Assessing the Potential for Energy Efficiency in Low-Income Households under the Clean Power Plan

Lauren Ross and Sara Hayes, American Council for an Energy-Efficient Economy (ACEEE)

ABSTRACT

In an effort to ensure that the benefits of the Clean Power Plan (CPP) are shared broadly across society, the Environmental Protection Agency (EPA) has incentivized the expansion of demand-side energy efficiency programs in low-income communities. States can receive early credit for energy efficiency investments for low-income households through a pool of allowances set aside for the Clean Energy Incentive Program (CEIP). In this way the program can facilitate the reduction of energy expenditures in vulnerable and overburdened communities while helping states reduce their carbon emissions. In this paper we examine a data set representative of savings, costs, and participation rates associated with low-income programs across the nation, in order to determine whether these programs could attain the savings needed to earn a significant share of the CEIP pool of allowances. While we base our findings on a broad set of data and high-level estimates, we conclude that it would be nearly impossible for low-income energy efficiency programs in their current form to generate enough savings between 2018 and 2022 to reduce emissions by 150 million tons (half of the proposed CEIP pool of 300 million allowances). We also conclude that the proposed ratio of two allowances for each ton of carbon dioxide (CO_2) reduced by energy efficiency in low-income households is not enough to drive significant new activity in this sector. We provide several recommendations for how the CEIP could be modified to align incentives so that low-income energy efficiency programs can be ramped up quickly and used by states for CPP compliance.

Introduction

The Clean Power Plan (CPP) is a new federal regulation developed by the Environmental Protection Agency (EPA) to limit carbon dioxide (CO_2) emissions from existing power plants (EPA 2015a). The CPP sets emission limits on coal and natural gas plants, and states are responsible for developing a compliance plan that will ensure that the limits are met. Included in the rulemaking is a program to reward early investments in demand-side energy efficiency and renewable energy, the Clean Energy Incentive Program (CEIP). The CEIP would make available a kind of credit in the form of an allowance or emissions reduction credit for reductions that occur during the two years preceding the CPP compliance period. Credit could be earned in 2020 and 2021 from a pool of 300 million allowances held by EPA. EPA's pool of allowances would be used to match allowances awarded from states.[1] Allowances could be earned for emissions avoided through early investments in renewable energy and energy efficiency programs for low-

[1] Throughout the majority of this document we refer to tons of CO_2 or allowances in order to simplify the discussion. The CPP allows states to comply using an approach based on mass (in tons of allowances) or rate (emission rate credits, or ERCs). States can earn both allowances and ERCs under the CEIP, and both are awarded for energy efficiency for low-income households at a ratio of 2:1.

income households and communities. Energy savings from qualifying programs and projects would be awarded credit on a 2:1 basis: two allowances for each ton of CO_2 avoided.[2]

EPA is currently developing additional guidance on the CEIP. It has sought comments on its proposed approach, and additional details on the proposal are currently under development. While the CEIP is an exciting opportunity, it is unclear whether the pool set aside in the CPP aligns with what is possible. More to the point, if 300 million tons of CO_2 allowances are available for renewable energy and low-income energy efficiency over a two-year period, how many of those allowances could low-income energy efficiency programs actually earn? In this paper we examine a data set representative of savings, costs, and participation rates associated with low-income programs across the nation, in order to determine whether these programs could attain the savings needed to earn a significant share of the CEIP pool of allowances. We conclude by extrapolating some recommendations on what would be needed to achieve half (i.e., 150 million tons of CO_2 allowances) or more of the available CEIP pool. We include recommendations that would help ensure that the CEIP is administered to maximize energy efficiency investments in low-income households.

Background

For decades energy efficiency programs and bill assistance programs have been administered to reduce immediate energy burdens for low-income households and to improve the long-term efficiency of their homes. Figure 1 displays the landscape of funding for these programs in 2013. For the purpose of this paper we focus on ratepayer-funded utility low-income energy efficiency programs and the US Department of Energy (DOE)'s Weatherization Assistance Program (WAP), which is delivered by local organizations.[3] Both of these programs aim to achieve energy savings in this sector. Together they account for 86% of current investment in energy efficiency for low-income households.

[2] For a low-income energy efficiency project that avoids two tons of CO_2, EPA would award two allowances from its pool, and the state where the project was located would also award two allowances. For a renewable-energy project saving two tons of pollution, EPA would award one allowance and the state would award one allowance.

[3] Bill assistance programs provide financial assistance to help families pay their immediate home energy bills. The federally funded Low Income Home Energy Assistance Program (LIHEAP) is the primary vehicle for bill assistance and provides funding to states based on a formula. States then allocate this funding to qualified households.

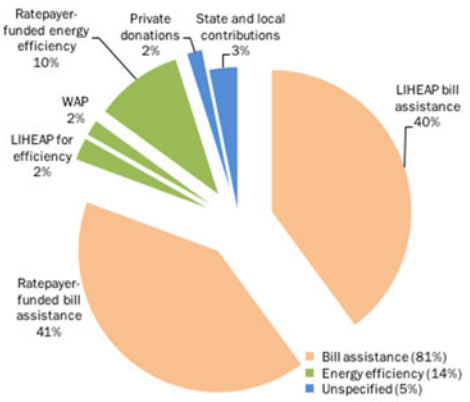

Figure 1. Support for low-income energy needs. Data on ratepayer-funded bill assistance, ratepayer-funded energy efficiency, WAP assistance, and LIHEAP assistance are from 2013. LIHEAP spending on efficiency is approximated based on 6% of LIHEAP funds spent on efficiency in 2006. Data on state and local contributions and private donations are from 2010. *Source*: LIHEAP Clearinghouse 2015.

As figure 1 illustrates, the majority of investment in energy efficiency targeting low-income households comes from ratepayer-funded programs. Typically utilities fund these programs through ratepayer charges and deliver energy savings as a resource to the entire utility system. Programs often focus on single-family households, with some programs also serving multifamily-building residents (Cluett, Amann, and Ou 2016; Hoffman et al. 2015). These programs can mirror other residential energy efficiency programs offered by utilities, but low-income programs often focus on specific measures and provide higher incentives.

The most common energy efficiency programs targeting low-income households belong to one of two types: comprehensive weatherization and the direct installation of low-cost energy efficiency measures (e.g., lighting, high-efficiency showerheads and faucet aerators, air infiltration reductions, and so on). Other, less common programs include conservation kits, product rebates, appliance recycling, and behavioral change or feedback programs (Cluett, Amann, and Ou 2016).[4] Some utility energy efficiency programs operate in tandem with local or statewide weatherization efforts, using similar channels to reach customers.

While energy efficiency programs have targeted low-income customers for decades, states increasingly look to them as a means of achieving emissions reduction goals. Each megawatt-hour (MWh) saved through these programs reduces corresponding amounts of nitrogen oxides, sulfur dioxide, and CO_2 from power-sector emissions; however the scale of the opportunity for emissions reductions at electric power plants from these programs is not well understood. This paper uses some estimations of scale to contextualize the opportunity for energy efficiency for low-income households to reduce CO_2 emissions within the framework of the CEIP.

[4] For more information on best practices for low-income utility programs see Cluett, Amann, and Ou (2016).

Data and Methodology

We collected cost, energy-savings, and participation data from a sample of utility-delivered energy efficiency programs serving low-income customers. These data represent 22 utilities in 11 states and were collected from formal utility filings submitted to state utility commissions. We used these data to identify typical energy savings and costs associated with programs targeting low-income customers. We also used these data to identify the percentage of utility customers who are participating in the low-income programs offered by their utilities. There are several significant limitations of this approach, notably:

- Utilities define *low-income* differently. They typically consider factors such as cost of living when identifying which customers can qualify for these programs. We took utility reports on participation at face value, meaning we did not attempt to modify the program participation numbers to normalize for a uniform definition of low-income.[5]
- Utilities can offer a range of different measures within a program. Some utilities may offer full house retrofits including insulation and air sealing, while others may limit their programs to direct installation of specific products such as low-flow showerheads and efficient lightbulbs. These differences can have a huge impact on the amount of electricity savings achieved by a program. Our results are indicative of the range of savings achieved by programs currently offered to low-income customers. They do not represent a range of what is possible.
- Our data sample is disproportionately representative of the southeast United States. A larger sample would better incorporate variations in climate, housing stock, socioeconomics, and other factors associated with diverse geographic regions. Table 1 presents summary statistics organized by geographic region.

We used the utility program data to extrapolate a rough estimate of how much electricity savings and emissions reductions are being achieved from utility-delivered programs targeting low-income customers. We supplemented the utility program data with research from the Consortium for Energy Efficiency (CEE) and the DOE on the federal WAP to further estimate the potential carbon emission reductions if these programs were expanded to serve more low-income households during the CEIP period.

Table 1. Breakdown of utilities included in sample

States	Utilities included	Residential customers (millions)
Northeast	3	2.17
Southeast	14	10.65
Midwest	2	1.16
Northwest	1	0.37
Southwest	2	1.41

[5] EPA's proposal for CEIP does not define low-income. ACEEE made several recommendations for how this term could be defined in its comments to EPA on the CEIP, available here: aceee.org/sites/default/files/comments-epa-012116.pdf.

Current Electricity Savings and Emissions Reductions

In order to estimate current electricity savings and emissions reductions from utility programs targeting low-income customers, we examined program participation and electricity savings per participant for a single year, 2014. Table 2 below lists the lowest points, highest points, and midpoints of savings and participation from the range of utility programs in our data set. Utilities report participation as a total number of participating households. To determine participation rates we divided the number of customers participating in the utility's low-income program by the total number of customers served by the utility. We have reported the participation rate. Electricity savings represent the highest, lowest, and midpoint electricity savings achieved in a year from the range of programs in our sample. Utilities report total electricity savings for a program in a single year. We divided that number by the total number of participants in the utility's program to calculate an average savings per household for each program. We rely on these data from existing programs to estimate the potential reach and electricity savings of future programs serving low-income households. Our high-point electricity savings of 2.25 MWh is the highest average savings per household achieved out of all of the programs in our data set.[6] The low point of 0.34 MWh is the lowest average household savings reported by any program in our data set. Table 2 includes these ranges.

Table 2. Participation rates and electricity savings across utility programs included in sample

	Range of annual program participation rates[7]	Range of savings per household (MWh)[8]
Low	0.03%	0.34
Midpoint	0.21%	0.70
High	1.86%	2.25

As table 2 illustrates, none of the utilities in our data set have reached 2% participation for their residential customers with their low-income programs. The midpoint of these programs is less than 0.25% of customers. Table 3 shows the percentage of residential customers that qualify for these programs, using two different definitions of low-income: the federal poverty level and 200% of the federal poverty level. These households represent 15–34% of the US population.[9]

Table 3. Total US households and number of households qualifying as low-income

[6] This level of savings was achieved by National Grid Massachusetts in program year 2014. Note that this state has a cold climate, and higher savings are likely due to reduced space-heating load.

[7] Based on data from 17 utilities. While these approximate participation rates indicate very low penetration into low-income markets, we think they are reasonable estimates. A recent ACEEE survey of whole-home retrofit programs found that it is possible to achieve annual participation rates of 1–3% of all residential customers, but few utilities reached an annual participation rate of more than 1.5% (York et al. 2015).

[8] Based on data from 19 utilities.

[9] ACEEE explains and discusses these definitions in its comments to EPA on CEIP, available here: aceee.org/sites/default/files/comments-epa-012116.pdf.

	Number of households
Total US households (including single-family and multifamily, excluding manufactured)[10]	108,935,000
Households below the federal poverty level	16,755,000 (15%)
Households below 200% of the federal poverty level	37,238,000 (34%)

Source: AHS 2013

While our data set is small and there are a number of variables we were unable to account for, the data indicate a substantial lack of penetration by existing utility programs relative to the potential low-income market. We estimate that the potential market could be 15–34% of residential customers, while less than 2% of customers are currently participating. In the next portion of this paper, "Discussion," we combine this finding with data from federal programs targeting the low-income sector to draw some preliminary conclusions about how participation could be increased in the time frame of the CEIP.

We used the estimates from our data set of current participation in utility-delivered programs targeting low-income households to derive an estimate of current electricity savings from these programs nationwide. The range of electricity savings per household from our set spanned a program average of 0.34–2.25 MWh per household per year. We multiplied the high and low electricity savings from our range by the number of households that would be affected if participation rates in our data set were applied nationwide. Table 4 below reports our estimate of total nationwide electricity savings from current utility-delivered low-income programs.

Table 4. Estimated savings based on high and low participation rates and high and low annual savings per household

	Low electricity savings	High electricity savings
Low participation	11,780 MWh	78,178 MWh
High participation	688,469 MWh	4,569,026 MWh

We converted these electricity savings into tons of avoided pollution using the national average emissions rate of 1,175 pounds of CO_2 emitted per MWh generated, in order to estimate the tons of pollution currently avoided by utility-delivered low-income programs (EIA 2015). We address these results alongside data on federal programs targeting low-income populations and discuss them in our section titled "Discussion."

Potential Electricity Savings and Emissions Reductions

Our analysis thus far has focused on current programs. To derive potential electricity savings we created several scenarios, starting with our higher estimates of electricity savings. We used the highest average electricity savings per household from our data set: 2.25 MWh per household per year, which represents a savings of about 30% of the average annual consumption of a household in Massachusetts, where the program is administered (EIA 2009). This savings percentage is consistent with previous savings estimates for whole-building energy efficiency

[10] Programs can target manufactured homes; their exclusion is due to data limitations. Manufactured housing represents 6% of the US housing stock and could be a potential source of emissions reductions through energy efficiency improvements.

retrofits (DOE 2014). We then multiplied electricity savings per household by the number of households that meet the definition of low-income when using the federal poverty level and when using 200% of the federal poverty level. We assumed participation would need to be ramped up and set potential levels of 25% and 50% of the total eligible population. We then converted these electricity savings into tons of avoided pollution using the national average emissions rate of 1,175 pounds of CO_2 emitted per MWh generated (EIA 2015). We supplemented the 22 utility filings in our sample with data from reports on electricity and emissions savings from low-income energy efficiency programs from CEE and the DOE's WAP (CEE 2015; DOE 2015). The savings reported by CEE and WAP represent national figures. Table 5 includes these additional data.

Table 5. Additional estimates of emissions reductions achieved in a single year by low-income energy efficiency programs

	Tons of CO_2 avoided
CEE	139,238 (2013 program year)[11]
WAP 2008	2,475,788 (2008 program year)
WAP Recovery Act	8,137,252 (2010 program year)

Source: CEE 2015; DOE 2015

In order to understand whether the emissions reductions that could be achieved from energy efficiency in low-income households would provide a meaningful financial incentive, we applied a range of potential allowance values to the low and high estimates of emissions reductions per household. We based our allowance prices on the record high trading value for Regional Greenhouse Gas Initiative (RGGI) credits, the April 2015 spot price for California's multi-sector greenhouse gas cap-and-trade program, and the federal government's social cost of carbon (EPA 2015). We assume that a project can earn full credit for both years of the CEIP.

Discussion

Current Electricity Savings and Emissions Reductions

As figure 2 below shows, our primary data from utility filings and the supplementary sources of data on low-income programs all indicate that the current level of investment made in low-income energy efficiency programs in a single year avoids less than 3 million tons of CO_2. Even the 2008 American Recovery and Reinvestment Act (ARRA)-funded WAP, which represented an unprecedented level of investment in energy efficiency, achieved less than 10 million tons of CO_2 reductions. The CEIP would make 300 million tons of CO_2 available over a two-year period. If we assume that half of the CEIP allowances are available in each year of the two-year program and that the annual pool is divided equally between energy efficiency and renewables, that leaves 75 million tons of CO_2 reductions for eligible energy efficiency projects. We are able to confidently conclude that the current universe of low-income energy efficiency programs will achieve nowhere near the number of allowances EPA is making available.

[11] Converted from electricity savings using a 1,175 lbs/MWh national-average emissions rate. Note: This number is lower than savings reported by WAP but consistent with our lower estimate of program savings. We believe that these differences are attributable to varying definitions of low-income and variations in program offerings.

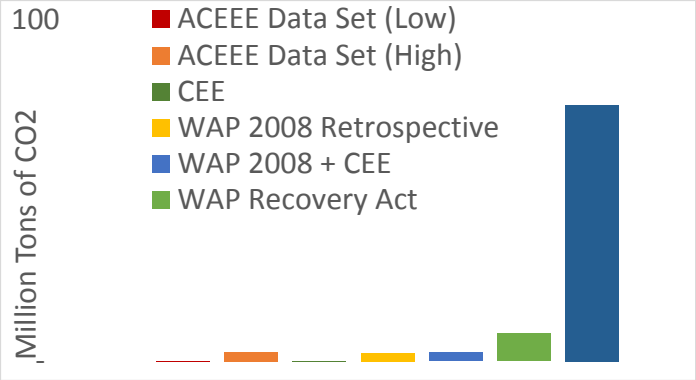

Figure 2. Estimates of current annual emissions reductions from low-income programs relative to available CEIP allowances

Potential Electricity Savings and Emissions Reductions

Proposing four different scenarios, we estimated potential CO_2 emission reductions if low-income energy efficiency programs were expanded to serve more households during the CEIP period. Figure 3 compares two different definitions of eligible low-income households—those at or below the federal poverty level and those at or below 200% of the federal poverty level. For each we show scenarios in which programs reach 25% or 50% of eligible customers. We assume that programs begin saving in 2018 (the year that eligibility for CEIP begins) and achieve the high MWh savings per household from the range in our data set over the two years of CEIP, 2020 and 2021. Projects completed in 2018 and 2019 that are still achieving savings can be counted during this period as well.

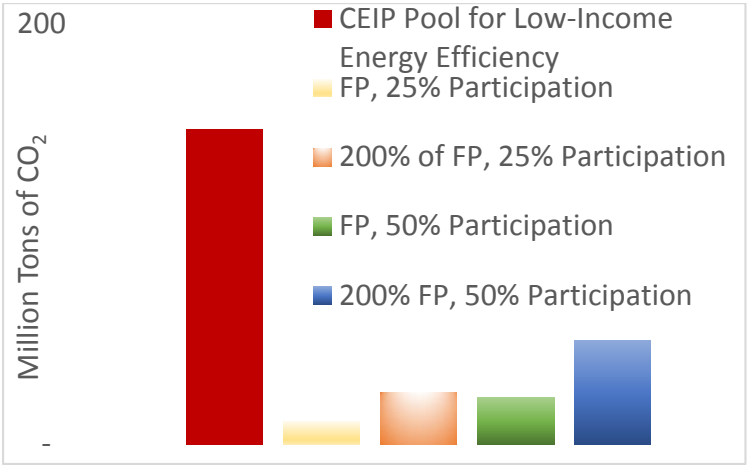

Figure 3. Potential emissions reductions from expanded low-income programs

The scenarios we include here would require exceptional and unprecedented change from the current situation in a very short time period. Low-income programs would have to reach significantly more households, expanding participation dramatically. Using our data sample of utilities offering low-income programs, we can extrapolate that the majority of low-income programs are currently reaching less than 4% of eligible households each year if using the narrower definition of low-income (federal poverty level) and less than 2% of eligible

households if using the broader definition (200% of federal poverty level).[12] As figure 3 shows, even our more aggressive scenarios (e.g., 200% of federal poverty level and an increase in participation from less than 2% currently to 50% of eligible households) do not approach the amount of allowances available.

We also considered whether the emissions reductions avoided by low-income energy efficiency programs might create a financial incentive great enough to drive new investment or participation in these programs. Table 6 shows that assuming a $35-per-ton allowance price and the highest household energy savings from our data set for both years of the CEIP, a project would be awarded allowances worth just over $90. The price of allowances in current trading markets in the Northeast and West Coast regions indicates that prices are likely to be much lower, at least in the early years of the program. Based on these experiences the per-household incentive from allowances earned by participating in the CEIP might range from $14 to $36 (EPA 2015). As a percentage of total project cost this is a tiny drop in the budget.[13] Given the barriers to participation in these programs, an additional financial incentive of less than 1% of project cost seems unlikely to motivate the large increase in participation that would be needed to achieve savings equivalent to the CEIP pool. Even if the price of allowances were $35 per ton a homeowner would earn less than $100. The value of these allowances could be viewed as a nearly 2% bonus on projects, which might motivate some program administrators or energy service companies that are in a position to aggregate many projects across a program, as 2% aggregated across a portfolio of programs might mean millions of dollars. However, if program administrators do not pass the financial incentive on to customers, there is no new incentive for homeowner participation to increase.

Table 6. Potential value of CEIP allowances per household and as a percentage of total project cost

Source of assumed allowance values	Assumed value of an allowance	Value of CEIP allowances awarded per household (energy savings low)	Value of CEIP allowances awarded per household (energy savings high)	Allowance value as a percentage of total project cost (high energy savings and project cost)
RGGI	$5.41	$2.16	$14.31	0.3%
CA cap-and-trade	$13.73	$5.47	$36.32	0.8%
Social cost of carbon	$35.00	$13.95	$92.58	1.9%

Conclusions and Recommendations

While we base our findings on a broad set of data and high-level estimates, we believe we can draw some significant conclusions:

- It would be nearly impossible to ramp up current low-income energy efficiency programs between 2018 and 2022 to generate enough savings to reduce emissions by 150 million tons (half of the proposed CEIP pool of 300 million allowances) during 2020 and 2021.

[12] We divided the percentage of residential customers from our data set that participate in low-income programs by the percentage of households that meet the federal poverty level and 200% of the federal poverty level, respectively, to extrapolate current low-income participation under each of those definitions.

[13] The average price of whole-home weatherization can be around $5,000, commonly covering measures such as furnace replacement, attic and wall insulation, and air infiltration reduction (DOE 2015).

- The proposed ratio of two allowances for each ton of CO_2 reduced by energy efficiency investments in low-income households is not enough to drive significant new activity in this sector.

Given these findings we recommend a number of changes to the proposed CEIP.

Expand the CEIP to include a broader set of energy efficiency policies and measures. The CEIP is an opportunity to incentivize early action. Energy efficiency is a zero-emission resource, a least-cost path to compliance with EPA's emissions goals in the CPP, and it results in multiple benefits to ratepayers and program participants. By reducing overall electricity demand, energy efficiency reduces the capacity needed to meet demand with clean energy generation, lowering costs across the entire electric generating system. Early investments in energy efficiency (beyond those resulting in energy savings for low-income households) should be encouraged on par with early investments in renewables. We recommend that early investments in energy efficiency receive at least the same incentive as early investments in renewables.

Allow states to use a flexible and broad definition of *low-income*. The types of measures and programs that qualify as low-income should be defined broadly. Our research indicates that using the federal poverty level would limit the incentive created by the CEIP. A broader definition, including household income of more than 200% of the federal poverty level, would make more households eligible.

Allow credit to be earned for low-income investments even earlier. Large-scale energy savings are typically achieved over a multiyear period from investments in energy efficiency measures. The measures installed in year 1 will accrue savings for many years, and each year that measures are installed can result in exponential growth as savings accrue and program participation expands. Experience also shows that programs typically take time to ramp up and that while high annual savings can be sustained, it may take some time to achieve those high levels of savings, especially when it involves developing and expanding delivery channels. In order to ensure that early action is rewarded and to provide the lead time needed to truly incentivize low-income energy efficiency programs, we recommend that early ERCs or allowances be awarded beginning shortly after a state plan is finalized and no later than 2018.

Dramatically increase the incentive for low-income investment. Energy efficiency reduces CO_2 emissions, but in residential households the scale of those emissions only becomes significant when projects are aggregated across programs. This means that the dollar value of the incentive offered by a single allowance or credit is highly unlikely to move a project forward that would not otherwise happen. If a purpose of the CEIP is to make projects happen for low-income households beyond business as usual, the incentive needs to be large enough to overcome the upfront hurdles involved with program participation. Therefore we recommend significantly increasing the ratio of credits awarded to energy savings for low-income households. Both households and program administrators could benefit from an increased incentive.

What's Next for Low-Income Programs?

Beyond the CEIP a long-term commitment to better efficiency for low-income households can help states meet their emissions reduction goals under the CPP and encourage

healthier and more equitable communities. These developments have led to an increasing urgency to identify best practices for improving the design and delivery of low-income energy efficiency programs.

While the CEIP has the potential to incentivize the expansion of low-income programs, the amount of savings these programs achieve and the number of households they are able to reach will require changes to program design and delivery. To achieve greater savings within this sector, program administrators can offer more-comprehensive programs that meet the needs of a diverse low-income customer base. Currently the majority of utility low-income energy efficiency programs focus on the weatherization model and direct-install measures, with the most common measures including insulation, air sealing, and heating and cooling measures (Cluett, Amann, and Ou 2016). Moving forward, these programs could include direct-install and weatherization measures as well as appliance, equipment, and electronics upgrades. One example is the Energy Savings Assistance (ESA) Program offered by the California investor-owned utilities. This program includes a range of measures in addition to traditional weatherization measures, such as lighting, refrigerators, and air conditioners.[14]

Utilities should also develop programs to target multifamily-building customers, of which the majority are low-income renters (AHS 2013). Multifamily-building owners and residents are frequently eligible for a mix of residential and commercial rebates and incentives, which leads to market confusion and the majority of these customers being underserved. A 2013 ACEEE report found that 40% of the metro areas with the highest concentrations of multifamily buildings were not served by a utility-led multifamily energy efficiency program (Johnson and Mackres 2013). While the number of multifamily-specific programs is on the rise, more programs should track participation and savings for various segments of the multifamily market, such as the affordable-housing sector. This would allow program administrators to track investments in the affordable multifamily sector.

Program administrators should also strive to build strong partnerships with trusted community organizations to disseminate information and run programs. For example, utilities can expand low-income energy efficiency programs alongside WAP implementation in order to best leverage delivery channels and program strengths and resources (Cluett, Amann, and Ou 2016). In order to better inform the design and delivery of low-income energy efficiency programs, state and local governments can partner with utilities and local organizations that already work on outreach to low-income communities. Local governments can also assist with joint delivery of energy efficiency programs alongside other low-income programs in order to streamline program delivery and maximize program participation.

References

AHS (American Housing Survey). 2013. *AHS 2013 Metropolitan Public Use File*. Accessed November 2015. Washington, DC: United States Census Bureau.

CEE (Consortium for Energy Efficiency). 2015. *2014 State of the Efficiency Program Industry: Budgets, Expenditures, and Impacts*. Boston, MA: Consortium for Energy Efficiency.

[14] Utilities include Southern California Edison, Pacific Gas and Electric, San Diego Gas & Electric, and Southern California Gas.

Cluett, R., J. Amann, and S. Ou. 2016. *Building Better Energy Efficiency Programs for Low Income Households.* Washington, DC: American Council for an Energy-Efficient Economy.

DOE (US Department of Energy). 2014. "Better Buildings Neighborhood Program Summary of Reported Data from July 1, 2010–September 30, 2013." Accessed March 3. energy.gov/sites/prod/files/2014/09/f18/bbnp_summary_reported_data_9-15-2014.pdf.

DOE (US Department of Energy Office of Energy Efficiency and Renewable Energy). 2015. Weatherization Assistance Program: National Evaluations Summary of Results. Washington, DC: DOE. http://weatherization.ornl.gov/WAP_NationalEvaluation_WxWorks_v14_blue_8%205%2015.pdf.

EPA (US Environmental Protection Agency). 2015a. "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule." 80 Fed. Reg. 64661. Accessed October 23. www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf

EPA (US Environmental Protection Agency). 2015b. "Regulatory impact analysis for the Clean Power Plan Final Rule." Accessed March 3. https://www.epa.gov/sites/production/files/2015-08/documents/cpp-final-rule-ria.pdf.

EIA (US Energy Information Administration). 2009. "Household Energy Use in Massachusetts Accessed May 9. https://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/ma.pdf.

EIA (US Energy Information Administration). 2015. "State Electricity Profiles." Accessed March 3. https://www.eia.gov/electricity/state/unitedstates/.

Hoffman, I., G. Rybka, G. Leventis, C. Goldman, L. Schwartz, M. Billingsley, and S. Schiller. 2015. *The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs: Estimates at the National, State, Sector, and Program Level.* Berkeley, CA: Berkeley Lab and Electricity Markets & Policy Group.

Johnson, K., and E. Mackres. 2013. Scaling Up Multifamily Energy Efficiency Programs: A Metropolitan Area Assessment. Washington, DC: ACEEE. www.aceee.org/researchreport/e135.

LIHEAP Clearinghouse. 2015. "2010 State-by-State Ratepayer Funded Low-Income Energy Assistance and Energy Efficiency." Accessed December 3. www.liheapch.acf.hhs.gov/Supplements/2010/supplement10.htm.

York, D., M. Neubauer, S. Nowak, and M. Molina. 2015. *Expanding the Energy Efficiency Pie: Serving More Customers, Saving More Energy Through High Program Participation.* Washington, DC: American Council for an Energy-Efficient Economy. http://aceee.org/research-report/u1501.