

Making Maryland Homes More Affordable through Energy Efficiency

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Executive Summary

In 2008, Maryland enacted the EmPOWER Maryland Energy Efficiency Act to provide utility customers' homes and businesses with energy efficiency upgrades to meet rising energy demand. EmPOWER has established stringent statewide energy savings goals to guide the deployment of energy efficiency resources. It also has a specific focus on delivering these resources to limited-income households because these customers have historically been underserved by utility sector customer-funded energy efficiency programs. Improving the efficiency of these homes also advances the financial stability, health, and well-being of low-income families.

Electric utilities throughout the state began administering limited-income programs in 2009, but this responsibility was transferred to the state's Department of Housing and Community Development (DHCD) in 2011. DHCD proposed to deliver energy efficiency programs that would tackle the dual challenges faced by many of the state's limited-income households: high energy costs and lack of affordable housing. The Maryland Public Service Commission (PSC) transferred the program because DHCD had shown a record of accomplishment in overseeing both the state's Weatherization Assistance Program (WAP) and affordable housing programs.

DHCD administers two programs under EmPOWER: the Low Income Energy Efficiency Program (LIEEP), which targets single-family homes, and the Multifamily Energy Efficiency and Housing Affordability (MEEHA) program, which targets apartment buildings. Since taking over administration of the state's limited-income programs, DHCD has been able to increase overall energy savings. DHCD surpassed its forecast energy savings for the first program cycle. This is due in part to DHCD's pursuit of many of the program best practices identified in research done by the American Council for an Energy-Efficient Economy (ACEEE). With the 2018–2020 program cycle beginning soon, the Maryland PSC is in the process of reviewing a new DHCD program proposal for both LIEEP and MEEHA.

This report supplements the findings of two previous ACEEE studies examining the EmPOWER program.¹ While those studies focused mostly on EmPOWER's outcomes for the state at large, this report examines the performance of its energy efficiency programs targeting low-income households. In analyzing these programs, we have drawn on our existing nationwide best practices research to highlight opportunities for advancing Maryland's low-income programs.

Our assessment indicates that both LIEEP and MEEHA have opportunities to improve performance. DHCD should pursue the following changes in targeting single-family households through LIEEP:

¹ B. Baatz and J. Barrett, *Maryland Benefits: Examining the Results of EmPOWER Maryland through 2015* (Washington, DC: ACEEE, 2017). [aceee.org/research-report/u1701](https://www.aceee.org/research-report/u1701). J. Barrett and B. Baatz, *EmPOWERing Maryland: Estimating the Economic Impacts of Energy Efficiency Investments on Maryland's Economy* (Washington, DC: ACEEE, 2017). [aceee.org/white-paper/empowering-maryland-0317](https://www.aceee.org/white-paper/empowering-maryland-0317).

- Expand efforts to serve households with home health and safety deferrals
- Increase coordination with community organizations
- Strengthen engagement with rental property owners

DHCD should also take the following actions to improve its work with multifamily customers through MEEHA:

- Extend incentives to master-metered buildings
- Help applicants design and plan financially feasible projects
- Provide new training for contractors

Finally, the Maryland PSC should pursue integrating natural gas incentives in DHCD's programs, and direct DHCD to track new program performance metrics that can be used improve performance, set program goals and targets, and expand its programs' eligibility criteria.

LOW INCOME ENERGY EFFICIENCY PROGRAM (LIEEP) FOR SINGLE-FAMILY HOMES

LIEEP provides the owners of limited-income homes with low- or no-cost whole-home energy efficiency upgrades. Compared with similar programs in other states, LIEEP has achieved higher than average energy savings per participant. However participation has been inconsistent. We have highlighted both the potential reasons for this inconsistency and possible solutions to address each challenge.

Contractors working on behalf of LIEEP have encountered high cost barriers associated with repairing home health and safety problems that must be addressed before efficiency measures can be installed. Energy efficiency upgrades hold the potential to improve indoor air quality, but only when health and safety issues such as poor ventilation, mold, and water leaks in the structure or equipment of a home are addressed first. Otherwise, efficiency upgrades can exacerbate these problems by sealing in moisture and contributing to several negative health outcomes. In past years, program contractors have been allowed to address home health and safety issues that cost less than \$1,000, but these required repairs often exceed this threshold, leaving contractors unable to complete many projects. In order to reach more low-income customers, the Maryland PSC should seek to increase spending on deferred home maintenance that could prevent the implementation of energy efficiency measures, or it should be more flexible in its current approach.

To further improve participation levels, LIEEP staff can coordinate with additional state agencies and local community-based organizations. Program administrators currently work with agencies and organizations providing payment assistance for energy bills, such as the Maryland Office of Home Energy Programs (OHEP). However staff could do more to coordinate with social service organizations such as those providing welfare, health, and job assistance. Doing so would provide program staff an opportunity to reach additional low-income households. LIEEP could also offer WAP participants high-efficiency appliances and equipment that they do not currently receive through weatherization.

Finally, LIEEP staff could do more to strengthen their relationships with landlords of single-family homes, and especially those who own multiple homes. LIEEP staff tend to

communicate with landlords only after a tenant has applied for assistance and secured the owner's authorization for a retrofit. Other low-income efficiency program administrators have increased their participation rates by reaching out to property owners directly. This can involve networking with tenant advocates, presenting at landlord association meetings, and organizing informational lunches for property owners.

MULTIFAMILY ENERGY EFFICIENCY AND HOUSING AFFORDABILITY (MEEHA) PROGRAM

DHCD's MEEHA program provides affordable multifamily building owners with incentives and no-cost options to retrofit their buildings. MEEHA has seen decreases in both participation and savings over the past program cycle. To address these issues, the Maryland PSC could begin by allowing master-metered multifamily properties to apply for program incentives to improve performance. While these buildings account for only a small share of multifamily properties, they offer promising opportunities for energy savings. Because owners of these properties are responsible for all energy costs, they are often motivated to complete a comprehensive retrofit.

Designing and planning a financially feasible project has been a persistent challenge for many MEEHA applicants. And many affordable multifamily building owners apply for program incentives only to encounter challenges with financing. The following are actions that program staff can take in the early stages of the application process to prevent these problems from occurring in later stages:

- *Provide no-cost, data-driven energy benchmarking support to applicants* to assess whether a comprehensive retrofit is needed to improve building efficiency.
- *Search for savings across an applicant's portfolio of buildings* to identify multiple properties that can provide cost-effective savings.
- *Suggest bridge financing opportunities* to help with funding upgrades before incentives are made available.

MEEHA program administrators are currently seeking opportunities to increase training for project contractors. Several programs across the country offer only occasional educational workshops for their contractors, while others provide more frequent training opportunities. Programs can provide contractors with support in the form of a regular workshop series, industry-specific forums for discussions with other contractors and program staff, newsletters, and updates through a central online portal. Experience has shown that more contractors will participate in these initiatives when program administrators publicly promote them as highly trained energy professionals. Pursuing an approach such as this can increase multifamily owners' confidence that a project's work will be of superior quality. This in turn can increase the likelihood of their participation in MEEHA.

Natural gas incentives are available to LIEEP and MEEHA participants only in the Baltimore Gas and Electric (BGE) service territory, despite many Maryland households' reliance on gas heating. Gas utilities across the state, along with the Maryland PSC, should consider directing resources to DHCD to fund natural gas incentives for their customers. This would allow DHCD to achieve higher overall energy savings by providing comprehensive energy efficiency improvements to more limited-income households. BGE

natural gas incentives are currently available only to residential customers. The PSC should allow DHCD to provide commercial natural gas incentives to MEEHA applicants who are building owners, as many of them are likely in need of upgrades for natural gas building equipment.

TRACKING PROGRAM PERFORMANCE

As the single-family and multifamily low-income programs evolve, the PSC should direct DHCD staff to track and report new performance metrics that align with changes in operations and goals for the programs. ACEEE and others have used the following metrics to compare the performance of low-income programs across the country:

- Annual energy savings
- Program participants as individual housing units
- Annual program spending
- Annual program spending as a percentage of total energy efficiency or residential efficiency spending
- Savings per participant and spending per participant
- Annual and/or cumulative participation as a share of eligible customers
- Share of total energy savings from low-income programs
- Annual lifetime savings
- Cost per unit of annual lifetime savings
- Occupant comfort
- Frequency, measures, cost, energy savings, and nonenergy benefits of homes receiving health and safety repairs

Most notably, program staff have an opportunity to employ metrics that track the multiple benefits of efficiency upgrades, in addition to energy savings. These can be used to reinforce the programs’ full value to utilities, participants, and society. Program staff could also incorporate a consideration for energy efficiency’s multiple benefits in qualifying applicants.

We recommend that the PSC use data from some of the above metrics to create specific goals for DHCD’s programs. The Maryland PSC should require timely process and impact evaluations to demonstrate and document that the programs accomplish their goals. Routine and comprehensive evaluation, measurement, and verification (EM&V) of LIEEP and MEEHA will enable DHCD to accurately document energy efficiency program savings and alter program design and measures accordingly.

Introduction

Residents of affordable housing, much of which is aging and in need of repair and upgrades, may pay less in rent than those with higher incomes living in newly constructed or updated homes, but these households often pay nearly the same amount in energy bills (Carliner 2013). Most low-income families live in smaller and less energy-efficient housing units because larger and more energy-efficient options are out of reach (EIA 2012; Desmond 2017). Their energy costs also consume a larger proportion of their incomes compared with more affluent households, adding to the struggles they face in paying for many other basic necessities (Drehobl and Ross 2016).

Each year, 15% of renting families across the country receive utility disconnection notices for nonpayment (Census Bureau 2016). While only a small share of low-income households will have their electricity or natural gas service disconnected, research indicates that many more will fall behind on their rent and risk eviction from their homes (Desmond 2017). Energy efficiency upgrades offer these households an opportunity to ease their energy cost burdens. Retrofitting a low-income family's home can make it 25% more efficient than the average household's, and this has the potential to reduce up to 30% of their energy burden (Drehobl and Ross 2016).

The challenges of energy and housing affordability are intertwined, and they are especially pronounced in Maryland. Among the states and District of Columbia, according to data from the National Low Income Housing Coalition (NLIHC), Maryland has the fourth most expensive housing in the nation. A Maryland household would need to earn at least \$48,760 to comfortably afford the 2017 market cost of rent and utilities for a one-bedroom apartment (NLIHC 2017b). Nearly one-third of Maryland households earn below this level, and the state would need to add nearly 150,000 units of affordable housing to accommodate these individuals and families (Census Bureau 2017; NLIHC 2017a).²

Low-income families need homes that have both affordable rents and affordable energy bills, and this requires the creation of innovative policies and programs. Maryland's Department of Housing and Community Development (DHCD) has sought to address the state's dual challenges of housing and energy affordability by providing incentives to property owners that both improve the efficiency of low-income homes and preserve their affordable rents.

While DHCD's energy efficiency programs have achieved much and continue to evolve, several challenges remain. Program administrators want to ensure they are reaching limited-income households most in need of energy efficiency upgrades and providing all possible support to applicants (MD DHCD 2017g, 2017h). Throughout 2017, DHCD staff

² While an exact count of households with incomes below \$48,760 is not available, the US Census Bureau's 2016 American Community Survey one-year estimates indicate that 28.1% of Maryland household incomes were below \$45,000. NLIHC's *The Gap* report has concluded that Maryland lacks 141,378 affordable housing units needed to meet demand by those earning less than 50% of the state's area median income (AMI). According to DHCD (2017e), the current AMI for Maryland is \$92,500; 50% of this is \$46,250. Thus we can reasonably assume that roughly 150,000 affordable units would be needed to accommodate the needs of nearly one-third of Maryland's households.

convened a series of working groups to discuss these issues and propose solutions. We have used Maryland stakeholder feedback, DHCD's annual performance reports, and lessons learned from low-income energy efficiency programs across the country to guide the research and writing of this report with the goal of highlighting opportunities for future program development. We include recommendations for not only DHCD, but also the Maryland Public Service Commission (PSC) and the state's utility companies.

Maryland EmPOWER's Limited-Income Programs

In 2008, Maryland's state legislature adopted the EmPOWER Maryland Energy Efficiency Act. The Maryland PSC authorized the EmPOWER program's implementation and directed the state's utilities to develop energy efficiency programs to reduce per-capita electricity consumption and peak demand by 15%. As part of the EmPOWER program, the PSC required that utilities target limited-income residents. The state's utilities administered these programs for three years, but overall participation across these was only 21% of what had been forecast (EPA 2017). In 2012, the Maryland PSC tasked DHCD with the responsibility of administering these programs. The commission stated that DHCD was well positioned as an administrator because of its long history implementing affordable housing programs in Maryland and experience in administering the state's weatherization programs (MD PSC 2011).

DHCD began administering the Low Income Energy Efficiency Program (LIEEP) and the Multifamily Energy Efficiency and Housing Affordability (MEEHA) program in 2012. DHCD exceeded savings expectations during the first program cycle, which ran from 2012 to 2014. Program administrators set a goal to achieve nearly 14,000 kWh of energy savings over this period and ended the cycle with 24,400 kWh of savings, surpassing the original target by 75% (MD DHCD 2014a). While the program had achieved high savings, costs also ran high and participation was lower than expected. In response, the commission ordered DHCD, the Office of People's Counsel, PSC staff, the Maryland Energy Administration, and the utility companies serving Maryland to establish a Low-Income Work Group to improve program performance (MD DHCD 2014b).

In 2015, the PSC approved DHCD's plan to continue administering LIEEP and MEEHA for the 2015–2017 program cycle (MD PSC 2015). By this time, utilities had achieved their goal of reducing per-capita electricity consumption and peak demand 15% by 2015 (Batz and Barrett 2017). Utilities now include energy savings generated by DHCD programs in their efforts to meet a new statewide goal of 2% incremental savings by 2023 (MEEA 2017). However DHCD itself is not held to a program-specific energy savings target.

Since 2015, DHCD has made significant progress in reducing costs while maintaining overall savings levels comparable to those of previous years. However working groups meeting in 2017 identified several opportunities to improve program performance by reaching more low-income households and increasing per-household energy savings (MD DHCD 2017g, 2017h). With the end of the current program cycle in sight, the Maryland PSC is in the process of reviewing a new proposal for the 2018–2020 cycle. Program administrators are assessing their past accomplishments and challenges to better guide the future development of their programs.

Review of DHCD Limited-Income Program Performance

Before assessing DHCD’s performance over the past few years, it is useful to examine the level of investment in LIEEP and MEEHA relative to similar programs in high-performing states. Table 1 compares low-income energy efficiency spending across states achieving savings of at least 1% of annual retail sales.³ The table also provides a sense of how a state’s share of spending on its low-income programs compares with its share of families living below 200% of the federal poverty level (FPL).⁴

Table 1. 2016 low-income energy efficiency spending in states with at least 1% energy savings compared with their share of families living below 200% of poverty

State	Total EE spending	Low-income EE spending	Low-income spending as % of total EE spending	Percentage of families below 200% of FPL
California	\$1,658,117,154	\$422,500,000	25%	27%
Connecticut	\$235,639,027	\$ 37,692,751	16%	17%
New York	\$583,562,057	\$85,400,000	15%	25%
Massachusetts	\$740,615,355	\$104,279,757	14%	17%
Maryland	\$203,031,545	\$28,729,842	14%	17%
Rhode Island	\$103,000,000	\$14,264,295	14%	22%
Michigan	\$263,239,888	\$25,652,571	10%	25%
Minnesota	\$215,700,000	\$22,200,000	10%	17%
Vermont	\$56,795,230	\$4,796,684	8%	20%
Oregon	\$180,506,882	\$12,727,646	7%	24%
Idaho	\$50,828,764	\$2,804,363	6%	27%
Maine	\$33,329,177	\$2,038,894	6%	23%
Iowa	\$174,113,440	\$7,642,535	4%	21%
Washington	\$313,330,725	\$5,556,138	2%	19%

Spending totals include both electric and natural gas spending whenever possible. We have included only those states that both achieved at least 1% energy savings and reported statewide energy efficiency spending for low-income programs. Maryland did not achieve 1% energy savings in 2016. Some states provided only estimated spending numbers. *Sources:* Census Bureau 2017; Berg et al. 2017.

³ Maryland’s goal for utilities to achieve energy savings of 2% of total retail sales is among the most aggressive in the country. Most states with goals establish a threshold of at least 1% savings of total retail sales (ACEEE 2017b).

⁴ The data reported here are not based on a complete count of all those living below 200% FPL. We have used families rather than households to report the portion of state populations that live below 200% FPL because the 2016 American Community Survey Public Use Microdata Samples (PUMS) were not available to calculate total households living below 200% FPL at the time of this report’s publication. In the American Community Survey, *families* refer to households where an individual lives with one or more persons related by birth, marriage, or adoption. Our estimates do not include nonfamily households where a householder is living alone or with nonrelatives only.

Maryland’s share of efficiency spending on limited-income programs is typical compared with that of similar states and is relatively close to the share of its families with incomes below 200% FPL, but spending data provide only a narrow view of program performance. Low-income energy savings data offer a different perspective.

Ideally, it would be useful to compare the energy savings and other performance metrics of DHCD’s limited-income programs with those of similar states. However low-income energy savings data are not available at the statewide level for most states. Therefore, we have chosen to compare savings data from DHCD’s programs with those of the largest electric utilities in several select states that are achieving savings of at least 1% of annual retail sales. These states run large energy efficiency portfolios, including programs targeted at low-income customers.

Energy savings data for DHCD’s programs come from their semiannual reports and include savings from both single-family and multifamily initiatives. These reports typically include data on participation and savings that have not been independently verified. Realization rates of 63% for single-family electric savings and 49% for multifamily electric savings have been used to account for discrepancies between expected and actual savings before reporting. It is also important to note that the relatively low savings reported in 2015 were a result of a slower program year due to DHCD’s negotiations with new weatherization contractors and the start-up of a new program cycle (VEIC 2017). DHCD also credits gains in 2016 to improved operations and increased program consistency, better quality of work, and continued commitment by program contractors. Staff also ran ads on social media and radio to market the EmPOWER limited-income programs (DHCD 2017a).

Tables 2 and 3 provide electric energy savings for DHCD programs from the 2015 and 2016 program years. Table 4 provides 2015 savings data for the largest electric utilities in select states achieving energy savings of at least 1% of total retail sales.

Table 2. 2015 net incremental electric energy savings for Maryland limited-income programs by utility

Utility	Low-income savings (kWh)	Total portfolio savings (kWh)	Low-income savings as a % of total utility portfolio savings	Lifetime low-income savings (kWh)	Cost per kWh of lifetime savings
BGE	2,521,000	414,587,000	0.6%	42,657,000	\$0.17
Delmarva	1,069,000	117,219,000	0.9%	19,920,000	\$0.07
PEPCO	1,711,000	384,269,000	0.4%	37,014,000	\$0.10
Potomac Edison	428,000	60,119,000	0.7%	4,974,000	\$0.14
SMECO	314,000	40,229,000	0.8%	3,571,000	\$0.23
All DHCD programs	6,043,000	1,016,423,000	0.6%	108,136,000	\$0.13

All energy savings are reported as net incremental at generator. The expected useful life (EUL) of measures used to calculate lifetime energy savings varies by utility. Budgets for each utility service territory vary because they correspond to each territory’s share of the statewide low-income population. *Source:* DHCD 2016a.

Table 3. 2016 net incremental electric energy savings for Maryland limited-income programs by utility

Utility	Low-income savings (kWh)	Total portfolio savings (kWh)	Low-income savings as a % of total utility portfolio savings	Lifetime low-income savings (kWh)	Cost per kWh of lifetime savings
BGE	4,692,000	546,412,000	0.9%	77,373,000	\$0.14
Delmarva	995,000	68,179,000	1.5%	17,073,000	\$0.08
PEPCO	1,606,000	324,568,000	0.5%	24,089,000	\$0.18
Potomac Edison	2,249,000	78,941,000	2.8%	30,222,000	\$0.07
SMECO	851,000	43,314,000	2.0%	10,472,000	\$0.12
All DHCD programs	10,393,000	1,061,414,000	1.0%	159,229,000	\$0.12

All energy savings are reported as net incremental at generator. The expected useful life (EUL) of measures used to calculate lifetime energy savings varies by utility. Budgets for each utility service territory vary because they correspond to each territory's share of the statewide low-income population. *Sources:* MD DHCDs 2016b, 2017a.

Table 4. 2015 low-income net incremental electric energy savings for the largest electric utilities in selected states with at least 1% portfolio savings

Utility	State	Low-income savings (kWh)	Total portfolio savings (kWh)	Low-income savings as a % of total utility portfolio savings	Lifetime low-income savings (kWh)	Cost per kWh of lifetime savings
PECO Energy	PA	18,716,000	214,205,000	8.7%	112,380,000	\$0.08
DTE Energy	MI	27,031,000	611,464,000	4.4%	264,611,000	\$0.03
Eversource	CT	15,085,000	357,699,000	4.2%	166,351,000	\$0.04
Eversource	MA	30,313,000	789,186,000	3.8%	484,136,000	\$0.05
National Grid	RI	6,587,000	222,822,000	3.0%	79,436,000	\$0.13
Pacific Gas & Electric	CA	34,517,000	1,378,895,000	2.5%	464,254,000	\$0.15
Consolidated Edison	NY	8,248,000	413,613,000	2.0%	131,968,000	\$0.04
Portland General Electric	OR	3,874,000	262,677,000	1.5%	52,110,000	\$0.13
Puget Sound Energy	WA	1,739,000	230,853,000	0.8%	19,998,500	\$0.17
Efficiency Maine	ME	1,534,000	224,341,000	0.7%	14,065,000	\$0.09
Xcel Energy	MN	2,597,000	408,822,000	0.6%	29,865,500	\$0.08
MidAmerican Energy Co.	IA	1,642,000	268,937,000	0.6%	18,888,000	\$0.04

When possible, energy savings are reported as net incremental at generator. We have assumed a measure of life of 11.5 years in instances where a utility's lifetime savings have not been reported, in keeping with the methodology used in ACEEE's *2017 Utility Energy Efficiency Scorecard*. The expected useful life (EUL) of measures used to calculate lifetime energy savings varies by utility. While Pennsylvania has not achieved 1% energy savings across its statewide portfolio, it is included here because the state has adopted a specific low-income energy savings target. We have only included utilities in states where complete low-income energy savings and spending data were available. *Sources:* Relf, Baatz, and Nowak 2017; Drehobl and Castro-Alvarez 2017.

Tables 2 and 3 show that overall energy savings from DHCD's limited-income programs accounted for only 0.6% of all EmPOWER portfolio savings in 2015 and 1.0% in 2016. These savings are low compared with most of the utilities in table 4. Low-income programs

offered by PECO Energy, DTE Energy, Eversource Connecticut, and Eversource Massachusetts account for more than 3% of total portfolio energy savings and cost less than \$0.09 per kWh of lifetime savings.⁵ Like Maryland, these programs focus on providing comprehensive whole-building retrofits (Drehobl and Castro-Alvarez 2017). However DHCD's programs cost roughly \$0.12 per kWh of lifetime savings to operate.

Overall, this brief look at performance data reveals opportunities for increasing limited-income program energy savings as a proportion of total EmPOWER portfolio savings. Increased spending may be necessary to both boost savings and preserve the program's focus on providing comprehensive whole-home and whole-building upgrades. The data also reveal the potential to improve program operations and get more from current funding and labor. The following sections highlight several opportunities to improve the processes and performance of both LIEEP and MEEHA programs.

Low Income Energy Efficiency Program (LIEEP) for Single-Family Homes

LIEEP provides electric and natural gas energy-saving measures to Maryland limited-income households that live in single-family homes.⁶ The program is available to households that have an income below or equal to 200% of FPL and have an account with one of five utilities: Baltimore Gas and Electric (BGE), Delmarva Power, Potomac Edison (PE), Potomac Electric Power Company (PEPCO), or Southern Maryland Electric Cooperative (SMECO) (MD DHCD 2011). Roughly one in six Maryland families meets these eligibility requirements (Census Bureau 2017). To participate in the LIEEP program, households must submit an application form and undergo an energy audit before receiving home upgrades. Efficiency improvements available to applicants include lighting, insulation, refrigerator, and hot water upgrades.⁷ Certain homes also qualify to receive health and safety improvements as part of a retrofit project.⁸

During the current program cycle (2015–2017), LIEEP has reached more than 6,800 housing units, yielding total savings of almost 15,000 MWh and 1.45 million therms (MD DHCD 2016a, 2016b, 2017a, 2017b). Compared with the programs evaluated in ACEEE's *Low-Income Energy Efficiency Programs Baseline Assessment*, LIEEP's average savings per participant of 2,338 kWh is relatively high (Drehobl and Castro-Alvarez 2017). Low-income programs serving only single-family households had an average savings per participant of only 1,802

⁵ Lifetime energy savings take into consideration the expected useful life (EUL) of all installed efficiency measures and provide an estimate of the long-term energy savings that will be achieved from a year's worth of program activity. These savings can provide a more accurate assessment of how comprehensive programs are in their approach to upgrading a home or building, since measures with high savings but a short EUL will often produce lower lifetime savings.

⁶ Natural gas measures are provided only to BGE residential customers.

⁷ Participants may also receive furnace cleaning, tuning, and safety repairs. Insulation is available for attics, floors, and walls.

⁸ Health and safety measures often involve addressing the causes of excessive moisture, mold, poor indoor air quality, and pests in a home. While these measures do not always save energy, they can be critical to the health of residents. Installing energy efficiency upgrades in these homes without addressing health and safety concerns can exacerbate these problems.

kWh in ACEEE's baseline assessment.⁹ These data indicate that the program is achieving better than average energy savings for each participating household by delivering comprehensive whole-home retrofits. However annual participation, as seen in table 5, has been inconsistent since the last year of the previous cycle.

Table 5. Annual LIEEP program electricity savings and participants

Year	Total savings (kWh)	Total participants	Savings (kWh) per participant
2014	11,416,00	3,340	3,418
2015	3,486,000	1,737	2,007
2016	9,349,000	3,510	2,664
2017 (Q1/Q2)	1,835,000	1,564	1,173
Current program cycle annual average (2015–17)	5,868,000	2,724	2,338

The 2015 dip in program performance was due to negotiations with new weatherization contractors and start-up of the new program cycle (VEIC 2017). *Sources:* DHCD 2015a, 2016a, 2016b, 2017a, 2017b.

If increasing participation is a goal, a challenge for DHCD in the next program cycle will be reaching more households. Maryland has an estimated 241,744 families (16.6% of the state total) that live below 200% FPL and could therefore potentially qualify for LIEEP upgrades (Census Bureau 2017). Looking across program years, participation has been inconsistent, and the program continues to serve only a small portion of eligible households. As with all energy efficiency programs, trade-offs can occur when administrators increase their emphasis on participation (Ross, Jarrett, and York 2016). Operating with limited budgets, program administrators must decide whether they will direct funding to limited projects and achieve deep savings or spread funding among more participants while realizing comparatively lower savings. Ultimately, regulators may have to approve an increase in a program's budget to achieve both a high participation rate and high saving per participant. It may also be possible to address these issues through more efficient program operations in some cases.

In a national review of similar programs, Cluett, Amann, and Ou (2016) identify several best practices employed by low-income energy efficiency programs that can be used to increase participation and savings:

- *Offer a range of eligible measures* such as those that address more electric plug loads.
- *Coordinate with other organizations* that serve many low-income households and have a good community reputation.
- *Use a portfolio approach* with multiple programs that serve both homeowners and renters.

⁹ This average is calculated using data from five programs included in the baseline assessment because these were the only programs solely focused on providing upgrades for single-family homes.

- *Address health, safety, and building integrity issues* that can prevent low-income households from participating in whole-home energy retrofits.
- *Increase electricity savings through high-efficiency products* such as ENERGY STAR® appliances and equipment.

DHCD incorporates some of these practices within LIEEP, including using a portfolio approach, coordinating with other, external organizations, offering high-efficiency refrigerators, and addressing health and safety issues. However opportunities remain for DHCD and the Maryland PSC to increase participation, such as

- Expanding efforts to serve households with home health and safety deferrals
- Increasing coordination with community organizations
- Strengthening engagement with rental property owners

We discuss each of these recommendations in greater detail in the following sections.

EXPAND EFFORTS TO SERVE HOUSEHOLDS WITH HOME HEALTH AND SAFETY DEFERRALS

To secure affordable housing, low-income families often live in older, non-renovated homes. Due to deferred maintenance, these homes can have numerous structural or mechanical deficiencies that pose a threat to the health and safety of residents. These issues can be a substantial challenge for low-income single-family efficiency programs (Cluett, Amann, and Ou 2016). A program, like DHCD's, that seeks to incentivize whole-home retrofits must address health and safety concerns before installing energy efficiency measures, as some of these upgrades can degrade indoor air quality (DHCD 2017g). However the cost to fix health and safety deficiencies can be high and result in few if any energy savings. Many efficiency programs defer these homes from participation until all health and safety concerns are remedied. Unfortunately, these issues often go unaddressed since low-income households often cannot afford to pay for the necessary repairs. This can impede participation and harm overall performance for low-income energy efficiency programs.

DHCD's LIEEP contractors are currently permitted by the Maryland PSC to spend up to \$1,000 on health and safety upgrades in each eligible single-family limited-income home (MD DHCD 2017g).¹⁰ While this funding allows the participation of many households that would otherwise not be able to, many other homes require repairs that would exceed the current spending cap. DHCD launched the Targeted and Enhanced Weatherization pilot program in 2015 to gauge the cost and time needed to address more extensive health and safety issues in homes (MD DHCD 2017d). The pilot removed the health and safety spending cap for some BGE customers and found that common needs such as plumbing

¹⁰ DHCD delineates health and safety interventions using a definition outlined in the US Department of Energy's (DOE) weatherization programs. DOE defines these as "actions necessary to maintain the physical well-being of both the occupant and/or weatherization workers where the actions must be taken to effectively perform weatherization work or the actions are necessary as a result of weatherization work" (DOE 2011).

repair, mold remediation, lead abatement, waterproofing, roof repair, and pest control each cost more than \$1,000 on average.

Homes deferred from upgrades because of these needs have been eligible to receive energy kits with measures such as power strips and LED lighting (MD DHCD 2017c). While these kits offer recipients some energy savings, program administrators could provide deferred households with additional high-efficiency appliances or equipment to capture energy savings (Cluett, Amann, and Ou 2016). Drehobl and Castro-Alvarez (2017) documented several high-efficiency appliance and equipment upgrades offered by low-income energy efficiency programs:

- Refrigerators
- Washing machines
- Dishwashers
- Freezers
- Air-conditioning units
- Dehumidifiers
- Boilers/water heaters
- Heating equipment

Households that are deferred due to health and safety issues can still achieve energy savings through measures such as these.

For instance, Massachusetts's Low-Income Energy Affordability Network administers low-income programs using a combination of the US Department of Energy's Weatherization Assistance Program (WAP) and utility customer funds. All WAP-eligible households that have appliances meeting a high energy usage threshold can have those appliances replaced. These replacements happen regardless of total household energy consumption. Appliances such as refrigerators, window air conditioners, and clothes washers are all potentially eligible for replacement (J. Wells, vice president of real estate and energy services, and J. Collins, program manager, Action for Boston Community Development, pers. comm., September 13, 2017). If LIEEP is to offer additional appliances, the Maryland PSC must facilitate greater coordination between utilities and DHCD to ensure that any additional measures are complementary and not duplicative of those offered through utility-administered energy efficiency programs.

In addition to DHCD offering a more diverse set of options, the Maryland PSC should seek to either increase spending on deferred home maintenance that affects occupant health and safety or be more flexible in its current approach. Several other low-income programs spend more than DHCD to address home health and safety or establish a program-level average spending cap per household. This permits a great deal of flexibility in addressing health and safety repairs on a case-by-case basis. For example, Massachusetts allows contractors to spend up to \$2,500 per home on these improvements as long as the average expense across the entire program portfolio remains below \$500 per home. To stay within this requirement, program staff conduct a rolling assessment to determine the available funds for health and safety repairs when each audit is conducted. This helps avoid excluding valuable repairs and upgrades or having to defer a project. Program implementers in Massachusetts then

develop project scopes that include health and safety repairs and fund these repairs leveraging utility, federal, and state funding (Wells and Collins, Action for Boston Community Development, pers. comm., September 13, 2017). Puget Sound Energy in Washington State sets aside 30% of its implementing agency’s total budget for health and safety upgrades (Cluett, Amann, and Ou 2016). Duke Energy in North Carolina recently increased spending on deferred maintenance to a maximum of \$3,000 per participating home (Duke Energy 2017).

Maryland’s limited-income programs have a lower cap on health and safety spending than Massachusetts, Washington, and North Carolina even though many of Maryland’s low-income citizens live in comparatively poorer-quality housing. DHCD’s 2017 low-income single-family working group identified Baltimore City’s poor housing quality as a leading reason for the high number of health and safety deferrals (MD DHCD 2017g). Nearly one in five families that are eligible for LIEEP lives in Baltimore City—more than in any county in the state (Census Bureau 2017). Data from the US Census Bureau’s (2015) American Housing Survey indicate that many of these eligible families will not be able to participate in the program due to deferred maintenance. As table 6 shows, the number of Baltimore homes with water leakage, the cause of some of the costliest health and safety repairs, is high, with nearly one out of every five homes having water leakage from an outside source.

Table 6. Single-family homes with water leakage in major cities of states that spend more on home health and safety than Maryland

City	% of homes with leakage from inside source	% of homes with leakage from outside source
National average	8.4%	8.2%
Baltimore City	10.2%	17.7%
Boston	7.2%	8.4%
Seattle	9.0%	8.7%

Data were not available for Charlotte. *Source:* Census Bureau 2016.

Baltimore City homes are more likely to have water leakage than major cities in other states with higher utility spending on health and safety repairs. These leaks are likely to originate from outside a home due to poor-quality roofs, basements, walls, windows, and doors (Census Bureau 2016). Many limited-income Baltimore City residents are not able to participate in LIEEP because of these deficiencies. The Maryland PSC should consider a more flexible approach to addressing health and safety deferrals. In addition, DHCD should continue to engage with other state and local agencies or organizations to coordinate and leverage program support for health, safety, and energy efficiency measures.

INCREASE COORDINATION WITH COMMUNITY GROUPS

DHCD works closely with staff from the Maryland Office of Home Energy Programs (OHEP), which provides bill assistance to limited-income households in Maryland (MEEA 2017). Applicants to OHEP’s programs are automatically considered for DHCD’s programs. Additionally, DHCD has presented at OHEP’s annual meeting and provided a one-hour

training for staff on the details of its programs. While DHCD commits to planning events with community-based organizations at least twice per month, program staff have discussed combining efforts with OHEP to reach more of these local groups. DHCD staff also hold monthly meetings with utilities to discuss ways to work more closely together. While these are all effective collaborative approaches to increasing program participation, the experiences of other low-income programs point toward additional opportunities for DHCD coordination with external organizations.

Cluett, Amann, and Ou (2016) found that low-income energy efficiency programs can gain participants through coordination with social service organizations, energy assistance programs, and community groups. These organizations often have existing relationships with eligible low-income customers, and as trusted community resources, they are in an advantageous position to disseminate information on the benefits of participating in efficiency programs. Taking advantage of these opportunities can also help reduce marketing costs for program administrators. Staff can also deliver program offerings more seamlessly if services complement those provided by weatherization programs and social service organizations.

Successful low-income programs often build on and leverage weatherization initiatives to assist low-income households. In Ohio, Dayton Power and Light reduced training costs for contractors by coordinating and sharing resources with Ohio's Home Weatherization Assistance Program (Nowak et al. 2013). Many low-income energy efficiency programs will coordinate with WAP providers to offer additional energy conservation measures not provided through WAP (Cluett, Amann, and Ou 2016). In the past, LIEEP contractors were not allowed to leverage WAP funding, but this recently changed (MD DHCD 2015b; 2017c). DHCD should combine EmPOWER and WAP funding in more projects and plan to offer complementary measures that save more energy than those provided by WAP.

Program staff can also coordinate with social service organizations to expand a program's reach. For example, in Washington, DC, the Sustainability Energy Utility (DCSEU) program distributes energy kits at church food pantries, community events, and mobile food markets (Cluett, Amann, and Ou 2016). This program has been successful not only due to DCSEU's close coordination with community-based organizations, but also because the program continually evaluates the effectiveness of its interaction with participants and adjusts its strategy accordingly.

Efficiency Vermont provides an example of how to effectively coordinate with a government social services agency. Program administrators collaborate with the Women, Infants, and Children (WIC) supplemental nutrition program and have trained WIC call center staff on how to educate their recipients on the value and availability of refrigerator upgrades (NEUAC 2015). The Efficiency Vermont and WIC partnership is particularly instructive for DHCD because WIC operates within the Maryland Department of Health, as OHEP does.

STRENGTHEN ENGAGEMENT WITH RENTAL PROPERTY OWNERS

LIEEP program administrators and contractors have encountered several challenges in engaging low-income single-family renters. Currently, renter applicants must obtain their

landlord's permission to install efficiency upgrades in their homes (MD DHCD 2017g). While many low-income renters would like to save on their energy bills, they may not know how to best persuade their landlord to pursue a retrofit. Consequently, program staff and contractors often find it difficult to coordinate with renters on an efficiency project.

LIEEP has been most successful when program staff and contractors communicate directly with property owners. This is especially true for those who own multiple homes and offer the opportunity for multiple retrofits. However program administrators and stakeholders have been uncertain about how to improve outreach to landlords (MD DHCD 2017g).

PECO's Low-Income Usage Reduction Program (LIURP) in Pennsylvania offers lessons that speak to this concern (Bullock 2017). PECO staff have been able to build strong relationships with single-family landlords through engagement with tenant advocacy groups, program presentations at local landlord association meetings, and free informational lunches for property owners. Staff prioritize responding to all landlord concerns and provide continued support to property owners throughout the program's application and audit process. During an audit, contractors will install efficiency measures at no cost (PECO 2013). DHCD should consider implementing a similar approach to increase outreach and engagement with property owners.

Multifamily Energy Efficiency and Housing Affordability (MEEHA) Program

DHCD's MEEHA program incentivizes owners of affordable multifamily buildings to incorporate energy efficiency upgrades as part of a retrofit or renovation (MD DHCD 2017f).¹¹ The program serves buildings with five or more units that keep affordable rent restrictions in place for the five years following a project's completion. To receive financial assistance, buildings must undergo an energy audit conducted by a DHCD-qualified energy auditor. These on-site assessments will identify all feasible energy efficiency upgrades that are potentially eligible for MEEHA incentives. Final review and approval of funding is performed by DHCD. MEEHA funds are primarily used for electric efficiency upgrades, but BGE residential customers are also eligible for natural gas measures.

The program exhibits several of the best practices identified in ACEEE's report *Apartment Hunters: Programs Searching for Energy Savings in Multifamily Buildings* (Johnson 2013). These MEEHA practices include:

- *Target low-income multifamily households*, which are among the most likely customers to be underserved by energy efficiency programs.
- *Incentivize whole-building upgrades* to ensure that both individual units and common spaces are retrofitted.
- *Target buildings during a time of refinancing* so owners can use capital financing to cover the cost of a retrofit or renovation.

¹¹ Renovations are projects that seek to improve the condition of older buildings; a retrofit involves adding measures that were not originally installed.

- *Align utility and housing programs* to better target affordable multifamily buildings during a period of refinance or redevelopment.

Despite these practices, MEEHA does still face several challenges, as evidenced by declining overall energy savings and energy savings per program participant, as shown in table 7.

Table 7. Annual MEEHA program savings and participants

Year	Total savings (kWh)	Total participants	Savings (kWh) per participant
2014	3,133,000	1,923	1,629
2015	2,592,000	2,273	1,140
2016	1,044,000	1,013	1,031
2017 (Q1/Q2)	377,000	411	917
Current program cycle annual average (2015–17)	1,605,200	1,479	1,085

Sources: DHCD 2015a, 2016a, 2016b, 2017a, 2017b.

The program has seen a decline in energy savings since the end of the previous program cycle. Program participation has also been low. Low-income multifamily programs included in ACEEE’s *Low-Income Energy Efficiency Programs Baseline Assessment* reached an average of 2,598 households in 2015.¹² MEEHA has not been able to achieve this level of participation in recent years.

In working groups convened by DHCD in 2017, program stakeholders identified several concerns that should be addressed to improve program performance (MD DHCD 2017h). With these in mind, we have identified the following opportunities to improve program performance:

- Extend incentives to master-metered buildings
- Help applicants design and plan financially feasible projects
- Provide new training for contractors

In the following sections, we explore each of these in more detail and provide examples of how other programs have pursued similar strategies. Recommendations are provided for the Maryland PSC, DHCD, and utility companies.

EXTEND INCENTIVES TO MASTER-METERED BUILDINGS

MEEHA funds are currently prohibited from incentivizing upgrades to master-metered multifamily buildings (DHCD 2017h). Owners of master-metered buildings pay for the full cost of a building’s energy use and either include this cost in tenants’ rents or receive a

¹² This average is calculated using data from four programs included in the baseline assessment because these were the only programs solely focused on providing upgrades for multifamily buildings.

government subsidy to cover the cost. As of 2016, approximately 14% of Maryland housing units had utility costs included in their rent (Census Bureau 2017).¹³ While these households account for only a small share of Maryland's housing market, they offer promising opportunities for energy savings. Owners of these properties are responsible for all energy costs and, because of this, may be more motivated to complete a comprehensive retrofit (Samarripas, York, and Ross 2017).

Since 2014, DHCD has been operating a pilot program funded by Maryland's Customer Investment Fund (CIF) that targets master-metered properties. The One Stop Shop pilot provides owners of master-metered properties with project management support, full energy audits, quality control inspections, training, and deep energy retrofits. Results have been encouraging. The program is currently projected to save participating low-income multifamily households an average of 1,759 kWh per participant (MD DHCD 2017d). This is a 62% increase over the average 1,085 kWh saved in the current MEEHA program cycle. To increase energy savings, the Maryland PSC should allow DHCD to deliver upgrades to master-metered multifamily buildings.

HELP APPLICANTS DESIGN AND PLAN FINANCIALLY FEASIBLE PROJECTS

The CIF pilot program owes part of its success to the assistance it provides for the preliminary design and planning of a multifamily energy retrofit or rehabilitation project. Currently, DHCD offers MEEHA applicants a pre-audit visual site inspection and a written report estimating whether a building's potential energy savings would likely justify an energy audit (MD DHCD 2017f). Building on the success of the CIF pilot's approach, program staff could provide additional support for applicants to benchmark building energy use, help plan upgrades across an owner's larger property portfolio, and suggest financing opportunities.

These steps could address several challenges currently faced by applicants. Numerous multifamily owners have applied for MEEHA assistance, but 21% of these do not complete projects (S. Falvey, senior program manager, Maryland Department of Housing and Community Development, pers. comm., September 12, 2017). Financing challenges are common for these applicants. Many undergo an energy audit only to encounter difficulties securing up-front funding or permission from investors and lenders to proceed. This can lead to months or even years of delays.

Provide Energy Benchmarking Support

When used as a preliminary application step, energy benchmarking has proven to reduce the cost of administering multifamily efficiency programs. Energy benchmarking compares a building's whole-building energy use with similar buildings in similar climates. This can help multifamily building owners and managers gauge the efficiency of their buildings, and it aids efficiency program managers in targeting the most-inefficient buildings. The Low-Income Energy Affordability Network (LEAN) in Massachusetts collaborated with a benchmarking software and support company to benchmark three-quarters of the state's

¹³ This percentage includes both single-family and multifamily units. Separate data for each are not available at the state level.

affordable multifamily housing stock. Utility energy efficiency programs saved \$2.2 million by using these benchmarking data to initially qualify multifamily applicants for incentives rather than requiring all applicants to undergo more expensive energy audits (Krukowski 2014).

The MEEHA program has asked applicants to pay for the up-front cost of an energy audit.¹⁴ Providing benchmarking as a no-cost first step for applicants could encourage more of them to consider retrofits (MD DHCD 2017h). It would show owners of the most-inefficient buildings the value of investing in an energy efficiency project and participating in MEEHA. Both BGE and PEPSCO provide aggregate whole-building energy use data to owners of multifamily buildings for benchmarking, but other Maryland utilities do not (BGE 2015; PEPSCO 2017). Maryland's other utilities should provide these data to encourage multifamily owners to take stock of their buildings' efficiency. If they do so, DHCD is in an advantageous position to help building owners make full use of these data in planning energy retrofits or renovations.

In the absence of utility-provided whole-building aggregate energy use data, DHCD has other opportunities to assist owners with benchmarking. Master-metered buildings can easily be benchmarked because owners are already responsible for whole-building energy costs and have ready access to their properties' energy data. Owners of buildings with individually metered units can use the US Department of Housing and Urban Development's *Tenant-Paid Utility Data Sampling Calculator* to estimate the energy use of a building on the basis of data from only a few tenants (HUD 2017). Affordable housing providers who receive support from the HUD Office of Multifamily Housing's assisted housing programs are already required to collect some tenant utility data and could use this process to collect information for benchmarking. Program staff could use data from several tenants and the owner-controlled common spaces of a single property to estimate whole-building energy use.

Identify Savings across Building Portfolios

Program administrators could also consult with multifamily applicants about upgrading multiple buildings that they own. Currently, most MEEHA applicants enter the program because they are seeking other DHCD-administered grants, loans, or tax credits (MD DHCD 2017h). Most owners are not seeking to reduce energy costs when they apply for MEEHA incentives. They are more likely motivated by an immediate need to replace aging equipment, extend the useful life of the building, or increase a property's asset value (Elevate Energy 2014). This narrow focus can result in owners not considering future efficiency upgrades for other buildings in their portfolio, some of which may offer even greater energy-saving opportunities (McArthur and Jofeh 2016). Program staff can work with owners to identify these prospects early in the application process.

Multifamily program administrators working for Arizona Public Service (APS) provide an example of how this approach can be effective (Ross, Jarrett, and York 2016). APS has been

¹⁴ DHCD's 2018–2020 program plan proposes providing some up-front incentives to cover the costs of energy audits (MD DHCD 2017c).

able to upgrade many multifamily buildings by focusing their attention on owners with large portfolios, while still encouraging owners of fewer or smaller buildings to apply. This has simplified communication with potential participants. Program staff can afford to devote more of their attention to fewer decision makers because these applicants offer greater potential for upgrades. Due in part to this approach, APS was recently able to report its highest annual participation rate to date.

Highlight Bridge Financing Opportunities

Many lenders will not recognize energy efficiency incentives as a source of funds if they are awarded after the start or completion of a project because the incentives are contingent on fulfilling the entire scope of work (Mann, Chi-Johnston, and Mugica 2016). This means that many multifamily projects must find another source of funding to cover the up-front cost of energy upgrades.

Mann, Chi-Johnston, and Mugica (2016) argue that program administrators should assist owners in identifying and securing short-term bridge financing or provide some portion of incentive funding up front. The researchers found that this support was critical to the planning of upgrades for several multifamily buildings in New York City that held the potential to achieve greater than 20% energy savings. In these cases, several lenders were uncomfortable offering conventional loans for efficiency and other energy-saving improvements.

Typically, there are two major barriers imposed by lenders that can prevent property owners from securing a loan for a project: underwriting practices that do not value energy savings, and restrictions on owners' taking on additional debt (SEE Action 2017). Traditional underwriting methods often exclude projected energy cost savings, and this, coupled with the fact that many affordable property owners have limited cash at hand, can make obtaining financing difficult. Additionally, many mortgage holders have financing agreements in place that restrict property owners from taking on additional debt, especially when the building will be treated as collateral under a new financing agreement. This is especially challenging when a new loan arraignment would subordinate existing mortgage holders.

Given DHCD's role and experience in financing the provision and preservation of affordable multifamily housing, it is well positioned to provide useful guidance to building owners on options for bridge financing and processes for securing consent, particularly when multiple mortgage holders are involved. For instance, DHCD might identify lenders that value efficiency under alternative underwriting methods and those that offer junior-lien or unsecured loan products to help property owners avoid restrictions on new debt that are part of preexisting financing arrangements. Obtaining financing for multifamily energy efficiency can be a long and messy process, and DHCD can help owners navigate these waters and get to project completion.¹⁵

¹⁵ DHCD's 2018-2020 program plan proposes providing more up-front incentives for projects (MD DHCD 2017c).

PROVIDE NEW TRAINING FOR CONTRACTORS

Multifamily property owners are responsible for selecting contractors to work on MEEHA-funded projects. Unlike LIEEP contractors, most multifamily contractors have little or no communication with DHCD staff (MD DHCD 2017h). Program staff have an opportunity to increase engagement with contractors and provide additional training and support for these workers that can improve their overall work performance.

There are several energy efficiency programs that have a long history of providing training and support for contractors, including programs run by utilities in Maryland (DHCD 2017h). Ross, Jarrett, and York (2016) found that the amount of program support offered to multifamily contractors varies greatly. Some utilities have offered sporadic workshops to educate contractors on available multifamily incentives and to reiterate the importance of consistency in project implementation. Other utilities offer contractors ongoing support and training using multiple forms of communication beyond workshops.

Energy Trust of Oregon (ETO) provides a robust support program for contractors. ETO staff recruit contractors for their trade ally network through promotions at trade shows and through word of mouth (Ross, Jarrett, and York 2016). Network members then have access to an ongoing series of trainings offered at different locations throughout the state. These members also receive a periodic newsletter and meet at regularly occurring member-led forums to discuss challenges and opportunities encountered in their work. All resources are promoted and coordinated through a central web portal for members (ETO 2017).

Contractors are more likely to attend trainings if they perceive a benefit in doing so. Several efficiency programs have taken the initiative to promote the increased skill set and knowledge these workers acquire (Ross, Jarrett, and York 2016). DHCD could assist MEEHA applicants in soliciting contractor bids and provide them with a list of contractors holding advanced certifications. Multiple examples exist of other program administrators pursuing this approach. NYSERDA promotes its highly trained contractors through an online search tool that allows building owners to identify potential contractors for a retrofit or renovation project.¹⁶ Puget Sound Energy allows contractors in its Contractor Alliance Network to co-brand their services with the utility. Promoting highly trained contractors increases multifamily owners' confidence that an energy efficiency retrofit will be successful. This in turn increases the likelihood that those owners will participate and refer other owners from their community.

Integrate Natural Gas Incentives

While LIEEP and MEEHA each face unique challenges, several opportunities exist to improve the performance of both programs. For example, there are opportunities to integrate natural gas incentives in more projects to achieve greater savings. Natural gas incentives are available to LIEEP and MEEHA participants only in BGE's service territory, despite many Maryland households' reliance on gas heating. Therefore DHCD is limited in its ability to integrate gas incentives and savings throughout its program operations. For instance, gas savings are not included in project screening criteria, and therefore some

¹⁶ See www.nyserda.ny.gov/Contractors/Find-a-Contractor/Multifamily-Building-Solutions-Network.

residents may be underestimating their return on efficiency investments (VEIC 2017). This may ultimately lead them to choose not to move forward with a project that would generate comprehensive energy savings. Washington Gas and other gas utilities, with support from the Maryland PSC, should reconsider directing resources to DHCD to fund natural gas incentives for their customers. This would allow DHCD to achieve higher overall energy savings by providing comprehensive energy saving improvements to more low-income households.

In addition, while BGE’s multifamily residential customers are eligible to receive MEEHA incentives for natural gas efficiency measures, multifamily commercial customers are not (MD DHCD 2017c). This allows the installation of natural gas upgrades in apartment units, which are occupied by residential customers, but not the upgrading of building equipment linked to the property owner’s commercial account, such as boilers that heat water for the entire building. These owners may be eligible for incentives from a separate BGE commercial energy efficiency program, but pursuing these requires a separate application.

Multifamily owners are less likely to participate in energy efficiency programs when they must submit more than one application for upgrades on the equipment they most want to replace (Ross, Jarrett, and York 2016). Owners often seek out incentives to upgrade building equipment because it can be very expensive to repair or replace (Ludwig 2015). The Maryland PSC should allow DHCD to offer commercial natural gas incentives to BGE customers.

Use Additional Metrics to Inform Program Evaluation and Goals

Energy efficiency program administrators use various metrics to monitor performance. These measures track outcomes and progress toward goals. As DHCD’s programs evolve in the coming years, the PSC should direct administrators to use additional metrics to track performance relative to added or modified goals.

Table 9 details the quantitative metrics ACEEE has used in assessing the performance of low-income and multifamily programs across the country (including the metrics used in this report). We chose these metrics based on feedback from many low-income and multifamily energy efficiency program stakeholders.

Table 9. ACEEE metrics used to assess low-income and multifamily programs

Performance metric	Use in tracking performance
Annual energy savings	While savings must be considered in combination with the cost effectiveness of programs, this metric can indicate the overall comprehensiveness or reach of an efficiency program
Program participants as individual housing units	When including multifamily units in a low-income program, programs should count participants in terms of individual households or housing units rather than buildings or properties. Most multifamily households pay for their own energy costs. This metric allows evaluators to assess more accurately the number of low-income customers being served.

Performance metric	Use in tracking performance
Annual program spending	This metric assesses whether a program has been on track to meet its annual planned budget. Breakdowns in spending by category (e.g., marketing, administration, incentives) can assess the share of a program's spending going toward non-incentive costs and potentially identify opportunities to reduce overhead expenses.
Annual program spending as a percentage of total energy efficiency or residential efficiency spending	These metrics are often used to evaluate whether specific customer segments are receiving the benefits of energy efficiency in proportion to the charges they pay toward these programs.
Savings per participant and spending per participant	Spending per participant provides a sense of a program's overall cost relative to other programs. Savings per participant indicates the depth of savings a program achieves. When considered together, these metrics provide a rough estimate of a program's cost effectiveness.
Annual and/or cumulative participation as a share of eligible customers	These metrics are used to track how much of a specific customer segment a program has reached (e.g., the low-income population).*
Share of total energy savings from low-income programs	When compared with the share of customers who are low income, these metrics can provide a sense of how much of a market is being reached.
Annual lifetime savings	This metric takes into consideration the expected useful life (EUL) of all installed efficiency measures and provides an estimate of the long-term energy savings that will be achieved from a year's worth of program activity. Lifetime savings can also help in comparing the effectiveness of various programs since measures with high savings but a short EUL will often produce lower lifetime savings.
Cost per unit of annual lifetime savings	This provides a clear picture of the cost to deliver energy savings and is useful in projecting a program's future budget based on expected savings.
Occupant comfort	Program administrators can quantify occupant comfort on the basis of participant feedback to begin incorporating nonenergy benefits in project screening and evaluation.
Frequency, measures, cost, energy savings, and nonenergy benefits of homes receiving health and safety repairs	These metrics allow low-income program administrators to accurately project the number of homes that can be upgraded, given available funds. Used together, these metrics can also allow administrators and regulators to assess the full benefits generated from upgrading these homes.

* Most utility sector energy efficiency programs do not have a clear sense of the number of customers who are eligible for a program and must use estimates. *Sources* for metrics used in this report: Cluett and Amann 2015; Ross, Jarrett, and York 2016; Drehobl and Castro-Alvarez 2017; and Samarripas, York, and Ross 2017.

Program administrators who track the above metrics have a more comprehensive and accurate understanding of a program's performance over time, but this should not be considered an exhaustive or prescriptive list of metrics. For example, Energize Connecticut (2017) and Mass Save (2017) track several other metrics in addition to those used by ACEEE, including the estimated monetary value of all benefits and the ratio of benefits accrued per efficiency dollar spent. Seema Iyer (2015) of the Baltimore Neighborhood Indicators Alliance has shown that it is important to track not only low-income homes that receive retrofits, but also those that do not due to deferred home maintenance. Tracking the number and location of these deferrals can help identify underserved populations. This metric could be especially helpful in LIEEP's future development as many deferred homes are in Baltimore City.

Ultimately, program administrators must carefully select metrics that track the most critical indicators of program performance relative to program goals.

It is also important that the public be able to easily track performance metrics used by program administrators. Energize Connecticut (2017) and Mass Save (2017) have online statewide data dashboards that allow the public to track a program's progress using several of the metrics listed above. An online data dashboard could also allow DHCD administrators, regulatory staff, and other stakeholders to better track program performance. Online dashboards allow users to view complex program data in a more interactive and accessible format. These dashboards also allow users to customize the data displayed by time period, utility customer base, fuel type, geography, or specific measures. Access to these data ultimately permits program stakeholders to contribute well-informed feedback and suggestions that can improve program effectiveness.¹⁷

EVALUATION, MEASUREMENT, AND VERIFICATION

Along with tracking new metrics, the Maryland PSC should require DHCD programs to undergo regular EM&V. This will allow program administrators to demonstrate the value of their programs by providing accurate, transparent, and consistent assessments of their methods and performance (SEE Action 2012). Using both quantitative and qualitative methods, evaluators analyze the factors underlying changes in energy savings over time. They isolate the effects of individual measures and program operations on energy savings and more closely compare the benefits and costs of programs. Evaluations also look at the design and implementation of programs to put forth recommendations for improving program performance. The Maryland PSC should require timely process and impact evaluations to demonstrate and document that LIEEP and MEEHA accomplish their goals. Routine and comprehensive EM&V of these programs will enable DHCD to accurately document energy efficiency program savings and alter program design and measures accordingly.

SETTING PERFORMANCE GOALS

With third-party evaluations and tracking of new metrics, program administrators will be able to increase their confidence in forecasting future program performance along multiple dimensions. Program performance metrics not only help program administrators track their progress relative to goals, but can also be used to help inform the development of such goals. As low-income energy efficiency programs have proliferated across the country, state regulators are working to establish targets and goals that will help guide the design, implementation, and performance of these programs. Recently Pennsylvania became the first state in the country to establish a binding low-income savings target for utility energy efficiency programs. Each utility in the state is required to achieve at least 5.5% of total portfolio savings from low-income programs (Pennsylvania Public Utility Commission 2015). Annual spending requirements for low-income customer-funded energy efficiency programs are more common, as 16 states have adopted some form of these (ACEEE 2017a). Tracking new performance metrics can ultimately enable the Maryland PSC to establish realistic goals and targets for the future. We recommend that the PSC not only direct DHCD

¹⁷ Appendix A shows the layouts of the dashboards used by Mass Save and Energize Connecticut.

staff to track new metrics and undergo regular EM&V, but that they use data from these processes to create specific goals for DHCD programs.

Expand LIEEP and MEEHA Project Eligibility

The Maryland PSC has ordered that cost-effectiveness testing include values for certain nonenergy benefits that can be confidently quantified (Russell et al. 2015). Considering that the PSC supports the evaluation of energy efficiency’s multiple benefits, DHCD should consider incorporating these in the process of reviewing and permitting projects. DHCD’s programs currently operate under a self-imposed constraint that all incentivized energy efficiency projects must have a savings-to-investment ratio (SIR) of at least 1.1 (MD DHCD 2014a). The SIR is calculated by dividing the amount of energy saved over the useful life of all efficiency measures in a project by that project’s total cost. An SIR can also be calculated for individual measures.

Program staff may be able to justify approving more applicants with a low SIR or offer higher levels of incentives if they can document the potential nonenergy benefits of all projects. Given that the current application of SIR does not include nonenergy benefits, DHCD should consider loosening the SIR requirement or using a broader test that includes multiple benefits such as reduction in arrearages and greater household comfort. If the multiple benefits of LIEEP and MEEHA are routinely tracked, DHCD could consider using potential nonenergy benefits to qualify applicants in addition to their project’s potential energy savings.

Only limited research has been conducted to quantify the effect of nonenergy benefits. Table 10 provides a list of the nonenergy benefits that were quantified as part of a study commissioned by energy efficiency program administrators working in Massachusetts.

Table 10. Multiple benefits generated by energy efficiency programs

Benefits to utility	Benefits to participating occupants	Benefits to participating landlords of low-income renters	Benefits to society
Reduced arrearages	Higher comfort levels	Enhanced marketability of units and ease of finding renters	Improved national security
Fewer bad debt write-offs	Quieter interior environment	Reduced tenant turnover	Avoided landfill space
Fewer terminations and reconnections	Better lighting quality and longer bulb lifetime	Increased property value	Reduced greenhouse gas emissions
Discounted rates	Increased property value	Reduced equipment maintenance	
Reduced customer calls	Reduced water usage and sewer costs	Greater durability of property	
Fewer collection notices	More durable home and less maintenance	Fewer tenant complaints	

Benefits to utility	Benefits to participating occupants	Benefits to participating landlords of low-income renters	Benefits to society
Fewer safety-related emergency calls	Ability to meet equipment and appliance maintenance requirements		
Insurance savings	Health related nonenergy impacts		
	Improved safety		

Source: NMR Group and Tetra Tech 2011

Maryland’s low-income efficiency programs should routinely track metrics that report the full range of multiple benefits generated for utilities, participants, and society. Not doing so can lead to program undervaluation because assessments will be focused on energy savings (Cluett, Amann, and Ou 2016). Regular EM&V by a third party can reinforce the validity of multiple benefits for regulators and stakeholders (SEE Action 2012).

Recommendations and Conclusions

DHCD’s limited-income energy efficiency programs exhibit several best practices highlighted by ACEEE in past research. However program staff have encountered several challenges in working to reach those most in need of energy-efficient homes.

LIEEP has been largely successful in maximizing energy savings for each retrofitted single-family home, but participation has been inconsistent. Factors that suppress participation include the high number of homes deferred because they require costly health and safety repairs, a need for greater collaboration with other organizations and agencies, and barriers in working with renters to secure landlord authorization for upgrades. Our assessment leads us to recommend the following actions to address these challenges:

- Expand efforts to serve households with home health and safety deferrals
- Increase coordination with community groups
- Strengthen engagement with rental property owners

DHCD’s MEEHA program has experienced both low overall participation and declining energy savings per participant. Many multifamily property owners have applied for incentives, but fewer have completed projects. Addressing the program’s performance issues begins with remedying any problems experienced by current applicants, improving the quality of service provided, and amending eligibility requirements for program participants. More specifically, we recommend the following on the basis of our research:

- Extend incentives to master-metered buildings
- Help applicants design and plan financially feasible projects
- Provide new training for contractors

Several opportunities also exist to improve both LIEEP and MEEHA. The Maryland PSC can pursue integrating more natural gas incentives in DHCD's programs to increase participation and savings. DHCD can also consider adopting new program performance metrics and use these new data to improve performance and expand their programs' eligibility criteria. Since DHCD began administering limited-income programs in 2011, performance has varied from year to year. Program potential has remained unclear, and it has been challenging to establish long-term goals or metrics to track progress toward them. As DHCD's programs evolve, it is critical that the Maryland PSC direct administrators to track new performance metrics, undergo routine EM&V, and use data from these to inform future program goals.

LIEEP and MEEHA are among a very small number of programs across the nation that tie incentives for comprehensive energy efficiency upgrades with requirements for keeping rents affordable for those with low incomes. Improving the energy efficiency of low-income homes can reduce families' energy cost burdens, but it can be just as important to preserve affordable rents for these households. Without affordable rent requirements, energy efficiency upgrades can result in increased rents and offset the benefit of lower energy bills (Im et al. 2017). Maryland needs programs like LIEEP and MEEHA because they address these dual challenges faced by many limited-income households across the state. However it is important to expand the reach of these programs as many potential participants have still not been served. Our recommendations provide a first step toward DHCD's low-income programs' achieving their full potential.

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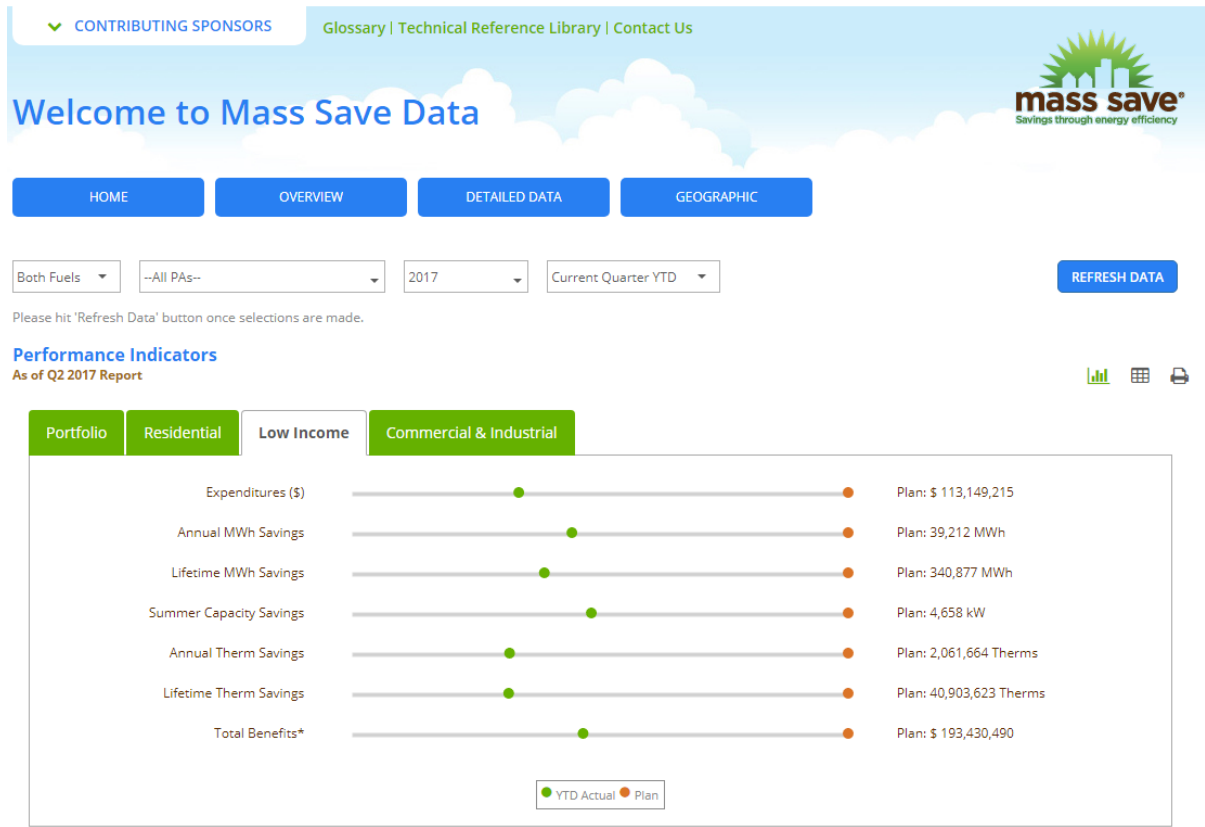
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Appendix A. Examples of Online Data Dashboards



*Prior to 2016, benefits were only reported in Q2 and Q4. Benefits in the other quarters are shown as zero.

Figure A1. Mass Save's online data dashboard



Figure A2. Energize Connecticut's online data dashboard