily buildings.

State and Federal Programs

The Connecticut Housing and Finance Authority (CHFA) and Department of Housing (DOH) have engaged with the Energize CT Sponsors directly for several years now to collaborate on program deliverables for the Multifamily Initiative. As reported by the agency, CHFA's policy includes:

1) A requirement to implement energy efficiency measures in all financed multifamily developments.
2) Encourages the use of the most cost-effective energy efficiency measures.
3) Supports the use of renewables and alternative energy.

This framework is aligned with the state's policy for renewable energy use and energy conservation in buildings, and directly ties to the goals of the utility-administered energy saving programs. The CHFA and local utilities work to ensure access to resources by cross promoting the availability of funds and assistance, and directly connecting customers with applicable agencies. A vital part of a customer's application seeking CHFA funding involves an initial discussion with the utility company administering the program. The utility and CHFA are then essentially looped in on funding awards, incentive estimates, and additional resources needed to move projects forward.

Another vital partner supporting energy related projects is the Department of Housing (DOH). With funding from the U.S. Department of Housing and Urban Development, the DOH oversees the Community Development Block Grants (CDBG) Small Cities program. These grants are awarded to towns with the goal of improving the lives of residents in Connecticut, by providing direct funding for upgrades to low- and moderate-income residents. In the case of Concord Meadows, as will be discussed shortly, the CDBG provided over a million dollars to help the property pursue the much-needed upgrades. Prior to submitting an application for this grant, the project team first initiated participation in the Multifamily Initiative, receiving an estimated incentive in the form of a Letter of Participation, a requirement made possible by this stakeholder engagement. This partnership works well across a number of large, multi-year

developments on both the retrofit and new construction side and is one unique leverage Connecticut customers have when it comes to braiding funding.

To reach the state's legislative MMBtu goals, several programs seek to weave funding from the federal Inflation Reduction Act and the U.S. Department of Energy's Weatherization Assistance Program with the local utility-administered energy efficiency programs. Whilst the WAP program for multifamily is a federally funded (Bipartisan Infrastructure Law – BIL) program designed to serve about 800 units per year for three years, the Multifamily Initiative serves an average of 9,700 dwelling units per year, as referenced in Figure 3 earlier in the paper. The funding for multifamily WAP flows from the federal Department of Energy (DOE) to Connecticut's Department of Energy & Environmental Protection (DEEP) to a service provider selected to implement the projects statewide. Projects eligible for WAP will simultaneously qualify for utility incentives through the Multifamily Initiative, and potentially other federally and state funded assistance programs as alluded to earlier in the paper. A collaboration between stakeholders offering these services and funding allow for a well-rounded braiding of incentives, financing, and assistance. A unique link in this partnership is having direct guidance from state agencies, such as DEEP, involved in the implementation and reporting of these projects, as they relate back to the state carbon reduction goals.

Although we softly introduced the newly founded resources, WAP and IRA rebate programs, it is important to note the offerings are not yet readily available for Connecticut customers. As these programs continue to remain under development, stakeholders will continue to collaborate on streamlining the various programs into the energy saving programs already in place, evolving collectively.

Building Relationships to Drive Carbon Reductions

Community Partnership Initiative

The Community Partnership Initiative is another resource administered by the Sponsors of Energize Connecticut. This program aims to leverage the knowledge and experience of local community groups, nonprofit organizations, and municipalities to raise awareness and encourage participation of energy efficiency upgrades to customers within a distressed municipality or Environmental Justice Census (EJC) Block Groups, and residents with limited English proficiency. Environmental Justice Communities are defined by the Department of Economic and Community Development (DECD) in Connecticut as distressed municipalities as well as census block groups that are not in distressed municipalities in which 30 percent or more of the population lives below 200 percent of the federal poverty level (DEEP, 2024). The figure 4 below depicts the state of Connecticut, and highlights the communities discussed. This is a direct tie to the energy savings programs, as multifamily properties located within the EJCs can take advantage of on enhanced incentive towards electricity (additional $0.10/kWh adder) and natural gas (additional $2.00/CCF adder) saving projects.

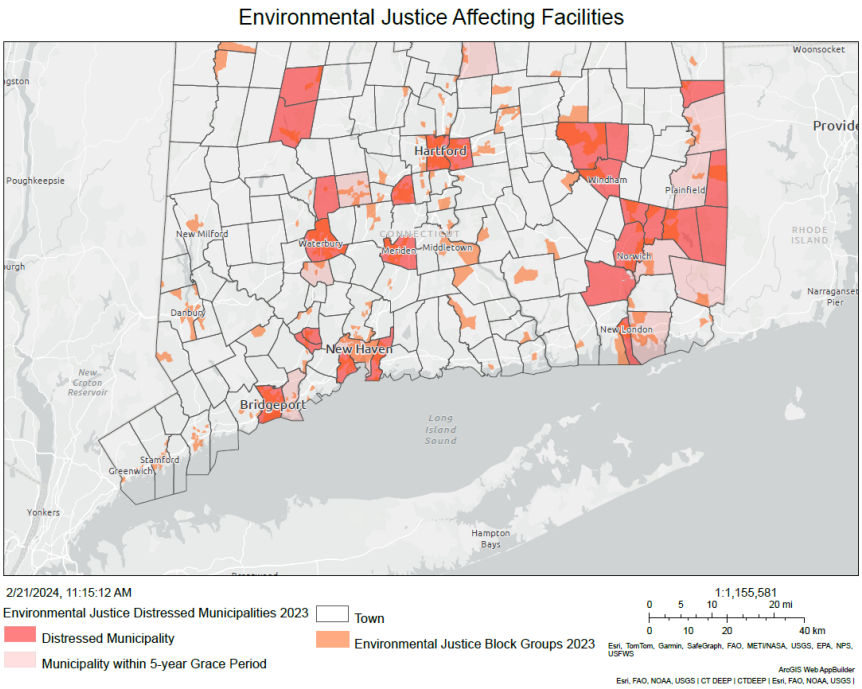

Figure 4: Environmental Justice Communities in Connecticut
Source: Connecticut Department of Energy & Environmental Protection

Landlord Round Tables

To continue driving carbon reduction goals in low-income multifamily properties, multiple communities continue to partner with the utilities and other key stakeholders to host Landlord Round Table discussions. Aiming to facilitate dialogue among landlords on barriers to implement energy saving projects, communities aim to understand how establishing partnerships with stakeholders can help these needed improvements move forward. Through the various opportunities identified, landlords and property managers of small and large buildings engage directly with utility representatives, pose questions, and offer feedback to better address barriers. A variety of landlords have been invited to attend, including those who own properties within the EJCs, landlords who rent to Section 8 tenants and key housing industry organizations. The goal is to create a collaborative forum where stakeholders can share insights, identify challenges, and explore opportunities to enhance energy efficiency in low-income multifamily properties while ensuring equitable access and participation across diverse communities.

The key takeaway from the ongoing Landlord Round Table discussions is the need for technical assistance, bilingual support, and additional financing to move projects along. Property owners and managers, especially of five-to-twenty-unit properties, do not have resources readily available to understand the energy usage of their buildings nor individual dwelling units, let alone resources to implement the needed upgrades. Midsize-to-large properties typically have a building supervisor in charge of building maintenance and operations, or in other cases, a dedicated sustainability staff or energy manager making improvements. Another learning was the depth of financial constraints where investments are typically made on an emergency or last resort basis, rather than planned or even preventative efforts. In closing, landlords and property managers are open to learning about energy saving resources available and even implementing needed improvements, but a key component of these projects moving forward still depends on

the technical assistance and braiding of financing resources to make the projects more feasible without further burdening the low-income communities. Connecting landlords with available programs mentioned earlier, is a direct result of the ongoing outreach and dialogue.

Energy Efficiency at Concord Meadows

Background

A comprehensive project completed at a property called Concord Meadows is an example of energy efficiency strategies at work, coupled with community engagement and braiding of utility, state, and federal programs.

Concord Meadows, an apartment complex comprised of several buildings, makes up 90 units of affordable housing in Madison, Connecticut. This property set out to improve the buildings' energy performance, while helping to create a sustainable living experience for its elderly residents, by tackling a multi-year modernization project. The goals of this project were to tighten the building envelope and upgrade the existing space heating and cooling systems within the dwelling units and common areas, all with the intention of improving the look and feel of the individual units and community areas with minimal tenant disruption. Increasing dwelling unit efficiency meant a potential decrease in the living costs experienced by residents and building operating costs, as well as lowering electric bills and the maintenance costs related to the existing equipment.

At the inception of the design work, the customer's project team looked to the local utility and government agencies for technical and financial support in making the individual units more efficient and comfortable for the complex's residents. The project team included the apartment complex's board members, an affordable housing development team, a selected general contractor, sub-contractors, and individual installers. The team worked directly with an Energy Efficiency Consultant of the local electric utility, Eversource, staff from CHFA, DOH and members of the local town and state government. The key stakeholders involved formed a unique coalition to address the implications this project would bring in the coming months.

Project Execution

The property participated in the Multifamily Initiative's income eligible segment and was able to take advantage of lucrative financial incentives for the energy efficiency upgrades, resulting in sizable electric savings. The project incorporated nine energy efficiency measures, including upgrades to all dwelling units, common and exterior areas. Each unit and common space transitioned from heating with electric resistance baseboards, partially displaced to heating and cooling with air source heat pumps, utilizing the baseboards as back-up heat. This partial displacement was made possible by implementing the ability for the newly installed heat pumps to be directly connected to the existing baseboard heating system in place with outdoor reset controls, or relays. Each dwelling unit was outfitted with a high efficiency, cold climate heat pump system designed and sized for the individual apartments and integrated into the existing heating system, now to be used as back-up during cold Northeastern winter days, if needed. The expectation for the tenants to control both heating systems was minimal. The residents utilize a wall mounted remote to call for heat and the integrated controls have full capabilities to interact with both systems, utilizing the heat pump system as the primary heating mechanism, and switching over to the resistance heat only when heat pumps do not provide sufficient heating.

The mechanism in place is a program requirement established to ensure heat pumps are utilized as the primary heating source and not only used for cooling, and the customer is able to leave the baseboards in place as back-up without manual tenant control.

While focusing on upgrades to the heating and cooling systems of any building may bring the largest energy savings and potentially have the greatest impact in reducing the buildings energy usage, the thermal boundary must be addressed to minimize the heating and cooling loads. A building envelope that is free of air leaks and drafts can most commonly be achieved through air sealing, insulation of the attic, basement and exterior walls, and window upgrades. The thermal boundary at Concord Meadows was addressed by the replacement of existing single pane windows to new triple pane windows, air sealing around the new windows, doors, plumbing penetrations, and insulation couple with advanced air sealing of the external walls with the removal of through-the-wall air conditioning sleeves. All this work was done to ensure the new heating and cooling system would operate as optimally as possible while minimizing the air leakage throughout each unit and building. The comprehensive project also included new low-flow showerheads, faucet aerators in the kitchens and bathrooms, and new LED lighting in the dwelling units, common, and exterior areas within the complex. All mentioned energy efficiency measures were addressed in accordance with the utility program requirements, and in some cases, exceeded basic efficiency standards, yielding energy savings and measure incentives. The allocated energy efficiency incentives and electric energy savings for the nine implemented measures are outlined in Table 1 below.

All energy efficiency programs in Connecticut utilize a Program Savings Documentation (PSD), also known as a Technical Resource Manual. The PSD provides detailed, comprehensive documentation of resource savings corresponding to the individual program technologies and any results of program impact evaluations (Ananthachar et al., 2024). The Table 1 below outlines the estimated savings for each of the energy efficiency measures addressed by this project and the prescriptive savings claimed are traceable through cross-referencing to the given program year's PSD manual.

Project funding included $307,261 in measure level and comprehensive incentives provided by the Multifamily Initiative. Whilst the program has moved towards a prescriptive based approach for heat pumps in 2024, the Concord Meadows project was completed prior to this programmatic change and therefore included custom incentives, based on the electric savings claimed by the utility. The comprehensive incentive included in this project represents a bonus allocation of funds that energy efficiency projects are eligible for when at least two end uses are impacted by the comprehensive project, such as insulation and lighting. Furthermore, the Concord Meadows project also received a United States Department of Housing and Urban Development Small Cities Community Development Block Grant for the improvements, which totaled approximately $1.4 million. This funding was braided with the utility-based incentives and allowed for a maximized financial package for the customer.

Table 1. Concord Meadows Energy Efficiency Measures, Incentives, and Savings

Energy Efficiency Measures	Measure Incentive	Annual Savings (kWh)
Dwelling Unit ASHPs	$198,680	123,444
Dwelling Unit Air Sealing	$15,660	21,030
Faucet Aerators and Showerheads	$1,443	15,487
Window Replacement	$27,858	9,506
Dwelling Unit Lighting	$1,229	9,076
Common Area Lighting	$9,147	8,035
Advanced Air Sealing	$8,000	5,508
Common Area ASHPs	$2,814	1,048
Insulation	$1,000	403
Comprehensive Incentive	$41,430	-
Total	**$307,261**	**193,537**

Source: Ananthachar, V., G. Eigo, R. Emerick, R. Esthus, R. Oswald, G. Ramdani, and V. Sheth., 2024

All the energy efficiency measures implemented are saving the property approximately 200,000 kWh annually, equivalent to about $374 per unit in direct electric utility costs, utilizing the blended electric rate of $0.172 at the time of the project.

With these efficiency measures, residents can expect to see savings on their bills while experiencing better temperature control and comfort in their homes. In addition, their common areas were improved, supporting community building in Concord Meadows. “The electric heat pump upgrades have made a really big difference in the comfort of my apartment,” said Deborah McDonald, resident. “I’m able to keep the temperature constant, the heating is uniform, and the system is very easy to use. Before we had heat pumps, I didn’t use air conditioning because I had an older unit and couldn’t afford to run it. Now I am much more comfortable and saving quite a bit of money.” All in all, this project contributed to a total carbon reduction of 743 tons which the Environmental Protection Agency’s Greenhouse Gas Equivalencies Calculator equates to removing 177 gasoline-powered passenger vehicles from our roads for one year (Environmental Protection Agency, 2024).

Concord Meadows is a prime example of overcoming resource constraints and financing barriers, with help from statewide energy efficiency programs and braiding available funding.

Closing and Next Steps

The low-income multifamily building segment is challenging to decarbonize, but with the utility, state, and federal resources available, it is not impossible, as was proven by the applied example of Concord Meadows. Furthermore, limited technical resources and financial constraints, as demonstrated by this project, and other community partnerships, may be temporary barriers as various local, state, and federal stakeholders partner to offer program integration with financial braiding allowance. Pursuing the resources in place, and other coming down the road in the near future, property owners can overcome financial hurdles and implement comprehensive energy efficiency projects leading to building decarbonization efforts. Lucrative incentives offered by energy efficiency programs directly impact a project’s economic viability

and can offset the upfront costs of energy saving measures, making them more financially feasible for property owners. State and federal programs focus on providing financial assistance and technical support through grants, loans, tax incentives and technical assistance. Additionally, property owners and managers can collaborate with local utilities, state and federal agencies and community stakeholders to access resources, share best practices, and leverage collective expertise, streamlining project implementation and enhancing the effectiveness of decarbonization efforts, as proven within the Concord Meadows example.

As an alternative to standalone upgrades, property owners and managers have the tools and resources available to undertake comprehensive projects that address multiple energy saving measures simultaneously, locking in additional funding otherwise not available. An approach such as this maximizes the impact of investments and yields greater savings over the long term, while reaping immediate savings especially within the dwelling units of affordable housing communities. Many energy efficiency measures offer attractive returns on investments by reducing utility bills and operating costs. Property owners and managers can prioritize cost-effective measures with shorter payback periods to achieve immediate savings and recoup their investment quickly. In the case of Concord Meadows, the building complex is more energy efficient, the heating and cooling system in place is more reliable, and the building is more resilient. Utilizing a project of this magnitude helps to frame the viability of the solutions we discussed throughout this paper that should be further explored, in addition to new offerings.

The proposed integration of the utility administered energy efficiency programs with the federal Multifamily WAP and possibly the IRA rebates programs in Connecticut pose challenging next steps. However, lessons learned from the programs already in place and solutions discussed in this paper may help us understand that braiding of resources is the way forward to help affordable housing customers and projects such as Concord Meadows move forward. These initiatives help reduce carbon emissions and lower utility costs and enhance the comfort, health, and sustainability of multifamily buildings. Moreover, they contribute to the broader environmental and social goals, such as driving carbon reduction goals and reducing energy poverty. Moving forward, continued collaboration between stakeholders, innovative financing mechanisms, and targeted support for the underserved low-income communities will be crucial in advancing carbon reduction efforts within the affordable multifamily sector.

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