

RETROFITTING AMERICA'S HOMES: DESIGNING HOME ENERGY PROGRAMS THAT LEVERAGE FEDERAL CLIMATE INVESTMENTS WITH OTHER FUNDING

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About ACEEE

The **American Council for an Energy-Efficient Economy** (ACEEE), a nonprofit research organization, develops policies to reduce energy waste and combat climate change. Its independent analysis advances investments, programs, and behaviors that use energy more effectively and help build an equitable clean energy future.

About BPA

The **Building Performance Association** (BPA) is a 501(c)6 industry association committed to advancing the home performance industry by supporting policies and programs that will improve and increase the expansion of home and building performance, energy efficiency businesses, and industries. BPA is made up of more than 20,000 members and program participants who are working professionals in contracting services, weatherization, product manufacturing and distribution, program administration, building science, and nonprofits. The association is devoted to enhancing the professional development of its members by creating educational opportunities that establish a culture of ongoing learning.

About AnnDyl Policy Group

The **AnnDyl Policy Group** is an energy and environmental strategy firm that specializes in policy solutions to advance smart, efficient, energy technologies. AnnDyl staff have decades of experience working with contractors, contractor trade associations, and other stakeholders in home energy efficiency and are recognized as principal thought leaders behind adoption of the Home Energy Rebate Programs in the Inflation Reduction Act.

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Because groundbreaking laws influenced our research, it relied heavily on the insights of researchers, program implementers, and policy practitioners as we combined their

experiences and knowledge with policies being implemented. We wish to thank those who gave their time for discussions in formal interviews with the authors, including: Ross Anthony, Maine Governor's Office of Energy (GEO); Aaron Berndt, Google; Erin Cosgrove, Northeast Energy Efficiency Partnerships (NEEP); Lloyd Kass, Franklin Energy; Peter Krajsa and Matthew Brown, National Energy Improvement Fund (NEIF); Anika Kreckel, Rhode Island Office of Energy Resources; Commissioner Ann McCabe, Illinois Commerce Commission; Michael Murray, Mission:Data; David Nemtzw, Kerry O'Neill and Madeline Priest, Inclusive Prosperity Capital; Commissioner Stacey Paradis, Illinois Commerce Commission; Commissioner Michael T. Richard, Maryland Public Service Commission; and Alice Rosenberg, Consortium for Energy Efficiency (CEE).

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Executive Summary

KEY FINDINGS

- Billions of dollars of new federal funding are creating opportunities for states to develop and expand residential retrofit programs. By leveraging nonfederal public and private funding, states can increase the impact of federal investments and invigorate longer-term market transformation for a sustainable home retrofit industry.
- States can successfully braid and stack federal funds with other funding sources, by reaching out to key constituencies to identify existing program gaps, reviewing and expanding state policy goals to guide program priorities and coordination, and matching new and existing funds to program objectives.
- Decades of experience with residential retrofits along with recent technical developments inform the recommendations here for eight program design elements that best support property owners, contractors, and policymakers to achieve their objectives.

Federal programs created or expanded through the Infrastructure Investment and Jobs Act of 2021 (IIJA) and the Inflation Reduction Act of 2022 (IRA) provide funding to support residential retrofits through financing, incentives, installation of efficiency measures, workforce training, and program support. This white paper identifies strategies for policymakers, efficiency program administrators, and other decision makers to support home energy upgrades by braiding and stacking new federal funds with existing state, local, utility, and other resources. We provide recommendations on directing funding toward program elements that have proven most successful and guiding property owners and contractors as they navigate funding options for their projects.

Starting with a review of new and existing funding sources for residential energy efficiency and electrification, we then discuss how funding can have more impact by supporting the key elements for successful retrofit programs. We include several case studies highlighting how programs braid and stack funds to support their objectives. Two appendices provide brief descriptions and links to resources on the federal and nonfederal funding sources covered in the paper.

As states launch their programs, policymakers and program staff should consider how program design can support near- and long-term policy objectives for climate, equity, and resilience. We cover eight elements of successful retrofit programs. Funding from the federal government and other sources is available to support each program element.

PROVIDE TRAINING AND WORKFORCE DEVELOPMENT

Robust training and workforce development initiatives are essential to ensure adequate workforce capacity and skills to deliver quality retrofits. To meet specific needs and gaps, states can start by engaging stakeholders to deepen their understanding of the local market. Expanded contractor and technician training on high-efficiency technologies and quality installation practices can be complemented with training for business owners and managers, who will benefit from learning how to adapt their business models to maximize the financial opportunities available from energy efficiency projects.

OFFER REBATES AND INCENTIVES

Direct financial assistance—rebates, tax credits, or other incentives—helps address the upfront costs of retrofits and encourages the purchase of more efficient technologies. These opportunities should be stackable and, where needed, paired with financing that is easy for customers and contractors to access and use.

DELIVER AFFORDABLE FINANCING

Affordable financing is a critical tool for increasing accessibility to residential retrofits for middle-income families and rental property owners that do not qualify for the full range of rebates targeted to low- and moderate-income households. While rebates and other incentives reduce overall project costs, financing is often needed. Financing options should include strong consumer protections and work with the contractor sales process.

PRIORITIZE ENERGY EQUITY

Program administrators and policymakers can increase overall savings and reduce household energy burdens by prioritizing equitable access to program benefits for historically underserved and disadvantaged communities. Program navigators can increase program participation by providing capacity building, resources, and technical assistance to community-based organizations, contractors, and supply chain partners. Renters and rental properties have long been underserved by efficiency programs; creating options to attract multifamily and single-family building owners and protect renters can help address these historic inequities.

ADDRESS HEALTH AND SAFETY ISSUES BEFORE EFFICIENCY UPGRADES

Energy efficiency improvements contribute to healthier, safer home environments while making housing more affordable. Before energy retrofit work can begin, some home health and safety concerns (e.g., mold, lead, structural issues) must be addressed to protect residents and prepare the home or building. By prioritizing health and safety considerations in funding criteria, federal and state agencies can ensure more retrofits move forward. Coordination across energy, health, and housing agencies supports more effective and efficient delivery of home retrofit projects and may provide for leveraging of healthcare funds.

ENSURE ACCESS TO DATA

Safe, secure, and seamless access to consumer utility data supports innovation and program improvement—and is critical to implementation of some federal rebates. Secure access to their own energy use data provides utility customers with information they can use to change their behavior and to partner with third parties (e.g., contractors) to reduce their energy use. Advanced metering infrastructure facilitates data access; federal and state governments are working with utilities to develop best practices to support data access while addressing privacy concerns.

INCORPORATE GRID FLEXIBILITY TO BRIDGE TRADITIONAL AND DYNAMIC ENERGY EFFICIENCY

Incorporating grid-interactive technologies, like smart thermostats or grid-enabled water heaters, into residential retrofit programs can help enable demand flexibility. Technologies and approaches that enable demand flexibility in addition to traditional energy efficiency can drive increased value for customers while helping to stabilize the power grid and achieve climate goals.

PLAN FOR LONG-TERM SUCCESS: MARKET TRANSFORMATION AND OVERSIGHT

Current federal investments can support longer-term market transformation toward a self-sustaining residential retrofit industry once incentives and other program interventions are removed. Key steps for market transformation include consideration of long-term goals in program design; collaboration with contractors, distributors, and suppliers to build a robust industry infrastructure; and demonstration of the long-term value of retrofit investments. By considering opportunities to drive lasting changes in both market supply and demand, programs can generate benefits well beyond the life of the program.

Incorporating these elements and relevant funding streams into programs will support all states as they supercharge their existing programs and build the infrastructure to support homeowners and renters. Contractors that have invested in training because incentives can only be offered by a skilled workforce will use that knowledge long after the IRA and IIJA funds have been expended. If programs are well-designed, innovative, and successful, the ultimate legacy of these new federal resources will be the creation of self-sustaining and growing markets for energy efficiency products.

Introduction

Tens of billions of dollars in new federal funds for residential energy efficiency and electrification projects present an unprecedented opportunity to deliver energy savings and associated benefits to households across the United States while improving the quality of our housing stock, reducing carbon pollution, and generating local jobs. Federal funding from the 2021 Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act of 2022 (IRA) is intended to boost home efficiency and electrification projects in the near term and support states¹ in the rollout of programs to enable longer-term market transformation. By effectively navigating, leveraging, and braiding federal funding with existing and new state, local, and private sector resources, policymakers, program actors, and other decision makers can address the climate crisis along with the interconnected challenges of improving housing affordability, energy equity, and resilience.

Good program design and implementation are critical to the success of these federal funding initiatives. State energy offices (SEOs), other state and local agencies, and other entities engaged in program design, administration, and implementation can build on the lessons learned over decades of experience with residential retrofit programs to support the development and growth of a robust market infrastructure (e.g., workforce, affordable financing) to deliver retrofits throughout their communities.

In large commercial building upgrades, financiers refer to the “capital stack” when looking to compile the loans and equity investments that will pay for capital improvements. Homeowners—and many owners of multifamily rental housing—lack the resources or access to financing of large commercial property owners. Funding challenges often lead them to defer energy efficiency investments. Residential retrofit programs can help build the “capital stack” for home performance investments, whether an HVAC replacement or larger home retrofit project. Similarly, program administrators can build the capital stack for their programs by identifying and directing different funding sources toward program costs (e.g., administration, marketing, technical assistance, training and other services, project incentives).

This report identifies strategies for policymakers, efficiency program administrators, and other decision makers to support home energy upgrades by braiding and stacking new federal funds with existing state, local, and utility resources. We provide recommendations on directing funding toward program design elements that have proven most successful and guiding property owners and contractors as they navigate funding options for their projects.

¹ Much of IIJA and IRA funding is allocated to states, the District of Columbia, U.S. territories, and Tribal governments for administration. In this document, “states” means “states, the District of Columbia, U.S. territories, and Tribal governments” unless otherwise indicated.

Starting with a review of new and existing funding sources for residential energy efficiency and electrification, we then discuss how the various funding sources can be leveraged to increase their impact by supporting each of the key elements for successful retrofit programs. We include several case studies highlighting how programs braid and stack funds to support their objectives.

We started our research in spring 2022 with a detailed review of information on new and expanded federal funding made available through the IIJA. We also conducted in-depth interviews with more than a dozen experts in residential retrofit program design and implementation, the housing market, affordable housing, and funding/financing for single- and multifamily housing to get their perspectives on how the new funding could support and expand on existing work. Partway through our research, Congress passed the IRA and we included the vastly expanded funding and programs in this legislation and subsequent materials published by the White House and relevant agencies on both the IIJA and IRA. We returned to these experts to get their updated thoughts on the new funding opportunities and reviewed websites for the latest information on existing federal, state, local, utility, and other funding sources available for residential retrofits. We cast a wide net to include funding and financing for homeowners and rental property owners as well as funding directed toward public and private sector entities administering residential retrofit programs and services.

IIJA and IRA Funding for New and Existing Federal Programs

An array of federal programs expanded or introduced by the IIJA and IRA provide funding to support residential retrofits through financing, incentives, installation of efficiency measures, workforce training, and program support. Many existing programs received significant additional funding through the IIJA and the IRA. Other programs were created by these laws, bringing tens of billions of dollars in new funding for energy efficiency into the residential sector.

The IIJA and IRA allocated funds for residential retrofits and electrification projects through a number of new and existing programs to be administered by the Departments of Energy (DOE), Housing and Urban Development (HUD), Health and Human Services (HHS), Interior (DOI), Treasury (specifically the IRS), and the Environmental Protection Agency (EPA).² Table 1 summarizes the new and existing programs, funding amounts, and lead agencies. Additional details on each program can be found in Appendix A.

² For some programs, retrofits and electrification are two of many other eligible uses for program funding.

Table 1. IIJA and IRA funding available for new and existing residential retrofit activity

Program	Funding amount	Agency	New or existing
IRA Sec. 50121: Home Efficiency Rebates (HER or HOMES)	\$4.3 billion	DOE	New
IRA Sec. 50122: High-Efficiency Electric Home Rebates (Home Electrification and Appliance Rebates, HEAR)	\$4.5 billion	DOE	New
IRA Sec. 50123: Energy Efficiency Contractor Training Grants (Training for Residential Energy Contractor Program, TREC)	\$200 million	DOE	New
IRA Sec. 13301: 25C Energy Efficient Home Improvement Credit	Unlimited	IRS	Existing
IRA Sec. 13302: 25D Residential Clean Energy Tax Credit	Unlimited	IRS	Existing
IRA Sec. 13303: 179D Energy Efficient Commercial Buildings Deduction	Unlimited	IRS	Existing
IRA Sec. 60103: Greenhouse Gas Reduction Fund	\$27 billion	EPA	New
IRA Sec. 60114: Climate Pollution Reduction Grants	\$4.85 billion	EPA	New
IRA Sec. 60201: Environmental and Climate Justice Block Grants	\$3 billion	EPA	New
IRA Sec. 80003: Tribal Electrification Program	\$145.5 million	DOI	New
IRA Sec. 30002: Green and Resilient Retrofit Program	\$1 billion	HUD	New
IIJA Sec. 40502: Energy Efficiency Revolving Loan Fund Capitalization Grant Program	\$250 million	DOE	New
IIJA Sec. 40552(a): Energy Efficiency and Conservation Block Grant Program	\$550 million	DOE	Existing
IIJA Sec. 40503: Energy Auditor Training Grant Program	\$40 million	DOE	New
IIJA Sec. 40107: Smart Grid Investment Grant Program	\$3 billion	DOE	Existing
IIJA Sec. 40551: Weatherization Assistance Program	\$3.5 billion + annual budget (\$366 million for FY23)	DOE	Existing
IIJA Sec. 40109: State Energy Program	\$500 million + annual budget (\$66 million for FY23)	DOE	Existing
IIJA Div. J, Title VII: Low Income Home Energy Assistance Program	\$500 million + annual budget (\$5 billion for FY23)	HHS	Existing

Other Funding Sources

In addition to the federal funding from the IRA and IIJA, a number of other public (federal, state, and local) and private funding sources are available for residential retrofit programs

and projects. These funding streams can complement, supplement, and leverage the IRA and IIJA funds to expand the number of homes retrofitted, support program delivery, and improve overall program performance and outcomes.

Many of these funders have extensive experience and can offer technical assistance along with financial support. Their expertise may cover specific segments of the housing market, different financial tools and services, or particular retrofit types. They are also a diverse set of potential partners for states to work with as they create and expand retrofit offerings. Table 2 provides a summary of other retrofit program funding sources (by no means exhaustive). Further descriptions and details can be found in the appendix.

Table 2. Nonfederal funding for residential retrofits

Funding source	Type	Amount	Description
Green banks	Public	\$1.5 billion (2021–22)	Flexible financing structures designed to leverage private capital to address gaps in market funding (Coalition for Green Capital 2023)
Housing trust funds	Public	>\$1 billion/year	(Center for Community Change 2016)
State/local programs	Public	No separate estimate available	Rebates, loans, grants, permit fee waivers, or other incentives offered through state and local programs to encourage efficiency improvements
State/local tax incentives	Public	No separate estimate available	Income tax credits or deductions, sales tax exemptions, property tax reductions
Utility programs	Private	>\$2 billion/year	Customer rebates, financing support, and other incentives account for a reported 55% of roughly \$4 billion annual residential and low-income program budgets (CEE 2021)
Healthcare funds	Public and private	>\$1 billion/year	State and local healthy housing initiatives and preventive health funds (including state cost share of

Funding source	Type	Amount	Description
			federal program dollars); private health insurance and hospital funds
Finance institutions	Private	>\$24 billion/year	Private financing (loans, credit cards, home improvement lines of credit) that must be paid back but can be leveraged for residential upgrades (based on data from JCHS 2023)

Assembling the Capital Stack for Residential Retrofit Programs

The funding sources identified above provide a wealth of resources for residential retrofits. Understanding how each of these funding sources can be used and combined with other funding can be challenging. Since most of the federal funding programs are allocated to state and local government agencies, we focus on how these agencies can work with each other, with other funders, and with communities to assemble a capital stack of options that best serves the retrofit needs of homeowners, rental property owners, and occupants in their jurisdictions.

As a starting point, every state receives federal funding for the Weatherization Assistance Program (WAP) and the Low-Income Home Energy Assistance Program (LIHEAP); both received an infusion of added funds under the IIJA. Individual homeowners, building owners, renters, and builders can pursue federal tax credits. Some states have additional state and local programs supporting residential retrofits and other efficiency upgrades. All states will have access to funding for new and existing programs supported by the IRA and IIJA. As states work to expand or modify their use of existing funds to braid in the new resources, we recommend starting with the following five steps:

1. Reach out to key constituencies for insights into existing gaps to be filled and strategies for successful implementation:
 - **Community members and community-based organizations.** Procedural justice calls for hearing from those who will be impacted by a policy or

program prior to implementation. They know the community's needs best and are critical partners in program implementation and uptake.³

- **Contractors working in the field.** Contractors are most likely to educate the homeowner or property owner at the break-fix moment. They will not offer programs they think are too cumbersome or will not address the home's problems efficiently and effectively.
 - **Existing program administrators.** Current program administrators can provide insights into the pain points of a current program and what has worked. They also have existing systems and processes and established relationships with communities and market actors.
2. Review state policy goals (energy plan, legislative and/or governor initiatives) and identify the existing programs aiming to achieve these goals. Review these programs to determine gaps and where expansion and program coordination are needed to achieve policy goals. Every state has an energy plan and/or weatherization funding. If the overall energy policy goals for the residential sector are limited, take the broad goals and expand on them. New funding opportunities can support updated housing infrastructure, reduce energy waste, and improve resiliency.
 3. Identify what, if any, limitations apply to the use of new and existing funds (e.g., labor standards, contractor certifications, income qualifications, data requirements), as funds with more and fewer limitations should not be blended. Identifying restrictions will help to bucket the funds accordingly, being mindful that these requirements need to be met in the program spending.
 4. Consider how targeted funds (e.g., training grants) could be used to free up more general funds that are currently used for that purpose (e.g., SEP or utility funds) or to fill in a program gap. Coordinating among often siloed agencies—housing, public

³ For more information on inclusive community engagement, see these resources:

[The Spectrum of Community Engagement to Ownership](#) (Gonzalez 2020);

[From Community Engagement to Ownership: Tools for the Field with Case Studies of Four Municipalities](#) (USDN 2019);

[Community Outreach and Solar Equity: A Guide for States on Collaborating with Community-Based Organizations](#) (Ramanan et al. 2021);

[NAACP Guidelines for Equitable Community Involvement](#) (Lin et al. 2021);

[Energy Equity for Homeowners Toolkit](#) (Ayala and Dewey 2023)

health, energy, environment, commerce—can also improve outcomes. A set of principles for collaboration and/or a formal Memorandum of Understanding (MOU) can assist agencies in sharing resources, staff expertise, and program implementation timelines and goals to ensure the best possible outcomes.⁴

5. Identify which of the eight elements of successful retrofit programs (discussed in the next section) are already included in your existing program design. Identify those not included and determine how each of the available funding streams could be utilized to improve outcomes by addressing gaps in current program offerings, allowing for increased participation and/or increased spending per project (e.g., use grant funding to utilize revolving loan funds or those designed for leverage financing, or to buy down an interest rate), or creating new options. Do not simply add the funding to existing programs without change or expansion; this is an opportunity to invest in buildings in a way that was not possible before. If no programs exist, use what you learned from Step 1 to build out the programs, being mindful of the following eight elements.

Designing Successful Residential Retrofit Programs

Years of experience designing, implementing, and evaluating residential retrofit programs and policies have enabled the authors and those we interviewed for this report to identify the key elements of successful programs. These elements support not only the homeowner or rental property owner's goals, such as improved comfort and energy bill savings, but also broader program and policy goals, such as reduced emissions, increased grid flexibility, and energy equity. We focus on eight elements—in no specific order—that policymakers and program staff should consider in their retrofit program design to support near- and long-term policy objectives. Funding from the federal government and other sources is available to support each program element. The discussion notes relevant federal funding sources and offers examples of how funding can be braided and stacked. This information on successful programs and funding can help any state, regardless of its previous experience, stand up program opportunities to create jobs, advance grid resiliency, meet climate and equity goals, and help residents save money on utility bills.

PROVIDE TRAINING AND WORKFORCE DEVELOPMENT

Robust training and workforce development initiatives are essential to ensure adequate workforce capacity and skills to deliver quality retrofits. The energy efficiency workforce is already the largest in the clean energy industry, with nearly 2.2 million jobs across the United

⁴ [NASEO \(2024\)](#) provides useful examples of state interagency collaboration on IIJA-funded electric vehicle infrastructure programs.

States, but it must continue to grow in order to fill existing skilled labor shortages and support growing demand (E4TheFuture 2022a). New federal investments in the IIJA and IRA are projected to create tens of thousands of new jobs in residential energy efficiency in the coming years (Pollin, Lala, and Chakraborty 2022), which will require a significant increase in training and workforce development to keep pace.

Training supports and services can include subsidizing on-the-job training, providing wage support, developing workers' soft skills, and offering other wraparound services. Expanding access to job opportunities to underrepresented and disadvantaged communities should be a priority. Important considerations for program designers and implementors are noted below.

Expand contractor education and training on high-efficiency technologies and quality installation. Contractors need education that brings them up to speed with current products and best practices so that they can identify and install the most appropriate system in each home they service (BPA 2022). The IRA provides \$200 million for the Training for Residential Energy Contractor Program (TREC). In July 2023, DOE opened applications for \$150 million in state formula funds under the program; the remaining funds will be allocated through a competitive grants process opened in March 2024. These funds can leverage existing state and federal support for apprenticeship programs, vocational high schools, and community colleges as well as utility training programs to train more contractors.

If contractors are unfamiliar or uncomfortable with new technologies and their benefits, they are unlikely to recommend them to homeowners. For some technologies, overcoming misconceptions or negative biases may be necessary (Anika Kreckel, Rhode Island Office of Energy Resources, pers. comm., July 2022). For example, many contractors have lingering doubts about heat pumps based on the performance of older models, particularly in colder climates. Education and training on the advances in heat pump technology can dispel these concerns and demonstrate that the new generation of heat pumps perform well in a variety of climates.

Training should also emphasize the core principles of quality equipment installation. Proper installation is often the most important determinant of how energy efficiency measures will perform. Research suggests that installation deficiencies (e.g., improper refrigerant charge, oversized systems, leaky ducts) can increase heat pump energy use by as much as 30% (Domanski, Henderson, and Payne 2014). Programs can incorporate existing training programs, such as those aligned with ENERGY STAR Verified HVAC Installation,⁵ to ensure contractors have a solid foundation in proper equipment installation practices.

⁵ Program details available at: https://www.energystar.gov/saveathome/heating_cooling/esvi.

Engage contractors on energy efficiency business models to support business development and growth.

Contractors will need to adapt their business models to maximize the financial opportunities available for energy efficiency projects. This may include incorporating financial incentives as part of their sales pitch and customer service, expanding the list of energy efficiency upgrades available, aligning their services with available funding, and taking advantage of training opportunities. It is important to demonstrate to contractors that energy efficiency is a stable way to expand their business and access the capital they need for long-term growth (Peter Krajsa and Matthew Brown, National Energy Improvement Fund, pers. comm., February 2024). While contractors adapt their business models to incorporate incentives, it is also important that businesses are not reliant on program incentives that may eventually disappear. Thus, this period of high federal support needs to focus on building a robust and sustainable residential retrofit industry.

Support small businesses, including union and nonunion contractors. Many contractors in residential retrofitting are small businesses, putting them at a disadvantage relative to larger companies in hiring and retaining workers. Partnerships and creativity in program design are crucial to support these businesses. For example, the Maine Governor's Energy Office partnership with Maine Housing in providing a rent-to-own program for blower door equipment enabled small companies to participate in federal funding programs that require them (Ross Anthony, Maine Governor's Energy Office, pers. comm., March 2024). Larger companies have the capital to attract skilled workers and provide ongoing training and development. Direct assistance in the form of wage support and accessible training for new workers creates opportunities for smaller businesses to build up skilled contractor teams and pay competitive wages. Single-family homes are mostly served by nonunion contractors; the skills needed to serve these homes need to be built through training and apprenticeship programs that focus on independent small businesses.

In a "contractor roundtable" discussion hosted by the Arizona Office of Resiliency to better understand the needs of local stakeholders in implementing the IRA (Phoenix, Arizona, on January 25, 2024), participants highlighted the distance to training centers as more important than having free training. When looking at the \$2.6 million that the state would receive from the IRA's TREC program, contractors called for funding for local training, and support for companies to train their own teams rather than "fly them to Ohio and pay for hotels."

Providing training opportunities for both union and nonunion workers—through community colleges, WAP, and certification programs like the Building Performance Institute—can help reach a wider and more diverse network of contractors with the skills needed for retrofitting single- and multifamily housing. Larger, union contractors are more likely to focus on multifamily properties, while smaller, nonunion businesses are prevalent in the single-family market. Having accessible training for both union and nonunion contractors will help ensure a skilled workforce to address the specific needs in each region of the country (Stacey Paradis, Illinois Commerce Commission, pers. comm., March 2024).

Engage stakeholders to understand the market. Effective programs engage a variety of stakeholders to create workforce development initiatives that meet industry needs and expand employment opportunities. Successful training programs build partnerships and leverage existing relationships with educational institutions, community organizations, workers, and other relevant groups to ensure programs are designed to best serve the specific needs of the local community. Working through existing networks helps target the communities most in need (Ross Anthony, Maine Governor's Energy Office, pers. comm., March 2024). These relationships create a pathway for ongoing input on what elements are working well and how programs can be improved.

Example stacking and braiding scenario: Federal TREC grants can be used to expand state-sponsored business development training and facilitate a network of business support services for contractor business development and management roles. Utility-supported auditor and technician training can be supplemented with federal support to contractors to cover the costs of certification for their employees.

PROVIDE REBATES AND INCENTIVES

Direct financial assistance—rebates, tax credits, or other incentives—helps address the upfront costs of retrofits and encourages the purchase of more efficient technologies. These opportunities should be stackable and, where needed, paired with financing that is easy for customers and contractors to access and use.

Eliminating friction is key for customer and contractor. The success of a residential retrofit program is partly defined by the experience of the contractor and consumer. To effectively run their businesses without fear that program requirements are too complicated or may change, contractors need streamlined and consistent programs. Contractors greatly benefit from simple rebate applications and reduced processing times (E4TheFuture 2022b). If the process of claiming a rebate is complicated and requires onerous paperwork, contractors will not mention the opportunity and consumers will likely forgo the funds (David Nemtzw, pers. comm., March 2024). Contractors remain the primary educators of consumers about the importance of energy efficiency retrofits and how to access rebates or incentives.

Once contractors or consumers have a negative experience with a program, they are unlikely to participate again or recommend it to others (Lloyd Kass, Franklin Energy, pers. comm., February 2024). And the best program marketing is by word of mouth of customers who had a good experience. The list of eligible measures and rules for receiving the incentives must be clear for both contractors and program participants while straightforward requirements should align with state and local policy. When financing is required to cover the full cost of the project, the process to obtain financial support should be easy for consumers and contractors (Kerry O'Neill & Madeline Priest, Inclusive Prosperity Capital, pers. comm., April 2024). Upstream incentives to distributors and manufacturers—when passed on to the consumer through reduced costs—can also help contractors by reducing administrative effort and lowering overall project costs (E4TheFuture 2022b).

Streamline access to information. Streamlining access to information about financial incentives facilitates the use of program funds for customers and contractors (Erin Cosgrove, Northeast Energy Efficiency Partnerships, pers. comm., March 2024). Public education and mass marketing campaigns can also help encourage energy efficiency upgrades for homeowners who did not consider retrofitting their home due to affordability and lack of program awareness (David Nemtzw, pers. comm., March 2024). Creating a single, cohesive, and public-facing resource can help customers and contractors obtain accurate and up-to-date information about residential retrofit programs without the need to maneuver through various websites and contact different offices. Using existing resources or websites helps reach consumers and contractors more easily and further reduces friction (Ross Anthony, Maine Governor's Energy Office, pers. comm., March 2024). This "one-stop-shop" can help homeowners and rental property owners understand what they qualify for and find the contractors who are trained to provide the eligible upgrade.

It is critical, especially when expanding programs to new communities that have not yet accessed efficiency programs, to engage community partners to understand their priorities and objectives, get input on program planning, provide information, and build trust. Studies have shown that communities of color have had less access to clean energy programs for a myriad of reasons, including upfront costs, lack of marketing, failure to address community needs, and distrust of the sales force (Amann, Tolentino, and York 2023). Programs can expand participation by partnering with community leaders to co-design programs that meet community needs, reach those who have been disenfranchised, and bring contractors into these neighborhoods. Doing so successfully requires accountable and transparent partnership, fair compensation, and responsiveness to community leaders' perspectives.

Tailor outreach and education to each state program. Although the federal Home Efficiency Rebates (HOMES) and Home Electrification and Appliance Rebates (HEAR) rebate amounts are the same across the country, they will be implemented through 50-plus different programs. The State Energy Offices (SEOs) will be allocated their portion of the \$8.8 billion in rebates using the State Energy Program formula. The IRA forbids combining the rebates with each other or another grant program (e.g., WAP) "for the same single upgrade." DOE issued detailed guidelines in summer 2023 to ensure a standard set of rules for implementing the programs, as outlined in the statute. The guidelines give states flexibility in how they design and deliver the rebates. While DOE can and should educate the public about the availability of funds, states will need to inform homeowners and contractors about how to access them in their specific location.

CLEAN HEAT RHODE ISLAND

The Rhode Island High Efficiency Heat Pump Program (now Clean Heat RI) was created using \$25 million in funds from the American Rescue Plan Act (ARPA). Managed by the Office of Energy Resources (OER), the program provides rebates for high efficiency heat pumps (HP) and heat pump water heaters (HPWH), including enhanced rebates for low-income households. Because Rhode Island bars utilities from using ratepayer dollars to fund fuel-switching (e.g., natural gas/propane/fuel oil to electricity), Clean Heat RI is designed to fill those funding gaps, enabling homeowners to get financial support to install heat pumps.

The program also includes a \$1.3 million workforce development incentive to train and upskill workers in high-efficiency HVAC technology and support a just transition for workers in the fossil fuel industry. It covers program operating costs, wage replacement/reasonable compensation, and wraparound services for participants. Additionally, in line with Federal Justice 40 goals, OER aims to direct 40% of program funding for rebates and workforce development to disadvantaged communities.

Type of incentive	Residential (existing homes)	Income-eligible
Total funding	\$ 11,207,500	\$ 7,250,000
Eligibility	Single- and multifamily homeowners who currently use gas, oil, or propane for heating	Low-income and disadvantaged customers using oil or propane heating Customers qualified through the Supplemental Nutrition Assistance Program (SNAP), LIHEAP, or RI Energy Discount Rate eligibility or income-qualified application
Incentive	\$1,000/ton HP in existing homes \$750 HPWH \$500 electrical service upgrade Max \$10,000 per household	100% of total cost including up to \$3,000 for electrical service upgrade

The Clean Heat RI incentive program launched on September 1, 2023. In addition to the incentives above, the program links residents to other federal, state, and utility incentives (e.g., federal tax credits or utility rebates for heat pump installations to replace electric baseboard heating) and partners with organizations experienced in right-sizing heat pumps, working in disadvantaged communities, and educating consumers about green technologies. All ARPA funds must be committed by December 31, 2024, and spent by

December 31, 2026. Additional details on Clean Heat RI incentives, including efficiency requirements, participating contractors, and an interactive dashboard tracking rebate applications, can be found at cleanheatri.com.

Multiple funding streams/stacking incentives. Using multiple funding streams together in one cohesive residential retrofit program can increase program simplicity, stability, and long-term market transformation (Ross Anthony, Maine Governor's Energy Office, pers. comm., March 2024). These funding streams could include federal incentives, utility energy efficiency funds, and other state or regional program dollars (e.g., Regional Greenhouse Gas Initiative funds). However, states must be mindful of the “color of money” that is included to ensure that funds that have different requirements do not blend in the accounting. Programs that appear more like a single incentive are less confusing to customers. Enhancing incentives with other funding and financing helps customers receive all of the financial support for which they and their project are eligible. Layering funds can also encourage more comprehensive and successful retrofits by allowing the contractor to adjust the retrofit to address the home as a system. For example, high-efficiency electrification should be paired with building envelope upgrades to ensure the best outcome for the homeowner, including cost savings from a smaller HVAC unit if the home is properly weatherized (Specian 2023). This is especially important for older homes aiming to maximize energy savings (BPA 2023).

A diverse set of funding sources improves program stability and increases the number of eligible participants. Funding and incentive levels can fluctuate with program cycles (e.g., utility programs are often on three-year program cycles). With diverse funding sources, programs can adjust as needed to continue functioning. Because income eligibility for incentives may vary depending on the source, such that not all customers or projects are eligible for the same funding streams, it is important that states provide simple tools to assist homeowners and contractors in adding up the incentives to offset the upfront costs.

Finally, as customers often stage their upgrades, it is important that they are provided with a staging plan. While they may not have the time, resources, or inclination to undertake a comprehensive project when their HVAC is replaced, they should be provided an upgrade plan so that they can invest in future years.⁶ By developing incentive and financing structures that accommodate staging, programs can encourage customers to continue to install efficiency improvements.

⁶ Tools like Pearl Certification's [Green Door](#) help homeowners keep track of upgrades, making it easier to spread project investments over time.

Example braiding and stacking scenario. While the IRA does not allow rebate claims under both HOMES and HEAR for the same single upgrade, it does allow “stacking” of these rebates with other federal funding sources, including WAP—provided that “each Federal grant only funds distinct, separable upgrades”—and allows for pairing with the 25C tax incentive. According to DOE guidance,⁷ HOMES rebates based on modeled energy savings can be stacked, provided they are for a different single upgrade.⁸ For example, a family qualifying for WAP may receive free envelope upgrades through the WAP program and HEAR rebates to cover the costs of electrical panel upgrades and heat pump installation. Another family could receive a HOMES rebate for achieving 20% modeled energy savings through envelope and HVAC replacement and then receive a HEAR rebate when purchasing a heat pump water heater.

DELIVER AFFORDABLE FINANCING

Affordable financing is a critical tool for increasing accessibility to residential retrofits. While rebates and other incentives may reduce overall project costs, the balance can still be difficult for most households to cover. In 2022, about 37% of Americans did not have \$400 to address small emergency expenses, like HVAC repair (Federal Reserve 2023). Project costs can also be untenable for multifamily building owners, particularly smaller portfolio holders that were hit hard by the loss of rental revenue during the pandemic (Samarripas and Jarrah 2021). These building owners are an important source of unregulated affordable housing (sometimes referred to as naturally occurring affordable housing). Table 3 provides examples of effective financing tools identified in our research. Other recommendations for programs delivering financing opportunities are highlighted here.

Provide affordable and accessible options. Financing options for residential retrofits must be affordable and accessible to consumers and building owners. Many middle-income consumers have access to credit card or bank financing, but these can be costly options. Others may have limited or negative credit history that makes it difficult to qualify for traditional financing products. Energy efficiency financing options should cost less than conventional financing to ensure that affordable payments and attractive terms encourage participation—not to mention promoting energy and climate mitigation options that are easy to understand (David Nemtzw, pers. comm., March 2024). State- and utility-sponsored retrofit programs have experience working with lenders to buy down interest rates on consumer loans for energy efficiency projects. Inclusive utility investment programs, such as the Pay As You Save (PAYS) model, cover the upfront costs of

⁷ DOE IRA Home Energy Rebates Program Requirements & Application Instructions [here](#).

⁸ A recent policy brief by the AnnDyl Policy Group provides details as of August 2023. See Saul-Rinaldi K., and S. Wiltshire-Gordon, [AnnDyl Residential Capital Stack Briefing Paper.pdf - Google Drive](#).

home retrofits without requiring credit checks. Project costs are repaid through customer utility bills, with payments structured to be less than the expected monthly energy savings.

All financing options should include strong consumer protections. The program should provide information on any no-cost efficiency programs consumers may be eligible for, such as WAP, and guarantee that all available rebates, grants, and other incentives are accessed before financing is used to cover remaining project costs. Any participating lender or financing program (e.g., Property Assessed Clean Energy (PACE), PAYS, utility on-bill financing) should be thoroughly vetted, agree to required consumer protections, and provide details on how consumers can file complaints with relevant state oversight agencies.

Make it work for the contractor. Financing options need to be structured in a way that energy efficiency contractors can understand and share simply and securely with their customers. A standardized approach to educating contractors facilitates their participation and ensures they are aware of consumer financing options that meet customer needs and fit their business model. This can often be accommodated through the same workflow platform used to vet contractor qualifications and manage their participation in the program. Financial services have found success by treating contractors as customers to ensure programs are designed with contractors' needs in mind (Kerry O'Neill and Madeline Priest, Inclusive Prosperity Capital, pers. comm., April 2024).

While some contractor staff specialize in performing retrofits, there are also sales staff who focus on selling retrofit services to customers. Sales staff need to understand the available financing options and be able to explain how they work to customers. Well-trained salespeople can help convince homeowners by explaining that their options are not limited to traditional financing, but rather they can access special energy efficiency financing supported by the utility and state (Peter Krajsa and Matthew Brown, National Energy Improvement Fund, pers. comm., March 2024). Programs should require that all discussions with customers about financing cover details of the consumer protections included and how to access them if needed.

Provide consumers with alternatives to high-interest rate options. There is always the traditional financing option of unsecured debt. Many contractors offer their customers credit cards through manufacturer or bank financing programs to ensure customers have a mechanism to pay for equipment repairs and replacements, which are often emergency purchases. These credit cards may offer short-term low interest rates, but like other unsecured debt, the interest rates may balloon before the debt is fully paid, leaving the homeowner in a difficult situation that more severely impacts low-income households and other marginalized groups. In the absence of lower-cost financing, many households are left to cover the cost of needed repairs and replacements with unsecured debt or to postpone or forgo them altogether. Nonemergency projects—like envelope upgrades—remain out of reach for many. Policymakers should ensure that rebates and tax credits are always exhausted as the first option and then make available secure financing that covers the non-rebated, nontax credited balance of a project. Low-income customers should be given options that minimize or eliminate any balance requiring financing.

Offer alternatives that attract and support rental property owners. Rental property owners often rely on bank financing or other loan financing offered by equipment manufacturers, vendors, and contractors for upgrade projects. Alternative debt financing, including state and local loan programs and community development financial institutions (CDFIs), may present lower-cost or more flexible options designed to encourage greater energy savings and maximize cost savings for the owner and their tenants. These options can play an important role for unsubsidized affordable housing properties that lack access to the same long-term financing opportunities and regulatory protections as subsidized housing. In subsidized multifamily housing, owners can use refinancing or recapitalization cycles to obtain the funding needed for building rehabilitation projects, including energy efficiency retrofits.

Energy performance contracts (EPCs) and energy as a service (EaaS) provide off-the-balance-sheet financing that does not require upfront capital investment from the property owner. While these approaches have proven more challenging for affordable housing, the housing finance agencies in Massachusetts and New York have delivered successful comprehensive retrofit projects using these models (Kamalay 2023).

Use public funding to enhance—not compete with—private capital. Public funding and private capital markets work differently, but both sectors play essential roles in supporting economic growth. Both have important roles here, which should capitalize on their strengths and not pit them against each other. There is a great deal of private capital in the marketplace looking to fund large clean energy projects—less so for hard-to-fund projects such as consumers with poor credit. State policymakers can examine what the traditional market addresses and identify gaps the state can fill. For example, if private capital is not sufficient in low-income communities, a revolving loan fund can help fill the gap (Peter Krajcs and Matthew Brown, National Energy Improvement Fund, pers. comm., March 2024).

Loan loss reserves, interest rate buy-downs, and similar credit enhancements are eligible uses of funding under the IIJA-funded Energy Efficiency Revolving Loan Fund Capitalization Grant Program (EERLF) and the IRA-funded Greenhouse Gas Reduction Fund (GHGRF). This gives states the ability to maximize equitable access to financing for energy efficiency improvements by leveraging private capital and co-lending with private capital providers as discussed above.

Table 3. Examples of effective financing tools for residential retrofits

Type of financing	Implementor examples	Description
Loan loss reserve	Michigan Saves Program	Reduces lender risk by covering a prespecified amount of loan losses, allowing the program to provide below-market interest rates to customers with limited or mixed credit history

Type of financing	Implementor examples	Description
Loan loss reserve	Smart-E Platform model (MI, CT, and CO)	Loan loss reserves leverage the lending capacity of participating local lenders.
Interest-rate buy down	Jersey Central Power & Light (NJ)	Uses ratepayer dollars to offer 0% financing by buying down the interest rate
On-bill financing	Illinois electric utilities	The Climate & Equitable Jobs Act directs public electric utilities to permit customers to finance energy projects through an optional tariff payable directly on their utility bill.
Public fund allocation (e.g., federal, state, and local housing trust funds)	National Housing Trust Fund (HUD)	Public fund allocation allocates funds to states that apply. States use the funds to produce and preserve affordable housing; 80% of funds must be used for rentals while 10% may be used for homeownership and 10% for program administration.
Revolving loan fund	Dollar and Energy Saving Loans (NE)	This revolving loan fund was seeded in 1990 by an escrow fund of penalties paid by oil companies. Money in the fund is lent at a low interest rate (capped at 5%), which is then paid back into the fund to perpetuate retrofit development. Funds are available for single-family and multifamily housing, as well as businesses and government entities.

Example braiding and stacking scenario. Eligible states can establish or enhance an existing revolving loan loss reserve by braiding in federal GHGRF or EERLF monies. These funds can leverage private capital by reducing risk to private lenders while offering low interest rates to borrowers, including those with limited access to credit and rental property owners. States can also leverage the efforts of energy services companies to help their clients identify funds that can be stacked to reduce overall project costs, including the Investment Tax Credit (ITC), the Low-Income Housing Tax Credit (LIHTC), PACE financing, utility rebates, and other IRA funding (e.g., Green and Resilient Retrofit Program, Greenhouse Gas Reduction Fund).

ALIGNING FINANCING OPTIONS WITH INCENTIVES: SMART-E LOAN PROGRAM (CONNECTICUT)

The [Smart-E Loan platform](#), developed by Inclusive Prosperity Capital, helps increase access to clean energy home improvements for low-income and credit-challenged borrowers by offering no-money-down, low-interest financing. Eligibility is still limited depending on credit score and debt-to-income ratio, restricting the most financially challenged households, but the program offers relatively accessible funds to those who qualify. The Smart-E platform features a standardized loan product offered by a network of local lenders covering a wide range of green home improvements including energy efficiency, electrification, solar, and other projects. Program administrators, lenders, and vetted contractors use an online workflow platform, the National Green Energy Network (NGEN), to streamline the application process and ongoing project management. Homeowners and lenders can, respectively, apply for and approve loans through the website. Contractors can request to join the network, watch training videos, and submit project information on the platform. The University of New Hampshire is a partner and used a grant from the Department of Energy to create the online training curriculum for contractors.

The [Connecticut Green Bank](#) offers the Smart-E Loan in the state. Loans can range from \$500–40,000 for one- to four-unit, owner-occupied residential properties with interest rates ranging from 4.49% for 5-year loans to 6.99% for 12-year loans (loan maximums and interest rates may vary in other states). Smart-E functions in part by using American Rescue Plan Act (ARPA) funds for a loan loss reserve to provide partial risk coverage to lenders and help keep interest rates low. The Smart-E loan loss reserve absorbs 100% of portfolio losses in excess of the first 1.5% of lender portfolio losses. The loan loss reserve account balance is set based on loan principal: 7.5% for loans 680–740 credit score, 15% for loans 580–680 credit score; 2.5% of loan balance is reserved in a loan loss reserve cash account. To attract new lenders to clean energy lending and provide risk mitigation in early years, loans originated in the first 2–3 years of the program are covered as part of Smart-E.

“The eligible measures we allow to be financed under our program, we align those with building codes, and any local incentive either through the utility, municipality, or state. That way contractors will not have to learn multiple sets of requirements. For example, with Smart-E it’s these sets of requirements, and for efficiency it’s these sets of requirements. They should be the same, lock step with the policy on the ground.” (Kerry O’Neill and Madeline Priest, Inclusive Prosperity Capital, pers. comm., April 2024).

PRIORITIZE ENERGY EQUITY

Program administrators and policymakers can increase overall savings and reduce household energy burdens by prioritizing equitable access to program benefits for historically underserved and disadvantaged communities. Importantly, these programs should prioritize procedural equity by listening to the communities that they will be serving from the outset of program development. By engaging trusted community-based organizations (CBOs), effective programs can gain an understanding of the community context and design offerings that respond to community needs, leading to greater participation. Community engagement can also support workforce training and development of career pathways in these communities by ensuring programs are designed to serve the particular community's needs. Ensuring equitable outcomes also requires that energy efficiency policies and programs work to increase the affordable housing supply (by minimizing energy costs in existing housing) and do not lead to increases in housing prices.⁹

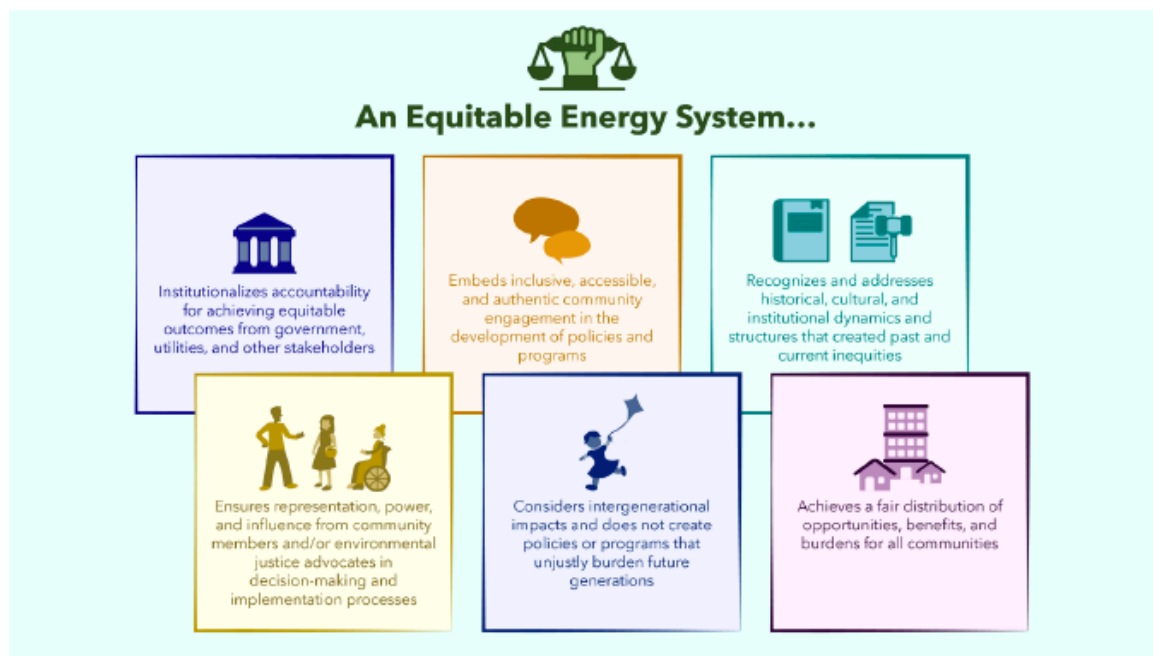


Figure 1. Key components of an equitable energy system (ACEEE)

Provide capacity-building, resources, and technical assistance to CBOs, contractors, retailers, and others as needed. Establishing a single point of contact or designated

⁹ Additional resources and case studies are available from Residential Retrofits for Energy Equity: <https://www.aceee.org/r2e2>.

program navigators to match CBOs and businesses delivering retrofits and their supply chain partners to program resources, training, and support eliminates barriers to entry. Smaller companies, minority- and woman-owned enterprises, and new businesses will benefit most from services that connect them to technical assistance, business networks, and other opportunities. This type of coordinated effort can ensure that program outreach, job creation, and other benefits reach underserved and disadvantaged communities. Programs should financially compensate CBOs and other organizations for the expertise and capabilities they bring to the effort.

Create options and protections for renters and rental properties. Renters and rental property owners, whether in single- or multifamily buildings, have long been underserved by efficiency programs and policies. This lack of investment contributes to the disproportionately high energy burden facing many renters, especially low-income households and Black and Latino renters (Drehobl, Ross, and Ayala 2020). The recent trend toward renting among higher-income households—a 45% increase in renter households with annual income of \$75,000 or more from 2010 to 2018—is pushing low- and moderate-income renters into lower-quality, less-efficient housing (Samarippas and Jarrah 2021). Expanding energy efficiency to rental housing is key to greater energy equity and preservation of affordable housing. This requires addressing the unique needs of renters and rental property owners.

Programs can better engage rental property owners by establishing a single point of contact to support them through the program application process, reducing the documentation burden, and allowing property owners to apply for programs on behalf of renters in their properties (Dewey, Mah, and Howard 2021). Program marketing and outreach should target property owners, property management staff (e.g., property managers, maintenance staff, and leasing agents), and renters. Materials should make clear that rental properties are eligible. Program staff can leverage the relationships of business associations, government agencies, utilities, and other organization with property owners to support their outreach and engagement efforts.

Unregulated affordable housing does not carry the same rental protections applied to government-assisted properties. States can adopt anti-displacement rules to protect renters from rent increases and evictions once the property is made more attractive, comfortable, and efficient with federal incentives. Examples include first right of return and tenant opportunity to purchase (TOPA) policies, affordability covenants, closing loopholes in rent control ordinances, and just cause eviction policies. For the HOMES and HEAR programs, federal guidelines require rent stabilization for a minimum of two years after completion of retrofit projects. These policies can play an important role in protecting renters and ensuring the long-term availability of energy-efficient naturally occurring affordable housing (NOAH).

Design programs to attract multifamily building owners. Programs can appeal to multifamily building owners by offering incentives that address their unique needs. Programs have to offer high enough incentive amounts to account for the diversity of multifamily building types (high rises, garden-style, etc.). Allowing program funding to pay

for common area (owner-metered) measures in addition to in-unit measures that benefit renters can also increase participation. States should consider allocating funds over multiyear program budgets and/or reserving funding for multifamily affordable housing so owners can direct the funding into projects with longer lead times and greater complexity.

Align programs with state and local equity initiatives and goals. Many state and local governments are pursuing clean energy initiatives in environmental justice and pollution-burdened communities to address long-term disinvestment and racially biased policies. State and local funding can help cover the difference between federal rebates and total project costs. State retrofit programs can also make use of tools developed by the federal government (e.g., the Climate and Economic Justice Screening Tool, or CEJST) or their own state agencies to streamline the delivery of new and existing programs and to identify priority communities for investment.¹⁰

Conduct an equity assessment, establish equity metrics, and track performance.

Without equity metrics and performance targets, administrators cannot be sure the program is performing as intended and make necessary adjustments. A review of four energy efficiency loan programs (including the Connecticut Green Bank Smart-E Loan program, covered in a case study above) found that median credit scores for participants ranged from 740 to 754, well above the national average for the period studied, and less than 15% of borrowers had scores below 660 (SEE Action 2021). While these programs are intended to provide financing to those with less access to traditional financing, the distribution of benefits of these loans was concentrated among households with more access to other financing options. A process to track metrics for equity-related goals can illuminate shortcomings and allow for adjustments.

¹⁰ The Climate and Economic Justice Screening Tool (CEJST) can be accessed at <https://toolkit.climate.gov/tool/climate-and-economic-justice-screening-tool>. State screening tools include CalEnviroScreen (<https://oehha.ca.gov/calenviroscreen>), Maryland Environmental Justice Screen Tool (<https://p1.cgis.umd.edu/ejscreen/>), North Carolina DEQ Community Mapping System (<https://www.deq.nc.gov/outreach-education/environmental-justice/deq-north-carolina-community-mapping-system>), and Washington Environmental Health Disparities Map (<https://fortress.wa.gov/doh/wtn/WTNIBL/>).

REDUCING RENTER ENERGY BURDENS IN AFFORDABLE HOUSING: ATLANTA HOUSING ENERGY EFFICIENT RENT BOOST PROGRAM

Atlanta's [Energy Efficient Rent Boost](#) (EERB) program offers financing and incentives to support energy efficiency upgrades in eligible rental properties. The program was launched by Atlanta Housing (the housing authority of the City of Atlanta) in 2021 to help preserve affordable housing and stabilize communities while reducing renters' energy costs and improving health and safety. On completion of energy-saving upgrades, EERB provides property owners who participate in the city's Housing Choice Voucher Program with a monthly rent boost of \$50–175 per unit. The rent boost remains in effect as long as the same tenant occupies the unit or with a new tenant if the rent boost was certified within the past five years.

Rental property owners may also receive rebates for energy efficiency measures from Georgia Power and for water conservation measures from the City of Atlanta Department of Watershed Management. Georgia Power's Multifamily Home Energy Improvement Program offers rebates to cover 50% of project costs, up to \$575 per unit per year; the Home Energy Improvement Program offers rebates of up to \$1,250 for single-family rentals. To increase awareness of the range of incentives available, Atlanta Housing conducts outreach and engagement with owners, including sessions featuring representatives of the [Solar and Energy Loan Fund](#) (SELF) and partner utilities and retailers.

In addition to the rent boost, Atlanta Housing offers other incentives for property owners participating in the EERB program, including financing for upgrades through the Sustainable, Energy-Efficient Rental (SEER) loan, retail discounts, and free energy efficiency inspections. Atlanta Housing partnered with SELF to develop the SEER loan, which provides unsecured financing of up to \$25,000 per rental unit, with interest rates starting at 7% and loan terms of up to 72 months.

SELF is a community development financial institution (CDFI) and nonprofit green bank focused on low- and moderate-income markets operating in Florida, South Carolina, Alabama, and Georgia. SELF administers the SEER loan program, with funding from the Opportunity Finance Network's (OFN) Finance Justice Fund. OFN is a national network of more than 390 CDFIs operating around the country. The Finance Justice Fund was established with the goal of bringing more than \$1 billion in investments from corporate and philanthropic partners to OFN member CDFIs working to close the racial wealth gap and serve disadvantaged communities.

Align programs with state and local equity initiatives and goals. Many state and local governments are pursuing clean energy initiatives in environmental justice and pollution-burdened communities to address long-term disinvestment and racially biased policies. State and local funding can help cover the difference between federal rebates and total project costs. State retrofit programs can also make use of tools developed by the federal government (e.g., the Climate and Economic Justice Screening Tool, or CEJST) or their own state agencies to streamline the delivery of new and existing programs and to identify priority communities for investment.¹¹

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Without equity metrics and performance targets, administrators cannot be sure the program is performing as intended and make necessary adjustments. A review of four energy efficiency loan programs (including the Connecticut Green Bank Smart-E Loan program, covered in a case study above) found that median credit scores for participants ranged from 740 to 754, well above the national average for the period studied, and less than 15% of borrowers had scores below 660 (SEE Action 2021). While these programs are intended to provide financing to those with less access to traditional financing, the distribution of benefits of these loans was concentrated among households with more access to other financing options. A process to track metrics for equity-related goals can illuminate shortcomings and allow for adjustments.

Minimize costs to participants. Common features of traditional programs can create unnecessary cost barriers to participants. Tax incentives are typically available only to tax-paying entities, leaving out properties owned by public agencies and nonprofit owners or households without a tax burden. By making tax incentives assignable to project designers or contractors, these organizations can realize lower project costs. In many cases, rebates are paid out on project completion, creating an obstacle for those without the resources to cover initial costs. Providing rebates upfront or in stages, rather than waiting until project completion, can allow more participants to take on projects. Finally, in the push toward electrification, programs must ensure that electrification does not leave residents with unaffordable monthly energy costs. Coupling projects with envelope efficiency upgrades reduces overall electric load and the bill. Changes to electricity rate design can also lower total energy bills and ensure affordability for low- and moderate-income households. Utility regulators are considering several options: percentage-of-income payment programs that

¹¹ The Climate and Economic Justice Screening Tool (CEJST) can be accessed at <https://toolkit.climate.gov/tool/climate-and-economic-justice-screening-tool>. State screening tools include CalEnviroScreen (<https://oehha.ca.gov/calenviroscreen>), Maryland Environmental Justice Screen Tool (<https://p1.cgis.umd.edu/ejscreen/>), North Carolina DEQ Community Mapping System (<https://www.deq.nc.gov/outreach-education/environmental-justice/deq-north-carolina-community-mapping-system>), and Washington Environmental Health Disparities Map (<https://fortress.wa.gov/doh/wtn/WTNIBL/>).

protect customers by ensuring their bills do not exceed an energy burden ceiling; income-graduated fixed electric charges; and time-based volumetric rates and seasonal rates (Yim and Subramanian 2023).

ADDRESS HEALTH AND SAFETY ISSUES BEFORE EFFICIENCY UPGRADES

Energy efficiency improvements can contribute to healthier, safer home environments while making housing more affordable. Before energy retrofit work can begin, some home health and safety concerns (e.g., mold, lead, asbestos, ventilation, structural issues) must be addressed to protect residents and prepare the home or building for installation of envelope and equipment efficiency measures. Repairs and hazard mitigation can be costly and may put energy retrofits out of reach for many households, often those that would benefit most from weatherization. An estimated 10–30% of income-eligible federal Weatherization Assistance Program clients are deferred from the program due to health and safety issues (E4TheFuture 2022c). Many utility energy efficiency programs are also prohibited from using funds for pre-weatherization work. Incorporating funding or other mechanisms to address these deficiencies, including healthcare funds to support retrofits that provide direct health benefits, allows more retrofits to move forward.

Engage state and local governments and other stakeholders. Coordination across energy, health, and housing agencies can support more effective and efficient delivery of home retrofit projects that address health, safety, and energy efficiency. Agency engagement with utilities, healthcare providers, and other stakeholders can bring additional resources (e.g., funding, expertise, community partnerships) to support more comprehensive approaches to meeting the challenge of providing healthy, affordable, and decarbonized housing (Hayes et al. 2022).

Prioritize health and safety in funding criteria. DOE’s guidance for the Energy Efficiency Revolving Loan Fund (EERLF) Capitalization Grant Program requires building and home retrofits to improve at least one of the following:

- The physical comfort of the building or facility occupants
- The energy efficiency of the building or facility
- The quality of the air in the building or facility¹²

States can also direct a portion of their LIHEAP funds toward remediation of health and safety barriers so that homes can receive energy-related weatherization services.

¹² See DOE’s FAQs on the RLF for more details: <https://www.energy.gov/sites/default/files/2022-10/SEP-FAQs-RLF-BIL-v2.pdf>

Establish an accessible health and safety barriers remediation program. A dedicated program to address pre-retrofit health and safety issues can streamline the process for participating households, contractors, agencies, and funders.¹³ At the outset, program staff collect data on the number and type of issues preventing energy retrofits to identify needs and support tracking of program progress. Then the program can pool available resources to cover the costs of remediation work for income-qualified households; facilitate project flow from identifying repairs, bringing in remediation contractors, and then going back to the retrofit or weatherization contractor; and provide outreach to community organizations, contractors, and other agencies to increase awareness and access to services. Program staff maintain connections with funders that may include state agencies responsible for disbursing state and federal funds (e.g., housing funds, LIHEAP, Weatherization Readiness funds, EERLF), municipal agencies, utilities, and private sector funders.

¹³ An early example of this emerging program type is administered by the Connecticut Department of Energy and Environmental Protection. Details are available at <https://portal.ct.gov/deep/energy/conservation-and-load-management/weatherization-barrier-mitigation>.

WEATHERIZATION FUNDS FOR HEALTH AND SAFETY: CLIMATE AND EQUITABLE JOBS ACT (ILLINOIS)

In late 2021, Illinois Governor Pritzker signed into law the Climate and Equitable Jobs Act (CEJA), intended to help the state use 100% clean energy by 2050. To reach this aggressive goal, Illinois and its utilities will need to invest in energy efficiency measures, including weatherization. The Illinois Home Weatherization Assistance Program (IHWAP) uses a capital stack of funds from the Low-income Home Energy Assistance Program, the federal Weatherization Assistance Program and utility ratepayers. Community action agencies then braid these sources of funding to provide energy efficiency and health and safety improvements to individual homes.

With passage of the IRA, additional federal dollars are available to compliment WAP, LIHEAP, and utility investments. Increased investment in energy efficiency immediately lowers energy usage and reduces carbon while also providing improvements to building resiliency and indoor air quality.

Under CEJA, utilities are required to implement a health and safety fund of at least 15% of the total income-qualified weatherization budget for repairs that must be completed prior to energy efficiency upgrades. These funds will be targeted at low-income single-family and multifamily households. Buildings for 501(c)3 organizations, daycare centers, and group homes will also be eligible. The funds are intended to reduce deferral rates and increase efficiency benefits for customers who most need assistance. Utilities are also instructed to direct participants to other companion programs for further assistance (Stacey Paradis, Illinois Commerce Commission, pers. comm., March 2024).

CEJA also increased the applicable minimum annual low-income expenditures. For Illinois' two largest utilities, annual minimum spending requirements increased from \$25 million to \$40 million in 2023 for ComEd, and \$8.35 to \$13 million for Ameren Illinois. Updates on CEJA programs and open applications can be found at <https://dceo.illinois.gov/ceja/ceja-program-announcements.html>.

ENSURE ACCESS TO DATA

Safe, secure, and seamless access to consumer utility data supports innovation and program improvement. Enabling utility customers' secure access to their own energy use data via a simple online verification process provides them with information they can use to change their behavior and partner with third parties to reduce their energy use.

Use AMI data to advance energy efficiency Access to data from advanced meter infrastructure (AMI) is essential to the future of upgrading the energy efficiency of residential buildings. AMI data can provide consumers and contractors with important information on personal energy use in order to install the best energy efficiency upgrades to save energy

and money (Michael Richard, Maryland Public Service Commission, pers. comm., March 2024). In June 2023, Senators Welch and Van Hollen reintroduced S.1936, the “E-Access” legislation to enhance consumer access to electric energy and natural gas information and “allow for the development and adoption of innovative products and services to help consumers, organizations, and governments manage their energy use, reduce greenhouse gas emissions, and improve electric grid reliability.”

Contractors can use AMI data in marketing materials to provide customers with more accurate predictions on potential energy savings and the upgrades that make the most sense. Post installation, contractors can leverage data to monitor outcomes and evaluate the upgrade’s success. In addition, energy usage and rate code information can be transmitted to water heaters, electric vehicle (EV) chargers, and other appliances to automatically optimize and even become a resource for the power grid (Michael Murray, Mission:data, pers. comm., February 2024). Finally, customers with continued access to their energy use data may adjust their habits to maximize the potential of their energy efficiency upgrades. This helps customers understand their bills and build trust in contractors.

Assigned third-party access to customer utility data needs to be easier while addressing privacy concerns. Illinois is working on improving access to AMI data in several ways. In 2023 the Illinois Commerce Commission created a Data Access Work Group, which has met throughout the year to discuss the benefits of increased data sharing for both residential and commercial and industrial customers, including products and services that rely on increased access to customer interval data. Ongoing ComEd and Ameren dockets will address access to AMI interval data by retail electric suppliers (Ann McCabe, Illinois Commerce Commission, pers. comm., March 2024). Similar to healthcare and financial data, customers should be able to consent to safe and secure data transfer without fear of privacy breaches (Murray 2023). States are working to address concerns about data security. For example, Mission:data worked with the North Carolina Attorney General’s Office in 2020 to propose a data privacy rule¹⁴ requiring electric utilities to adhere to best practices on data privacy and allow for state-of-the-art data portability. The proposed ruling also forbids utilities from selling customer information or using contractors that are not bound to customer security and privacy. For federal rebate programs, DOE provided appropriate best practices for customer sign-off on energy use data and usage protections (per statute).

Data access supports implementation of federal rebate programs. As noted, the HOMES in the IRA is a performance-based incentive. To receive this rebate, the contractor is required to provide either a bill-calibrated home energy model or to show measured energy

¹⁴ Docket No. E-100, Sub 161 before the North Carolina Utilities Commission. Comments and Proposed Rules by Mission:Data Coalition, February 2020, <https://starw1.ncuc.gov/ncuc/ViewFile.aspx?NET2022&Id=e2e057ef-0b05-4670-93a4-3ae87dcb1cd5>.

savings based on customer usage data. This approach was designed to encourage higher-quality performance-based contracting, rather than a one-size-fits-all approach, and requires contractors to improve the quality of their offerings. In both modeled and measured pathways, energy bill data are required to calibrate model accuracy or to directly measure savings. Energy data can be provided by the homeowner, the utility, or through a partnership with one of many data access providers already in the market. In fact, states applying for HOMES rebates are required to develop and submit Utility Data Access Plans prior to program initiation. To provide states with specific requirements and recommendations, DOE released a separate nine-page [Data Access Guidelines](#) document with additional [guidance](#) released in January 2024. Solar programs and some home performance contractors have been getting such data for years. Facilitating electronic data access will simplify the process for customers and contractors and eliminate transcription errors.

INCORPORATE GRID FLEXIBILITY TO BRIDGE TRADITIONAL AND DYNAMIC ENERGY EFFICIENCY

Incorporating grid-interactive technologies, like smart thermostats or grid-enabled water heaters, into residential retrofit programs can help enable demand flexibility—where home energy usage is shifted to different times or throttled up or down to help address peak demand periods and better align with clean, renewable, and/or least-cost energy resources. Technologies and approaches that enable this demand flexibility in addition to traditional energy efficiency can drive increased value for customers while helping to stabilize the power grid.

Combine demand response and demand flexibility with traditional energy efficiency.

Energy efficiency and demand response have related goals of reducing energy use and demand on the grid, with efficiency focused on baseload and demand response focused on peak load. By combining these efforts, residential retrofits could maximize benefits and savings. Demand response and load shifting are more successful when paired with building shell measures like insulation and air sealing that improve the thermal envelope. And customers who participate in low-income weatherization programs (primarily shell measures) could save more energy and money through demand response programs, where the utility compensates the occupant for participating in a peak reduction program. Importantly, HVAC-focused demand response programs work best with energy efficiency, because a home that is not well insulated will have difficulty maintaining a set temperature range that keeps occupants comfortable during a demand reduction event. Communication and collaboration, such as sharing outreach lists and other information between different parts of demand-side management teams, could create more streamlined participation in various programs (Aaron Berndt, Google, pers. comm., March 2024). Furthermore, homes that connect their thermostats to the grid for monitoring could be targeted for insulation programs if their home does not effectively maintain thermal comfort during extreme temperatures (Saul-Rinaldi and Bunnan 2018).

Incorporating demand flexibility and dynamic efficiency will help increase the value of retrofits. The value of a kilowatt hour is different based on how much it is needed and how expensive it is to produce—so the value to the grid, the utility, the climate, the energy user, and the policymaker are variable. However, most consumers pay the same rate per kWh across time and location. Policy mechanisms like time-of-use rates and pay-for-performance can help address that gap and appropriately compensate customers according to the varying value of energy savings at different times. Combined with the right grid-interactive technologies and strategies, these policy mechanisms can help customers save more on their energy bills while also increasing benefits to the grid (Saul-Rinaldi, Bunnan, and Rogers 2019). Due to equity issues associated with fluctuating rates, policymakers should be sure to engage community-based organizations in establishing these programs. Note, maximizing the potential for demand flexibility requires taking into account the unique load curve of a jurisdiction, the peaks and valleys of energy use—and this may change as a result of new policies and incentives (such as for electric vehicles or solar power).

Simplicity is supreme. New programs must be as easy as possible for residents and building owners to understand, even if they are based on complex grid needs and diverse home types. Not all homeowners are able to embark on deep retrofit projects, but even smaller-scale measures can benefit homeowners and the grid. For example, enrolling customers in demand response (DR) programs in conjunction with efficient appliance and equipment upgrades can increase DR adoption. Promoting both large retrofits and smaller improvements can help more customers engage in energy efficiency efforts and save on their energy bills (Aaron Berndt, Google, pers. comm., March 2024).

Diverse solutions, flexible pathways. With a wide range of high-performance technologies available, various approaches to retrofitting a home can result in both a more dynamic grid and a more efficient building stock. Depending on the circumstances, the contractor and customer may elect solutions such as a smart electrical panel, connected appliances, or other grid-enabled devices as part of their home upgrade. Diverse solutions, paired in different ways or designed for specific configurations, can provide similar outcomes in energy savings, depending on their application and usage. Specifying overall performance targets rather than individual technologies can enable the market to remain competitive and allow greater innovation (Alice Rosenberg, Consortium for Energy Efficiency, pers. comm., March 2024).

PLAN FOR LONG-TERM SUCCESS: MARKET TRANSFORMATION AND OVERSIGHT

The final key element of successful residential retrofit programs is incorporating strategies to enable ongoing progress toward program and policy goals once incentives and other program interventions are removed. By considering opportunities to drive lasting changes in both market supply and demand, programs can generate long-term benefits well beyond the life of the program.

Consider long-term goals in program design. Clearly stating the long-term program goals and objectives (e.g., reduced climate emissions, equitable decarbonization, improved health outcomes, resilience, lower housing costs, workforce development) provides the broader context for program activities. While creating a common language for communities and stakeholders, this longer-term vision also guides the specific strategies and tactics to be employed while carrying out the program and sets the stage for the desired conditions when the current funding wraps up. Key questions to address include: Will the program end when the current funding is exhausted or will it continue as a more self-sustaining initiative? What would a self-sustaining initiative require? What should be priorities in the early stage of the program and how might priorities shift over the course of the program?

Build the infrastructure to support robust businesses and vibrant career paths in the industry. Program investments should be used to stand up an industry that can thrive without heavy reliance on public sector funding. Strategies that build up both the supply and demand side of the market are required. Supply-side support may include upstream incentives for the development and introduction of more efficient products or products that meet the needs of market segments that have been overlooked. Updated or revised technical standards may be needed to allow credible comparisons of product or building performance. As discussed above, robust and equitable workforce development and training are critical. Low-cost continuing education options are needed to reinforce and update skills and knowledge. In addition to training, establishing or expanding recognized certification programs to demonstrate skills and competencies helps workers advance and makes it easier for employers to identify the workers they need for specific roles.

Demonstrate the long-term value of retrofit investments. Establishing the value and benefits of home efficiency improvements is key to building durable demand for retrofits. Policymakers should consider pairing incentives with asset valuation to shine a bright light on all efficiency measures in the home and the value of the improvements. Home Energy Score and Pearl Certification are examples of tools designed to showcase efficiency upgrades.¹⁵ Studies also show that providing certifications with access to portals that help the homeowner remember what their home upgrade entailed and what other measures were recommended and by what contractor will help the homeowner undertake their upgrade in stages, if needed, and highlight these upgrades when selling or renting their home (Brookstein 2022). Studies show the potential for a greater return on investment at the time retrofit homes are sold (Adomatis 2015, 2017; Fincham 2022)

Incorporate oversight mechanisms to measure progress and drive continuous improvement. Robust evaluation and tracking of key metrics are crucial to understanding

¹⁵ For more information: Home Energy Score: <https://www.energy.gov/eere/buildings/articles/home-energy-score> and Pearl Certification: <https://pearlcertification.com/>.

program outcomes. From the outset, program implementers should review proposed metrics and agree on reporting requirements and expectations on the use of inspections or other quality assurance activities. Transparency and opportunity for stakeholder review and input are needed to allow outside watchdogs to provide feedback to regulators. Contractors, distributors, and other service providers will need program guidance that includes adequate training and resources to support compliance with reporting and other requirements.

PROGRAM ELEMENTS

Table 4 summarizes the primary and secondary funding sources available to support each of the program elements discussed above.

Table 4. Funding sources supporting key program elements

Program element	Primary funding sources	Secondary funding sources
<i>Training and workforce development</i>	<ul style="list-style-type: none"> • TREC Grants (IRA Sec. 50123) • Energy Auditor Training (IIJA Sec. 40503) 	<ul style="list-style-type: none"> • WAP (IIJA Sec. 40551, annual federal appropriations) • HOMES (IRA Sec. 50121) • HEAR (IRA Sec. 50122) • Career Skills Training “CST” (IIJA Section 40513) • State workforce development programs • Utility-funded training
<i>Affordable financing</i>	<ul style="list-style-type: none"> • EERLF (IIJA Sec. 40502) • GHGRF (IRA Sec. 60103) • GRRP (IRA Sec. 30002) 	<ul style="list-style-type: none"> • EECBG (IIJA Sec. 40552(a)) • SGIG (IIJA Sec. 40107) • SEP (IIJA Sec. 40109, annual federal appropriations) • Green banks • Housing trust funds • Utility funds
<i>Rebates/incentives</i>	<ul style="list-style-type: none"> • HOMES (IRA Sec. 50121) • HEAR (IRA Sec. 50122) • 25C (IRA Sec. 13301) • 25D (IRA Sec. 13302) • GRRP (IRA Sec. 30002) 	<ul style="list-style-type: none"> • GHGRF (IRA Sec. 60103) • EECBG (IIJA Sec. 40552(a)) • SGIG (IIJA Sec. 40107) • State tax incentives • Utility funds
<i>Energy equity</i>	<ul style="list-style-type: none"> • GHGRF (IRA Sec. 60103) • GRRP (IRA Sec. 30002) 	<ul style="list-style-type: none"> • EERLF (IIJA Sec. 40502) • CPRG (IRA Sec. 60114)

Program element	Primary funding sources	Secondary funding sources
	<ul style="list-style-type: none"> • HOMES (IRA Sec. 50121) • HEAR (IRA Sec. 50122) • ECJBG (IRA Sec. 60201) • WAP (IIJA Sec. 40551, annual federal appropriations) • LIHEAP (IIJA Div. J, Title VII) 	<ul style="list-style-type: none"> • Housing trust funds • Healthcare funds • Utility/State funds
<i>Health and safety</i>	<ul style="list-style-type: none"> • WAP (IIJA Sec. 40551, annual federal appropriations) • WRF (annual federal appropriations) • LIHEAP (IIJA Div. J, Title VII) 	<ul style="list-style-type: none"> • GHGRF (IRA Sec. 60103) • CPRG (IRA Sec. 60114) • HEAR (IRA Sec. 50122) • Healthcare funds • Housing trust funds
<i>Grid flexibility</i>	<ul style="list-style-type: none"> • SGIG (IIJA Sec. 40107) • HOMES (IRA Sec. 50121) 	<ul style="list-style-type: none"> • WAP (IIJA Sec. 40551, annual federal appropriations) • 25C (IRA Sec. 13301) • CPRG (IRA Sec. 60114)
<i>Data access</i>	<ul style="list-style-type: none"> • HOMES (IRA Sec. 50121) • SGIG (IIJA Sec. 40107) 	<ul style="list-style-type: none"> • Utility capital expense • Utility operating expense
<i>Long-term success plan</i>	<i>ALL SOURCES CAN SUPPORT</i>	

Conclusion

The IRA and IIJA are providing unprecedented opportunities for states to leverage their current funding and programs while offering new and deeper energy savings opportunities in the residential sector. What these opportunities look like will vary widely depending on the state. Some states have access to deep funding streams from ratepayer programs, government agencies with a wealth of capacity and history in clean energy, and access to secure energy data, whereas other states are beginning now with none of this existing infrastructure. However, states with less history are also less burdened by past decisions and precedents in building their future policies and innovations. Importantly, the new federal resources aim to meet states where they are and move all states forward. This paper intends to help states transform their energy efficiency markets by learning from best practices and building on their unique model.

At the outset of absorbing the new resources, states are already choosing to

1. Reach out to contractors, community-based organizations, and program administrators to find the gaps in existing programs and ensure disadvantaged communities are included as beneficiaries of new program dollars.
2. Review state energy policy goals to ensure that the new initiatives are consistent with policies designed for the state's current energy and equity challenges.
3. Identify the expectations of existing programs in their state portfolios to use the new funding streams to stretch goals and provide deeper, broader reach while supplementing and not supplanting the current programs. It is critical that lessons from existing programs are folded into the expansion and innovation of new programs.
4. Coordinate with other agencies to break down silos and identify staff and funding that can be leveraged, comparing funds and their limitations in order to target funds according to their best, most efficient use. This includes resources for labor and education that can support a growing, diverse workforce and provide new career opportunities.

The new federal resources are an important opportunity for states to not only upgrade a large portion of America's homes but also to educate Americans about home energy efficiency and decarbonization. Changing how people think about the homes they live in and their energy consumption, increasing data flows to assist measuring energy savings, and directing attention to overlooked energy-hungry appliances will support all states in supercharging their existing programs and building a new future for their homeowners. Contractors that have invested in training because incentives can only be offered by a skilled workforce will use that knowledge long after the IRA and IIJA funds have expended. As the ultimate legacy of these new federal resources, successful, well-designed, and innovative programs can lead to the creation of self-sustaining and growing energy-efficient home retrofit markets.

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Appendix A: Federal Funding for Residential Retrofits

DEPARTMENT OF ENERGY: EXISTING PROGRAMS

The U.S. Department of Energy's (DOE) **State Energy Program (SEP)** provides annual funding to 50 states, the District of Columbia, and the five U.S. territories to support a nationwide infrastructure of state energy offices to enhance energy security, advance state-led energy initiatives, and increase energy affordability. Since 2010, SEP has provided states and territories with more than \$540 million in financial assistance.

Implementation of this funding by the states has resulted in a wide range of benefits to states, including reduced energy waste in more than 45,000 buildings through energy efficiency upgrades and education of more than 4.7 million people in performing energy audits and upgrades (DOE 2023). The IIJA provides an additional \$500 million for SEP through fiscal year 2026. States could choose to leverage all or part of this increased formula funding to support residential retrofit programs. <https://www.energy.gov/scep/state-energy-program>

DOE's **Weatherization Assistance Program (WAP)** provides low-income households with funds and resources for home weatherization upgrades.¹⁶ Since WAP's creation in 1976, over 7 million households have received weatherization funds averaging \$4,695 per household, with approximately 35,000 homes served annually (WAP 2021). Expenditures are limited to \$6,500 per home adjusted annually according to the consumer price index (CPI). In December 2020, WAP was reauthorized and expanded, providing additional innovative opportunities for the funding. In addition to the program's annual appropriations, the IIJA provides \$3.5 billion in supplementary funding for WAP for fiscal year 2022 until expended. With this significant increase in funding, WAP is now poised to serve many more households in need.

In addition, Congress passed the FY22 annual appropriations package¹⁷ with \$334 million appropriated to WAP, including \$15 million set aside for a new Weatherization Readiness Fund (WRF) to reduce the number of homes deferred from WAP each year. The WRF is designed to address necessary repairs—including health and safety issues and structural repairs—that would otherwise prevent a home from receiving weatherization services. The WRF dollars are specific to the annual appropriations funding and cannot be used for repairs on dwelling units weatherized with supplementary IIJA funding (WAP 2022). Legislation has

¹⁶ DOE guidelines define low-income as households at or below 200% of the federal poverty level.

¹⁷ H.R. 2471, the Consolidated Appropriations Act, 2022.

also been introduced in 2022 to codify and fund the WRF going forward.¹⁸

<https://www.energy.gov/scep/wap/weatherization-assistance-program>

The **Energy Efficiency and Conservation Block Grant Program (EECBG)** assists eligible local governments, states and territories, and Indian tribes in implementing strategies to improve energy efficiency, including in the residential building sector. IIJA appropriated an additional \$550 million to the EECBG Program.¹⁹ State and local governments may use grant funding to conduct programs and activities, including developing and implementing residential energy efficiency programs, providing incentives, and delivering financing.

<https://www.energy.gov/scep/energy-efficiency-and-conservation-block-grant-program>

The **Smart Grid Investment Grant Program (SGIG)** was first established in 2007. Under the 2009 American Rescue and Recovery Act (ARRA), the program was allocated \$3.5 billion in federal funds, which leverage over \$8 billion in nonfederal funding. The program is funded again at \$3 billion through 2026 via IIJA. This cost-sharing grant program is administered by the Office of Grid Deployment. Customer-sited projects in homes (including single- and multifamily, owner-occupied, and rental housing) are eligible, including smart appliances and equipment, home energy management systems, distributed energy systems, demand response and load control equipment, and energy storage devices.

The majority of projects implemented under this program include advanced metering infrastructure (AMI), a system of smart meters, two-way communications networks, and data management systems. This two-way information exchange enables a range of new customer service applications that may be used to facilitate retrofit programs.

<https://www.energy.gov/gdo/smart-grid-grants>

DEPARTMENT OF ENERGY: NEW PROGRAMS

IIJA provides \$250 million for a new **Energy Efficiency Revolving Loan Fund Capitalization Grant Program (RLF)**, which will support residential building energy audits and upgrades. The program will be established by DOE under SEP, with 40% of RLF funding distributed to states through SEP formula funding, and 60% for supplemental capitalization grants of up to \$15 million per state to a set of priority states.

States may use up to 25% of their allocation for direct grants to certain eligible entities including low-income homeowners. The law requires that the capitalization grant be used to

¹⁸ H.R.7947, Weatherization Enhancement and Readiness Act, 2022; S.3769, Weatherization Assistance Program Improvements Act, 2022.

¹⁹ Energy Efficiency and Conservation Block Grant Program, U.S. Department of Energy, <https://www.energy.gov/bil/energy-efficiency-and-conservation-block-grant-program>.

leverage private capital to the maximum extent practicable and encourages states “to utilize and build on existing programs and infrastructure within the State that may aid the State in carrying out a revolving loan program.” DOE released an initial Request for Information in May 2022; specific program guidance has not been issued at the time of this writing.

<https://www.energy.gov/scep/energy-efficiency-revolving-loan-fund-capitalization-grant-program>

Under IIJA, the RLF Capitalization Grant Program is paired with \$40 million for an **Energy Auditor Training Grant Program**. DOE is charged with establishing this competitive grant program under SEP with funding allocated for fiscal years 2022–2026. States with demonstrated need will be able to apply for grants of up to \$2 million to train individuals to conduct energy audits or surveys of commercial and residential buildings.

Up to 10% of the grant funds can be used to cover trainee wages, and trainees must receive a covered certification upon completion of the training curriculum. For residential energy auditor training, eligible certifications include the Building Performance Institute (BPI) Home Energy Professional Energy Auditor certification, the Residential Energy Services Network (RESNET) Home Energy Rater certification, and any other equivalent third-party certification determined by DOE. <https://www.energy.gov/scep/energy-auditor-training-grant-program>

The first program to focus on residential performance-based energy efficiency was established in the IRA. Originally known as HOPE for HOMES, the **Home Efficiency Rebates (HOMES)** and **Training for Residential Efficiency Contractor (TREC)** programs set out \$4.5 billion through September 2031 in training and rebates to be allocated by formula to State Energy Offices. Funds will be distributed to each state as they apply for the funding by presenting programs that meet DOE guidance.

First, it sets aside \$4.3 billion in rebates through the Home Efficiency Rebates program. Previously referred to as HOMES (Homeowner Managing Energy Savings) rebates, this funding provides an unprecedented key to unlocking a wholesale change in the residential energy space, which accounts for one-fifth of the energy-related CO₂ emissions in the United States.²⁰ The state-run HOMES programs across the country will be designed to encourage performance-based residential energy efficiency retrofits in single-family homes and multifamily buildings. Rebates begin at \$2,000 for a 20% reduction in home energy use and are doubled for low- and moderate-income households (non-income-qualified individuals can see up to 50% of their project covered, while those making less than 80% of area median income can receive 80% coverage). The rebates are designed to incentivize all Americans to perform an energy efficiency upgrade while providing more financial support to those with the highest energy burdens. The rebates are provided via two pathways: (1)

²⁰ <https://www.eia.gov/environment/emissions/carbon/>.

Modeled Energy Savings, where a baseline is established and the rebate is based on the expected energy savings from the modeled and then installed measures, and (2) Measured Energy Savings, where an aggregator provides upgrades across a portfolio of homes and receives the rebates based on the actual energy savings. Details of each pathway are summarized in figure A1. The IRA also provides for \$200 contractor incentives for projects in disadvantaged communities. Additional details are provided in program guidance issued by DOE in July 2023.²¹ <https://www.energy.gov/scep/home-efficiency-rebates>

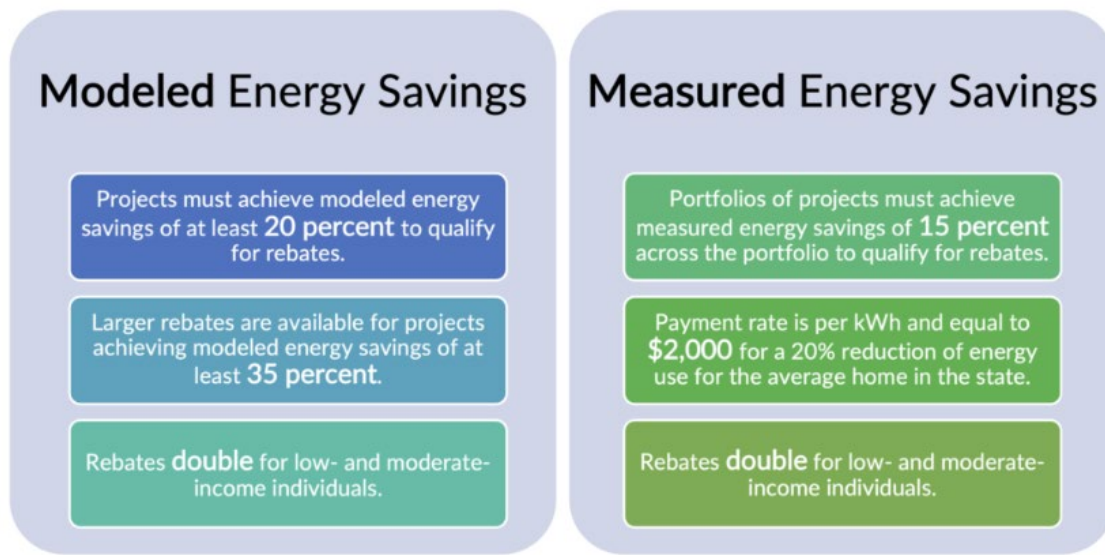


Figure A1. HOMES rebates program modeled and measured energy savings pathways

The HOMES rebates were designed to create an increased demand for whole-home retrofits, thus increasing the need for newly trained contractors. For this reason, HOMES is coupled with \$200 million in IRA funding for state-based **Training for Residential Energy Contractor Program (TREC)** grants. Contractors with new training from the programs will be better able to assist homeowners in understanding all the avenues for achieving meaningful reductions in their home energy use. The training grant program expands training opportunities and educates contractors on providing deep retrofits and electrification measures—growing and diversifying the energy efficiency workforce. <https://www.energy.gov/scep/training-residential-energy-contractors-grants-formula>

In addition to the HOMES efficiency rebates described above, the IRA includes point-of-sale **electrification rebates** to facilitate equity and inclusion by focusing \$4.5 billion of additional

²¹ Guidance documents and related materials are available at www.energy.gov/scep/home-energy-rebate-programs-guidance.

funding solely for low- and moderate-income households to further reduce reliance on onsite fossil fuels. State Energy Offices will set up new **Home Electrification and Appliance Rebate Programs (HEAR)** that will provide point-of-sale rebates for electric appliances exclusively for low- and moderate-income households as well as multifamily buildings in which 50% or more of occupants are LMI. Rebates cannot be combined with HOMES rebates or WAP for the same measure, but IRA does not prohibit combining rebates with federal tax credits and state/utility rebates. Notably these rebates are prescriptive, with funding for specific electrification measures as well as enabling technologies like new electrical panels (breaker boxes) to support increased electrification. The program also allows for incentives up to \$500 for contractors installing qualified electrification projects. Figure A2 outlines the electrification measures eligible for HEAR rebates. <https://www.energy.gov/scep/home-electrification-and-appliance-rebates>


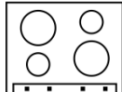




	Appliance	Rebate Amount (Maximum)
	Heat Pump (for space heating and cooling)	\$8,000
	Electric Stove, Cooktop, Range, or Oven, or Clothes Dryer	\$840
	Heat Pump Water Heater	\$1,750
	Electric Wiring	\$2,500
	Electric Load Service Center (Breaker Box)	\$4,000
	Insulation, Air Sealing, and Ventilation	\$1,600

Figure A2. Electrification measures eligible for HEAR rebates

ENVIRONMENTAL PROTECTION AGENCY

The IRA also allocates \$27 billion in funding to the Environmental Protection Agency to establish the **Greenhouse Gas Reduction Fund (GGRF)**. The GGRF's objectives include reducing emissions of greenhouse gas and other air pollutants, delivering pollution-reduction benefits to communities with an emphasis on low-income and disadvantaged communities, and mobilizing financing and private capital investments in pollution-reduction projects. EPA developed three grant competitions for allocating funds and awarded them in April 2024. The National Clean Investment Fund (NCIF) granted \$14 billion to three nonprofit clean financing institutions to support affordable financing for clean technology projects in partnership with private sector financial institutions. The Clean Communities Investment Accelerator provided grants totaling \$6 billion to five nonprofit hubs for funding and technical assistance to local community lenders in low-income and disadvantaged communities. The remaining \$7 billion was awarded to 60 Solar for All competition grantees from states, territories, Tribal governments, municipalities, and nonprofits to increase low-income households' access to new and existing solar programs. <https://www.epa.gov/greenhouse-gas-reduction-fund>

EPA is also administering \$4.85 billion in IRA-funded **Climate Pollution Reduction Grants (CPRG)**. These grants provide funding for states, local governments, tribes, and territories to develop and implement plans to reduce greenhouse gas emissions and other harmful air pollution. The grant program has two stages: In the initial planning stage, \$250 million in noncompetitive grants are available for the plan development; in the second phase of the program, \$4.6 billion in competitive grants will be available for plan implementation. <https://www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants>

The IRA established the \$3 billion **Environmental and Climate Justice Block Grants (ECJBG)** program to provide funding for environmental justice activities benefitting underserved communities. For the purposes of this program, underserved communities are identified in the [Inflation Reduction Act Disadvantaged Communities Map](https://www.epa.gov/inflation-reduction-act-disadvantaged-communities-map). The program offers \$200 million for technical assistance and \$2.8 billion for financial assistance. <https://www.epa.gov/inflation-reduction-act/inflation-reduction-act-environmental-and-climate-justice-program>

DEPARTMENT OF HEALTH AND HUMAN SERVICES

The Department of Health and Human Services (HHS) administers the **Low-Income Home Energy Assistance Program (LIHEAP)** to keep families safe and healthy through initiatives that assist them with energy costs. LIHEAP provides federally funded assistance in managing costs associated with weatherization and energy-related minor home repairs. With LIHEAP, 15% of funds can be used for weatherization projects. However, if a grantee wishes to utilize more funding toward weatherization projects, they can ask HHS for a waiver for up to 25%. Congress appropriated \$100 million in supplemental LIHEAP funds in the IIJA.

On July 20, 2022, President Biden issued Executive Actions on Climate to Address Extreme Heat and Boost Offshore Wind. As part of this action, HHS issued guidance that for the first

time expanded how LIHEAP can deliver energy efficiency improvements. New program elements include support for high-efficiency air-conditioning replacement and adoption of high-efficiency air-source heat pumps for heating and cooling.

<https://www.acf.hhs.gov/ocs/programs/liheap>

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Under the IRA, the Department of Housing and Urban Development (HUD) received \$1 billion to develop and implement the **Green and Resilient Retrofit Program (GRRP)** to support energy efficiency, improved indoor air quality, and climate resilience in privately owned, HUD-subsidized multifamily properties. Program funds are available through September 2028. The vast majority of the funds, \$837.5 million, is dedicated to grant and direct loans, including funding to subsidize up to \$4 billion in direct loans. An additional \$42.5 million will support energy and water use benchmarking of eligible properties, and \$120 million is reserved for program administration. Property owners can use project funding and financing to improve energy and water efficiency, enhance indoor air quality, implement building electrification and renewable energy technologies, install low-emission building materials, and improve climate resilience. As of March 2024, \$544 million has been awarded through the first 6 of 12 anticipated rounds of funding (HUD 2024).

<https://www.hud.gov/GRRP>

DEPARTMENT OF THE INTERIOR

The **Tribal Electrification Program (TEP)**, administered through the Office of Indian Economic Development (OIED), provides \$145.5 million in IRA funding for clean electrification in Tribal communities. The funding opportunity is available for Tribal communities at many stages of the electrification process, whether they are in the initial planning stage or currently implementing an electrification program. The TEP does specify that this program is for electrification projects to be served by zero-emission electricity. This presents a challenge, as many underserved Tribal communities still rely on fossil fuel for their electricity needs. The BIA [notes on its website](#) that it is currently working with the Office of the Solicitor of Labor (SOL) and other government agencies to balance the needs of transitioning Tribal areas' grids to renewable sources and connecting unelectrified homes to the current grid. It mentions that a potential option would be to define "net zero" with a netting option where energy efficiency measures could be used to offset emissions; however, this is not in place at this time. <https://www.bia.gov/service/electrification>

INTERNAL REVENUE SERVICE: FEDERAL TAX CREDITS

Federal Energy Efficient Home Improvement Credit Section 25C of the Internal Revenue Code provides homeowners with a tax credit for investments in certain high-efficiency heating, cooling, and water-heating appliances, as well as energy-efficient windows and doors. The IRA expanded provisions under 25C to add electrical panels of 200 amps or more, home energy audits, and biomass systems. The list of qualified insulation and building envelope measures was expanded to include air sealing, while roofing was removed. Under the IRA, available tax credits were increased to cover up to 30% of project costs—rather than

10%—up to \$1,200 annually, a significant jump from the previous \$500 lifetime cap. In addition, installation of eligible heat pumps, heat pump water heaters, and biomass stoves and boilers qualify for a \$2,000 maximum tax credit beyond the \$1,200 annual cap. Table A1 summarizes tax credit for specific energy efficiency improvements.

<https://www.irs.gov/credits-deductions/energy-efficient-home-improvement-credit>

Table A1. Federal energy efficiency improvement tax credit amounts and criteria

Improvement	% of cost	Maximum credit	Efficiency criteria
Home energy audits*	30%	Up to \$150	Auditor certification requirements to be determined by DOE
Heat pumps	30%	Up to \$2,000 per year	Based on CEE Tiers
Heat pump water heaters	30%	Up to \$2,000 per year	Based on CEE Tiers
Central air conditioners*	30%	Up to \$600	Based on CEE Tiers
Natural gas, propane, or oil furnaces, boilers, or water heaters*	30%	Up to \$600	Based on CEE Tiers
Biomass stoves or boilers	30%	Up to \$2,000 per year	Thermal efficiency of at least 75%
Electric panel or circuit upgrades for new electric equipment*	30%	Up to \$600	200 amps or more
Insulation materials*	30%	Up to \$600	Based on 2021 IECC
Windows and skylights*	30%	Up to \$600	ENERGY STAR Most Efficient
Exterior doors*	30%	Up to \$500 (max of \$250 for each door)	ENERGY STAR

*Subject to combined cap of \$1,200 per year

Federal Residential Clean Energy Tax Credit Section 25D is a residential clean energy credit, allowing for tax breaks for qualified expenditures made by a taxpayer on clean energy projects such as solar panels, geothermal heat pumps, and fuel cells. The IRA expanded coverage under 25D to include standalone battery storage systems. The applicable percentage of the tax credit was increased under the IRA to 30% of project costs for 2022 through 2032 before dropping to 26% for 2033 and 24% for 2034. There is no maximum credit amount for these, except for the fuel cells at \$500 per 0.5 kW of capacity. Table A2 summarizes tax credits and criteria for energy property investments.

<https://www.irs.gov/credits-deductions/residential-clean-energy-credit>

Table A2. Federal energy property tax credit amounts and criteria

Property	% of cost	Criteria
Solar electric (PV)	30%	
Solar thermal (water heating)	30%	At least half of the energy used by the system must come from the sun Performance certified by the Solar Rating Certification Corp.
Fuel cell	30% up to maximum of \$500 per 0.5 kW	
Small wind energy	30%	
Geothermal heat pumps	30%	ENERGY STAR
Battery storage	30%	Capacity of at least 3 kWh

Homeowners should be made aware of these incentives that make upgrades in these qualified areas more affordable. Both the § 25C credit and the § 25D credit are nonrefundable personal tax credits. A taxpayer claiming a nonrefundable credit can only use it to decrease or eliminate a tax. Under 25D, unused credits can be carried forward to the next taxable year.

Federal Energy Efficient Commercial Buildings Deduction Section 179D is a long-standing provision of the tax code that provides a tax deduction for new construction exceeding building energy code requirements and for some energy efficiency retrofits. Unlike a tax credit, the 179D tax deduction reduces the owner's taxable income leading to a smaller decrease in taxes paid relative to a tax credit. The IRA revised the provision and increased the value of the 179D deduction; it is estimated the revised provision could provide hundreds of millions of dollars for commercial retrofits each year (Ungar and Nadel 2023).

Owners who retrofit their existing buildings to improve efficiency by at least 25% can take advantage of tax deductions of \$0.50–5.00 per square foot of building floor area. The specific deduction is based on the percentage of energy savings according to the building energy use index before and after the retrofit. The deduction is reduced by 80% if contractors fail to meet prevailing wage and apprenticeship requirements as shown in table A3. Tax-exempt building owners (e.g., governments, nonprofit organizations) can assign their incentive to the engineers or other contractors working on the project, who in turn can reduce their fees on the project. <https://www.irs.gov/credits-deductions/energy-efficient-commercial-buildings-deduction>

Table A3. Maximum incentive levels for the 179D tax deduction (\$/sq. ft.)

	25% savings	25-50% savings	>50% savings
Meets prevailing wage requirements	\$2.50	Prorated	\$5.00
Does not meet prevailing wage requirements	\$0.50	Prorated	\$1.00

Source: Nadel and Ungar 2023

Appendix B: Other Funding Sources for Retrofits

GREEN BANKS

Green banks are mission-driven institutions that utilize flexible financing structures with public capital to mobilize greater private investment into underserved markets. Green banks have the ability to overcome traditional obstacles such as pricing of perceived risks in loans and the ability to fund deals smaller than the current market would. In addition, the Coalition for Green Capital identifies the following market barriers that green banks help overcome: the low incentive to serve LMI and communities of color, marginal project economics for clean energy projects, lack of technical capacity at the local level, low consumer awareness of financing products for clean energy, and ability to underwrite debt in a duration that is more aligned with the lifetime expected use of the project (Coalition for Green Capital 2021). It is important that green banks maintain this mission and the focus on funding gaps. There is a great deal of private capital in the marketplace looking to fund large clean energy projects—less so for hard-to-fund projects such as those with poor credit. Public-supported green banks are best used to fill critical gaps where there is a great public need for financing but the project is not attractive to private capital. Green banks can leverage private capital by buying down financing or stepping in to support projects that provide carbon reductions with less return on investment.

The first green bank, the Connecticut Green Bank, was established in 2011. State and local green banks currently operate in more than 20 states as well as Puerto Rico and the District of Columbia; more have been proposed or are under development in additional states. In 2021 and 2022, green banks invested \$1.51 billion to mobilize a total of \$4.64 billion of green energy investment (Coalition for Green Capital 2023).

STATE AND LOCAL FUNDING

Financial incentives provided at the state and local level are an important tool to provide needed funding and accelerate investment in residential retrofits. They can take many forms: rebates, loans, grants, or bonds for energy efficiency improvements; income tax credits and income tax deductions for individuals or businesses; and sales tax exemptions or reductions for eligible products. These incentives can lower the upfront cost and shorten the payback period of energy efficiency upgrades, two critical barriers to making cost-effective efficiency investments. Incentives can be administered by various state agencies but are most often coordinated by state energy offices. Likewise, many municipalities make available at least one of the following financial incentives: tax abatement, permit fee reductions or waivers, grants, and rebates.

HOUSING TRUST FUNDS

Housing trust funds are established by city, county, or state governments as ongoing public revenue—over \$1 billion per year as of 2016—for the production and preservation of affordable housing (Center for Community Change 2016). Ideally funding is transferred automatically each year to allow for a continuous stream of funding, avoiding the

appropriations or budgeting process. Since 2016, federal funds allocated through the National Housing Trust Fund have provided states with additional funding largely targeted toward the lowest-income households.²² Housing trust funds across the country have included as eligible activities weatherization and upgrades to energy efficiency, renewable energy, and water efficiency. A 2016 study by the Housing Trust Project found that housing trust funds across the country recognize the important role that energy and water efficiency can play in maintaining affordable housing and improving the health and well-being of residents (Center for Community Change 2016). Due to their flexibility, housing trust funds can be readily combined with other energy efficiency program funding, such as utility-sponsored rebates and incentives, to maximize improvements by affordable housing owners and developers.

STATE TAX INCENTIVES

At the state level, most tax incentives are in the form of property tax credits, which states and localities administer, for renewable energy systems. Tax credits and deductions are available from a smaller number of states for purchase and installation of energy-efficient equipment and renewable energy.

PROPERTY TAX INCENTIVES

All but six states (Hawaii, Idaho, Oklahoma, Pennsylvania, Washington, and West Virginia) offer property tax incentives that can lower property taxes to homeowners. Property tax incentives work in two ways: tax incentives for specific equipment and exemptions based on efficiency standards. Incentives for specific equipment, at the lower end of savings, will only exclude the value added by the home improvements. These incentives are considered exclusions rather than exemptions, as it is only excluding the value added but not exempting the entire asset (New Jersey, Iowa, and California offer these).

More common are full exemptions of the energy assets themselves, allowing homeowners to save on property taxes. The bulk of property tax incentives focus on renewable energy and do not apply to efficiency improvements. However, Maryland, New York, and Virginia each offer local options, where counties and municipalities can set up individual property tax incentives for efficiency measures. Local options shift the burden of legislation to local governments and require them to opt out of property tax revenues, thus likely slowing their rollout statewide. Three Maryland counties (Baltimore, Montgomery, and Howard) offer property tax credits for high performance buildings, based on their Leadership in Energy and Environmental Design (LEED) or National Green Building Standard (NGBS) classification. Due to the local nature of these credits, their calculations differ; Montgomery and Howard counties offer a 50% tax credit for three years if an existing building is retrofitted to reach a

²² For more information, see www.nhtf.org.

platinum LEED rating, whereas Baltimore County offers a 100% credit for the increased efficiency only if it reaches a platinum LEED rating. While local options have allowed for efficiency-related incentives, none of the states with local options have seen a majority of municipalities and counties offer them.

TAX CREDITS AND DEDUCTIONS

Personal tax credits and deductions at the state level are less common, with less than half of states offering them, and with the incentives at significantly lower value. Deductions offer less tax savings than credits as they reduce taxable income, rather than the tax liability itself. Indiana and Missouri both offer up to \$1,000 deductions for particular upgrades (solar-powered ventilation and insulation, respectively), while only Arkansas offers deductions for the full cost.

Tax credits for use in retrofitting homes are more common than deductions, with states and the District of Columbia offering these incentives. These credits are typically capped between \$1,000 and \$2,000, offering less savings than the IRA incentives given typical retrofit costs. Unlike federal programs, these credits do not have income limits. Outliers among these programs are Rhode Island, which offers up to \$3,750 for PV systems, and Hawaii, which offers \$2,250 for solar water heating and \$5,000 for solar space heating.

UTILITY FUNDS

Utilities and other efficiency program administrators allocate their energy efficiency funding (primarily ratepayer dollars) to residential retrofits through several mechanisms, including those listed below. Utility spending on residential retrofit and product/equipment replacement programs totaled \$2.5 billion in 2019 including \$906.6 million for programs targeted to low-income households (CEE 2021). Electric efficiency programs account for roughly 55% of total expenditures with the remaining 45% going to natural gas efficiency. Importantly, those programs sponsored by utilities must be approved by their board (public power or municipal utility) or utility commission (investor-owned utilities) and may need to prove cost effective for the utility, not only the customer, and are often paid for by ratepayers.

The following are traditional utility-sponsored programs to support energy efficiency:

1. **Rebates/Cash incentives:** Cash rebates target the end use customer to offset the upfront cost of a product or service at or near point of sale. These incentive payments are taken off the total price and are valued for their immediacy (many programs offer instant rebates at point of sale or are able to process payments within only a few weeks). They may also be directed to midstream (retailers, contractors, distributors) or upstream (manufacturers) market actors to encourage increased availability, visibility, and installation of energy-efficient products and measures.
2. **Financing support (third-party lenders):** Programs work with lenders to provide streamlined financing application and approval for participating customers. Programs

may also buy down the interest rate offered by lenders to reduce the overall project cost for program participants in addition to or in lieu of rebates.

3. **On-bill financing and repayment programs:** A portion of retrofit project costs are paid upfront by the utility or a third party and paid back through the customer's utility bill. A variation of on-bill programs is Inclusive Utility Investment (e.g., Pay As You Save), which reduces barriers to participation by eliminating credit checks, making upfront customer investment optional, and linking the utility investment (or tariff) to the home/utility meter rather than the customer.
4. **Supplemental support/coordination with WAP:** Programs may also use efficiency program funds to leverage or support weatherization projects funded by the federal Weatherization Assistance Program. Program funding can cover the cost of measures exceeding the federal project spending cap or address measures that are not eligible for WAP funding.

HEALTHCARE FUNDS

Energy efficiency upgrades provide more than energy and utility bill savings; upgrades can also result in a healthier and safer home for occupants. Measures to improve the health and safety of a residence can be independent of energy efficiency upgrades, but there is significant overlap.²³ Leveraging financial resources earmarked for improving health can maximize public benefits and make direct positive impacts on the well-being of households. Funding can be offered by federal, state, or regional agencies, as well as private and nonprofit entities. Blending or braiding funds earmarked for health, including but not limited to Medicaid, Children's Health Insurance Program (CHIP) Administrative Funds, and Weatherization Plus Health, can not only help offset the upfront costs of energy efficiency upgrades but also can help programs think more collaboratively about how to reduce costs, share resources, and streamline customer engagement through partnership.

FINANCING

Energy bill savings resulting from energy efficiency retrofit projects are—by themselves—unlikely to cover the full cost of the investments without a very long payback period or otherwise motivate homeowners and landlords to participate, particularly where project costs are highest. Accessing capital to finance energy efficiency upgrades is often an important piece of the capital stack, as grants, rebates, and other incentives alone are not always sufficient to cover the full costs of an upgrade. Blending financing into an energy efficiency program should incorporate many elements including, but not limited to,

²³ Improved lighting prevents falls; weatherization measures and more efficient HVAC filter the air and prevent exposure to extreme temperatures.

inclusivity, attractive terms (e.g., rates and duration), a simple application process, convenience, contractor friendliness, scalability, and strategic public–private partnerships.

RETROFITTING AMERICA'S HOMES: DESIGNING HOME ENERGY PROGRAMS THAT LEVERAGE FEDERAL CLIMATE INVESTMENTS WITH OTHER FUNDING

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