

TOWARD MORE EQUITABLE ENERGY EFFICIENCY PROGRAMS FOR UNDERSERVED HOUSEHOLDS

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ACEEE Report

ACEEE
Smart Energy. Clean Planet. Better Lives.

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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.

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Executive Summary

KEY FINDINGS

- Low- and moderate-income households, renters, and households identifying as Black, Latino/a, Indigenous, rural, or non-English speakers are underserved by utility energy efficiency programs relative to other households: They have lower rates of participation in available incentive programs and fewer available options for energy-efficient equipment that is eligible for program incentives.
- Inequities in providing energy efficiency services and incentives can result in disproportionate negative impacts—including high energy burdens and various residential comfort, safety, and health problems—for underserved households.
- Several program approaches are emerging that reach underserved customers effectively. These approaches include the following:
 - Improving program design and customer engagement by working with community-based organizations and prioritizing equity and inclusion.
 - Expanding targeted low-income programs, such as weatherization assistance, to include major appliances and home mechanical equipment.
 - Intervening upstream of customer purchase choices by working with manufacturers, distributors, and program administrators to expand the availability of entry price point models of major appliances and equipment.
 - Creating new affordable, flexible options for purchasing energy-efficient technologies, such as microfinancing and online markets with available incentives applied at checkout.
 - Aligning program objectives with equity, and adapting program metrics and evaluation for equity.
- Making energy efficiency programs more equitable can ensure that all households, regardless of income, race, ethnicity, homeownership status, or home location have equal opportunities to be a part of the clean energy transformation that is underway.

Despite decades of growth in energy efficiency program availability for residential utility customers, some types of customers and communities remain underserved, including those who are low and moderate income (LMI), renters, Black, Latino/a, rural, tribal, or non-English speakers. This inequity results in some customers being unable to take advantage of program services and incentives to reap the multiple benefits of improved energy efficiency, including lower energy costs; lower energy burdens; and improved health, safety, and comfort in their homes. Research shows that many energy programs promoting energy-efficient products and technologies have disproportionately served households that are white, higher income, college educated, and English-speaking (Frank and Nowak 2016). As a

result, programs have paid the majority of available incentives for larger, higher-priced product models, even when these units use more energy than smaller, lower-priced models with fewer features. Rates of program participation among LMI customers in appliance/equipment incentive programs are generally much lower than customers with higher incomes (Pigman, Deason, and Murphy 2021).

Further, programs often include products that tend to benefit higher-income customers while excluding those that may better serve the needs of smaller renter-occupied and LMI homes, such as apartment-sized refrigerators and stackable/compact clothes washers and dryers.

Inequities in providing energy efficiency services and incentives can result in disproportionate negative impacts on underserved customers. Underserved households pay their share into ratepayer-funded programs; to the extent that their homes and equipment are less efficient, they pay more into these programs relative to their household energy use, which already may be relatively low due to rationing to keep costs down. These households have not reaped commensurate energy efficiency benefits from program participation.

For underserved groups, the consequences of inefficient housing and appliances are manifold. They include but are not limited to the following:

- Higher energy costs and burdens for low-income households as well as many rural customers and communities of color
- Increased likelihood of utility disconnections and continued reliance on bill payment support
- Disproportionate negative health impacts related to housing quality
- Proximity to pollution sources often tied to energy production, generation, and delivery
- Greater vulnerability to weather- and climate-related power outages

Underserved customers may be interested in the utility bill savings and environmental gains that result from energy efficiency—and they often have the most to gain from participation in efficiency programs. However, energy efficiency program designs often make it difficult, if not impossible, for many customers to access them. Low-income customers face many barriers, including the following:

- Difficulty in accessing programs, including finding information on program offerings, rules, and requirements, and finding participating retailers
- High up-front costs and lack of capital or financing options to purchase high-efficiency major appliances or mechanical equipment (e.g., refrigerators, clothes washers, heat pumps) or to invest in building envelope improvements (e.g., air sealing and insulation, windows)
- Limited availability and choices of efficient appliances and equipment at entry-level price points in retail stores

- Language barriers if program information and communications are unavailable in languages that customers use and understand
- Inefficient products in secondary (used) markets
- Split incentives in rental properties (that is, if renters pay utility bills, owners have no incentive to upgrade the efficiency of rental units)
- Income qualifying processes that are difficult and time-consuming to complete
- Limited funding for targeted low-income programs

Our research revealed emerging program approaches that utilities and other program administrators can use to help overcome these barriers and thus better serve previously underserved customers. These approaches include the following:

- Improve program design and customer engagement by working with community-based organizations and other partners
- Expand existing targeted low-income programs to provide more comprehensive solutions, such as major mechanical equipment and appliance upgrades
- Expand customer choice for efficient products online and at traditional retail
- Create more flexible shopping and purchase options
- Align and adapt program metrics and evaluation for equity objectives

While developing effective programs and services targeted to underserved customer groups may be challenging, the rewards are great. Customers benefit directly, and the aggregated energy and carbon reduction can be vital to reaching climate goals. New and creative approaches designed to meet the specific needs of target populations, such as those highlighted in this report, can reach these underserved groups and ensure that all customers have equal opportunities to be a part of the ongoing clean energy transformation.

Introduction

Many residential energy efficiency programs have achieved most of their participation and resulting energy savings from higher-income, highly educated customers. These customers typically have the necessary resources to learn about, invest in, and accept the risks associated with high-efficiency products and technologies, often with the support of incentives such as rebates or tax credits. Some program benefits flow to less affluent, less educated consumers later when products become more widely accepted and available, prices decline, and codes and standards are revised to require higher energy efficiency. However, these customers miss out on rebates and years of energy savings accrued to early program participants.

Research shows that traditional resource acquisition¹ and market transformation² programs have disproportionately served white, well-educated, and higher-income households; such programs have also paid the vast majority of incentives for larger, higher-priced product models (e.g., large, French-door refrigerators and large clothes washers), even when these units use more energy than smaller, lower-priced models with fewer features (Niederberger and Frank 2015; Pigman, Deason, and Murphy 2021). It is also common for programs to include measures that almost exclusively benefit higher-income customers (e.g., pool pumps), while excluding products that may better serve the needs of smaller, low-income households and renters (e.g., small, low-cost refrigerators or compact, stackable clothes washers and dryers). Participation in home retrofit programs that deliver building envelope upgrades (e.g., insulation, air sealing) and equipment upgrades also skew toward white and wealthier households. The combined impact of these biases is that programs have underserved many households and communities, including but not limited to low and moderate income (LMI), rural, indigenous, Black, Latino/a, renters, and non-English speakers, resulting in persistent high energy burdens.

In this report, we focus on program and policy approaches that yield equitable energy efficiency programs—that is, those that can effectively reach, engage, and serve residential customer populations that untargeted programs have historically underserved.³ Our

¹ *Resource acquisition* is a program model for achieving energy savings by providing customers with services and often financial incentives for taking measures to improve the energy efficiency of a given use of energy, such as for refrigeration, space heating, lighting, or water heating.

² *Market transformation* is a program model for achieving and sustaining high market penetration of targeted energy efficiency products, measures, or practices through strategic market interventions, which are likely to be reduced, withdrawn, or changed over time.

³ *Untargeted programs* are programs that are mass marketed and available to all utility customers within a broad class, such as residential. Common examples include rebate programs for high-efficiency products, such as major appliances, HVAC equipment, or lightbulbs (Frank and Nowak 2016).

research examines the barriers these customers face, inequities in existing programs, and approaches to designing and delivering programs that can fill identified gaps to increase program equity. Given that the majority of efficiency programs are supported by ratepayer funds collected from all utility customers, greater efforts must be taken to ensure that all customers have ready access to programs that serve their specific—and highly variable—needs.

Underserved customers fall into various subgroups. While LMI customers are a prominent segment of this population, other demographic characteristics can affect customer access to adequate energy efficiency services. Further, some customers may fall into more than one subgroup, and thus face additional challenges. Following are the primary customer segments we address in this report:

- Homeowners who meet low-income income guidelines that qualify them for various federal, state, and local programs
- Homeowners that we define here as “moderate” income—that is, they fall above established income thresholds and are thus ineligible for energy assistance and subsidized low-income programs
- Renters (in both multifamily and single-family housing)
- Communities of color
- Rural populations
- Non-English speakers

The specific reasons for low program participation vary among these different types of customers. The challenge for program administrators is to design and deliver programs that achieve equitable outcomes—primarily, reduced energy burdens and ensured access to a full range of energy-efficient products and equipment—so that all types of customers can benefit from increasing energy efficiency in their homes.

Research Objectives and Methodology

The primary aim of our research is to explore program approaches that address existing inequities with the goal of increasing underserved customers’ participation in energy efficiency programs.

Following are our key research objectives:

- Identify and discuss the key barriers to program participation faced by underserved customer segments
- Identify and describe innovative program designs that lead to more equitable outcomes, while also ensuring significant, meaningful energy and cost savings as well as carbon reductions

This research builds on earlier studies and analyses to identify the main barriers to program participation and the gaps in program offerings (Cluett, Amann, and Ou 2016; York et al. 2022). Our methodology comprises the following:

- Literature review, including conference papers, research reports, white papers, and selected utilities and consumer publications
- Interviews with experts on energy equity,⁴ low-income programs, and energy efficiency program design and evaluation
- Input from ACEEE’s Equity Working Group⁵

The Problem of Program Inequities

Efficiency program administrators (whether utilities or non-utility organizations) and utility regulators or other governing bodies design and approve programs that can improve residential energy efficiency for all utility customers. Typically, offerings include programs for income-qualified customers (those falling below specific low-income guidelines) and “untargeted” programs available to all customers regardless of income (Frank and Nowak 2016). The funding available for income-qualified customer programs varies widely from state to state based on state policies, regulatory decisions, and utility goals. In practice, both types of programs leave gaps and fail to serve many customers who would benefit from the services and incentives available. For income-qualified programs, the lack of sufficient funding means participation is limited, especially relative to the number of customers who would qualify and benefit.⁶ The eligibility criteria for income-qualified programs also excludes moderate-income customers who exceed a specified income threshold yet lack the income and financial resources to invest in energy efficiency improvements without assistance.

The type of utility and regulatory structure can also affect program equity. Public service commissions that regulate investor-owned utilities (IOUs) are responsible for ensuring reliable service at reasonable rates to all customers. This responsibility typically carries over into ensuring that regulated utilities provide portfolios of energy efficiency programs that are available to and can serve all customer types. Municipal utilities typically are governed by

⁴ To define energy equity, ACEEE uses the four equity dimensions outlined by Park (2014): procedural, distributional, structural, and transgenerational equity. Further details on these dimensions and ACEEE’s definition of energy equity can be found at www.aceee.org/topic/energy-equity.

⁵ ACEEE’s Energy Equity Working Group informs ACEEE’s approach to equity in its research and communications. The group comprises representatives of seven community-based organizations serving frontline communities in areas of energy and environmental justice (see www.aceee.org/energy-equity-working-group).

⁶ A recent ACEEE study estimates the median participation rate in utility low-income energy efficiency programs is 5% of eligible customers; many of these customers receive only low-cost measures (Morales and Nadel 2022).

municipal utility boards or managers under the direction of mayors and other elected officials. Rural cooperative utilities (co-ops) are governed by boards of directors elected by members. Making equity a program objective can be a political decision for all types of utilities—IOWs, co-ops, and municipals. As a result, utilities vary widely in the types of programs they offer and how well they serve all types of customers. In most cases, program portfolios include gaps and deficiencies in program coverage and services, resulting in underserved markets and customer segments, particularly for rural and LMI customers.

Population segments that fall through the cracks comprise the group we refer to as “underserved” in this report. Underserved customers are not reached by income-qualified or untargeted program streams, and are not adequately considered during program design. Underserved groups can encompass various demographics that are not mutually exclusive including, but not limited to, LMI customers (who are either not eligible for income-qualified programs or not served due to funding constraints); communities of color; renters; rural customers (including tribal households); and/or non-English speaking households.

EVIDENCE OF PROGRAM INEQUITIES

There are clear gaps and inherent inequities in customer energy efficiency programs and product markets for energy-efficient major appliances and home mechanical equipment (Niederberger and Frank 2015; Pigman, Deason, and Murphy 2021). The missed opportunities and gaps tend to be major appliances (refrigerators, dishwashers, washing machines, clothes dryers) and building equipment (HVAC systems and water heaters, though some programs do include selected upgrades). As a result of these gaps, many LMI and other underserved customers are unable to realize the many benefits of improved home efficiency, particularly the energy and cost savings that reduce their energy burdens. Untargeted program designs compound this problem when they promote and incentivize (through rebates or tax credits) only relatively costly energy-efficient appliances and equipment—equipment that is typically accessible only to higher-income customers and homeowners.

Rural and tribal communities have been particularly underserved by energy efficiency programs. Of all U.S. households, 16% are in rural areas that spread across 72% of U.S. land; this low density contributes to the difficulty of delivering services to rural populations (Ross, Drehobl, and Stickles 2018). Research in Wisconsin found a marked difference in rural customers’ receipt of state Focus on Energy program incentives, with residential customers in rural census blocks receiving \$2.75 in incentives per capita compared to \$4.83 per capita for nonrural customers (Fontaine 2018). Among rural households, 41% earn below 200% of the federal poverty level, marking a significant overlap between rural and LMI communities.

Energy insecurity⁷ plagues one-third of rural households. This is evident in the rural median energy burden of 4.4%, which is 42% higher than the national median for all U.S. households. LMI households in rural areas are further burdened; they face the highest median energy burden in the country, spending 9% of their income on energy bills (Ross, Drehobl, and Stickle 2018).

ACEEE routinely reviews retail product availability, efficiency, and cost data, and has found that high-efficiency models are available in many product categories with little or no additional up-front purchase cost (i.e., incremental cost) relative to less efficient models, although it can be difficult to find energy-efficient options at the opening price points for some product categories (details of recent analysis are provided later in this report). Research has found that lower-cost models are also less likely to be featured in efficiency program promotions and can be difficult to find in many retail outlets (Shift Consortium 2021). In some cases, products with lower annual energy consumption (e.g., compact washers, top-freezer refrigerators) are not included in incentive programs; the lack of incentives and retail promotion to support product sales likely contribute to manufacturers' decisions to discontinue high-performing models at entry price points—the very models that are most affordable for LMI customers.

A meta-analysis of 66 California residential program evaluations and market studies for 2010–2012 found that untargeted energy efficiency programs resulted in low participation among several underserved populations and communities. Participants in the statewide whole-home retrofit program were disproportionately white (72% versus 39% of the state population), had annual household income over \$100,000 (53% versus 28%), or had attained a college degree (74% versus 39%). Similar findings were reported for plug load and appliance rebate programs offered by Pacific Gas & Electric, Southern California Edison, and Los Angeles Department of Water & Power; program participants were more likely to own their home (95% versus 69% of these utilities' customers), have an annual household income over \$100,000 (48% versus 25%), or have a college degree (87% versus 51%) (Frank and Nowak 2016).

Similarly, analysis of utility program participation in the Pacific Northwest found that some market segments (e.g., multifamily residents) were harder to reach, even in a region generally well served by targeted programs (NPCC 2018). The research also showed that when targeted programs are stopped, the targeted population may quickly become

⁷ Energy insecurity describes the hardships a household may face in paying its utility bills, and manifests in several ways, including the inability to pay energy bills on time and avoid energy service disconnections; choosing between paying utilities and paying for other essentials (e.g., food or medicine); or adopting coping responses that may jeopardize health and/or comfort, such as carefully managing energy consumption and using a stove or oven for heat (Lewis, Hernández, and Geronimus 2019).

underserved. The study further found that low-cost measures (such as energy kits and direct install measures) were often adopted at above-average rates in lower-income households, while high-cost measures were adopted at below-average rates (NPCC 2018).

THE EQUITY IMPERATIVE

Inequities in providing energy efficiency services and incentives can result in disproportionate negative impacts on underserved customers. While all residential customers pay into ratepayer-funded energy efficiency programs, barriers prevent many customers from participating; these customers therefore fail to reap the programs' many benefits. In 2019, low-income program spending by individual utilities ranged from about 0.2% of energy efficiency spending to more than 70% of total spending, with a median of approximately 13% of program spending for both gas and electric utilities. Yet approximately 27.5% of U.S. households are low income, so many low-income communities are not receiving an equitable share of funding (Morales and Nadel 2022). This 13% median also falls far short of the Justice40 Initiative's goals, which were set by the federal government and some state governments to increase to 40% the portion of climate and clean energy spending that reaches and benefits low-income communities.

Underserved groups bear the brunt of historic program underinvestment and of injustices in the energy system, resulting in the following:

- Higher energy burdens for low-income and rural customers, and communities of color
- Increased likelihood of utility disconnections and continued reliance on bill payment support
- Disproportionate health impacts related to housing quality and proximity to pollution sources often tied to energy production, generation, and delivery
- Greater vulnerability to weather- and climate-related power outages

Equity requires the design and delivery of programs that meet the needs of underserved communities, such as low-income customers and communities of color. Achieving greater equity in programs can ensure that all types of customers can benefit from the clean energy transformation and reap the multiple benefits of increased energy efficiency.

Barriers to Improving Energy Efficiency for Underserved Households and Communities

While underserved customers may be interested in the utility bill savings and environmental gains resulting from energy efficiency—and often have the most to gain from efficiency program participation—they often face barriers to participation or encounter program elements that make it harder for them to participate compared to wealthier customers (Scavo et al. 2016). When programs are designed to address these specific barriers, participation among underserved customer segments is much greater (Frank and Nowak 2016; NPCC 2018). Unfortunately, misperceptions about underserved customers' interests,

priorities, and behaviors can lead to program choices and designs that do not address these barriers and thus do not effectively serve these customers. LMI households have similar economic and environmental priorities to higher-income households (SECC 2020a). These households are also strongly interested in smart technologies for the energy savings and convenience they provide (SECC 2020b).

INSUFFICIENT CUSTOMER ENGAGEMENT

Decades of experience with all types of customer energy efficiency programs show that customer engagement is key to realizing the benefits of energy-efficient homes and buildings (Jewell and Christenson 2014; York et al. 2013). Many energy efficiency programs require participating households to invest a substantial amount of time, money, energy, and knowledge. As a result, households that can dedicate these resources are the most likely to participate and benefit from reduced energy use, while under-resourced households cannot easily overcome those barriers. Many programs are ill-equipped to engage with under-resourced households, which often have competing demands for their resources and may have limited English proficiency. Market research in Massachusetts on more than 1,500 residential customers prioritized the “hardest-to-reach nonparticipants” and identified four principal barriers to their participation in available programs: (1) lack of knowledge, (2) perception of programs as not relevant, (3) mistrust of program legitimacy and providers, and (4) low prioritization of energy efficiency compared to other more basic needs (Schauer et al. 2022; Navigant, Illume, and Cadeo 2020). Educational attainment is one of the most consistent predictors of program engagement and participation; highly educated customers are more likely to participate in programs (Pigman, Deason, and Murphy 2021). Therefore, program engagement strategies for underserved populations should be designed and targeted to appeal to customers with lower educational attainment.

Access to computers and online resources can be another barrier, particularly for households in rural areas and Tribal lands, which may have limited broadband service. The Federal Communications Commission (FCC) reports that 22.3% of rural residents and 27.7% of Tribal residents—totaling 15.5 million people—lack access to high-speed Internet compared to only 1.5% of urban residents (FCC 2020); these households make up 82% of Americans without broadband access. The FCC’s current mapping limitations, however, suggest that this figure is significantly understated (Poon 2020). Many general energy efficiency programs rely on customers using the Internet to enroll and receive program information, services, and available incentives. Consequently, those services are not easily accessible to a sizable portion of rural and Tribal customers.

Non-English-speaking communities are often forgotten during program design. Few programs offer materials, let alone conduct outreach and support, in languages other than English. According to the American Community Survey (ACS), 46.1% of foreign-born U.S. residents (or 8.3% of the total U.S. population) speak English with limited proficiency (Census Bureau 2021). Program administrators may find it challenging to identify customers who lack or have limited English proficiency or to identify their language preference because of inconsistent, unreliable, or unavailable data (Kelley, Johnson, and Milla 2022). Many

programs do provide program information in Spanish because of its prevalence in many areas, but less common languages may not be covered by program communications. Even those targeting non-English speakers sometimes fall short. They might limit their efforts to translating program materials, for example, while failing to consider cultural preferences beyond language; or they might conduct program evaluations in English, which likely compromises their findings' reliability by limiting responses from those without adequate English proficiency (Frank and Nowak 2016, Kelley, Johnson, and Milla 2022).

HIGH UP-FRONT COSTS AND LIMITED AFFORDABLE FINANCING OPTIONS

Many underserved groups lack the funds required to purchase energy-efficient appliances or contractor services (e.g., for attic insulation or high-performing windows) that would improve their home's efficiency. According to the Federal Reserve (2022), more than 30% of U.S. adults lack the cash or cash equivalent to cover an emergency expense of \$400, and 11% report that they could not pay such an expense by any method. When faced with an emergency appliance or equipment purchase, many households rely on high-interest credit cards or turn to the secondhand market, rent-to-own stores, or expensive payday lenders. Other efficiency improvements—such as envelope upgrades or replacing older and inefficient (but operable) appliances—may be deemed “discretionary” regardless of the longer-term savings when households lack affordable purchasing options.

Market transformation initiatives have successfully driven increased energy efficiency in many products, including clothes washers, refrigerators, LED lighting, energy-efficient windows, and various home electronics, by increasing customers' familiarity with high-efficiency products and accelerating the products' adoption. Once higher-efficiency products are more widely adopted, minimum appliance standards are set at the federal or state level, but this is a slow process. By the time new standards are enforced, new products have come to market that often significantly outperform the standards, providing greater energy and utility bill savings. But these savings are not applied across the spectrum of offerings for the product. Higher efficiency has often been incorporated primarily into high price point products, typically with more features, upscale finishes, and larger capacities. These higher-end products are then promoted more widely in retail outlets and by efficiency programs, including the ENERGY STAR Retail Products Portfolio and local utility programs. Figure 1 shows examples of promotions from utilities, retailers, and manufacturers.

The emphasis on higher-end products ignores the experiences of the many customers who shop for low-cost appliances. In common appliance categories (e.g., refrigerators, clothes washers, and room air conditioners), roughly 30% of sales are of the handful of models with the lowest price points. Research shows that these buyers are more likely to be in underserved customer groups, specifically LMI, communities of color, and renters (Shift Consortium 2020). The lack of available energy-efficient products at these price points not only leaves out a large segment of consumers, but it also leaves a significant untapped opportunity for energy savings. In addition, it can distort program messaging and incentive offerings, leading to perverse outcomes. In the case of refrigerators, for example, high-end

buyers that tend to purchase significantly larger models may receive rebates for ENERGY STAR models that use substantially more energy than low-priced small- and mid-sized refrigerators regardless of whether they qualify for ENERGY STAR.⁸

APPLIANCE REBATES

ENERGY STAR

Sussex Rural Electric Cooperative, Inc.
A Touchstone Energy® Cooperative

\$50.00 Rebate for Appliances

For list of eligible appliances go to www.njcleanenergy.org

Spring Energy Efficiency Tip

Purchase new appliances

If you're shopping for a new appliance, look for the ENERGY STAR® label. ENERGY STAR products meet strict energy efficiency and performance requirements.

Corridor

Simply Better Living
powered by SHARP

Energy Star Rebates on Refrigerators All Across the Country!

The SHARP SJG2254FS and SJG2351FS are both qualified for the Energy Star, **Flip your Fridge and Save** program! You can download the Energy Star Flip Your Fridge Fact Sheet [here](#).

[Click Here to Find New Energy Star Rebates in Your Area](#)

Sharp French 4-Door Counter-Depth Refrigerator with Water Dispenser (SJG2254FS)
\$3,699.99

- The Triple Cooling System Allows Independent Control Over Refrigerator, Drawers, and Ice Maker
- Flex Drawer with Four Independent Temperature Controls to Fit Your Lifestyle
- Door Ice and Water Dispenser
- Fingerprint Resistant Exterior with a Spacious and Sleek Interior Finish
- Automatic Ice Maker Produces Up to 4.4 lbs., of Ice Daily
- Replacement Refrigerator

10% OFF
ENERGY STAR QUALIFIED MAJOR APPLIANCES

Receive 10% off any in-stock or Special Order Energy Star® major appliances priced \$397 or more (before taxes). Includes refrigerators, dishwashers, and clothes washers.

LOWE'S
Life Just Smarter™

Figure 1. Manufacturer, utility, and retailer appliance promotions. Note that these promotions feature large appliances with stainless steel finishes and more expensive features, including French doors and through-the-door ice and water dispensers.

⁸ For example, a popular ENERGY STAR certified 25.5 cu. ft. bottom-freezer unit uses 562 kWh/year, whereas a typical 19.2 cu. ft. top-freezer non-ENERGY STAR unit uses 420 kWh/year and a 20.2 cu. ft. ENERGY STAR top-freezer unit uses only 387 kWh/year. Data compiled from a search on choose.enervee.com on February 23, 2023.

Using ENERGY STAR qualification as a proxy for energy efficiency, the Shift Consortium (2021) found that the ENERGY STAR clothes washer with the lowest price had a \$280 price premium—that is, a 56% increase over the lowest-priced (non-ENERGY STAR) model available. None of the five lowest-priced models qualified for ENERGY STAR. For room air conditioners and refrigerators, the lowest-priced ENERGY STAR model was among the five lowest price points, but the incremental cost (i.e., the additional cost for an energy-efficient model relative to a standard efficiency model) for room air conditioners was significant: \$71, or 45% of the lowest-priced model. Refrigerators carried an \$80, or 15%, incremental cost. Inefficient and efficient models can also have considerable price overlap, as well as large price fluctuations from day-to-day due to various retailer promotions and changing product inventories. Providing consumers with readily comparable product details and prices along with data on local and national inventories, such as the Enervee Score,⁹ can greatly assist and influence purchase decisions (Arquit Niederberger and Champniss 2018).

ACEEE conducted a search for full-size clothes washers (3.0 cubic feet or larger, excluding portable models) available from major retailers. Figure 2 shows the price and efficiency of 200 clothes washers that national retailers listed for sale online on October 26, 2022.¹⁰ As the figure shows, lower-cost models achieving high-efficiency scores (e.g., 88 and above) cost \$275 more than the lowest-cost models available. High-efficiency top load washers had a higher incremental cost at \$399 relative to the lowest-cost models.

⁹ The Enervee Score is a 0–100 efficiency score calculated based on energy efficiency, energy use, size, and related product metrics. For clothes washers, the Enervee Score is based on the washer’s cubic feet of capacity per kWh per cycle. Details on the Enervee Score and calculation methodology are available at www.enervee.com/score.

¹⁰ Based on search results from choose.enervee.com, a national marketplace site that provides model-specific data including energy use and prices from major retailers.

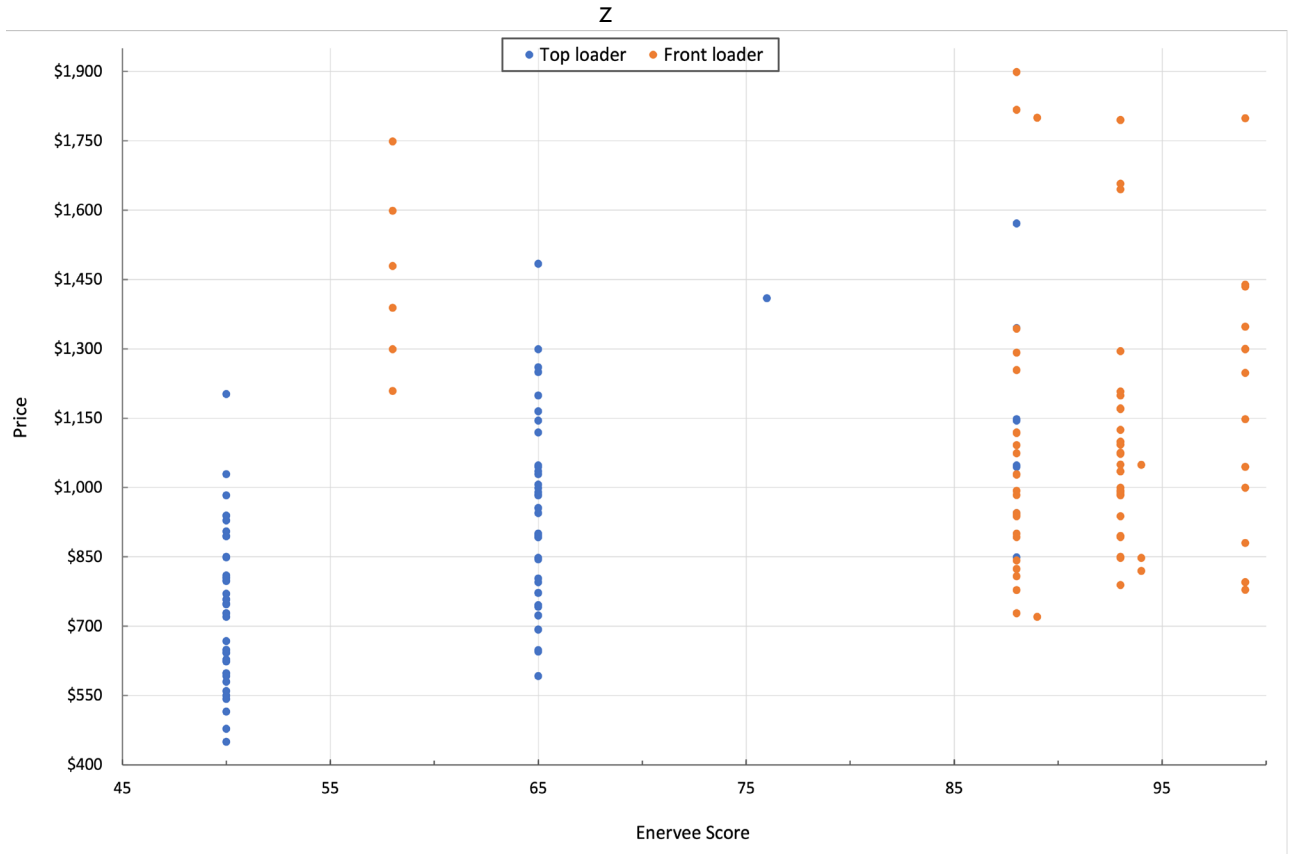


Figure 2. Price and efficiency of clothes washers at major retailers, October 2022

In-store research shows that incremental costs of \$50–100 can have a significant impact on low price point shoppers. When a retailer dropped the original \$100 (20%) price premium on an ENERGY STAR clothes washer to \$50 (10% premium) and then to \$0, 50% and 90% of customers, respectively, shifted from a baseline efficiency model to ENERGY STAR (Kogut and Frank 2019).

LACK OF LOW-COST EFFICIENT PRODUCTS AT RETAIL

Even when low-cost energy-efficient products exist, retailers may stock few, if any, in their stores. In Sacramento, an in-store survey of major appliance retailers (Best Buy, Home Depot, and Lowe's) found few low-price refrigerators in stock, and none of the lowest-priced ENERGY STAR models were available in store or displayed on the sales floor (Shift Consortium 2021). Products displayed on the sales floor sell in much higher volume than those visible only through an online search. Research with low-price buyers has found that most use both online research and in-store shopping to select an appliance, with 80% choosing to purchase in-store where they can examine different models in-person and speak with sales associates (Shift Consortium 2020). Online shopping to purchase products not available in store may not be an option for LMI customers who might lack credit cards and are more likely to purchase an appliance in haste as an emergency replacement.

Common outlets for shoppers to browse and purchase energy-efficient products can present or exacerbate barriers to underserved customer groups. As noted above, the limited availability of low-cost efficient products and product models designed for smaller homes and households make it difficult for many consumers to find and purchase products that meet their needs. Limited product selection in retail stores is an issue in many markets, particularly in rural and low-income areas where consumers have access to fewer retail outlets. Renters may be challenged to find product models for small spaces, such as apartment-sized refrigerators and stacked washer–dryer units. Even generally widespread products, such as LED bulbs, can be difficult for certain households to purchase. Big-box retail stores provide the greatest availability and lowest cost for energy-efficient compact fluorescent lamps (CFLs) and light-emitting diode (LED) light bulbs. However, multiple studies have found that these stores are less frequently located in neighborhoods where a majority of residents are low income or Black (Reames, Reiner, and Stacey 2018; Bellinger and Wang 2011). Another factor leading to inequitable availability of energy-efficient lighting products has been a rollback of the nationwide phase-out of incandescent light bulbs. As a result, some dollar and convenience stores—often the most accessible stores to rural and low-income communities—still sell incandescent bulbs over the much more efficient LEDs; even if the latter are on the shelves, they can be considerably more expensive than LEDs sold in wealthier areas (Tabuchi 2022).

SECONDARY MARKETS ATTRACT THE MOST COST-CONSCIOUS BUYERS

Many LMI customers shop in secondary markets (used goods) when replacing appliances and some mechanical equipment (such as water heaters). Research conducted for the Northwest Regional Technical Forum (Cadeo Group 2021) found particularly large secondary markets for refrigerators, freezers, clothes washers, and clothes dryers, and estimates the secondary market for refrigerators is at least half the size of the primary (new product) market. The age, features, and energy efficiency of goods in these markets varies widely, with used appliance retailers typically offering newer and more efficient models relative to those sold peer-to-peer. There clearly is a tendency for such products to be older and less efficient than new units, which are subject to the latest efficiency standards and/or incorporate improved technology. Customers in these markets are overwhelmingly focused on price because they lack the funds to purchase new (Shift Consortium 2020) and are unlikely to make energy performance a determining factor for their purchase. Traditional offerings from energy efficiency programs are seldom lucrative for these customers. Repair is another option for customers faced with broken appliances, but repair is unlikely to yield higher energy efficiency. Finally, some customers may simply do without, losing the service and convenience that a given appliance provides.

PROPERTY OWNERS AND TENANTS: DIFFERING MOTIVATIONS, RESPONSIBILITIES, AND BENEFITS FOR ENERGY EFFICIENCY

Property owners and tenants have different interests when replacing appliances and equipment and when considering other energy efficiency improvements. Owners want to minimize purchase price to reduce up-front costs or obtain the most favorable financing terms; tenants want to minimize monthly operating costs but have limited control over upgrades that would achieve that. The barriers to energy efficiency that this split incentive creates are well documented (Johnson 2013). Low-income households and Black, Latino/a, and Asian American households are more likely than average to be renters, suggesting that underserved groups are more likely to be affected by the split incentive problem and its implications.

Despite wide recognition of the problem, some programs continue to exclude rental property owners from efficiency rebates, making it less likely that they will purchase energy-efficient products. Much like LMI buyers, property owners often wait until failure occurs to replace appliances and equipment, and then opt for the lowest-cost products (Carruthers et al. 2022). These decisions lead them to face many of the same affordability and accessibility barriers as other underserved customer groups.

Emerging Approaches for More Equitable Programs

To better serve underserved customers and create more equitable energy efficiency programs that address service gaps, we drew on insights from the literature and expert interviews to identify five promising overarching approaches:

- Improve program design and customer engagement by working with community-based organizations (CBOs) and prioritizing equity and inclusion
- Expand targeted low-income programs, such as weatherization assistance
- Use upstream initiatives to expand customer purchase choices, working with manufacturers, distributors, and program administrators to expand the availability of major appliance and equipment models with entry price points
- Create more affordable, flexible options for purchasing energy-efficient technologies
- Align program objectives with equity, and adapt program metrics and evaluation for equity

We discuss each of these approaches below and provide specific examples of programs that are using them to increase the number of historically underserved households participating in energy efficiency programs. Table 1 presents a summary of the utility programs discussed in this section; more detailed descriptions follow below. In some cases, administrators may need to develop additional targeted programs, but there are benefits to modifying existing programs to better serve all customers—and achieve more equitable results—rather than creating more program silos.

Table 1. Innovative utility program examples

Program or portfolio	Program administrator	Measures and services included	Innovative approaches
Efficiency Vermont portfolio of programs	Efficiency Vermont	Comprehensive retrofits, appliance replacements, direct install	Partnering with affordable housing providers and community agencies providing weatherization services; delivering products through food banks; appliance voucher program
SMUD portfolio of programs	Sacramento Municipal Utility District (SMUD)	Decarbonization retrofits (including envelope), HVAC, direct install	Close partnerships with CBOs; outreach to non-qualifying low-income customers; targeted outreach using smart meter data; multilingual outreach and services
California's Multifamily Low-Income Weatherization Program	Association for Energy Affordability	HVAC, solar PV, water heating, insulation, lighting	Higher incentives for tenant/in-unit measures versus owner-controlled common areas
EmPower New York	NYSERDA	HVAC (heat pumps), insulation, lighting, direct install products	Combines Weatherization Assistance Program (WAP) and internal resources for eligible customers in need of comprehensive upgrades
NYSERDA Affordable Multifamily Energy Efficiency Program	NYSERDA	HVAC, insulation, envelope, direct install	Flexible points- and impact-based structure

Program or portfolio	Program administrator	Measures and services included	Innovative approaches
MCE Low-Income Families and Tenants (LIFT) Program	Marin Clean Energy	HVAC, water heating, direct install	Supports pre-retrofit structural upgrades, multilingual outreach, and services
Shift Retail Promotions	Various	Direct install	Partners with programs, retailers, and manufacturers; goal is to increase availability of/access to efficient appliances at entry price points
Enervee Online Marketplace	Various	Direct install	Partners with utility direct install programs; energy efficiency score (Enervee Score) for easy comparison; prices and product details updated daily; local and nationwide inventory

IMPROVING PROGRAM DESIGN THROUGH TARGETED OUTREACH AND CUSTOMER ENGAGEMENT

For all types of energy efficiency programs to succeed, effective customer engagement is essential. To increase customer participation, programs must reach, motivate, and deliver incentives and services that meet customer needs and provide value from the resulting benefits. In addition, targeting messaging and outreach to attract customer interest and provide information that is relevant to their needs is fundamental for gaining participation. This is especially true for underserved populations that face the barriers discussed earlier.

PRIORITIZING INCLUSION IN PROGRAM DESIGN

Emerging technology programs and early-stage market transformation programs that target so-called “innovators” or “early adopters” often reach more affluent consumers because they offer insufficient incentives, customer education, and support to attract underserved customer groups. Limitations in program design have a negative impact on broad customer participation, but they also make programs less effective. Ensuring the involvement of a

diverse set of customers can provide valuable input on how new technologies and products function and perform for different users and market segments.

Less-proven emerging technologies carry a risk of poor performance or failure and often require much larger incentives to attract all but the most determined early adopters. Pairing such pilots or demonstrations with households that need a total cost subsidy can benefit program administrators and customers. It is beneficial to offer customers a remediation pathway—such as for troubleshooting, product repair, or full replacement—in case the technology fails before its expected lifetime. Although not currently common, some programs, especially those funded by research grants, have incorporated this component.

In terms of market transformation, limited participation gives program administrators, manufacturers, and retailers a limited view of market needs, interests, and product acceptance. Without greater diversity among program participants, market transformation initiatives learn how to address only those barriers relevant to a portion of the market and how to appeal only to a subset of customers. By reaching formerly underserved market segments, programs and market actors gain a more complete picture of which products suit the needs of various market segments.

ENGAGING CUSTOMERS AND COMMUNITIES TO MEET SPECIFIC NEEDS

SACRAMENTO MUNICIPAL UTILITY DISTRICT

The Sacramento Municipal Utility District (SMUD) fosters trusted relationships with its customers and CBOs to implement its programs and maximize their impact. SMUD considers its customers to be stakeholders, which allows it to prioritize customer satisfaction over cost effectiveness—an approach that contrasts with the transactional dynamic common among many other utilities and their customers.

This innovative relationship is particularly evident in SMUD’s customer engagement strategies. As discussed earlier, rigid program eligibility criteria can result in families not receiving necessary services if they are just outside of income cutoffs (Darin Schrum, SMUD, pers. comm., July 14, 2022). SMUD reaches out to these non-qualifying applicants of LMI programs, discusses their household needs, and tries to connect them to services for which they are eligible and that address their energy priorities. Such targeted outreach is uncommon among utilities, but it is critical in connecting SMUD customers to suitable programs that they may not know about, thereby raising awareness of energy efficiency opportunities in some underserved communities. SMUD also takes great care to be accessible to all households in its diverse territory. In addition to having a multilingual staff, SMUD uses an external translation service during home assessments that virtually connects the customer and the utility staff to an intermediary who can translate in real time.

SMUD gathers smart meter data to identify inefficient appliances connected to the grid and cross references them with the age of housing stock, income data, and information on tenure (renter versus owner) to target eligible households for a variety of services. In addition, SMUD collaborates with CBOs to maximize the impact of their services (Darin

Schrum, SMUD, pers. comm., July 14, 2022). The organizations share resources and refer customers to each other to ensure that they reach and serve as many households as possible. This individualized approach recognizes that energy efficiency programs are not “one size fits all,” or even “one size fits most”—they are often not sufficient or flexible enough to reach everyone in need, so SMUD attempts to fill those gaps through other avenues.

EXPANDING TARGETED LOW-INCOME PROGRAMS

There are a variety of existing energy efficiency programs that target underserved populations, especially LMI customers. Building on existing programs has clear advantages; it can serve more households through an expanded menu of products and services that can reduce energy burdens and provide other benefits, such as health, safety, and improved comfort. A primary advantage of this approach is in having an existing program infrastructure and associated channels of communications in place; this can offer credibility and a trusted source for information and program services, both of which are key for customer engagement and participation.

WEATHERIZATION

Weatherization programs are a primary type of program targeting low-income customers. They were among the first customer energy efficiency programs funded and provided by utilities, local nonprofit organizations, and all levels of government—local, state, and federal. These programs provide long-term benefits for low-income customers by reducing their energy use and associated energy bills. Weatherization emphasizes improving the thermal performance of the buildings, primarily insulation, air sealing, window repair and replacement, and space heating equipment and systems. Many weatherization programs have expanded to include water heaters and, in warmer climates, air conditioners. In general, such programs do not cover other equipment or appliance upgrades. These gaps present opportunities to expand the list of eligible measures and thereby offer additional customer savings. Coordinating with utility and other programs may provide the support needed to expand coverage for such additional measures. The recently passed Inflation Reduction Act provides new opportunities to make new technology accessible and deliver it by braiding rebates and tax credits.

Another way to expand weatherization programs is to expand eligibility to moderate-income customers using different incentives and cost coverage. Efficiency program administrators can support this expansion by coordinating with local weatherization agencies and CBOs, as in the earlier SMUD example.

For many customers, a barrier to receiving weatherization services is that their homes need repairs done before weatherization measures can be implemented. Historically, few weatherization programs covered the costs of such repairs. Expanding eligibility to cover necessary household repairs can greatly improve the health, safety, and comfort of homes in addition to greatly reducing household energy burdens. Programs in Connecticut and

Pennsylvania have added home repair coverage, and the recently enacted federal Weatherization Readiness Funds will provide similar opportunities nationwide.

Expanding existing weatherization programs to include additional measures will increase program costs and thus require additional funding. A major source of such funding is the Infrastructure Investment and Jobs Act enacted in November 2021, which includes an infusion of \$3.5 billion of additional funding over five years for the federal Weatherization Assistance Program (WAP). Federal funds are allocated to states for deployment through weatherization programs. Other sources of additional funding for expanded weatherization programs are state decarbonization programs, which may provide new or redirected funding sources. For example, Connecticut's Energy Assistance Program combines funds from the Low Income Home Energy Assistance Program (LIHEAP) and the LIHEAP CARES Act to provide weatherization services and help low-income residents pay for winter heating (Connecticut General Assembly 2021). Utilities also may be able to address these needs by increasing or redirecting relevant program spending with regulatory support or direction. Apart from public or utility funding, some philanthropic organizations targeting affordable housing and decarbonization may fund selected community programs for LMI weatherization and electrification. An emerging funding stream for LMI weatherization programs is through health and safety programs, which increasingly recognize the benefits that arise from improving indoor air quality and comfort through weatherization (Hayes and Gerbode 2020). Another innovative approach to increase funding for low-income weatherization is to direct carbon pricing revenues, such as those from the Regional Greenhouse Gas Initiative (RGGI), for this purpose. Virginia is taking this approach. Its General Assembly is directing \$55 million of RGGI auction proceeds toward a range of energy efficiency and weatherization programs for low-income customers (McGowan 2021). With the availability of new federal funding, such as that from the Inflation Reduction Act or state clean energy initiatives, policymakers should direct some funding to serve customers using unregulated fuels (e.g., propane, oil) as well as those served by rural coops or other rural utilities with fewer resources and/or no regulatory requirements for customer energy efficiency programs.

As the following examples show, a few weatherization programs have expanded their services and eligibility requirements to address gaps and thereby serve more customers and provide more comprehensive solutions.

EXPANDED LOW-INCOME PROGRAMS

VERMONT

Efficiency Vermont, the ratepayer-funded statewide energy efficiency utility, has long engaged in expansive efforts to maximize energy efficiency in its state, including successful

program pilots.¹¹ It attempts to achieve this, in part, by creating and maintaining a portfolio of low-income program offerings that is both “wide and deep”—that is, the portfolio includes lighter-touch measures that reach many customers, comprehensive retrofits that serve those most in need, and offerings that find a middle ground between reach and impact.

This strategy aims to address the limitations of cost-effectiveness testing. Evaluated alone, programs targeting LMI customers seldom prove cost effective according to narrowly defined costs and benefits—which do not include nonenergy impacts—and thus are restricted in the measures they can pursue and support with their limited funding. Examined as a portfolio, however, these LMI-targeted programs have more flexibility and can showcase better cost effectiveness by pairing measures that are less cost effective, yet very impactful, with measures having a lighter impact but better payback periods.

This balanced portfolio includes three approaches:

- Partnering with affordable housing providers on deep retrofits and new construction, and with community action agencies providing weatherization services
- Delivering energy-efficient products and devices (e.g., LED lightbulbs, smart power strips, faucet aerators, low-flow showerheads) through food banks
- Launching an appliance voucher program that gave qualifying households one free energy-efficient appliance (eligible categories include refrigerators, freezers, washing machines, air conditioners, and dehumidifiers) of their choice at a participating retailer; in 2019, this voucher program served 1,200 Vermonters (Efficiency Vermont 2019)

CALIFORNIA AND NEW YORK

California and New York have long records of targeting and providing programs for low-income households. Both states have engaged the Association for Energy Affordability (AEA), for example, to implement programs that seek to serve more low-income customers with comprehensive services to achieve greater energy equity. AEA’s approach to program design and implementation is a model for how to expand existing weatherization and related low-income energy efficiency programs. Making energy efficiency accessible to underserved and LMI customers is central to the AEA’s approach to its programs.

AEA’s efforts for equitable outcomes can be attributed to several program design choices. AEA designs its programs to lower common barriers to participation. Several general programs offer hard-to-reach applicants higher incentives and/or first access and priority, especially for high-demand programs. Other programs, such as California’s Multifamily Low-

¹¹ www.encyvermont.com

Income Weatherization Program, feature higher incentives for measures that result in tenant/in-unit savings than for measures targeting owner-controlled common areas (Dirr, Hill, and Ching 2022). This attribute helps combat the split incentive described earlier. In addition, AEA works to identify and stack all available incentives from different funding streams to minimize project costs rather than leaving this task to the consumer. Using this tactic, a project could use federal funds and/or local government rebates on top of the utility ratepayer-funded program. For example, EmPower New York, administered by the New York State Energy Research and Development Authority (NYSERDA), combines DOE's WAP with its own resources for WAP-eligible customers in need of comprehensive upgrades (AEA 2022). EmPower also uses Enervee's Online Shopping Platform, discussed later in this report, to streamline the direct install process for its participants. The Enervee NY Marketplace allows customers to apply their EmPower credit toward the cost of an appliance of their choice at checkout. Installation, haul-away, and recycling are included at no extra cost (Enervee 2022).

Regardless of implementer, many of the California and New York programs provide substantial flexibility compared to traditional prescriptive programs. Property owners often have the freedom to evaluate a variety of solution packages that achieve comparable carbon reduction, and then choose the ones best suited to their building's unique characteristics and their own maintenance capabilities in the long term (Nick Dirr, AEA, pers. comm., July 1, 2022). New York's Affordable Multifamily Energy Efficiency Program, for example, uses a points-based incentive structure to reward high-impact measures such as insulation and boiler replacement over lighter measures like direct install. Owners are thus challenged to pursue significant performance improvements without being prescribed specific technologies. Projects in the top incentive tier receive \$2,000 per unit (NYSERDA 2023). A second California program, Marin Clean Energy's Low-Income Families and Tenants Program (LIFT), uses similar flexible criteria to offer monetary support for structural upgrades that buildings need prior to implementing other efficiency measures. Moreover, during Phase 1 of LIFT's pilot, the program collected various information to use as metrics of success. Among its findings were that 42% of households were non-English or limited-English speaking and received program information in a language other than English (DNV 2021).

Another successful program component is long-term project management and support. In this case, a building's energy performance is monitored past the project's completion to ensure upgrades have the intended savings effect; if the results vary significantly from what is expected, program implementers (such as AEA) engage in troubleshooting and course-correction involving equipment repairs and/or customer education to ensure optimal performance and usage (Dirr, Hill, and Ching 2022). When a research grant is funding the installation of an emerging technology, it is usually possible to replace the equipment if all other troubleshooting fails. The outcome in these cases is that the programs maximize their impact and cement their longevity for any future households in that building or unit.

EXPANDING CUSTOMER CHOICE

Many programs that provide customer incentives (e.g., rebates or discounts) for purchasing energy-efficient products, such as home appliances, lack options that are affordable and that meet LMI customers' needs. Expanding efficient products' availability, accessibility, and range of prices, sizes, and features can achieve more equitable outcomes. Below, we provide examples of efforts to address expanded availability and accessibility of consumer products through collaborations among programs, retailers, and manufacturers, including bulk procurement to develop new products and technologies and achieve economies of scale. These examples also demonstrate the effectiveness of customer-driven program approaches over the top-down, subsidized approaches that have prevailed in many LMI programs, such as direct installation. In many cases, the bulk of LMI program funding has gone to direct-install programs, which have several shortcomings, including limited reach (number of customers served), scale (small savings per household), options (small set of eligible products or equipment), and high cost per unit of energy saved.

SHIFT CONSORTIUM

Launched in 2017, the Shift Consortium is working to address inequities in the appliance market by increasing both the number of low price point appliances and customer access to these products in various retail outlets. Shift Consortium sponsors include efficiency program administrators from the Northeast, the West Coast, and Colorado. The Consortium is focused on three efforts: (1) Deploying a retail strategy—the Shift Model—that offers markdowns on efficient appliance models to bring their cost down to (or close to) comparable, inefficient opening price point models; the model also emphasizes in-store marketing efforts. (2) Research and development to increase understanding of opening price point buyers, alternative distribution channels (including distributors serving multifamily building owners/managers, rent-to-own retailers), and the barriers and challenges to increasing equity in the appliance market. (3) Collaborating with manufacturers, retailers, program administrators, and other stakeholders to establish a “robust market for super-efficient, low-cost appliances” (Frank et al. 2020).

SHIFT RETAIL PROMOTIONS

Four Shift Consortium program sponsors offered in-store retail promotions using the Shift Model in 2018–2019. Shift Consortium staff worked with each program sponsor and participating retailers to identify the best-selling inefficient clothes washer and refrigerator models based on actual store sales data. Each program identified comparable efficient models to promote, set the sponsor markdown, and developed in-store promotional materials. Figure 3 shows a point-of-sale cling sticker used in Colorado. Sponsors engaged the four largest national retailers, a national buying group, and regional retailers to participate in the promotions.



Figure 3. Point of sale promotional cling from the Shift retail promotion.
Source: Frank et al. 2018.

Sales data from 10 participating stores on the West Coast show that sales of the target ENERGY STAR clothes washer increased by 12% over the course of the pilot, while sales of the target inefficient model decreased by 12% (Frank et al. 2020). Similar results were observed in Colorado, where the market share of the incented ENERGY STAR washer increased by 10% at participating national retailers and 7% at participating regional retailers, while share of the inefficient baseline washer declined by 5% across all participating retailers (Kogut and Frank 2019). The shift in sales in Colorado translated to a 22% reduction in the unit energy consumption of washers under \$500 and an 11% reduction across all washers sold by participating national retailers. The market share of ENERGY STAR certified clothes washers under \$500 grew from 16% pre-pilot to 39% during the pilot offering.

Several lessons from the retail pilots are informing implementation of Shift retail promotions (Frank et al. 2020). Thorough **training** of sales staff at the program's outset is critical and must be supplemented with regular engagement to ensure that program staff are informed of any in-store issues (e.g., stocking) and to collect feedback and insights from sales associates based on their interactions with customers. This training also provides opportunities to refresh sales staff awareness of the program and their role in the sales and checkout process, as well as in the display of products, pricing, and other relevant materials. A related lesson is the importance of **product placement**. Stores that placed the Shift models close to each other on the sales floor saw a higher percentage of customers purchasing the promoted model than other stores (Frank et al. 2020). Absent the Shift promotion, many energy-efficient opening price point appliances are not displayed in-store and may require the retailer to special order the appliance for delivery, inserting yet another barrier to the efficient purchase. One Shift promotion bears this out. In this case, the efficient incentives-eligible refrigerator was not available for customers to view on the sales floor. Sales associates and program materials pointed out similarities to a model that was on

display, but sales of the promoted refrigerator lagged that of other Shift promotions, including a clothes washer offered in the same store (Frank et al. 2020).

The Shift Consortium pilots also demonstrated the impact of **incremental cost increases** on opening price point consumers' purchases. The lowest-priced clothes washer and refrigerator models are less than \$500. One of the national retail stores participating in the Colorado Shift promotion offered a 4.8 cubic foot ENERGY STAR top loader clothes washer (originally priced at \$600) for the same price as an inefficient (but otherwise comparable) 4.2 cubic foot \$450 model from the same manufacturer; 90% of customers purchased the ENERGY STAR model. When the incremental cost was increased to \$20, it had little impact on customers' choices—88% went with the ENERGY STAR model. As the incremental cost increased to \$50, the percentage of customers buying dropped to 50%. At a \$100 incremental cost, sales were negligible (Frank et al. 2018, 2020). The Shift promotion had an impact on product sales beyond the baseline and incented models; ENERGY STAR washers' market share increased from 16% to 39% among models under \$500, and from 64% to 75% across all washer models (Kogut and Frank 2019).

Incentive delivery is another critical program element. When the Colorado program moved from an in-store markdown to an \$80 rebate coupon, participation dropped off dramatically (Kogut and Frank 2019). To access the rebate, customers had to enter their name and address in an online form and wait for the incentive payment.

Utility collaboration has been highly valuable to Shift Consortium sponsors. While many program specifics are left to the discretion of the individual Shift program sponsor (e.g., product categories, incentive amounts, implementation), sponsors have access to shared marketing and training materials, and regular meetings let them share successes, challenges, and insights from their experiences. Finally, working together in the Shift Consortium multiplies their ability to engage and influence manufacturers and retailers.

SHIFT CONSORTIUM UPSTREAM STRATEGY

The Shift Consortium complements its retail promotions with an upstream strategy designed to support broader, long-term market transformation objectives. Key to this strategy is working with manufacturers and retailers to expand customer choices for energy- and water-efficient appliances at opening price points. In 2023, the upstream strategy is focused on (1) researching opening price point buyers to understand which features beyond price are of greatest interest; (2) developing performance criteria for low-cost, efficient products; and (3) identifying product delivery channels to support market investments in new opening price point products. Consumer research will provide valuable insights for developing product performance criteria and feature sets that are most compelling to buyers. Promising product delivery channels to secure manufacturer commitments to design and manufacture new models could include bulk procurement programs, buy-down programs targeting local

retailers and online marketplaces, and subsidies or other incentives for the rent-to-own market.¹²

NEW YORK CLEAN HEAT FOR ALL CHALLENGE

In late 2021, the New York City Housing Authority (NYCHA), New York Power Authority (NYPA), and NYSERDA launched the Clean Heat for All Challenge to entice manufacturers to develop high-efficiency, cold-climate heat pump units as a simple replacement for the room air conditioners commonly found in NYCHA’s multifamily properties.¹³ The two challenge winners, Gradient and Midea, were selected in August 2022 and awarded the initial purchase contracts to supply 10,000 and 20,000 units, respectively, for installation in NYCHA buildings over the first five years of the program. If successful, NYCHA expects to install roughly 156,000 qualifying units in city-owned apartments over the next 5–10 years (NYSERDA 2022). The challenge includes a cost-match mechanism that allows other public housing authorities to purchase products for the same price as NYCHA. Table 2 summarizes the challenge’s product specifications that participant designs must meet.

Table 2. Major product requirements for the Clean Heat for All Challenge

Category	Requirements
Electrical	115 VAC, single-phase, 60 Hz Standard three-prong plug for 15-amp outlet
Minimum operating temperature (without back-up electric resistance)	0°F or lower
Capacity (at 17°F outdoor and 70°F indoor)	8,300–9,000 Btu/hour
Minimum efficiency (at 17°F outdoor and 70°F indoor, at rated capacity)	1.85 (COP*)
Installation	2 hours or less

¹² Details on the Shift Consortium 2023 activities are outlined in its 2023 Statement of Work (available on request).

¹³ In most NYCHA buildings, residents must purchase and install their own room air conditioners. The Clean Heat procurement program will ensure that all residents have access to air-conditioning without the added cost burden of purchasing and maintaining units themselves (CEE 2022).

Category	Requirements
	Plumber not needed for installation of condensate pump or drainage of condensate/defrost meltwater
	Drilling through exterior wall not required
	Vent through bottom of window opening
Other features	Variable speed compressor
	Condensate pump internal to unit, if needed
	Prefabricated and packaged in a window unit
	Minimal window obstruction and protrusion

*COP – coefficient of performance. Source: CEE 2022.

While the challenge’s primary goal is to reduce energy use and carbon emissions to meet state and city climate targets, interest from other cities and states and from utilities is expected to expand the challenge’s reach and create a broader market for the technology. Room air conditioners are relatively common in older multifamily and single-family housing, so they could appeal to renters living in apartments or houses, condo owners, homeowners without central air-conditioning, and private landlords. In addition to offering more efficient air-conditioning, the units can provide better heating performance than many older central heating systems, allow greater resident control over in-unit temperature, and provide a lower-cost, less disruptive option for electrification of space heating. Such an approach has proven successful in the past. In the 1990s, NYPA worked with the Consortium for Energy Efficiency (CEE) on the Super-Efficient Apartment Refrigerator Initiative (SEAR) to entice manufacturer development of a high-efficiency refrigerator for deployment in public housing around the country. SEAR led to the development and production of an apartment-sized refrigerator that was 30% more efficient than the minimum standard. Through NYPA’s bulk procurement agreement and subsidies provided by the U.S. Department of Housing and Urban Development, housing authorities could purchase and install hundreds of thousands of super-efficient units at a lower cost than they had been paying for minimally efficient units (CEE 2022). To ensure longer-term market transformation for low-cost, accessible window heat pump units, the Clean Heat for All program should coordinate with ENERGY STAR, utilities, and other program administrators to develop complementary strategies for distributing these products outside of the public housing procurement process.

CREATING MORE FLEXIBLE SHOPPING AND PURCHASE OPTIONS

Online utility stores or marketplaces are one way to ensure customer access to products that improve home energy efficiency. Studies show that utilities are one of the most trusted sources of information on improving home energy efficiency for households in several unserved groups (Carruthers et al. 2022), so this can be an effective way to present energy-

efficient options and offer incentives. The most prevalent model is a utility virtual store stocked with energy-efficient products such as light bulbs, air cleaners, dehumidifiers, and weatherization materials, and energy management devices such as power strips, smart thermostats, and power monitors. Products can be offered at a reduced cost, with incentives applied directly at checkout. Utilities typically work with marketplace vendors (e.g., EFI, Uplight) to administer their online marketplace. These stores provide consumers an easy way to find efficient products and may even connect customers to other programs offered by their utility and facilitate enrollment. However, the product types offered in such marketplaces are limited to smaller appliances and devices, and may represent only one or two manufacturer brands in any given product category.

ENERVEE ONLINE SHOPPING PLATFORM

Enervee takes a different approach, providing its utility clients with an online marketplace similar to large Internet marketplace sites like Amazon. Rather than curating specific products to offer for sale directly through the utility retail site, Enervee's software gives consumers information on products available online and through retail stores in their area, and includes specifics on product features and prices that are updated daily. The site highlights the most efficient products meeting the buyers' criteria, making use of an "Enervee Score"—which is a continuous scale of 1 to 100—to display and compare product efficiencies.¹⁴ The platform includes more than 40 categories of major appliances, small appliances, HVAC and water-heating equipment, electronics, lighting, and lawn and garden equipment. Customers purchase products directly from the retailer and can apply any utility rebates at checkout. Figure 4 shows a screenshot of search results on the Enervee site.

¹⁴ The Enervee Score and other consumer-facing elements of the marketplace design incorporate behavioral science insights to address barriers and nudge consumers to more efficient purchases. The effectiveness of these approaches has been tested with site users (Arquit Niederberger 2020, 2022b; Arquit Niederberger and Champniss 2018).

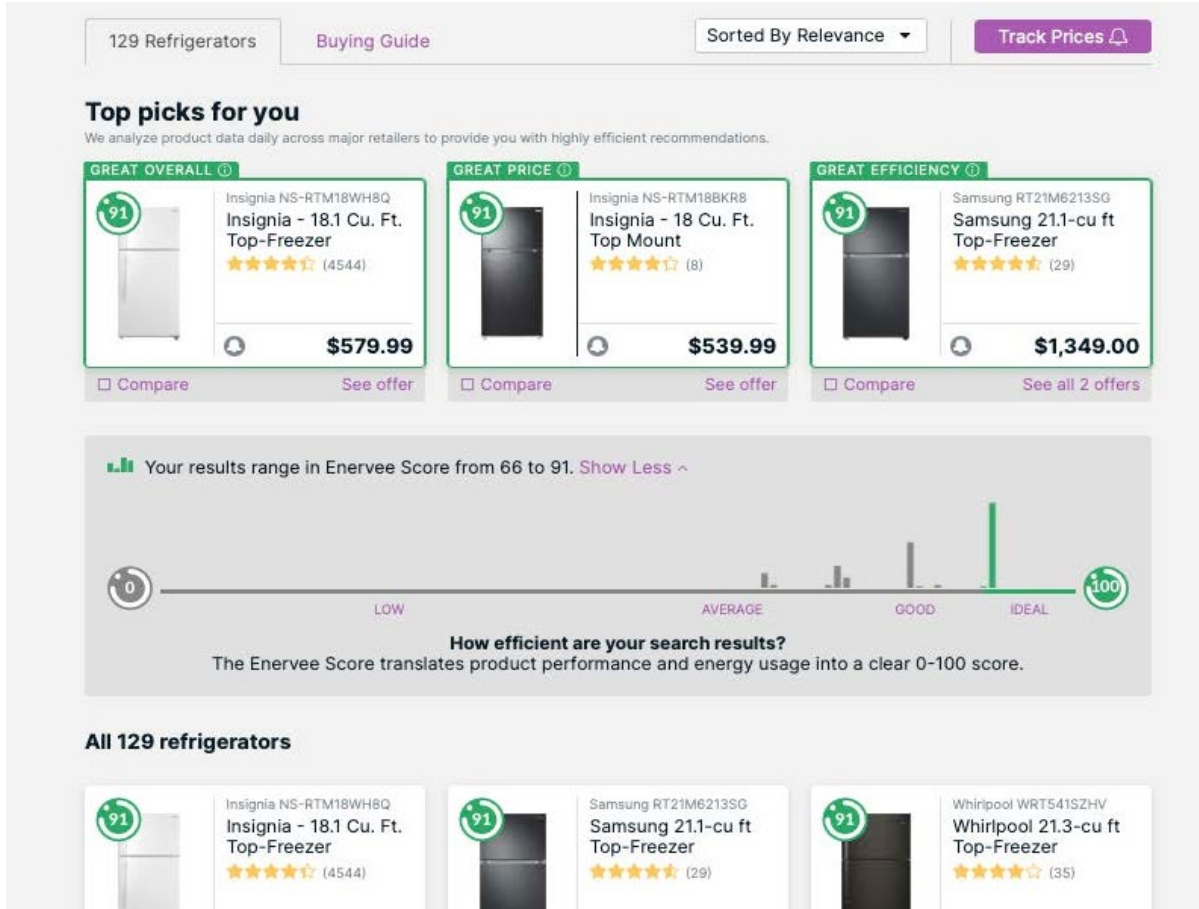


Figure 4. Enervee Choice Engine results for full-size (i.e., ≥ 18 cu. ft.) top-freezer refrigerators

For consumers, the shopping experience through the Enervee Choice Engine is much like other online shopping sites. Shoppers can filter and sort search results from major national and regional retailers offering a large selection of brands and models. This results in more product choices than other utility stores and direct install programs for low-income customers, which typically offer little flexibility or choice in available products. Limited options deter customers from participating or, if they do participate, leaves their needs unmet. The added flexibility and choice of the Enervee platform, along with its ease of access, expanded product information, personalized energy bill savings and total cost of ownership calculators, and integration/stacking of instant incentives supports utility efforts to reach underserved customer groups and promotes wider market transformation by working through existing market channels. Program administrators can choose to blend Enervee's Commerce platform with the Choice Engine to allow customers to make purchases directly through the marketplace.

Independent evaluations of the Commonwealth Edison (ComEd) and Ameren IL pilot Efficient Choice Marketplace programs (both of which use the Enervee platform) found that the utilities were able to achieve significant savings without rebates or other financial

incentives (Arquit Niederberger 2022b).¹⁵ Research suggests that some portion of customers—likely those with greater financial resources—will purchase more efficient appliances solely based on access to better information and an easier market transaction. Resources that have been dedicated to untargeted rebates, which tend to be small (in terms of dollars or percentage of cost) and largely claimed by over-represented customer groups, could instead be reallocated to offer incentives (e.g., rebates and low-cost financing) to customers who lack the resources to purchase efficient products that meet their needs.

In the summer of 2021, Enervee introduced the first financing option—Eco Financing—to its Commerce platform through the Southern California Gas (SoCalGas) Marketplace in partnership with fintech lender One.¹⁶ This element was added to the NYSERDA and Southern California Edison (SCE) marketplaces in 2023. Eco Financing allows purchasers to pay low fixed monthly payments for efficient products.

SoCalGas and SCE customers and all New Yorkers (via the statewide New York marketplace) are offered a point-of-sale payment option for energy-efficient appliance purchases ranging from \$200 to \$5,000 including installation, haul-away, and recycling costs. Customers can layer manufacturer or retailer incentives with utility rebates and pay no money down. Loans are backed by a loan loss reserve that allows the marketplaces to offer financing to people with credit scores of 580 or above. Loan terms are similar in New York, but NYSERDA requires lenders to provide a minimum of 35% of the total value of loans to customers with credit scores of 680 or less, or those at or below 80% of area or state median income, whichever is higher (Arquit Niederberger 2022a).¹⁷ Table 3 summarizes the early results from the beta deployment in California. Analysis of purchases found that borrowers purchase more efficient products than those paying with debit or credit cards and, in many cases, these products exceed ENERGY STAR levels (Anne Arquit Niederberger, pers. comm., February 1, 2023).

¹⁵ The evaluators developed a methodology for quantifying savings from the Enervee marketplace programs that is now included in the Illinois Technical Reference Manual (Arquit Niederberger 2022b).

¹⁶ Eco Financing is now offered through Lewis and Clark Bank.

¹⁷ Loan loss reserves provided by California's GoGreen Home program and NYSERDA cover losses in cases of loan default. This allows One to offer financing to borrowers with lower credit scores along with relatively long loan terms of 60 months (Arquit Niederberger 2022a).

Table 3. Early results for Eco Financing through the SoCalGas Marketplace

Purchases financed	85%
Average shopping cart value	\$1,400
Loans to underserved borrowers ^a	85%
Loans to LMI	70% from census tract below 120% of area median income (AMI) 30% from census tract below 80% of AMI
Loans to borrowers with credit score of 580–640	51%
Loans to renters	26%

^a Based on [California GoGreen Home regulations](#), underserved borrowers must meet the program definitions for low and moderate income or credit challenged.

GETTING INCENTIVES RIGHT

As with other program design elements, the incentive strategy must be tailored to meet customer needs. Offering a single rebate level and/or rebate mechanism (e.g., mail-in, in-store) may not reach some customers because it is too low to overcome the first cost barrier, requires burdensome paperwork, or is unavailable from all retailers. In some cases, a rebate may not be the most effective incentive to program participation for some customers.

Research from Minneapolis (Carruthers et al. 2022) and California (Frank and Nowak 2016) demonstrates the importance of understanding underserved communities and designing incentives and other supports tailored to their needs and preferences. Black homeowners in Minneapolis report a high level of trust in their utility and high levels of enrollment in the utility’s equipment service plan (Carruthers et al. 2022). At the same time, these homeowners are most likely to purchase appliances and equipment when facing an emergency replacement and opt for the lowest-cost product due to cash flow constraints and/or use costly financing. Rebates are unlikely to fully address these homeowners’ needs, but a program that leverages their existing relationship with their utility to offer guidance on high-efficiency replacement options, trusted contractors, and zero- or low-interest financing would make purchasing a high-efficiency replacement easier and more affordable. A marketplace approach like the Enervue platform leverages the utility relationship to provide these services.

A review of participant data from a range of California residential efficiency programs (Frank and Nowak 2016), including whole-home retrofit, appliance rebate, and refrigerator recycling, found that programs requiring larger participant buy-in (i.e., the amount a household must spend) are disproportionately used by higher-income, white, and highly educated households. Programs with neutral or negative buy-in (e.g., non-English educational programs, recycling) attracted greater participation from LMI or non-white participants. These lower buy-in programs often leverage participants' engagement with their utility, pointing to a potentially promising pathway to engage participants in more significant energy-saving programs that couple information, low-cost financing, and other customer supports.

California's statewide Multifamily Low-Income Weatherization Program offers higher incentives for in-unit efficiency and electrification measures to encourage landlords to install measures that reduce energy costs for tenants; this helps to address the split incentive barrier common in rental properties. This program and other utility-funded programs across the state also offer higher incentives to cover the perceived risks and uncertainties associated with electrification of fossil fuel measures and provide occupant education to ensure that renters can optimize savings from the projects (Dirr, Hill, and Ching 2022).

ALIGNING PROGRAM OBJECTIVES AND ADAPTING PROGRAM METRICS AND EVALUATION FOR EQUITY

The traditional concept of cost effectiveness considers only direct monetary savings and the expenses needed to achieve them. Measures that are deemed cost effective tend to be those that do not require subsidies to make financial sense, as they have a short or reasonable payback period. Measures with longer payback periods, that is, those that are not cost effective, need the subsidy. In other words, the traditional cost-effectiveness test, while logical from the utility regulators' perspective, drives investment to the most cost-effective programs, but not necessarily to the most equitable ones.

Discussions are increasing about the multiple benefits of energy efficiency including nonenergy benefits (NEBs)—also referred to as nonenergy impacts (NEIs)—which are the non-monetary, but highly beneficial, impacts of energy efficiency that are not so easily quantified. Examples here include increased tenant comfort, reduced health risks (especially respiratory illnesses), and improved safety and resilience. Efforts are underway to standardize definitions and monetize these benefits so that they can be better incorporated into cost-benefit analyses.

Several CEE member utilities are jointly undertaking such an effort; their goals include compiling a list of NEIs and identifying those of high priority/most impact with an eye toward equity; increasing understanding of methodologies in use by different jurisdictions; and considering how those methods can be improved to better account for and quantify NEIs (Lanciani et al. 2022). One component of the initiative is a series of lunch-and-learn calls, during which members of the CEE Evaluation Committee share results from their research on and analysis of NEIs. So far, the three completed calls have featured work from

ComEd, Puget Sound Energy, and the Independent Electricity System Operator–Ontario (IESO).

ISEO's Energy Assistance Program helped realize 7–21 GWh of yearly energy savings from 2013 to 2020. Despite this impact, the program's benefits–cost ratio has been below the 1.0 cost-effectiveness benchmark for most of its duration. To better reflect the program's real impacts, ISEO launched an effort to monetize NEIs across several sectors, including low-income and First Nation electricity customers. The highest-impact NEIs for both of those sectors was reduced financial stress (at \$0.09/kWh), followed by thermal comfort (\$0.08/kWh and \$0.09/kWh, respectively), and improved indoor air quality (\$0.02/kWh and \$0.06/kWh, respectively). In practice, this means that ISEO's low-income customers can obtain up to an additional \$0.19/kWh in benefits through program participation. With the added NEI of improved lighting levels at \$0.08/kWh, First Nation customers would receive up to an additional \$0.32/kWh (Lanciani et al. 2022; Dunsky Energy Consulting 2021). ISEO arrived at these figures through telephone and online surveys that asked participants to assign each NEI a value via two different methods; the responses were compiled and transformed to numerical values.

Other program administrators and regional energy efficiency organizations are working to develop equity metrics to improve program design and better gauge their work's impact. For example, Efficiency Vermont modified its Low-Income Targeted High Use program's eligibility criteria to focus on low-income households with higher energy burdens rather than high annual energy use to ensure that those with the highest energy burdens are served. The organization has also taken steps to identify and address disparities in program outcomes across different groups and geographies in the state (Wentz et al. 2020). In another effort, the Northeast Energy Efficiency Partnerships compiled insights and examples from program administrators and policymakers to identify six key steps for centering equity in program design, evaluation, and measurement (Cosgrove 2022). The California Public Utility Commission recently divided utility energy efficiency program portfolios into three components: resource, market support, and equity programs. Only the resource programs are required to meet cost-effectiveness thresholds. For programs aimed at providing energy efficiency to hard-to-reach or underserved customers and disadvantaged communities, evaluation criteria may include NEIs such as increased comfort and safety, improved indoor air quality, and more affordable utility bills (CPUC 2021).

Efforts to create and implement programs that address long-standing inequities for underserved communities require sufficient demographic data on program participants and non-participants—data that program administrators often lack. An analysis of 42 California residential program evaluations found that while 29 (69%) studies collected data on at least one demographic variable, only 16 (38%) included demographic findings in their report, and only 7 (17%) addressed the program's performance in incorporating program demographics or used their demographic findings to make program recommendations (Frank and Nowak 2016). Only one of the evaluations made program design recommendations based on a comparison of program demographic data and population data. Of the demographic data

collected, participant household income and educational attainment were the most common variables, followed by home ownership, age, race/ethnicity, and primary language spoken.

Utilities are beginning to use new data analytics, customer surveys, and other tools to fill in gaps in their understanding of customer demographics. Electric cooperatives, regional energy efficiency organizations, and market transformation programs that do not directly connect with end-use customers face larger challenges in obtaining such information. These challenges point to policymakers' role in supporting greater data collection and analysis to improve program design and delivery.

Conclusions and Recommendations

Our research shows that efforts to address historically underserved populations vary widely in their development and maturity. The primary approaches have specifically targeted either low-income programs, typically focusing on home weatherization, or limited direct install programs for various low-cost measures. We found relatively few well-established, long-running traditional efficient appliance and product programs that have achieved high participation among LMI and rural customers as well as communities of color. Recognition of the need to better serve the customers that existing energy efficiency programs largely fail to reach is more common. This recognition is driving some program administrators to fill gaps in their program offerings by targeting these customers with new, redesigned, or expanded programs. Limited data are available on the results of these efforts due to their newness. And, while early results are promising, robust data collection and tailored evaluations are needed to gauge the success of these programs in relation to equity goals. Still, their thoughtful design choices are already helping to innovate the field and push for improved program outcomes.

The following are key lessons from our research.

THE IMPORTANCE OF PARTNERSHIPS

Siloed programs and associated funding streams may limit and complicate available incentives and services for underserved populations. Partnerships among organizations with common, related interests and goals is a proven means to leverage available resources to offer more comprehensive solutions for customers, particularly those who have been historically underserved. Energy efficiency program administrators, whether utilities or third-party organizations, can partner with CBOs, housing authorities, and various local, state, and federal agencies and associated programs to reach and engage with disadvantaged customers to reduce their energy burdens and improve the conditions of their housing. Partnerships with retailers, manufacturers, lenders, and green banks can engage critical market actors in better serving and meeting the needs of these customer segments. Such partnerships can support improved and expanded programs through increased funding, leveraging existing services, and increasing supply and availability of suitable equipment and appliances; an example here is the Shift Consortium's work to expand customer choices. Partnering with CBOs can improve customer engagement and program accessibility.

IMPROVING PROGRAM DESIGN AND DELIVERY

The design and delivery of programs to better serve underserved populations can be improved by early and effective engagement with these targeted populations. To understand and address what customers need in order to pursue energy efficiency improvements and reduce energy burdens, programs must reach out to customers, find out what they are interested in and what works for them, and modify program offerings and delivery accordingly. For example, SMUD has begun reaching out to LMI customers who exceed the thresholds for participation in SMUD's low-income program to identify which products and services they are interested in and to connect them with community organizations that can help (Darin Schrum, SMUD, pers. comm., July 14, 2022). In this way, SMUD is seeking to better serve both its moderate- and low-income customers.

Program administrators should consider expanding programs with particular appeal to underserved customer groups. Examples include appliance recycling programs that work with secondary market actors selling appliances that are less than three years old, and programs targeting emergency replacement by making lower-cost, high-efficiency units readily available.

OVERCOMING COST BARRIERS

Affordability of energy-efficient products and services is a common barrier across underserved populations. Costs are also an issue for programs serving these customers, including higher service delivery costs for rural and other geographically isolated customers. To address these barriers, programs can use the following key strategies:

- **Address first-cost issues.** Tiered incentives that cover a larger portion of the up-front cost for LMI customers can increase program participation and discourage reliance on secondhand markets. Incorporating added incentives for low-income customers, like Efficiency Vermont's bonus incentive covering the full cost of one appliance, can increase participation and further support customers. Engaging in market transformation efforts—such as the Shift Consortium and Enervee's e-commerce partnerships with states, utilities, lenders, and manufacturers—can promote larger market changes that increase the number and availability of low-cost, high-efficiency products.
- **Provide innovative, affordable financing.** Micro-financing and other innovative financing tools support broader engagement in programs by enabling LMI customers and others with lower credit scores to pay for efficient products with affordable monthly payments. A promising example is the Eco Financing lending program delivered through e-commerce platforms in cooperation with NYSERDA, SoCalGas, and SCE; this program lets consumers pay low fixed monthly payments for efficient products.
- **Target and combine available resources:** When program incentives are limited (or programs are very popular), offering first access and/or higher incentives to LMI or other underserved communities can lead to more equitable program participation.

Because this can increase total program costs, administrators should identify and secure additional funding available through various local, state, and federal agencies. Federal funding for energy efficiency and electrification measures through the Inflation Reduction Act provides an excellent opportunity for programs to layer and stack incentives. Efforts to better serve LMI customers should not decrease available funding and program efforts for other customers.

CREATING AND EXPANDING AFFORDABLE MARKET CHOICES

Increasing the availability of affordable energy-efficient products and equipment in retail and online markets can achieve more equitable outcomes. Collaborations among programs, retailers, and manufacturers are necessary to expand customer choices at entry price points. A model here is the Shift Consortium, a collaboration that works to increase availability of affordable energy-efficient products that are well-suited to the needs of LMI households and other underserved communities. As the Shift Consortium demonstrates, expanding market choices requires a multipronged approach. Key elements include a retail strategy targeting price reductions for energy-efficient products; market research to increase understanding of targeted customers; and working with retailers, manufacturers, program administrators, and other key stakeholders to build robust markets for a broader set of energy-efficient products.

Increasing the options for program participants to shop and select the products that best meet their needs empowers them to take greater control over their energy use decisions. Two examples here are the low-cost financing options for efficient products on Enervee's marketplaces, and vouchers that can be used on a variety of appliances through Efficiency Vermont's low-income programs.

APPLYING AN EQUITY LENS AND METRICS FOR PROGRAM EVALUATION

Program objectives that fail to include equity and associated metrics readily lead to inequitable outcomes. Applying an equity lens to focus on equitable outcomes and using equity metrics to assess impacts are key elements for achieving more equitable programs.

A primary objective for evaluating energy efficiency programs for utility customers continues to be cost effectiveness. Historically, few program evaluations have included equity as an objective. As program experts often noted during our research interviews, the cost-effectiveness tests used to screen measures and programs can greatly restrict programs and services for underserved communities. Two factors can result in programs failing to pass cost-effectiveness tests. Generally, programs targeting LMI and other underserved communities have higher costs because they need to cover as much as full measure costs, as well as spend more program staff time to engage and assist customers. Further, the benefits resulting from serving these customers can be undervalued in benefit-cost analyses, even though these programs are explicitly intended to provide a broader range of benefits to the utility and to program participants.

CREATING MORE EQUITABLE PROGRAMS

Our review of existing programs and interviews with industry leaders reveal that achieving equity in serving all types of residential customers with energy efficiency services and incentives has become a priority for many utility and related programs. This objective is a response to the growing recognition that despite decades of experience with residential energy efficiency programs, these programs continue to underserve some customers.

Equity must be considered as a primary program objective to ensure more equitable outcomes, beginning with program design. Program models and theories should be reimagined to establish equity along with energy efficiency as a core objective. Without explicitly making equity a program objective, program designers, administrators, implementers, and evaluators cannot adequately incorporate or assess program progress toward achieving more equitable outcomes.

Furthering equity has been a particular challenge for market transformation programs that lack equity as a program objective in their original program theory or logic model. Market transformation program administrators may value equity, but they have found it particularly challenging to fit equity into traditional program designs. Market transformation's focus has been to increase new technology adoption to achieve the majority of market share, regardless of which customers are participating and benefitting from the technologies. The Shift Consortium and Enervee are demonstrating the potential for market transformation programs that center equity alongside energy savings as core program objectives.

While it may be challenging to develop effective programs and services targeted to underserved customer groups, the rewards are great. Customers benefit directly, and the aggregated energy and carbon reductions can be vital to reaching climate goals. All customers should have equal opportunities to contribute to and benefit from the clean energy transformation that is underway.

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