June 10, 2019

VIA ELECTRONIC FILING

Adam J. Teitzman
Office of Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, Florida 32399-0850

Re: Docket Nos. 20190015-EG, 20190016-EG, 20190018-EG, 20190019-EG, 20190020, 20190021-EG- Commission Review of Numeric Conservation Goals

Dear Mr. Teitzman,

On behalf of Intervenors Southern Alliance for Clean Energy, I have enclosed the testimony and exhibits of Forest Bradley-Wright. Please file these documents in Docket Nos. 20190015-EG, 20190016-EG, 20190018-EG, 20190019-EG, 20190020, 20190021-EG. Please contact me if there are any questions regarding this filing.

Sincerely,
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CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true copy and correct copy of the foregoing was served on this 10th day of June, 2019, via electronic mail on:

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DATED this 10th day of June, 2019.

/s/ Bradley Marshall
Attorney

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Commission Review of Numeric Conservation Goals Florida Power & Light Company	))))	DOCKET NO. 20190015-EG
In re: Commission Review of Numeric Conservation Goals Gulf Power Company	))))	DOCKET NO. 20190016-EG
In re: Commission Review of Numeric Conservation Goals Duke Energy Florida, LLC	))))	DOCKET NO. 20190018-EG
In re: Commission Review of Numeric Conservation Goals Orlando Utilities Commission	))))	DOCKET NO. 20190019-EG
In re: Commission Review of Numeric Conservation Goals JEA	))))	DOCKET NO. 20190020-EG
In re: Commission Review of Numeric Conservation Goals Tampa Electric Company	))))	DOCKET NO. 20190021-EG

TESTIMONY OF FOREST BRADLEY-WRIGHT ON BEHALF OF SOUTHERN ALLIANCE FOR CLEAN ENERGY

June 10, 2019

I. Introduction

Q. Please state your name, position and business address.

A. My name is Forest Bradley-Wright. I am the Energy Efficiency Director for Southern Alliance for Clean Energy ("SACE"), and my business address is 3804 Middlebrook Pike, Knoxville, Tennessee.

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of SACE.

Q. Please summarize your qualifications and work experience.

A. I graduated from Tulane University in 2001 and in 2013 received my Master of Arts degree from Tulane in Latin America Studies with an emphasis on international development, sustainability, and natural resource planning.

My work experience in the energy sector began in 2001 at Shell International Exploration and Production Co., where I served as Sustainable Development Team Facilitator.

From 2005 to 2018, I worked for the Alliance for Affordable Energy. As the Senior Policy Director, I represented the organization through formal intervenor filings and before regulators at both the Louisiana Public Service Commission and the New Orleans City Council on issues such as integrated resource planning, energy-efficiency rulemaking and program design, rate cases, utility acquisition, power plant certifications, net metering, and utility scale renewables. As a consultant, I also prepared and filed intervenor comments on renewable energy dockets before the Mississippi and Alabama Public Service Commissions. In 2014, I was a runoff candidate for the Louisiana Public

Service Commission First District seat.

Since 2018, I have been the Energy Efficiency Director for SACE. My responsibilities include leading dialogue with utilities and regulatory officials on issues related to energy efficiency in resource planning, program design, budgets, and cost recovery. This includes formal testimony, comments, presentations, and/or informal meetings in the states of Georgia, Florida, North Carolina, South Carolina, Mississippi, and in jurisdictions under the Tennessee Valley Authority.

A copy of my resume is included as Exhibit FBW-1.

Q: Have you been an expert witness on energy-efficiency matters before regulatory commissions?

A: Yes, I have filed expert witness testimony in Georgia related to Georgia Power Company's 2019 Demand Side Management application and in North Carolina related to the Duke Energy Carolinas DSM/EE Recovery Rider. This is my first time submitting testimony to the Florida Public Service Commission ("Commission").

Q: Please summarize your testimony and key findings.

A: I have reviewed the utility filings as they relate to evaluation of low-income efficiency opportunities and came to the following conclusion:

- With a low-income population totaling more than 5 million individuals (36.8%) across their combined service territories, and a prevalence of high energy burdens that cause financial vulnerability, there is an enormous need for energy efficiency that matches the unique characteristics of this important customer segment.

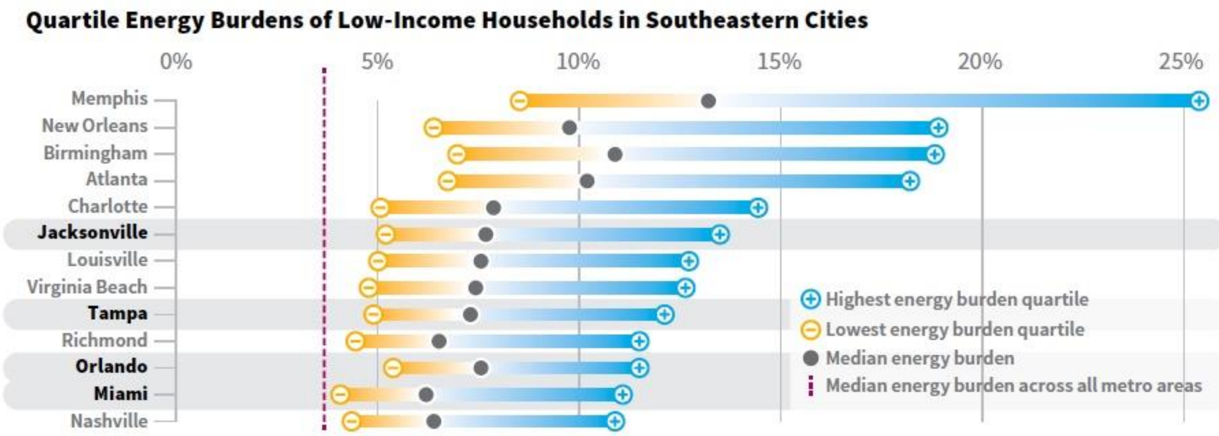
- Due to fundamental flaws in applicability of the Ratepayer Impact Measure ("RIM") test and the two-year screen, the Commission should establish evaluation standards for low-income efficiency based primarily on the Total Resource Cost ("TRC") test.
- I offer a methodology for calculating the low-income targets, provide specific savings levels for each utility, and suggest they be incorporated into the overall savings goals set by the Commission in this proceeding.
- I recommend the Commission set an expectation that all low-income customers will have access to relevant efficiency programs going forward, through both neighborhood deployment and deeper savings programs.

II. Specific Energy Efficiency Targets Should Be Established For Serving Low-income Customers

Q: Why is addressing energy burden for low-income customers an important consideration for Commission action in this Florida Energy Efficiency Conservation Act ("Energy Efficiency Act") proceeding?

A: For millions of Floridians living on limited income, paying the monthly energy bill presents a significant financial challenge, one that can lead to difficult tradeoffs against other essential needs. Research by the American Council for an Energy Efficient Economy[1] shows that families with high energy burdens often struggle to move out of poverty, may face increased economic hardship, and are at greater risk of negative health effects related to respiratory diseases and increased stress. The National Association for the Advancement of Colored People has recognized that advancing energy efficiency and clean energy is essential to decreasing depending on harmful energy production practices while preserving health and livelihoods of community members.[2]

Figure 1. Quartile Energy Burdens of Low-Income Households in Southeastern Cities



Low-income households in Florida cities in this study face high energy burdens. On average, half the low-income households in Jacksonville, Tampa, Orlando, and Miami have an energy burden greater than 7.2%, and a quarter of them, over 12%. The national average is 3.5%.

Figure 1 above shows that total energy burdens (both household and transportation) in major Florida cities are far above the threshold for unaffordability for households in the top quintile.

According to U.S. Census data, more than 5 million people served by the utilities in this proceeding live on incomes that are at or below 200% of the federal poverty levels, the threshold used for determining eligibility for federally funded low income weatherization assistance. In each of the utility service areas, this represents more than a third of the population, ranging from 35% for Gulf Power Company ("Gulf") to 43% for Orlando Utilities Commission ("OUC").

Table 1 below uses U.S. Census data to calculate the percentage of population in each utility service territory that is at or below 200% of the federal poverty level.

Table 1. Service Territory Population At or Below 200% of the Federal Poverty Level [3]

	Total Population	Population Below 200% Poverty Level	% Below 200% Poverty Level
Florida Power & Light	8,648,817	**3,171,934**	36.7%
Duke Energy Florida	3,099,509	**1,158,262**	37.4%
Tampa Electric	1,414,898	**511,709**	36.2%
Jacksonville Electric	777,039	**289,477**	37.3%
Gulf Power	524,860	**183,894**	35.0%
Orlando Utilities Comm.	169,278	**73,238**	43.3%
Total	14,634,402	**5,388,514**	36.8%

Energy efficiency is widely recognized as the best strategy for reducing high energy burdens. Its deployment should be scaled in both breadth and depth to truly and effectively improve conditions for the millions of families and individuals struggling to pay high monthly electric bills.

Q: How do energy efficiency programs address energy burden?

A: Utility energy efficiency programs that are designed to serve the unique needs of low-income customers address energy burdens at their root source. These programs strive to provide assistance to the neediest customers, like the elderly, disabled, struggling families, the working poor, and others for whom unaffordable energy bills can be the difference between their ability to make rent or afford medicine, food, or other necessities.

Many low-income households reside in older homes, which are often poorly insulated, have outdated appliances, and use heating and cooling systems that are less efficient. During times of extreme hot or cold weather, these inefficient homes have much higher energy bills, which can lead to difficult decisions between reducing or forgoing food or medicine in order to pay energy costs, leaving the home at unhealthy temperatures, or having their electricity service disconnected.[4] According to a recent report by the Federal Reserve, nearly 40 percent of Americans would struggle to cover an unexpected $400 expense, such as a car repair or appliance replacement, and 12% wouldn't be able to pay their current monthly bills,[5] while others resort to high-interest short-term lending (e.g. payday loans), which can lead to even greater financial risk.[6]

Energy efficiency improvements would substantially reduce energy bills for these families, both in general and especially during periods of extreme hot or cold temperatures. But without efficiency programs directed to serve low-income households, the same financial constraints that make energy bills unaffordable will also make efficiency improvements inaccessible, thus perpetuating a cycle of high electricity bills and energy insecurity. In recognition of this, utility efficiency programs for low-income customers typically provide the improvements for free, rather than covering just a portion of the incremental cost like standard efficiency rebate offerings.

Q: Has the Commission emphasized a need for utilities to provide energy efficiency to low-income customers?

A: The Commission made energy efficiency for low-income customers a key policy priority in the 2014 Energy Efficiency Act target-setting proceeding. Support of energy efficiency for low-income customers is a notable area of rare common interest between Florida's major utility companies and public interest advocates, like the Southern Alliance for Clean Energy. I believe further growth and formalization of low-income energy efficiency in this Energy Efficiency Act proceeding will be an important step forward, one that will make a significant difference in the lives of those customers who most need it.

In the 2014 Energy Efficiency Act final order, the Commission stated its concern for low-income customers and the need for energy efficiency assistance.

"During the hearing, we voiced our concerns regarding how the FEECA Utilities' goals-setting analyses affected the low income customer base and questioned the FEECA Utilities regarding the types of programs each utility marketed to their low income customers."[7]

Unfortunately, when the RIM test and two-year payback screen were applied, the most affordable measures with some of the highest impacts had been removed from the target setting process. This included measures that commonly make up low-income efficiency program offerings. However, the Commission's Order indicated that flexibility was warranted when it came to incorporating measures with a short payback period, stating generally:

"Using a two-year criterion to screen for potential free riders in the goals-setting stage is not so rigid as to prevent low-cost measures from being included in carefully crafted utility programs."[8]

The Commission was even more specific with their guidance to utilities with regard to addressing the two-year payback issue in their DSM implementation plans:

"When the FEECA Utilities file their DSM implementation plans, each plan should address how the Utilities will assist and educate their low income customers, specifically with respect to the measures with a two-year or less payback."[9]

Q: What actions has the Commission taken since to ensure this policy priority is enacted?

A: In responding to each utility's 2015 DSM Plans, the Commission further reinforced and specified their expectations regarding efficiency offerings for low-income customers. Most significant was the Commission's acceptance of measures and programs without the RIM test and two-year payback screening requirements. The Commission addressed each of these issues in their Order approving Tampa Electric Company's ("TECO") 2015 DSM Plan:

"In the goal-setting proceeding, we established a two-year payback methodology to account for free riders, but that educational and low-income programs, including those with measures with a less than two-year payback, were encouraged."[10]

"The only programs in TECO's DSM Plan to fail the RIM test were programs that target eligible low-income ratepayers. These programs did pass the TRC test, and comply with the requirements established in Order No. PSC-14-0696-FOF-EU, to assist and educate low-income customers."[11]

In approving Florida Power & Light's ("FPL") 2015 DSM Plan, they again stated that the utility's low-income efficiency program had met the Commission's requirements by passing the TRC test, rather than the RIM test, and specifically noted inclusion of measures for the low-income program without the two-year screen:

"The only program in FPL's DSM Plan to fail the RIM test is the Residential Low Income program, which targets eligible low income ratepayers for assistance with weatherization, air conditioning, and water heating. The program does however pass the TRC test, and complies with the requirements established in Order No. PSC-14-0696-FOF-EU to assist and educate low-income customers."[12]

"FPL has incorporated the two-year payback methodology into the design of its DSM Plan, and only includes savings from measures with a less than two-year payback in its residential low income program."[13]

The Commission similarly approved the program plans for all Energy Efficiency Act utilities that followed these guidelines.

Q: Have the Utilities spoken to inclusion of low-income efficiency in their 2019 Energy Efficiency Act applications?

A: Yes, each utility has indicated their intention to continue offering specialized low-income efficiency programs while including accommodations like those described above.

FPL stated in testimony that efficiency has been an important form of assistance for low-income customers and indicated that addressing it is a requirement from the Commission's 2014 Energy Efficiency Act target-setting Order. The Company went further this time, requesting a specific target for low-income efficiency that is notable for being approximately 34 times larger than the entire target they propose for all other customers.

"As previously discussed, in the decades since FEECA was enacted, the marketplace has evolved dramatically. While utility-provided incentives for traditional EE measures no longer make sense because they are not cost-effective,[14] they have been one of the sources of assistance to low income customers. In recognition of these changes, FPL is proposing to retain and expand its existing Low Income program. Although this program is not cost-effective, FPL believes continuing to provide assistance to this vulnerable group is appropriate and warranted to replace eliminated EE program options that will no longer be available. This proposal is consistent with the Commission 2014 Goals docket Order No. PSC-14-0696-FOF-EU, wherein the Commission recognized the importance of supporting these customers. If approved, the estimated ten-year amounts of 14 Summer MW, 4 Winter MW and 34,000 MWh associated with this proposal should be added to FPL's currently proposed 2020-2029 DSM Goals."[15]

TECO reiterated that there is additional flexibility for incorporating measures into low-income programs, which they intend to continue:

"[TECO] is not limited to using any measures that could be utilized in a cost-effective DSM Program. For example, the company is planning to retain its current weatherization and energy education programs that include energy-efficiency kits which are made up of both cost-effective and not cost-effective measures which focus on gaining participation of low-income customers in the company's DSM programs portfolio."

OUC made a point of highlighting the higher than average level of households living in poverty in their service territory. They describe the specific challenge these customers face when attempting to access efficiency without specific utility programs. For example, issues caused by use of the RIM test, which they note have "special weight" in light of their low-income population.

"Approximately 40 percent of OUC's residential customers have household incomes less than $35,000, which is approximately 1.4 times the federal poverty level for a family of four."[16]

"The fact that so many OUC residential customers are low-income and renters presents challenges to the effective implementation of DSM measures and programs for OUC, and particularly for this potential target population. Briefly, low-income customers simply do not have the discretionary income to pay the customer's cost to participate in a DSM program, and renters have little if any control over such expenditures and investments by their landlords."[17]

"The negative RIM results for the 278 measures studied by Nexant have special weight for OUC's consideration because of the relatively high portions of low income customers and renters we serve."[18]

Q: Should formal goals be established for each utility to delivering efficiency savings to low-income customers?

A: I strongly encourage the Commission to formalize targets for low-income efficiency as part of this Energy Efficiency Act proceeding. Their scale of need is large, with more than 5 million households (approximately 36.7%) in Energy Efficiency Act utility service territories living on incomes that are at or below 200% of the federal poverty line - a standard by which eligibility for low-income efficiency programs is commonly measured. This need is even greater at a time when utilities are seeking to scale back standard residential efficiency offerings, which are already less accessible to low-income customers. As a matter of policy, further direction from the Commission on setting low-income efficiency targets would bring additional clarity in evaluation standards, consistency between utilities, and lead to greater savings impact for low-income customers. As discussed later in this testimony, the superior performance results achieved by some Energy Efficiency Act utilities demonstrate that substantially higher savings attainment should be possible for their peers. By setting specific low-income efficiency savings targets, the Commission can raise the bar to ensure all utilities deliver optimal performance through their low-income efficiency programs.

Q: Should the evaluation of DSM potential and the setting of overall efficiency savings targets for each utility incorporate and reflect the low-income efficiency savings goals?

A: Yes, efficiency for low-income customers should be part of the broader efficiency potential analysis required in this proceeding, and the results for low-income standard efficiency offerings should be incorporated together into the total Energy Efficiency Act savings targets authorized by this Commission. Later in this testimony, I discuss a number of specific considerations that are needed for evaluating the low-income efficiency potential upon which targets can be set.

III. Formal Standards Are Needed for Evaluating Energy Efficiency Potential for Low-income Customers

Q: Why is use of the RIM test problematic with evaluating low-income efficiency?

A: The Commission has authorized utilities to proceed with low-income programs without a requirement for passing RIM. I believe this is the right approach for several reasons. In his testimony (relevant portions of which I summarize below), Mr. Grevatt raises a number of significant concerns with use of the RIM test.

- RIM is not actually a test of cost-effectiveness, it indicates whether rates will be impacted, which is at best an imperfect test of impact to non-participants.
- Lost revenues are not an added cost of energy efficiency.
- Potential rate impacts alone are not sufficient for regulatory decision-making, they must be balanced with a consideration of benefits.
- Limiting measures only to those that pass RIM greatly constrains the savings targets and reduces total financial benefit.
- No other state uses RIM as the sole or primary test.

Application of the RIM test is even more problematic when it comes to evaluating efficiency for low-income customers. The central policy consideration emphasized by the Commission in the previous Energy Efficiency Act cycle related to low-income customers concerned the additional barriers (primarily financial) that limit their access to efficiency and their vulnerability to high energy bills and rate increases.[19] However, the RIM test and the two-year screen, discussed below, caused many of the most common and impactful measures for low-income customers to be cut. Most of the measures that remained required significant up-front out-of-pocket expenditures that would likely be out of reach for low-income customers.

In addition to limiting specific measures, screening with RIM results in much smaller total budgets for energy efficiency than alternative screening methodologies. With less investment, fewer customers are able to participate, further eroding low-income customer access to efficiency. Without policy to ensure low-income efficiency programs are provided at sufficient scale, customers with limited financial means would lose a critical tool for controlling their energy costs and thereby remain vulnerable to the financial risk of high energy bills.

I'm aware of no program that uses RIM for screening of low-income at the measure, program, or portfolio level. As noted in the section above, since the 2014 Energy Efficiency Act proceeding, the Commission and utilities do not require low-income efficiency measures and programs to pass the RIM test.

Q: Why is use of the Total Resource Cost Test the appropriate method for evaluating low-income efficiency?

A: For all the deficiencies of the RIM test noted above, there is clearly still a value in screening low-income energy efficiency measures to ensure the investments will yield net benefits. The Total Resource Cost test is the natural choice, since it is already statutorily recognized[20] and its use is well established for this purpose.

The TRC test has several key advantages for screening low-income energy efficiency. First, it is one of the most respected industry standard cost effectiveness tests for evaluating energy efficiency.

Second, the utilities in this proceeding already calculated the TRC in their analysis of technical, economic, and achievable potential, though Mr. Grevatt identified a number of important technical issues. Third, the TRC can be applied effectively for screening individual measures, setting savings goals, and developing programs. Fourth, analysis with the TRC is not impacted by levels of utility incentives offered, meaning it can be used to evaluate savings potential regardless of the portion of cost paid by the participant or utility. Finally, use of the TRC test is the dominant method for evaluating cost effectiveness for low-income energy efficiency across the country, imparting both validity to its use and opportunities to learn from the practices employed in other jurisdictions.[21]

Q: Would use of the Participant Cost Test be a viable alternative?

A: Use of the Participant Cost Test, while also statutorily recognized, would not be appropriate as the primary test. Because low-income energy efficiency programs are generally provided at no cost to customers, any measure that produces savings will automatically pass, even if the cost of implementing the measure exceeds the value of its energy savings potential. Moreover, just because something passes the Participant Cost Test, low-income customers still may not be able to afford it.

Q: Why is use of the two-year payback screen inconsistent with the energy efficiency needs of low-income customers?

A: As with RIM, there are a number of problems with the two-year screen that result in double counting and suppression of targets based on assumptions that are at odds with existing conditions and customer decision-making practices. The effect the two-year screen has on reducing portfolio level savings for standard energy efficiency measures is significant. But the problems with use of the two-year payback screen are even more problematic when considering low-income efficiency because the free ridership assumptions underpinning the screen simply do not apply to this group of customers.

As noted in Mr. Grevatt's testimony, the leading issue is that naturally occurring energy efficiency adoption is already factored into the Nexant technical potential analysis, thereby accounting for free ridership prior to application of the two-year payback screen. This includes accounting for future government codes and standards, and identifies customers who will purchase products that exceed those requirements without utility efficiency programs. Because Nexant already accounted for free ridership at the technical potential level, "the two-year payback screen is a redundant adjustment for free riders that artificially makes cost-effective potential appear to be lower than it really is."[22]

Mr. Grevatt also points out that no empirical evidence has been shown to validate the claim that measures with payback shorter than two years are routinely implemented across the customer base without utility incentive programs.[23] Mr. Grevatt additionally identifies a number of market barriers in his testimony that can prevent customers from adopting efficiency measures, including those with payback of two years or less.[24]

For low-income customers, their financial constraints and housing conditions significantly reduce their ability to purchase higher efficiency measures in the absence of utility programs. For this reason, free ridership for low-income energy efficiency programs is reasonably assumed to be zero or near-zero.

Q: How do the measure screening results of the RIM test and two-year payback screen compare to the measures used in utility low-income EE programs?

A: The RIM and two-year payback screen have a profound impact on measure selection. Four utilities – FPL, Gulf, OUC, and JEA – use these screening tests to eliminate literally every single residential measure, including all measures included in their respective low-income efficiency programs. By contrast, after applying the RIM and two-year screen both TECO and DEF retain an array of residential measures including several that are part of their low-income efficiency programs. As noted above, the Commission has authorized utilities to deploy low-income efficiency programs regardless of whether they pass the RIM and two-year screen. However, the utilities' own analysis clearly shows that the RIM and two-year screen are deeply and fundamentally flawed as tools for evaluating low-income efficiency potential.

Q: How do the measures screening results of the TRC test compare to the measures used in utility low-income energy efficiency programs?

A: As with the RIM and two-year screen analysis discussed above, significant inconsistencies exist between the various utilities with regard to TRC screening.

However, in contrast to RIM and the two-year screen, at least a portion of the differences in TRC analysis between utilities appear to be related to fairly discrete issues that can be corrected by addressing specific input assumptions and calculation methodologies.

When low-income efficiency potential is analyzed using the TRC with the two-year payback screen removed, the list of measures for most utilities looks far more applicable.

For instance, separate from any other screening factors, all of the following residential measures pass TRC for Duke Energy Florida ("Duke"). In this list, the starred items appear to generally align with the measures included in Duke's two low-income efficiency programs. The first group of measures, in purple, pass TRC, RIM, and the two-year screen in Duke's analysis. The second group of measures, in green, pass both TRC and the two-year payback screen, but not RIM. The third group of measures, in blue, would have also been removed by the two-year screen. Notably, CFL and LED lights, faucet aerators, low flow showerheads, hot water pipe insulation, and water heater temperature setbacks are all standard components of Duke's largest and most impactful low-income efficiency program, the Neighborhood Energy Saver, but would have been removed by the two-year payback screen.

Duke Residential TRC Economic Potential ("EP"):

- * 14 SEER ASHP from base electric resistance heating
- * 15 SEER Air Source Heat Pump (only for single family homes)
- 15 SEER Central AC (only for single family homes)
- * 16 SEER Central AC (only for single family homes)
- * Air Sealing-Infiltration Control (only for existing homes)

- * Ceiling Insulation (R12 to R38)
- * Ceiling Insulation (R19 to R38) (only for single family homes)
- * Ceiling Insulation (R2 to R38)
- * Duct Repair (only for existing homes)
- Energy Star Windows (only for existing homes)
- Home Energy Management System
- Spray Foam Insulation (Base R2) (only for single family homes)
- Wall Insulation (only for existing single family and manufactured homes)
- Thermostatic Shower Restriction Valve
- Two Speed Pool Pump
- Variable Speed Pool Pump
- * LED Specialty Lamps – 5W Chandelier
- * LED – 9W Flood
- * CFL – 13W
- High Efficiency Induction Cooktop
- Energy Star Clothes Washer
- ENERGY STAR Room AC
- * CFL – 15W Flood (Exterior)
- * CFL - 23W
- * LED – 14W
- * LED – 9W Flood (Exterior)
- * LED – 9W
- * Linear LED
- * Low Wattage T8 Fixture
- Energy Star Dehumidifier

- Heat Pump Pool Heater
- Removal of 2nd Refrigerator-Freezer
- * Faucet Aerator
- * Hot Water Pipe Insulation
- * Low Flow Showerhead
- * Water Heater Thermostat Setback
- Smart Power Strip

Using the same delineations and color coding, significant differences can be seen in FPL's screening breakdown, but the general point is the same that RIM and the two-year screen must be removed to produce common low-income efficiency measures, including those offered by FPL. One more category has been added to this list in red, indicating measures that FPL additionally removed using an administrative cost screen on top of the RIM and two-year payback screen. It is notable that many measures that are included in Duke and TECO's existing low-income programs are not currently offered by FPL, so those measures are not starred.

- No residential measures pass RIM in FPL's analysis
- Ceiling Insulation (R2 to R38)
- ENERGY STAR Certified Roof Products
- 14 SEER ASHP from base electric resistance heating
- * Duct Repair (only for existing multi-family and manufactured homes)
- Smart Thermostat (EE only) (only for new single family homes)
- Two Speed Pool Pump
- ENERGY STAR Air Purifier

- ENERGY STAR Clothes Washer
- Removal of 2nd Refrigerator/Freezer
- ENERGY STAR Certified Roof Products
- * Duct Repair (only for existing single family homes)
- ENERGY STAR Dehumidifer
- ENERGY STAR Room AC
- Programmable Thermostat (only for new single family homes)
- Heat Pump Pool Heater
- * Low Flow Showerhead (only for multi-family and single family homes)
- ENERGY STAR Dishwasher
- ENERGY STAR Imaging Equipment
- Programmable Thermostat (only for new multi-family and manufactured homes)
- CFL – 23W
- CFL – 15W Flood (Exterior)
- LED – 14W
- LED – 9W
- LED – 9W Flood (exterior)
- Linear LED
- Low Wattage T8 Fixture (Bulb)
- * Faucet Aerator (all homes except for new manufactured homes)
- * Hot Water Pipe Insulation
- * Low Flow Showerhead (only for manufactured homes)
- Water Heater Thermostat Setback

Q: Are there issues with the administrative cost screen?

A: The primary problem with the administrative cost test is that FPL appears to assign highly unreasonable administrative costs to some of their residential measures; so even the most cost effective and fastest payback measures are removed. For instance, the administrative cost assigned to a CFL lightbulb is $29. The same $29 is added to the cost of a single faucet aerator.[25] These costs are indefensible for any reasonable delivery mechanism and suggest a heightened level of scrutiny is warranted on administrative costs in these analyses going forward.

Mr. Grevatt provides context using administrative costs in other jurisdictions and adds additional detail to the problem with the administrative cost test in his testimony.

Q: Are there other factors in the utility modeling that would lead to overly-conservative estimates of low-income potential?

A: Because low-income free ridership is zero or near-zero, use of standard baselines likely underestimates actual savings by a considerable degree. Additionally, deeper efficiency programs for low-income customers can include early replacement for large energy using equipment such as heating, air conditioning, water heaters, and refrigerators, but the analysis in this proceeding appears not to appropriately capture this savings potential. Additional instances of unreasonably high administrative costs could not be fully reviewed prior to filing this testimony and reflect another factor that could result in a potentially large underestimation of actual low-income efficiency savings potential.

IV. Calculation of Specific Low-income Energy Efficiency Targets for Each Utility

Q: What methodology do you propose be used to evaluate low-income energy efficiency savings potential as part of the Energy Efficiency Act goal setting process?

A: I propose starting with the residential portion of each utility's achievable TRC potential, with the following three adjustments described in Mr. Grevatt's testimony:

- Remove the two-year payback screen.
- Add the 14 SEER Air Source Heat Pump from base electric resistance heating[26] (FPL only).[27]
- Reduce Economic Potential by 50% to determine Achievable Potential.

This corrected Achievable Potential is then multiplied by the percentage of population for each utility that is at or below 200% of the federal poverty level. This provides the total 10 year efficiency savings potential for low-income customers.

Q: What are the total residential Achievable Potential savings used for these calculations?

Table 2 below has the residential Achievable Potential savings from Mr. Grevatt's testimony used for calculating the low-income efficiency targets below. These figures were drawn from Exhibit JMG-2 and FPL's were additionally adjusted to reflect the addition of SEER 14 ASHP as per Grevatt Testimony Table 4.

Table 2. Residential Achievable Potential Savings from Grevatt Testimony

	10-Year Total	Summer Peak (MW)	Winter Peak (MW)
FPL	1,077 GWh	337	187
Duke	1,530 GWh	663	303
TECO	323 GWh	64	51
Gulf	381 GWh	83	79
OUC	155 GWh	37	19
JEA	336 GWh	80	49

Q: What is the low-income energy efficiency savings potential for each Energy Efficiency Act utility?

Table 3 below identifies the energy saving potential for each utility's low-income customers for 2020-2029.

Table 3. Energy Saving Potential for Utilities' Low-Income Customers (2020-2029)

	10-Year Total	Summer Peak MW	Winter Peak MW
FPL	395 GWh	124 MW	69 MW
Duke	572 GWh	248 MW	113 MW
TECO	117 GWh	23 MW	18 MW
Gulf	133 GWh	29 MW	28 MW
OUC	67 GWh	16 MW	8 MW
JEA	125GWh	30 MW	18 MW

Q: How does the actual performance of Energy Efficiency Act utilities from 2015-2018 compare to these targets?

A: A wide disparity can be seen between the low-income efficiency program performances of these utilities since the start of the past Energy Efficiency Act cycle.

By a large degree, the top performers have been TECO, Duke, and Gulf. They have served vastly more households and delivered far more energy savings, both in absolute terms and in proportion to their relative size. Truly these utilities are to be commended for the difference they are making in their communities and clearly they set the standard by which the performance of the other utilities in Florida should be evaluated. However, even these utilities have significant room for improvement.

FPL and OUC had by far the worst performance in both absolute and proportionate terms. Adjusted for their respective total residential customer counts, Duke and Gulf both delivered more than 20 times the low-income energy savings of FPL and OUC – while TECO delivered nearly 50 times the savings of these lowest performing utilities. Notably OUC dramatically reduced their kWh savings from its high point in 2015, down to serving just 6 customers with their low-income program in 2018.

Table 4 below is a comparison between the average annual low-income efficiency targets I recommend for years 2020-2029 and the actual four-year average low-income program performance of each utility from 2015 – 2019, as reported annually by the utilities to this Commission.

Table 4. Recommended Average Annual Low-Income Efficiency Targets (2020-2029) Compared to Actual Four-Year Average Low-Income Program Performance

	2020-2029 Ave Annual Target (GWh)	2015-2018 Ave Annual Performance (GWh)
FPL	39.5	0.9
Duke	57.2	7.9
TECO	11.7	7.5
Gulf	13.3	1.9
OUC	6.7	0.05
JEA	12.5	1.1

Q: How do these proposed targets for FPL compare to the company's historic levels and their 2020-2029 proposed low-income target?

A: FPL has poverty levels that are similar to their peers in percentage terms (36.7%), but far larger in absolute terms (over 3 million). By contrast, as noted above, their historic performance (5,989 customers served) has lagged far behind their two next largest peers in Florida, Duke (22.9 times higher kWh saved, 65,284 customers served)[28] and TECO (51.6 times higher kWh saved, 27,346 customers served).[29] Their proposed low-income savings target, averaged over the next ten years, is just 3.8 times higher than their 2015-2018 performance, which would still lag behind the actual performance by Duke (6 times higher) and TECO (13.6 times higher) over the past four years. To their credit, FPL was the only utility to request Commission approval for a specific low-income efficiency target. Unfortunately, what they proposed falls far below what their peers have already accomplished and even farther below the target I recommend.

SECTION V: ADDITIONAL COMMISSION GUIDANCE FOR PROGRAM PLANNING

Q: Could additional Commission direction to the utilities prior to their development of DSM Plans lead to deeper savings, improved access for eligible customers, and increased overall savings achieved?

A: Yes. Direction from the Commission provides the utilities, intervenor parties, and the public with clarity on the Commission policy goals and expectations. In the last proceeding, Commission guidance focused Energy Efficiency Act utilities on deploying energy efficiency programs for low-income customers, while affording them the flexibility to offer some of the most impactful measures that otherwise would have been screened out by the RIM test and two-year payback screen.

In this Energy Efficiency Act proceeding, I have recommended that the Commission specify the TRC test as the standard for evaluating low-income efficiency potential and formalize targets for each utility. I also believe there are two additional subjects that warrant Commission guidance as part of its decision-making in this proceeding.

Q: Please describe your first recommendation for each utility to offer distinct delivery channels for far-reaching and deeper-savings efficiency programs.

A: I recommend the Commission direct each of the FEECA the utilities to offer two distinct delivery channels for efficiency programs.

One program delivery channel should aim to reach large numbers of customers quickly and at relatively low cost. These neighborhood-style programs have a valuable role in serving large numbers of low-income customers relatively inexpensively.

But the level of savings that come from a handful of minor efficiency measures do not, in of themselves, reduce bills enough to significantly eliminate high energy burdens. Lighting, faucet aerators, and minor air sealing projects are common features of Florida utility programs targeting customers in low-income neighborhoods; but larger scale improvements like HVAC equipment replacement, insulation, water heaters, and appliances upgrades, and comprehensive air sealing for ductwork and building envelopes do more to address the root causes of high energy burdens by eliminating significantly more energy waste and therefore substantially reduce monthly energy bills. Therefore, the other program delivery channel should strive to capture deep savings for each participant, sufficient to reduce electric bills enough to materially improve the financial standing of the low-income customers served every month for many years to follow.

Duke, TECO, and FPL each offer both of these delivery channels, albeit there is currently a wide chasm between these utilities in both program performance and transparency.[30] Gulf and JEA each have only broad-based neighborhood-style programs, while OUC has historically just offered a deeper savings program. By offering both types of programs, the utilities should be able to reach relatively large portions of their low-income customers within a short number of years. The reach of these programs can be quite impressive within a few years. From 2015-2018, Duke reached 15% of eligible customers,[31] while TECO reached 23.4%.[32]

While the deeper-savings program could have its own intake system, the broad-based neighborhood-style programs could also help identify candidate customers while in the field, thereby leveraging administrative resources and helping identify otherwise hard to reach customers that are in great need. Struggling families, the elderly, disabled individuals, veterans, and otherwise hard to reach customers who are in need could all benefit from this kind of pro-active outreach and deep savings projects. Separate tracking and reporting on program performance for both the neighborhood-style program and the deeper savings program should be standard practice going forward. TECO and Duke already do this in their annual efficiency reporting to the Commission.

Q: Please describe your second recommendation for each utility to ensure participation opportunities for residents across all categories of housing.

A: My second recommendation is to direct the utilities to provide meaningful program participation opportunities for customers in all types of housing, including small and large multifamily housing, manufactured homes and renters, as well as single-family owner-occupied homes. Table 5 below shows the relative proportion of each housing type by utility service territory. Exhibit FBW-5 also shows geographically where in the state manufactured homes are located. Different housing types, physical conditions, location and whether a customer owns or rents are all factors that should inform low-income efficiency offerings and all low-income customer have the opportunity to participate. For some utilities, many low-income customers are excluded from participation because they live in a housing type that the utility does not serve, like multi-family and manufactured homes in FPL's service territory.[33]

Table 5. Relative Proportion of Housing Type by Utility Service Territory [34]

Residential Housing Stock	DEF	FPL	GPC	JEA	OUC	TECO
Single Family	65.1%	58.5%	68.2%	65.7%	50.4%	63.6%
Small/Medium Multifamily	16.3%	18.7%	15.4%	20.5%	31.3%	19.3%
Large Multifamily	7.7%	17.4%	6.9%	8.7%	16.3%	8.2%
Manufactured	10.8%	5.4%	9.3%	5.1%	1.9%	8.7%
Estimated # of Units	1,420,331	3,842,475	247,773	343,443	78,700	606,805

Q: Why should this guidance be given during this proceeding, rather than after the utilities file their 2020 DSM Plans?

A: Making these priorities known to the utilities prior to developing their DSM Plans will lead to better outcomes for all low-income customers and provide the utilities with assurances that developing such programs will be supported by the Commission. Ultimately, this should lead to greater certainty and consistency among the utilities, greater access to program participation for low-income customers, and deeper savings for the customers who most need it – all while increasing overall savings impact for low-income customers, which is a goal all parties to this proceeding should be able to get behind.

Q: Does this conclude your testimony?

A. Yes, it does.

[1] American Council for an Energy Efficient Economy ("ACEEE"), 2016 "Lifting the High Energy Burden in America's Largest Cities." https://aceee.org/research-report/u1602, Exhibit FBW-2.
[2] National Association for the Advancement of Colored People ("NAACP") 2017 "Just Energy Policies: Model Energy Policies Guide." https://www.naacp.org/wp-content/uploads/2014/03/Just-Energy-Policies_Model-Energy-Policies-Guide_NAACP.pdf, Exhibit FBW-3.

[3] U.S. Census Bureau, 2013-2017 American Community Survey (ACS) 5-Year Estimates Tables S1701 Poverty Status in the Past 12 Months; B25033 Total Population in Occupied Housing Units by Tenure by Units in Structure; S0103 Population 65 Years; B25127 Tenure by Year Structure Built by Units in Structure via American Fact Finder: https://factfinder.census.gov.
[4] U.S. Energy Information Administration, Household Energy Insecurity, released October 2017, revised May 2018: https://www.eia.gov/consumption/residential/data/2015/hc/php/hc11.1.php
[5] Board of Governors of the Federal Reserve System, "Report on the Economic Well-Being of U.S. Households in 2018." 2019 https://www.federalreserve.gov/publications/files/2018-report-economic-well-being-us-households-201905.pdf, Exhibit FBW-4.
[6] Center for Financial Services Innovation.2012. "A Complex Portrait: An Examination of Small-Dollar Credit Consumers." www.fdic.gov/news/conferences/consumersymposium/2012/a%20complex%20portrait.pdf.
[7] Florida Public Service Commission, Order No. PSC-14-0696-FOF-EU, issued December 16, 2014 in Docket Nos. 130199-EI, 130200-EI, 130201-EI, 130202-EI, 130203-EM, 130204-EM, 130205-EI, at p. 27.
[8] *Id.*
[9] *Id.*
[10] Florida Public Service Commission, Order No. PSC-15-0323-PAA-EG, issued August 11, 2015 in Docket No. 150081-EG, at p. 9.
[11] *Id.* at 6.
[12] Florida Public Service Commission, Order No. PSC-15-0331-PAA-EG, August 19, 2015 in Docket No. 150085-EG, at p. 6.
[13] *Id.*
[14] FPL appears to assert here that efficiency programs are not cost-effective without a RIM score greater than 1.0, a subject discussed in greater detail further in my testimony.
[15] Testimony of Tom Koch on behalf of Florida Power & Light, at 37, April 12, 2019.
[16] Testimony of Kevin Noonan on behalf of OUC, at 11, April 12, 2019.
[17] *Id.* at 12.
[18] *Id.* at 29.
[19] Florida Public Service Commission, Order No. PSC-14-0696-FOF-EU, issued December 16, 2014 in Docket Nos. 130199-EI, 130200-EI, 130201-EI, 130202-EI, 130203-EM, 130204-EM, 130205-EI, at p. 27.
[20] *Id.* at 22; *see also* section 366.82(3)(b), Fla. Stat.

[21] ACEEE "State-Level Strategies for Tackling High Energy Burdens: A Review of Policies Extending State- and Ratepayer-Funded Energy Efficiency to Low-Income Households" 2018. https://aceee.org/files/proceedings/2018/node_modules/pdfjs-dist-viewer-min/build/minified/web/viewer.html?file=../../../../../assets/attachments/0194_0286_000404.pdf#search=%22drehobl%22, Exhibit FBW-6.
[22] Testimony of Jim Grevatt on behalf of Southern Alliance for Clean Energy, at 17, June 10, 2019.
[23] *Id.*
[24] *Id.*
[25] *Id.* at 32.
[26] *Id.* at 29-31.
[27] TECO's economic potential analysis also contains the same issue, but I have not corrected for it in the following calculations.
[28] Duke Energy Florida Demand Side Management Annual Report for 2018. Filed March 1, 2019, Exhibit FBW-7.
[29] TECO Demand Side Management Annual Report for 2018. Filed March 1, 2019, Exhibit FBW-8.
[30] Note: As noted above, DEF and TECO's performance greatly exceeds FPL and FPL does provide disaggregated data on their two delivery channels, while both DEF and TECO do.
[31] Duke Energy Florida Demand Side Management Annual Report for 2018. Filed March 1, 2019 (NOTE: this is counting only Duke's Neighborhood Energy Savers program. There are additional participants in Dukes Low Income Weatherization program that are not include here), Exhibit FBW-7.
[32] TECO Energy Florida Demand Side Management Annual Report for 2018. Filed March 1, 2019, Exhibit FBW-8.
[33] Florida Public Service Commission, Order No. PSC-15-0331-PAA-EG, issued August 19, 2015 in Docket No. 150085-EG, at p. 3.
[34] U.S. Census Bureau, 2013-2017 ACS 5-year Public Use Microdata Samples (PUMS) Florida Housing Units Records (January 17, 2019), https://www2.census.gov/programs-surveys/acs/data/pums/2017/5-Year/csv_hfl.zip; 2013-2017 ACS 5-year Estimates Table B25024 Units in Structure via American Fact Finder https://factfinder.census.gov ; *see also* Platts Electric Power Data, Electric Utility Service Territories, U.S. Census Bureau, ACS 5-Year Census Tract Estimates Units in Structure.

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PROFESSIONAL EXPERIENCE

Energy Efficiency Director: Southern Alliance for Clean Energy, Knoxville, TN **April 2018 – Present**

- Regulatory filings, testimony, strategy, and stakeholder management on integrated resource planning, energy efficiency program design, cost recovery and related matters throughout the Southeast.

Senior Policy Director: Alliance for Affordable Energy, New Orleans, LA **February 2017 – April 2018**

- Regulatory filings, strategy, and stakeholder management on integrated resource planning and energy efficiency rulemaking, power plant proposals and related matters at the city and state level.

Consultant: Utility Regulation and Energy Policy **December 2014 – February 2017**

- Technical and strategic guidance on clean energy policy and utility regulation for Opower, Gulf States Renewable Energy Industries Association, the Alliance, and Mississippi PSC candidate Brent Bailey.

Candidate: Louisiana Public Service Commission **July - December 2014**

- Won the open primary and secured 49.15% of the vote in the general election against a highly favored, well-funded incumbent.
- Raised nearly $500,000 in campaign contributions while publicly pledging not to accept money from monopoly companies regulated by the PSC.
- Campaign focused on ethical leadership, reducing bills, energy efficiency, the rights of customers to generate solar energy, and government transparency.

Utility Policy Director: Alliance for Affordable Energy, New Orleans, LA **October 2005 – June 2014**

- Directed successful policy efforts for energy efficiency, renewable energy, and integrated resource planning at the Louisiana PSC and New Orleans City Council, spurring every major Louisiana utility investment in clean energy over the past decade.
- Reviewed and filed intervenor comments, met with commissioners, utilities, and technical consultants, assembled and managed relationships with a broad coalition of stakeholders, worked with media, and served as the organization's public face.
- Launched and managed energy efficiency and solar workforce training programs, public education campaigns, and direct service projects to improve energy performance in over 100 homes following the city's rebuild post-Katrina.

Owner and Director: EcoPark LLC (d.b.a. The Building Block), New Orleans, LA **February 2008 – Present**

Created an innovative co-location business center to serve as a catalyst for moving green commerce and social entrepreneurship to the mainstream.

- Developed the business concept and plan, brought initial funding to the project, hired staff, established brand identity, and secured tenants.

Sustainable Development Team Facilitator: Shell International, New Orleans, LA **May 2001 – June 2004**

- Worked to facilitate a paradigm shift within corporate management's core business practices toward social and environmental issue management.
- Engaged a diverse team of professionals across the company to identify energy and resource inefficiencies and methods to reduce carbon emissions from venting and flaring in oil and natural gas exploration and production.
- Analyzed ways to incorporate sustainability accounting into each stage of new venture development for major drilling projects.

EDUCATION

Tulane University

- **Master of Arts in Latin American Studies, 2011**
  Concentration in environmental law, business, and international development
- **Bachelor of Arts with Honors in Latin American Studies, 2001**

ADDITIONAL PROFESSIONAL/PUBLIC SERVICE

Board President for the Louisiana Green Corps, Gulf States Renewable Energy Industry Association; Mayor's Sustainability Task Force; founder of Groundwork NOLA

APRIL 2016

Lifting the High Energy Burden in America's Largest Cities:

How Energy Efficiency Can Improve Low Income and Underserved Communities

Ariel Drehobl and Lauren Ross

ENERGY EFFICIENCY FOR ALL

ACEEE
American Council for an Energy-Efficient Economy

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Ariel Drehobl joined ACEEE in 2015. She conducts research and analysis on local-level energy efficiency policies and initiatives, with an emphasis on low-income energy efficiency. Ariel earned her master of science in environmental science, policy, and management from a joint-degree program at Central European University, Lund University, and the University of Manchester. She earned her bachelor of arts from Northwestern University.

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Contents

Executive Summary

This report provides a snapshot of energy burdens in cities across the US. We focus on the high home energy burdens faced by select groups in major metropolitan areas.[1] Years of analysis by the firm of Fisher Sheehan & Colton determined that low-income households pay proportionally more than the average household for energy costs.[2] Our analysis builds on this research as we take a closer look at energy burden in specific household groups. In the first half of this report, we analyze data from the US Census Bureau's 2011 and 2013 American Housing Survey to determine energy burden values for 48 of the largest US cities and specific households within each city. In the second half of the report, we discuss strategies for alleviating high energy burdens, with a focus on policies and programs to increase the impact of energy efficiency initiatives in these communities.

Families who face higher energy burdens experience many negative long-term effects on their health and well-being. These families are at greater risk for respiratory diseases and increased stress, and they can experience increased economic hardship and difficulty in moving out of poverty. Our research determined that the overwhelming majority of single-family and multifamily low-income households (those with income at or below 80% of area median income), minority households, low-income households residing in multifamily buildings, and renting households experienced higher energy burdens than the average household in the same city.[3] For example, the median US energy burden across all cities in our sample was 3.5%. The median low-income household's energy burden was more than twice as high at 7.2%, and three times greater than higher income households (2.3%). Overall, low-income households experienced the highest median energy burden (7.2%), followed by African-American households (5.4%), low-income households living in multifamily buildings (5.0%), Latino households (4.1%), and renting households (4.0%).[4] We also examined the results by region and found that these groups faced the highest average energy burdens in the Southeast and Midwest regions.

Research Results: US Energy Burden Landscape

The efficiency of housing stock is an important factor that influences a household's energy burden. Low-income households, renters, African-American households, and Latino households paid more for utilities per square foot than the average household, indicating that they reside in less efficient housing (see table ES1).

When we compared each group's expenditures on energy per square foot with the median household expenditure, we were able to determine the extent to which home inefficiency contributed to energy burden as compared with lower incomes. We found that for low-income households and for multifamily low-income households, bringing housing stock up to the efficiency of the median household would eliminate 35% of excess energy burden, reducing energy burden from 7.2% to 5.9%. For African-American, Latino, and renting households, 42%, 68%, and 97% of their excess energy burdens, respectively, could be eliminated by raising household efficiency to the median.

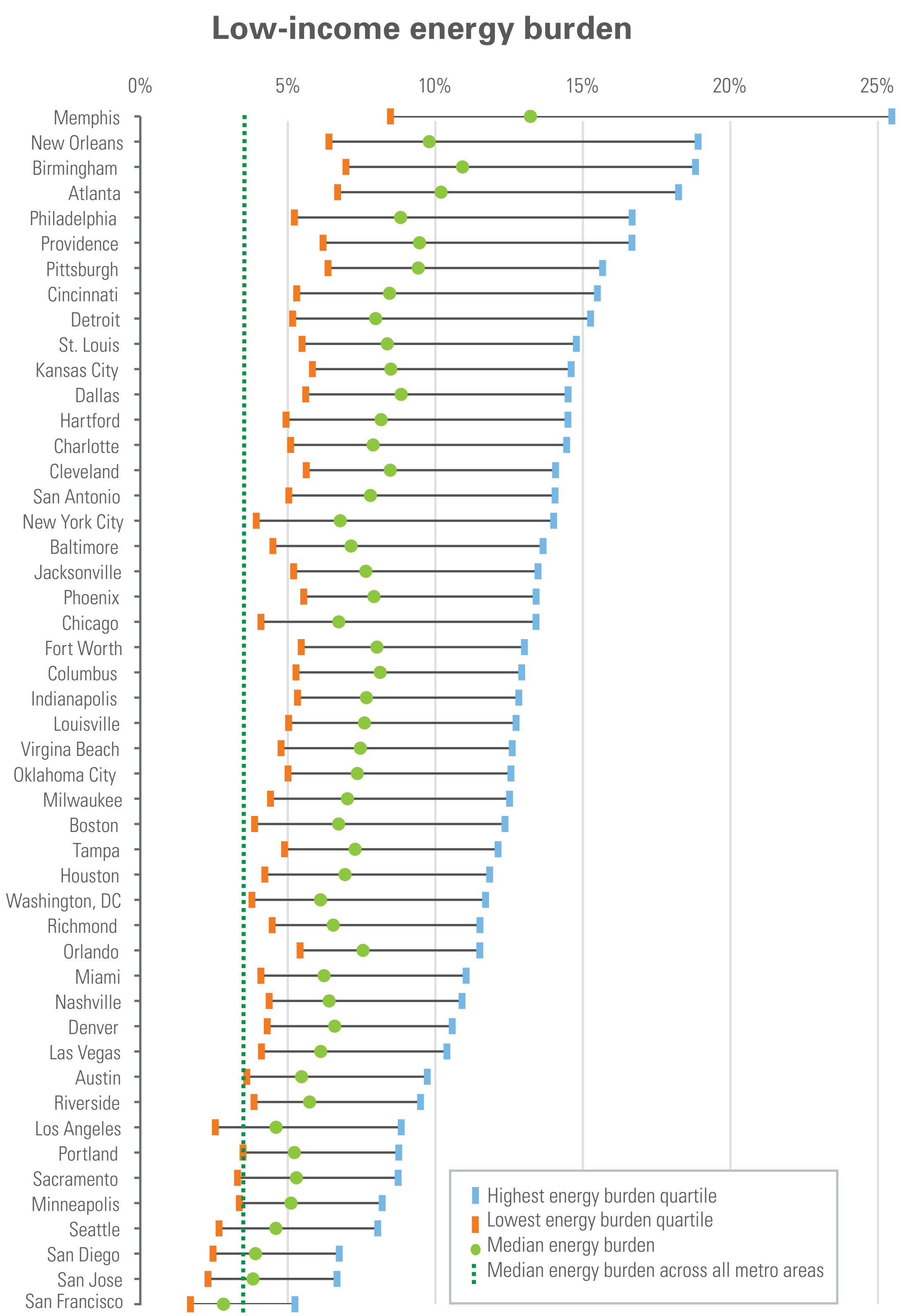
By examining these specific groups within cities, we found that many households experienced energy burdens that greatly exceeded both the overall median of 3.5% and their city medians. Median energy burdens were as high as 13% for some groups.

TABLE ES1. Median income, utility bill, energy burden, and unit size for households based on income type, building type, building ownership, and household race for groups across all metro areas

	Household type	Median annual income	Median size of unit (square feet)	Median annual utility spending	Median annual utility costs per square foot	Median energy burden[1]
Income type	Low-income[2] (≤80% AMI)[3]	$24,998	1,200	$1,692	$1.41	7.2%
	Non-low-income	$90,000	1,800	$2,112	$1.17	2.3%
	Low-income multifamily (≤80% AMI)	$21,996	800	$1,032	$1.29	5.0%
	Non-low-income multifamily	$71,982	950	$1,104	$1.16	1.5%
Building ownership	Renters	$34,972	1,000	$1,404	$1.40	4.0%
	Owners	$68,000	1,850	$2,172	$1.17	3.3%
Head of household race	White	$58,000	1,600	$1,956	$1.22	3.3%
	African-American	$34,494	1,290	$1,920	$1.49	5.4%
	Latino	$39,994	1,200	$1,704	$1.42	4.1%
All households	N/A	$53,988	1,573	$1,932	$1.23	3.5%

[1] Energy burden is the percentage of household income that is spent on energy bills. To calculate median energy burden, we calculated energy burden for all households and then took the median. This value differs from the median energy burden that is calculated using median annual utility spending and income.
[2] Low-income includes both single- and multifamily households. [3] Area median income (AMI) is the median dollar amount that divides the population into two equal parts.
Source: American Housing Survey (Census Bureau 2011 and 2013a).

FIGURE ES1. **Low-income (≤80% AMI) household energy burden for the median, highest energy burden quartile, and lowest energy burden quartile households. The orange bars represent the beginning of the quartile of low-income households with the lowest energy burden. The blue bars represent the beginning of the quartile of low-income households with the highest energy burden. These data include both single- and multifamily low-income households.**



For low-income households, we found that energy burden varied substantially. Figure ES1 presents energy burden data for low-income households in each city at the lowest, median, and highest energy burden quartiles. In 17 cities—which is more than one-third of the cities studied—a quarter of low-income households experienced an energy burden greater than 14%, substantially higher than the 3.5% average for all households.

While energy efficiency programs provide benefits beyond energy savings, we find they are an underutilized strategy that could complement bill assistance and weatherization programs to reduce high energy burdens in low-income communities.

Strategies for Improving Energy Efficiency in Low-Income Communities

Reducing high energy burden on low-income households is a well-established policy objective at the federal, state, and local levels. To help meet this objective, many state utility regulators require that utilities provide bill assistance programs that complement federal programs, such as the Weatherization Assistance Program (WAP) and the Low Income Home Energy Assistance Program (LIHEAP). In addition, many utility regulators require utilities with energy efficiency programs to target low-income customers.

Participants in energy efficiency programs, utilities, and whole communities experience multiple benefits from increased investments in energy efficiency. These benefits include improved health and safety, reduced risk of utility rate increases, reduced costs associated with arrearages and shutoffs, investment in the local economy, and local job creation, among others.[5] While energy efficiency programs provide benefits beyond energy savings, we find they are an underutilized strategy that could complement bill assistance and weatherization programs to reduce high energy burdens in low-income communities.

We propose the following strategies for improving energy efficiency in low-income communities: (1) Improve and expand low-income utility programs. (2) Collect, track, and report demographic data on program participation. (3) Strengthen policy levers and leverage existing programs. (4) Utilize the Clean Power Plan to prioritize investment in low-income energy efficiency.

Improve and Expand Low-Income Utility Programs

To increase program impact in low-income single- and multifamily housing, energy efficiency program managers should design programs to meet the needs of diverse low-income communities, include a range of eligible measures and services, coordinate delivery with other services, align and add on to existing weatherization efforts, address health and safety, and incorporate energy efficiency education into program design.[6]

Low-income programs should also target multifamily customers, who are often underserved by energy efficiency programs. More than two-thirds of the multifamily rental market consists of households that have an annual household income of less than $50,000 (NMHC 2015). Yet residential energy efficiency programs administered by states and utilities have historically focused on single-family, owner-occupied housing. Efficiency measures are far less likely to be installed in multifamily rentals than in any other type of housing, leaving significant energy savings unrealized. Examples of best practices in multifamily programs include integrating direct installation and rebate programs, streamlining rebates and incentives, offering multiple pathways to participation, and incorporating on-bill repayment or low-cost financing, among others.[7]

Access to up-front capital is one of the many barriers to energy efficiency for low-income single- and multifamily households and property owners. Financing programs—provided by several utilities and public and community-based entities—can serve as a complement to energy efficiency programs for low-income customers. With strong consumer protections in place, energy efficiency loans can be beneficial for some households and allow the financing of cost-saving measures. Financing options can also benefit multifamily building owners who lack the up-front capital to invest in energy efficiency retrofits.

Collect, Track, and Report Demographic Data on Program Participation

By collecting and making demographic data on program participation public, utilities can assess the extent to which their programs are serving different segments of the population, especially those customers known to experience high energy burdens. Demographic information can inform program design and marketing and outreach strategies. Examples of demographic data that should be incorporated into program evaluation include income level, renter versus owner, multifamily versus single family, and race/ethnicity.

Strengthen Policy Levers and Leverage Existing Programs

Utility regulators and boards of publicly owned utilities should aid utilities in developing, promoting, and executing strong low-income programs by approving and setting goals and guidelines for spending, savings, cost recovery, and cost-effectiveness testing. Additionally, state and local governments can set policy directives that support low-income energy efficiency, including disclosure and benchmarking policies for multifamily buildings, workforce development initiatives, state-level requirements for utility-delivered energy efficiency that include low-income goals, and other special efforts. Some public utility commissions (PUCs) also set low-income energy savings goals and spending requirements in order to increase investment in low-income energy efficiency. Many community-based organizations, city governments, and local utilities can petition PUCs to advance stronger low-income savings goals.

Few utilities include the nonenergy benefits of energy efficiency in their cost-benefit testing.[8] Both PUCs and local governments can encourage or require that cost-effectiveness testing take into account the multiple benefits of low-income energy efficiency programs.

Utilize the Clean Power Plan to Prioritize Investment in Low-Income Energy Efficiency

The Clean Power Plan—the first rulemaking to set limits on carbon pollution from power plants—offers another incentive for investment in low-income energy efficiency. States have several choices in developing their compliance plans, and they have the opportunity to prioritize low-income energy efficiency programs in this process. States can also opt into the Clean Energy Incentive Program, which offers early credit for energy efficiency projects in low-income communities during the two years before the start of the compliance period. These new regulations can make investment in low-income energy efficiency more attractive at the state and local levels.

Conclusion

We determined that low-income households and other groups experience higher energy burdens than households on average. Low-income families often live in less efficient housing and pay more per square foot on energy costs. Current utility-led energy efficiency programs could better complement bill assistance and weatherization programs to reduce high energy burdens in low-income communities. Our research identified several strategies to ramp up energy efficiency in these communities. While these represent important steps, we still have much work to do to increase energy affordability among vulnerable communities across the country.

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1 Energy burden refers to the percentage of gross household income spent on energy bills.

2 For more information on Fisher Sheehan & Colton's previous work on the Home Energy Affordability Gap, see www.homeenergyaffordabilitygap.com.

3 Area median income (AMI) is the median dollar amount that divides the population into two equal parts. HUD uses AMI to determine eligibility for low-income programs based on metropolitan area and household size.

4 Single-family low-income households experienced the highest average energy burden of 7.8%. We did not specifically analyze these households in this study.

5 For more information, see C. Russell et al., *Recognizing the Value of Energy Efficiency's Multiple Benefits* (Washington, DC: ACEEE, 2015).

6 For a more comprehensive discussion on successful low-income utility programs, see R. Cluett, J. Amann, and S. Ou, *Building Better Energy Efficiency Programs for Low-Income Households* (Washington, DC: ACEEE, 2016).

7 For a more comprehensive discussion of best practices in multifamily energy efficiency programs, see K. Johnson, *Apartment Hunters: Programs Searching for Energy Savings in Multifamily Buildings* (Washington, DC: ACEEE, 2013).

8 See M. Kushler, S. Nowak, and P. Witte, *A National Survey of State Policies and Practices for Evaluation of Ratepayer Funded Energy Efficiency Programs* (Washington, DC: ACEEE, 2012).

Introduction

This report analyzes energy affordability in cities across the United States, focusing on the high home energy burdens faced by select groups in major metropolitan areas. As defined in this study, a household's energy burden is its total annual utility spending (electric, gas, and/or other heating fuel) as a percentage of total annual gross household income. We focus on households in select cities due to the high concentration of poverty in cities, as well as the availability of city-level data.[9] However households in rural areas also suffer from high energy burdens (McCormick 2015). Our focus on cities does not imply that high energy burdens are not a serious issue in rural communities.

Years of analyzing home energy burdens by the firm of Fisher Sheehan & Colton have determined that low-income households pay proportionally more than the average household for energy (Fisher Sheehan & Colton 2013). Our analysis builds on this research as we look more closely at the energy burden of specific household groups. For low-income families, the majority of household income goes toward rent, transportation, and energy, in that order (CNT 2016).[10] In this study, we measure only home energy burden, which includes all spending on a home's energy utility bills. Spending on rent, water, and transportation is outside the scope of this analysis.

Annual energy bills may be affordable for one family but not for another due to differences in income. For example, a low-income family and middle-income family may pay the same $1,800 per year on utilities ($150 monthly average), but for the low-income family, this will be a larger burden on the household.

The data we examine show that the median energy burden for low-income households is more than two times that of the median household (7.2% and 3.5%, respectively), and three times greater than higher income households (2.3%).

This utility bill may represent 8% of annual household income for the low-income family and only 3% for the middle-income family, indicating that the low-income household faces a disproportionate energy burden. The data we examine show that the median energy burden for low-income households is more than two times that of the median household (7.2% and 3.5%, respectively), and three times greater than higher income households (2.3%). Low-income households also pay more per square foot for energy than the average household. These families experience higher energy burdens not only because of lower incomes but also because of inefficiencies in the home. This causes families to face trade-offs between energy and other basic necessities, such as food and medical care.

In the first half of this report, our analysis uses data from the US Census Bureau's *American Housing Survey* (AHS), a national sample of households, to systematically measure energy burdens in metro areas. In the second half of the report, we highlight several policies and programs that can reduce the high energy burden of many households, with a particular focus on programs to improve the energy efficiency of low-income housing. We conclude with an overview of recommended strategies for increasing investments in low-income energy efficiency.

While high energy costs are an important social and economic issue, few have systematically analyzed how energy burdens vary across the country and among specific groups. By developing a clearer understanding of the intersection of energy costs and household demographics, stakeholders can better target investments in energy efficiency to create more economically viable and healthy communities.

9 According to the Brookings Institute's 2013 study, poverty is concentrated in metropolitan areas. Of the families at or below the federal poverty level, 7.3 million live in rural areas as compared to 13.4 million in large cities and a growing 16.4 million in suburbs (Ross 2013).

10 See the Center for Neighborhood Technology's Housing + Transportation Index for more information on housing and transportation affordability: www.cnt.org/tools/housing-and-transportation-affordability-index.

Causes and Effects of High Home Energy Burden

What Is a High Home Energy Burden, and Why Is It Important?

There is no widely accepted value or threshold that establishes whether a household faces a high or unaffordable energy burden. Some researchers suggest home energy bills are unaffordable when they represent more than 6% of a household's annual gross income; others suggest a threshold of at least 10 or 11% of a household's annual gross income (Fisher Sheehan & Colton 2015; Heindl 2015; Hernández and Bird 2010).[11] Fisher Sheehan & Colton recommends using an affordability standard of 6% of gross household income based on the idea that a household can afford to spend about 30% of income on shelter costs and that about 20% of shelter costs are used for energy bills. Meanwhile, the Applied Public Policy Research Institute for Study and Evaluation (APPRISE) uses a model that identifies a severe shelter burden as 50% or more of income, and energy costs as about 22% of shelter costs.[12] Using this approach, APPRISE suggests that analysts use 11% of income as an indicator of high energy burden (APPRISE 2007). Other researchers and policymakers use the area median energy burden as the threshold for affordable energy. For example, the Nevada Percentage of Income program indicates that low-income home energy burden should be no higher than that of a median-income household (Nevada 2013). Others suggest that high energy burden should be defined as twice the median (Liddell et al. 2012; Moor 2012). When we discuss high energy burden in this report, we refer to households with an energy burden greater than the city's median energy burden.

As in the case of housing and transportation costs, low-income households spend a greater proportion of their income on energy costs compared with the average household.

The families who are the worst off—such as those with extremely low incomes or who face sudden economic

hardship—often suffer from high rates of arrearages and potential utility shutoffs due to unpaid energy bills. These families often live in older, less efficient housing stock, which means that their homes require more energy for heating and cooling than newer, more efficient housing (Penney and Kloer 2015). Due to lack of savings, disposable income, and access to credit, low-income households also have fewer choices in regard to housing options, with many low-income families living in units with structural deficiencies that can make energy retrofits not viable. These families also experience greater barriers to upgrading housing stock with traditional efficiency measures, especially in multifamily buildings where the majority of low-income residents are renters (EPC 2013a).

The families who are the worst off—such as those with extremely low incomes or who face sudden economic hardship—often suffer from high rates of arrearages and potential utility shutoffs due to unpaid energy bills.

Causes of High Home Energy Burden

Numerous factors contribute to a high household energy burden. Commonly reported causes of high utility expenses are inefficiencies in housing, such as poor insulation or air leaks; inefficient heating systems and appliances; lack of control over systems and appliances (e.g., in rental households); lack of access to or information about relevant energy efficiency programs; and lack of knowledge about energy conservation measures. High energy burden can also be caused by income reductions, such as loss of employment or support, or an increase in utility bills, such as with additional children or adult household members. In table 1, we list a range of possible physical, economic, policy, and behavioral factors that cause high energy burden.

Even though they spend a larger proportion of their income on energy than the average home, low-income households typically spend less on energy overall. According to the US Energy Information Administration's 2009 *Residential Energy Consumption Survey*, low-income households spend on average $1,690 annually on energy bills, while the average non-low-income household spends $2,134 per year (EIA 2009).[13] However low-income utility bills are lower not because low-income households are more efficient, but often because they live in smaller spaces.

At the same time, low-income households spend much more per square foot on utilities, with an average cost of $1.23 per square foot for low-income households

TABLE 1. Drivers of household energy burden

Type of driver	Examples
Physical	Inefficient and/or poorly maintained HVAC systems
	Heating system and fuel type
	Poor insulation, leaky roofs, and inadequate air sealing
	Inefficient large-scale appliances (e.g., refrigerators, dishwashers) and lighting sources
	Weather extremes that raise the need for heating and cooling
Economic	Chronic economic hardship due to persistent low income (see text box "Income Inequality and Energy Affordability")
	Sudden economic hardship (e.g., severe health event or unemployment)
	Inability or difficulty affording the up-front costs of energy efficiency investments
Policy	Insufficient or inaccessible policies and programs for bill assistance, weatherization, and energy efficiency for low-income households
	Certain utility rate design practices, such as high customer fixed charges, that limit the ability of customers to respond to high bills through energy efficiency or conservation
Behavioral	Lack of access to information about bill assistance or energy efficiency programs
	Lack of knowledge about energy conservation measures
	Increased energy use due to age or disability

versus $0.98 for non-low-income households (EIA 2009). The higher energy cost per square foot in low-income households appears to be, at least in part, a function of energy use, household/appliance efficiency, and unit size. Low-income households make up the majority of multifamily rentals, and families who rent tend to use more energy on average than owner-occupied homes, due in part to the difficulties renters face in regard to energy efficiency investments (Carliner 2013). In addition, the structure and appliances are less efficient in low-income housing (Penney and Kloer 2015). For example, low-income households are more likely to have older and less efficient appliances such as refrigerators and washing machines (EIA 2013). Finally, energy consumption is typically spread over a smaller area in low-income households, which are on average smaller than the average home (Census Bureau 2013a).

Investing in energy efficiency upgrades is often more challenging for low-income households than for higher-income households. For renters, of which the majority are low-income, landlords who do not pay for utilities may not be motivated to invest in efficiency upgrades, and renters may not want to invest, unsure if their tenure will be sufficient to recoup the investment. In many cases, low-income home and building owners are not able to afford the up-front investment needed to upgrade housing stock and equipment. The type of heating system installed in a building will also influence energy burden, as certain heating technologies are more expensive than others. Later in this report, we discuss strategies for overcoming the up-front barriers to energy efficiency investments for low-income households.

Therefore, customers' inability to meet monthly utility payments may lead to higher costs for the utility, which can lead to even higher home energy burdens for all households.

Customers who have difficulty paying their bills may ultimately contribute to additional utility costs that can increase utility bills for all customers. For example, the utility's costs for covering arrearages, bill payment accommodations, and shutoffs are distributed to all ratepayers. Therefore, customers' inability to meet monthly utility payments may lead to higher costs for the utility, which can lead to even higher home energy burdens for all households.

A recent trend toward raising fixed monthly charges on customer utility bills also threatens energy affordability, especially for low-income customers (Kind 2015). Fixed charges are generally applied to all bills equally, or based on peak demand, and are not related to the volume of energy usage. Shifting costs to fixed charges and away from the amount of energy use itself acts as a disincentive for energy efficiency and reduces the ability of the customer to save money by conserving energy (Whited, Woolf, and Daniel 2016). Increases in energy bills due to higher fixed charges pose a real threat to already overburdened households, negating their efforts to avoid high energy bills by reducing consumption. Strategies aimed at improving energy affordability must also address the issue of rising fixed charges and their impacts on low-income customers.

INCOME INEQUALITY AND ENERGY AFFORDABILITY

If income does not increase for all households on par with changes in energy costs, household energy burden for low-income and disadvantaged households will increase in future years. In the largest US cities, income inequality continues to rise and consistently remains higher than the national average (Stone et al. 2015). Between 1979 and 2007, the average income of the bottom 99% of households grew by 18.9%, while the average income of the top 1% of households grew by 200.5% (Sommeiller and Price 2015; Desilver 2015). According to a 2016 Brookings report, declining incomes are an influential factor in present-day inequality, as most households in cities experience growing income inequality between the top 5% and bottom 20% of households (Berube and Holmes 2015). Slow income growth—or even real income decline at the lowest levels—can lead to more extensive economic hardship and unaffordable energy costs. From 2004 to 2014, average US residential electricity prices increased from 9 cents/kWh to 12.5 cents/kWh, an increase of 39% (EIA 2016a). In contrast, average adjusted income grew from $29,900 in 2004 to $30,180 in 2014, an increase of 0.9% (Census Bureau 2014). If energy prices continue to increase more rapidly than income, energy burden will continue to grow for vulnerable households.

Families suffering from high energy burdens also tend to experience stress from living in constant fear of losing necessary electricity and gas service due to inability to pay their bills.

Effects of High Energy Burden

Addressing energy affordability can help to break the cycle of poverty and improve economic development, educational achievement, and public health. High energy burden can cause very real mental and physical health problems for household members due to thermal discomfort, inadequate lighting, unsafe housing conditions, and constant financial and social stress. Individuals who experience high energy burdens may cut back on necessary energy use and inadequately heat, cool, and light their homes, which can result in many negative health consequences.

Studies have found that living in homes that are not properly heated or cooled increases cases of asthma, respiratory problems, heart disease, arthritis, and rheumatism (Heyman 2011; Hernández and Bird 2010; Liddell and Morris 2010; Wright 2004). Children and the elderly are more susceptible to these health impacts. Families suffering from high energy burdens also tend to experience stress from living in constant fear of losing necessary electricity and gas service due to inability to pay their bills.

For many low-income families, this compounds with other stresses, such as difficulty accessing health care, fear of losing their housing, and living in potentially unsafe buildings and neighborhoods. These constant stresses cause serious health problems.

Researchers have also found that high energy burdens affect mental health by creating more stressful environments, increasing social isolation, and negatively impacting educational achievement and emotional resiliency (Li et al. 2014; Dear and McMichael 2011; Liddell and Morris 2010). Families that have trouble paying their energy bills may sacrifice nutrition, medicine, and other necessities in order to avoid shutoffs. These effects are especially detrimental to the physical and mental development of children. Living in underheated homes puts adolescents at double the risk of respiratory problems and five times the risk of mental health problems (Dear and McMichael 2011). Families may also cope with high energy burdens by heating fewer rooms in their home and reducing lighting use (Bruner Spitzer, and Christanell 2012). These stresses can hinder the ability of adolescents to study and complete school assignments, which negatively affects their academic success.

High energy burdens can also cause societal problems extending well beyond the household. For example, 5.5% of low-income customers in California experienced disconnections for nonpayment in 2011 as compared with 2.9% of non-low-income customers. Half of the disconnected households owed less than $315, and 6% of those disconnected did not reconnect within the year. Because of the disconnections, some of these families improvised hazardous methods to light and heat their homes (Watts-Zagha 2011). Additionally, researchers conducted studies in northern Kentucky, St. Paul, and Philadelphia and found utility shutoffs to be one of the primary factors that led to homelessness (Vick and Norton 2008).

Ultimately, the drivers and effects of high energy burden create a negative feedback loop that can become a trap that is hard to escape. Various factors associated with low income contribute to a high energy burden. In turn, higher utility bills require more of a family's income and make them more likely to remain in poverty.

The troubling reality is that many households resort to high-cost payday lending in order to pay their utility bills, which can further exacerbate the cycle of poverty. A 2012 study found that paying utility bills was the most common reason why individuals took out a payday loan (Levy and Sledge 2012). These loans are small, short-term loans with high interest rates that can make repayment difficult and costly. By addressing energy affordability, policymakers can help to break the cycle of poverty and increase economic development, educational achievement, and public health.

11 For more information on defining the energy affordability gap, see Fisher Sheehan & Colton's Home Energy Affordability Gap research at www.homeenergyaffordabilitygap.com. They provide a model that calculates the monetary gap between actual and affordable home energy bills at the county level for segments of the low-income population. Their model includes factors left out of this research, such as household size, fuel mix, and heating and cooling degree days.

12 In this context, shelter costs include all expenses relating to housing, such as rent or mortgage payments, condominium fees, utilities, and property taxes.

13 In 2009, the US Energy Information Administration's Residential Energy Consumption Survey defined "low-income" as less than or equal to 150% of the federal poverty line (FPL). This survey compiles data from a household survey and energy supplier survey and uses estimates of consumption and expenditures.

The US Home Energy Burden Landscape

We took a snapshot of energy burdens across the largest US metropolitan areas, with a focus on select groups. These data have helped us understand the disproportionate impact of energy burden on vulnerable households and the extent to which this experience varies regionally.

Methodology

Research shows that low-income households, especially renters and minority households, face disproportionate energy cost burdens (Hernández 2015). As part of this analysis, we focus on the energy burdens experienced by four groups of households:

- *Low-income households*: those who report an annual gross household income at or below 80% of the area median income, including both single- and multifamily households[14]
  - *Low-income multifamily households*: those who report an annual gross household income at or below 80% of the area median income and reside in a building with five or more units
- *Minority households*: African-American and Latino families[15]
- *Renting households*

We analyzed data from the US Census Bureau and US Department of Housing and Urban Development's (HUD) *American Housing Survey* (AHS) in 2011 and 2013. This survey samples households across the US to gather information on housing stock characteristics, housing and energy costs, occupant characteristics, and other related information (Census Bureau 2011 and 2013a). The survey is conducted every two years in 25 to 30 metro areas; the 2011 and 2013 surveys contain the most recent city data available. The survey's unit of analysis is the household, and interviewees self-report

TABLE 2. Metropolitan statistical areas (MSAs) included in analysis, by region

Northeast	Southeast	Midwest	South Central	Southwest	Northwest	California
Baltimore	Atlanta	Chicago	Austin	Denver	Portland	Los Angeles
Boston	Birmingham	Cincinnati	Dallas	Las Vegas	Seattle	Riverside
Hartford	Charlotte	Cleveland	Fort Worth	Phoenix		Sacramento
New York City	Jacksonville	Columbus	Houston			San Diego
Philadelphia	Louisville	Detroit	Oklahoma City			San Francisco
Pittsburgh	Memphis	Indianapolis	San Antonio			San Jose
Providence	Miami	Kansas City				
Washington, DC	Nashville	Milwaukee				
	New Orleans	Minneapolis				
	Orlando	St. Louis				
	Richmond					
	Tampa					
	Virginia Beach					

all collected information. For this study, we analyzed individual household-level data to measure energy burden in 48 of the largest US metropolitan statistical areas (MSAs), as detailed in table 2.[16]

Data Limitations

We experienced a few limitations in our analysis that should be considered when examining the results. While city samples are representative, these data represent only a snapshot in time (2011 and 2013). Therefore, the results may not reflect future energy burdens. Volatile gas or oil prices, stagnant wages, and rising electricity prices in past and future years could also significantly impact home energy burden. We did not adjust energy bills to reflect the difference in energy prices between 2011 and 2013 (EIA 2016b).

These data are also self-reported. Every household in the sample provided self-reported estimates of average monthly electricity and heating fuel bills, as well as estimated household income and household size. Even so, our findings are comparable to EIA's 2009 *Residential Energy Consumption Survey* (EIA 2009). EIA found that the average household spent $2,134 and low-income household spent $1,690 annually on energy bills, which is similar to our findings of $1,932 and $1,692 median annual bills for the average household and low-income household.

We also limited our sample to include only those households that reported positive income, paid their electricity bill directly, and also directly paid for their main heating fuel (electricity, gas, fuel oil, wood, coal, kerosene, or other).[17] Due to a lack of data necessary to calculate energy burden, our analysis necessarily excludes two categories of low-income homes that often have a high energy burden: households without any reported income and households in master-metered apartment buildings where energy costs are paid by the landlord and incorporated into monthly rent. Before we limited the sample sizes, the average city sample size was 4,190 households. This was reduced to 2,700 households after controlling for the above factors.

Measuring Home Energy Burden

We calculated energy burden as follows:

$$\text{HOME ENERGY BURDEN} = \frac{\text{TOTAL ENERGY UTILITY SPENDING}^{18}}{\text{TOTAL GROSS HOUSEHOLD INCOME}}$$

We first determined the energy burden for each household in our data set, and then calculated the median burden for each of the four household groups in each metro area (see Appendix B).[19]

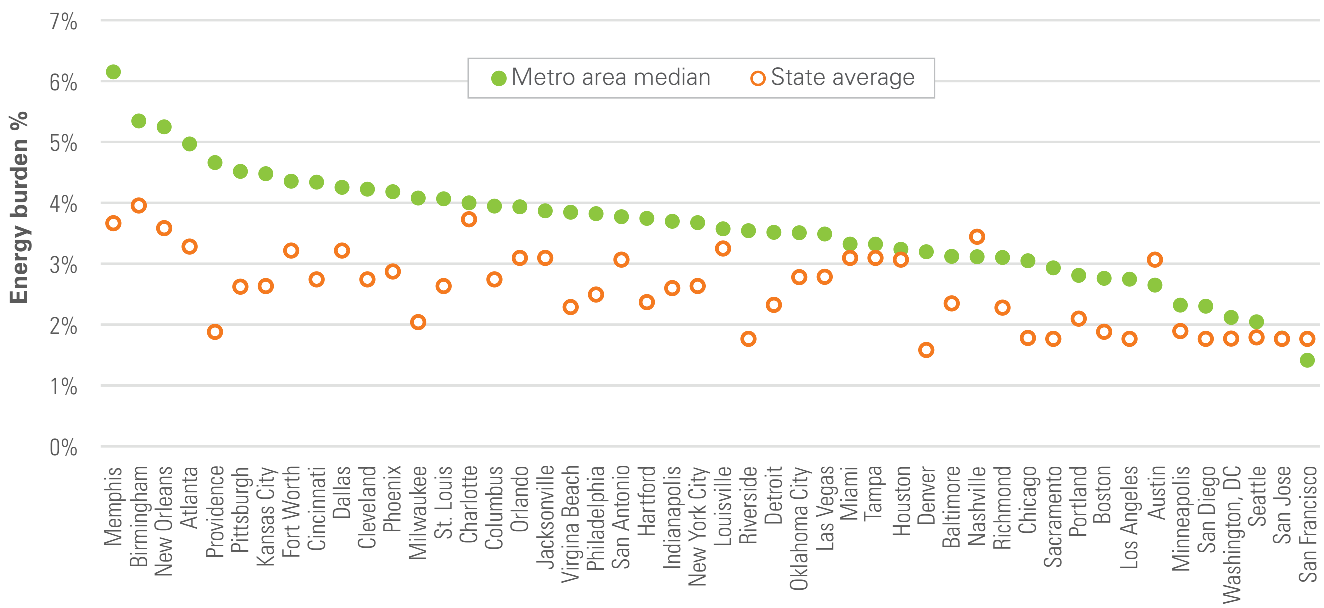
We also examined the households at the highest energy burden quartile in each group. (Simply put, 25% of households have an energy burden equal to or greater than the highest energy burden quartile value.) Appendix C shows the highest energy burden quartile value alongside the median. This additional analysis of the highest quartile gives a better sense of the burden placed on the most vulnerable households in each metro area, without the median burden masking the extremes.

Because different cities have different median energy burdens, comparing vulnerable groups between cities becomes difficult and potentially misleading. To provide a way to compare groups between cities, we created a metric that measures the proportion of each group that experiences an energy burden greater than or equal to twice the metropolitan area's median energy burden. We report these results in Appendix D.

Results: Energy Burdens in US Cities

Figure 1 compares the median energy burden in each metro area with the average for its state. Because we could not calculate state energy burdens using the AHS data set, we used EIA and US Census Bureau data to make these calculations. Most cities have higher energy burdens than the state average.[20] The five cities with the greatest difference between the city and state energy burden were Providence, Memphis, Milwaukee, Pittsburgh, and Kansas City. In these cities, the median metro-area energy burden ranged from 1.9 to 2.8 percentage points greater than the overall burden for the state.

FIGURE 1. Median energy burden for metro area and average energy burden for state households. Metro areas are ranked by their median energy burden. We used American Housing Survey (AHS) data from 2011 and 2013 to calculate the median energy burden for the metro areas (Census Bureau 2011 and 2013a). We also used data from the 2011 and 2013 US Energy Information Administration (Annual Electric Power Industry Report, EIA-861) and average historical income from 2011 and 2013 (Census Bureau 2013b) to calculate the average energy burden for the states.



Metro areas also varied by their median energy burden, ranging from more than 6% to less than 1.5%. The cities with the highest median energy burdens were Memphis (6.2%), Birmingham (5.3%), New Orleans (5.3%), Atlanta (5.0%), and Providence (4.7%). These metro areas—and others with higher median energy burdens—differ from one another in terms of typical energy costs. Overall, metro areas in the Southeast and Midwest regions faced the highest median energy burdens.

It is noteworthy that many of the metro areas in the Southeast—a region with relatively low electricity prices and lower average incomes—faced the highest energy burdens compared with cities nationally. As we describe further in the text box "The Relationship between Energy Burden and Energy Prices," low electricity prices do not equate to low bills. Figure 2 provides a visual

FIGURE 2. Median metro-area energy burden for all households

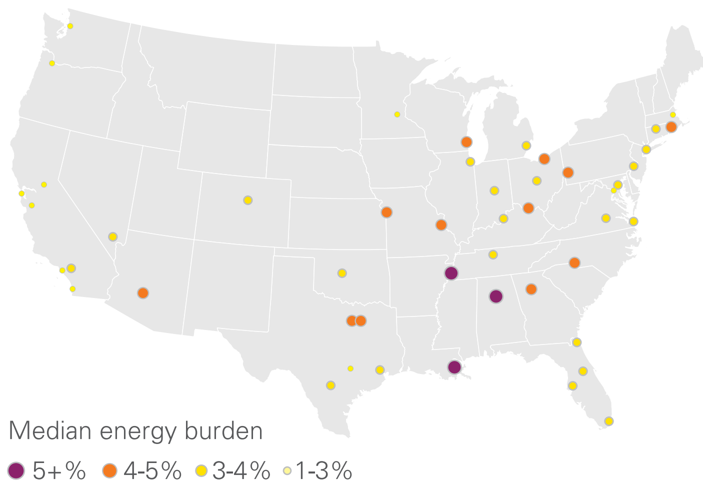


TABLE 3. Median income, utility bill, energy burden, and unit size for households based on income type, building type, building ownership, and household race for groups across all metro areas

	Household type	Median annual income	Median size of unit (square feet)	Median annual utility spending	Median annual utility costs per square foot	Median energy burden[1]
Income type	Low-income[2] (≤80% AMI[3])	$24,998	1,200	$1,692	$1.41	7.2%
	Non-low-income	$90,000	1,800	$2,112	$1.17	2.3%
	Low-income multifamily (≤80% AMI)	$21,996	800	$1,032	$1.29	5.0%
	Non-low-income multifamily	$71,982	950	$1,104	$1.16	1.5%
Building ownership	Renters	$34,972	1,000	$1,404	$1.40	4.0%
	Owners	$68,000	1,850	$2,172	$1.17	3.3%
Head-of-household race	White	$58,000	1,600	$1,956	$1.22	3.3%
	African-American	$34,494	1,290	$1,920	$1.49	5.4%
	Latino	$39,994	1,200	$1,704	$1.42	4.1%
All households	N/A	$53,988	1,573	$1,932	$1.23	3.5%

[1] Energy burden is the percentage of household income that is spent on energy bills. To calculate median energy burden, we calculated energy burden for each household, then took the median. This value differs from the median energy burden that is calculated using median annual utility spending and income.
[2] Low-income includes both single- and multifamily households.
[3] Area median income (AMI) is the median dollar amount that divides the population into two equal parts.
Source: American Housing Survey (Census Bureau 2011 and 2013a).

representation of the median energy burdens in metro regions across the country. See Appendix B for the median energy burden values for each city.

The five cities with the lowest median energy burdens were San Francisco (1.4%), San Jose (1.8%), Seattle (2.1%), Washington, DC (2.1%), and San Diego (2.3%). In these cities, households spent less of their overall income on utility bills, which could be due to a combination of lower energy bills and higher household income throughout the metro areas, and/or more efficient buildings and energy use.

Currently, we cannot make causal arguments about why a city has either a high or low energy burden. Factors such as the efficiency of housing stock and the effectiveness and reach of energy efficiency investments, among other factors, may play a role. More research is needed to understand the drivers of energy burdens in specific geographical areas.

Results: Energy Burden Trends by Household Group

We compared various household groups in our sample to identify overall energy burden trends. Table 3 includes median income, housing unit size, annual utility bills, annual utility spending per square foot, and energy burden for these groups across all metro areas.

Median energy burdens in low-income households were more than three times higher than in non-low-income households (7.2% and 2.3%, respectively). Higher energy burdens result in part from lower income. The data also show these households have higher energy cost per square foot than the average household, which could indicate lower efficiency of the housing unit itself. We discuss this point in greater detail below. The situation for multifamily households was similar. The median low-income multifamily household experienced an energy burden more than three times higher than that of the median non-low-income multifamily household (5.0% and 1.5%, respectively) and had higher utility cost per square foot.[21] Renters were also disproportionately impacted. The median renter experienced an energy burden greater than that of the median owner (4.0% and 3.3%, respectively).

We also found that energy burdens were related to the race of householders. On average, African-American and white households paid similar utility bills, but African-American households experienced a median energy burden 64% greater than white households (5.4% and 3.3%, respectively). Latino households paid lower utility bills, on average, than African-American and white households did, yet they experienced a median energy burden 24% greater than white households (4.1% and 3.3%, respectively).

Looking at how inefficient housing contributes to this issue, we calculated what the energy burdens for various categories would be if their housing stock were as efficient as the median— i.e., if their energy expenditures per square foot were the same as the median for all households. Then, for each category, we calculated the proportion of the excess energy burden (the difference between category median burdens and the all-household median burden) that would be eliminated if their housing stock were brought up to the efficiency standard of the all-household median.

THE RELATIONSHIP BETWEEN ENERGY BURDEN AND ENERGY PRICES

Many people confuse their high energy bills with high electricity and gas prices. However our findings show that low prices do not necessarily mean low bills. Consider that, in 2014, three of the five states with the highest average monthly utility bills for households—Alabama, South Carolina, and Mississippi—were states with average (not high) electricity prices and a wide range of gas prices. Our study found that the Southeast and Midwest regions, while having among the lowest average prices, also had the highest average metropolitan energy burdens. In 2014, New Orleans and Memphis were among the five cities in our sample with the lowest average electricity prices (both $0.10/kWh) and average gas prices ($10.9 and $10.1/1,000 ft^3). Even with these low prices, these two cities are in the top three for highest average energy burden for all households, at 5.27% and 6.18%, respectively. Therefore, it is important to recognize that factors beyond prices—such as lower incomes and inefficient housing stock—contribute to high energy bills.

We found that for all low-income households and for multifamily low-income households, bringing their housing stock up to the efficiency level of the median household would eliminate 35% of their excess energy burden. As one might expect, the energy burdens of low-income households are driven in large part by their low-income status. However more than one-third of their excess energy burden was caused by inefficient housing stock. Bringing their homes up to median efficiency would lower their energy burden from 7.2% to 5.9%. For African-American and Latino households, 42% and 68% of the excess energy burden, respectively, was due to inefficient homes. For renters that number was 97%, meaning that almost all of their excess energy burden could be eliminated by making their homes as efficient as the median.

Far from being an intractable problem related to persistent income disparity, the excess energy burdens they face are directly related to the inefficiency of their homes. This is important not only for understanding how best to address the problem for various populations, but also to correct any misconceptions that the energy burden problem is a driven purely by income, a perception that might be reinforced by the stark differences in incomes shown in table 3.

We found that for all low-income households and for multifamily low-income households, bringing their housing stock up to the efficiency level of the median household would eliminate 35% of their excess energy burden.

Results: Energy Burdens by City and Household Groups

When we examined specific demographic groups across different cities, we found that many of these groups experienced energy burdens greatly exceeding

TABLE 4. Energy burdens for demographic groups in the 10 cities with the highest energy burdens

	All households	Low-income households*	Low-income multifamily households	African-American households	Latino households	Renting households
1	Memphis (6.2%)	Memphis (13.2%)	Memphis (10.9%)	Memphis (9.7%)	Memphis (8.3%)	Memphis (8.6%)
2	Birmingham (5.3%)	Birmingham (10.9%)	Birmingham (8.7%)	Pittsburgh (8.3%)	Providence (7.3%)	Birmingham (7.3%)
3	New Orleans (5.3%)	Atlanta (10.2%)	Atlanta (8.3%)	New Orleans (8.1%)	Philadelphia (7.3%)	Atlanta (6.8%)
4	Atlanta (5.0%)	New Orleans (9.8%)	Providence (7.1%)	Kansas City (7.9%)	Kansas City (6.6%)	New Orleans (6.3%)
5	Providence (4.7%)	Providence (9.5%)	Pittsburgh (7.1%)	Birmingham (7.7%)	Atlanta (6.6%)	Providence (6.2%)
6	Pittsburgh (4.5%)	Pittsburgh (9.4%)	New Orleans (6.9%)	Milwaukee (7.4%)	Birmingham (6.6%)	Kansas City (6.1%)
7	Kansas City (4.5%)	Dallas (8.8%)	Columbus (6.5%)	St. Louis (7.4%)	Phoenix (6.0%)	Pittsburgh (6.0%)
8	Fort Worth (4.4%)	Philadelphia (8.8%)	Dallas (6.5%)	Cleveland (7.0%)	Dallas (6.0%)	Cincinnati (6.0%)
9	Cincinnati (4.3%)	Kansas City (8.5%)	Indianapolis (6.5%)	Cincinnati (6.9%)	Fort Worth (5.7%)	St. Louis (5.9%)
10	Dallas (4.3%)	Cleveland (8.5%)	Kansas City (6.3%)	Atlanta (6.6%)	Detroit (5.7%)	Cleveland (5.5%)

* Low-income includes both single- and multifamily households.

the city median, ranging as high as 13% for some groups (see Appendix B). Table 4 gives details for the 10 cities with the highest overall median energy burdens, as per figure 1. For example, low-income households face the greatest energy burden in Memphis (13.2%), Birmingham (10.9%), and Atlanta (10.2%), and African-American households face the greatest energy burden in Memphis (9.7%), Pittsburgh (8.3%), and New Orleans (8.1%).

Results by Energy Burden Quartile

We also calculated energy burden for the highest energy burden quartile households in each group (see Appendix C). Simply looking at the median does not provide insight into the distribution across the group and does not properly represent the range of experiences of those who are the worst off within these groups. We can better understand this by comparing the energy burden of the household at the median and the highest quartile of energy burdens.

For example, the median low-income energy burden in Atlanta was 10.2%, meaning that half of the city's low-income households experienced an energy burden greater than 10.2%. Looking at the highest energy burden quartile in Atlanta, we can see that 25% of the low-income population experienced an energy burden greater than or equal to 18.2%. This is more than three times the city median of 5.0%. Results for the 10 cities with the highest energy burdens are detailed in table 5.

In Atlanta, we can see that 25% of the low-income population experienced an energy burden greater than or equal to 18.2%. This is more than three times the city median of 5.0%.

TABLE 5. Highest energy burden quartiles in the 10 cities with the highest energy burdens

	All households	Low-income households*	Low-income multifamily households	African-American households	Latino households	Renting households
1	Memphis (12.8%)	Memphis (25.5%)	Memphis (21.8%)	Memphis (19.4%)	Memphis (15.9%)	Memphis (18.5%)
2	Birmingham (10.8%)	New Orleans (18.9%)	Birmingham (16.2%)	New Orleans (16.4%)	Philadelphia (15.7%)	Birmingham (15.1%)
3	New Orleans (10.0%)	Birmingham (18.8%)	Atlanta (15.7%)	Kansas City (16.2%)	Pittsburgh (12.4%)	Atlanta (13.3%)
4	Atlanta (9.7%)	Atlanta (18.2%)	Pittsburgh (15.7%)	Pittsburgh (16.1%)	Kansas City (12.0%)	St. Louis (12.9%)
5	Providence (8.7%)	Philadelphia (16.7%)	Chicago (14.6%)	Cincinnati (15.6%)	Providence (11.7%)	New Orleans (12.6%)
6	Pittsburgh (8.6%)	Providence (16.7%)	Cincinnati (13.0%)	Milwaukee (15.5%)	Atlanta (11.5%)	Cincinnati (12.1%)
7	Cincinnati (8.5%)	Pittsburgh (15.7%)	St. Louis (12.9%)	Birmingham (15.4%)	Hartford (11.1%)	Cleveland (11.9%)
8	Kansas City (8.4%)	Cincinnati (15.5%)	Cleveland (12.3%)	Chicago (15.3%)	Phoenix (10.7%)	Pittsburgh (11.9%)
9	Philadelphia (8.3%)	Detroit (15.3%)	Hartford (11.8%)	Detroit (14.8%)	Birmingham (10.4%)	Providence (11.7%)
10	Dallas (8.2%)	St. Louis (14.8%)	Fort Worth (11.4%)	St. Louis (14.4%)	Detroit (10.2%)	Kansas City (11.7%)

* Low-income includes both single- and multifamily households.

FIGURE 4. **Low-income (≤80% AMI) household energy burdens for the median, highest energy burden quartile, and lowest energy burden quartile households for each metro area. The orange bars represent the beginning of the quartile of low-income households with the lowest energy burden. The blue bars represent the beginning of the quartile of low-income households with the highest energy burden. These data include both single- and multifamily low-income households.**

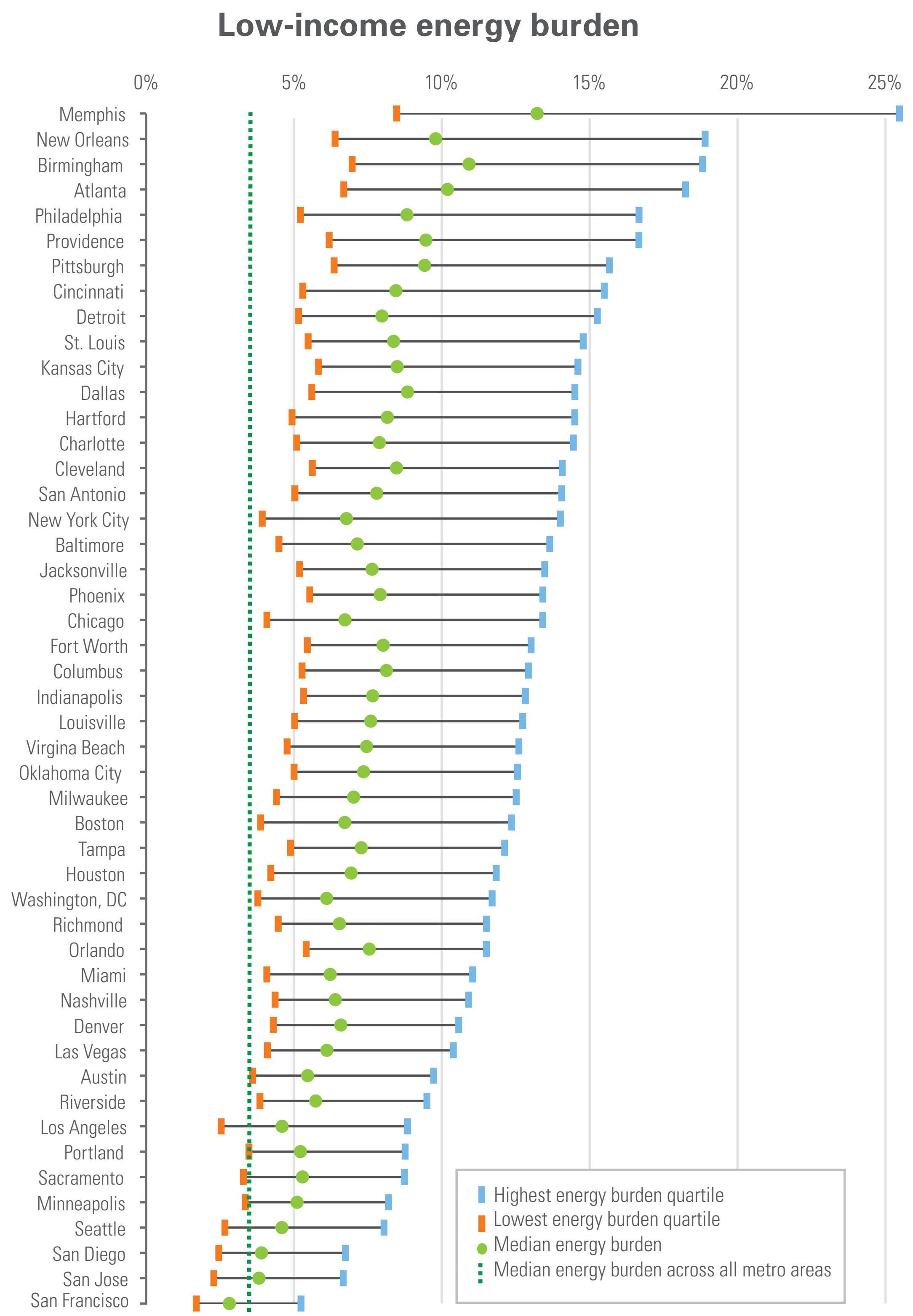


Figure 4 provides a more detailed representation of the energy burden faced by low-income households in each metro area. Across the metro areas in our sample, based on our definition of "low-income" (≤80% of AMI), low-income households made up 44% of all households included in our analysis (see Appendix A). Figure 4 highlights the household energy burdens for the highest and lowest quartiles, as well as the median energy burden for all low-income households. For comparison, the figure also includes a line indicating the median energy burden for all households across all metro areas in the sample.

For low-income households, the range of energy burdens varies greatly across and within cities. For example, one-fourth of low-income households in Nashville had an energy burden below 4.4%, one-fourth had an energy burden between 4.4% and the median of 6.4%, one-fourth had an energy burden between 6.4% and 10.9%, and one-fourth had a burden greater than 10.9%. The data, presented in this way, are useful for understanding the depth of the low-income energy burden in cities. In 17 cities, a quarter of low-income households experienced an energy burden greater than 14%.

In 17 cities, a quarter of low-income households experienced an energy burden greater than 14%.

Additionally, we assessed the energy burden for certain households and examined the proportion of residents that experienced an energy burden greater than or equal to twice the city median. We include this analysis in Appendix D. For all the cities in the sample, at least 38% of low-income households experienced an energy burden that was twice the city median.

Results: Regional Energy Burden Trends

In this section, we examine regional energy burden data for our select groups in more detail. Figure 5 shows the regional median energy burden for each group and for all households. In Appendix E, we include similar graphs for each region.

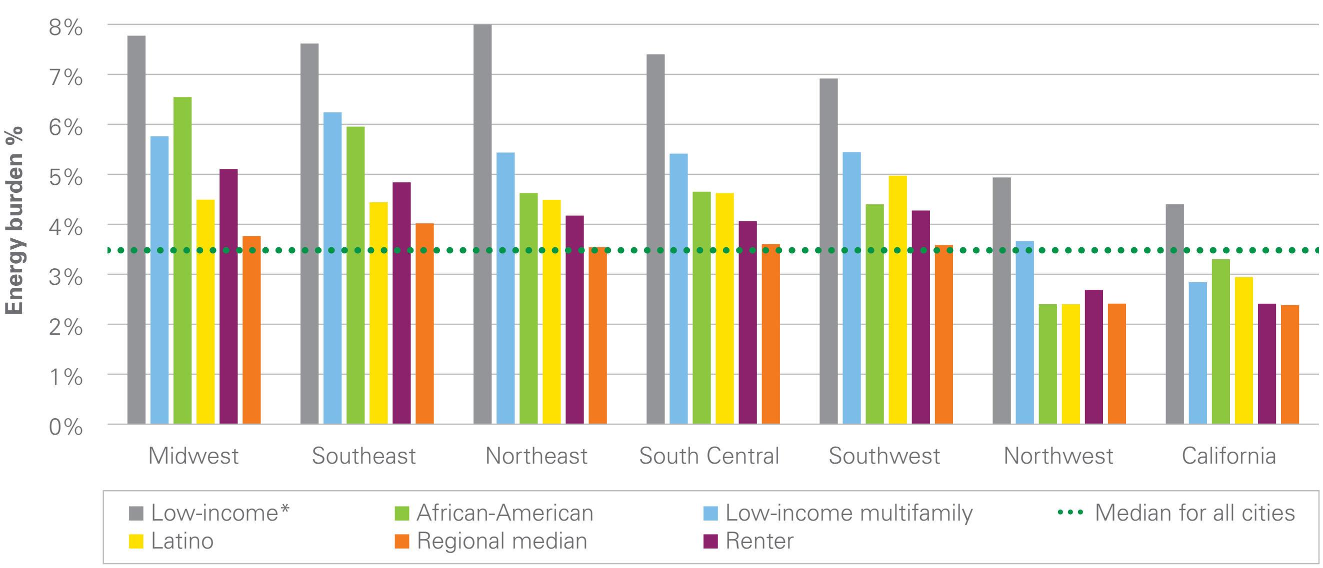
Metro areas in the Midwest and Southeast had the highest median energy burdens across all groups, with African-American and low-income multifamily households the worst-off in these regions.

Low-income households—including both single- and multifamily—had the highest energy burden in each region and were the worst-off across Northeastern metro areas. While we cannot attribute with certainty

REGIONAL TRENDS IN UTILITY ENERGY EFFICIENCY INVESTMENTS

We found that many cities with little to no investment in utility energy efficiency programs also experienced higher average energy burdens. Programs that help households save energy are often administered by the local utility. Utilities taking the lead on energy efficiency provide an array of programs for commercial and residential customers. Some localities and states will adopt energy savings targets or requirements to encourage and guide utility program spending and design. According to the rankings in *The 2015 City Energy Efficiency Scorecard* issued by ACEEE, the utilities with the least spending on energy efficiency programs were those serving southeastern cities. All of the southeastern cities in the *Scorecard* fell within the bottom 40% of the ranking (Ribeiro et al. 2015b). The cities with the most energy efficiency investment in 2015 were Boston, Minneapolis, Portland (Oregon), Chicago, and San Francisco. However, even when cities do have strong utility programs, there is no guarantee that low-income households will benefit. Information on what types of households are currently being served by energy efficiency programs is crucial to ensuring that these programs reach a diverse set of households.

FIGURE 5. Energy burden of select groups by region, ordered from highest to lowest based on the average of the median energy burdens across all groups.



* Low-income includes both single- and multifamily households.

the drivers of high energy burden within specific regions and cities, we know that numerous factors are at play. Southeastern households have the lowest median incomes in the country, which likely contributes to higher energy burdens. In terms of energy prices, the Southeast, Midwest, and Northwest regions have the lowest average electricity prices, but at the same time, they also have the highest average energy burdens. This indicates that low electricity and gas prices do not necessarily lead to low bills or affordable energy (see earlier text box "The Relationship between Energy Burden and Energy Prices"). Although we do not know the relative efficiency of housing stock in the Southeast, we do know that the southeastern utilities serving major cities currently have the lowest investment in energy efficiency programs as compared with other regions (see text box "Regional Trends in Utility Energy Efficiency Investments"). Low energy prices therefore do not compensate for the lack of energy efficiency investment or low incomes.

Metro areas in the Midwest and Southeast had the highest median energy burdens across all groups, with African-American and low-income multifamily households the worst-off in these regions.

14 Area median income (AMI) is the median dollar amount that divides the population into two equal parts. HUD uses AMI to determine eligibility for low-income programs based on metropolitan area and household size.

15 Sample sizes in some cities for Latino households (Birmingham, Cincinnati, Detroit, Louisville, Pittsburgh, and St. Louis) and African-American households (Portland) were small. See Appendix A for sample sizes for each group by city.

16 A metropolitan statistical area (MSA) is a geographical region typically made up of several counties, with a core urban area having a population of 50,000 or more. MSAs, therefore, include a central city and surrounding suburbs. Raleigh and Salt Lake City, two of the top 50 MSAs, were not included in the AHS 2011 and 2013 and therefore were not included in this analysis. See Appendix A for the corresponding year of data for each MSA—either 2011 or 2013.

17 See Appendix A for sample sizes for each group studied after filtering for these variables.

18 Total utility spending includes average annual spending on electricity and heating fuels, as reported. Total gross household income includes all annual income reported by all household members, including all government assistance.

19 By using medians for both income and energy costs, we were able to arrive at a truer median, as the data distributions for income and energy costs differed greatly.

20 We should note that we are comparing a median energy burden in metro areas with an average energy burden statewide. By using an average, the data may be skewed toward higher values because there is a zero lower bound on energy burden and no upper bound.

21 Single-family low-income households experienced the highest average energy burden of 7.8%. We did not specifically analyze these households in this study.

Policies and Programs to Address High Energy Burdens

In the following sections of this report, we discuss policies and programs that address high energy burdens, with a focus on energy efficiency. Reducing the impact of high energy burden has been a long-standing policy goal at the local, state, and national levels. Policy has focused on three main intervention programs: bill payment assistance, weatherization, and utility-funded efficiency programs (see table 6).

These efforts aim to address the two factors that impact energy burden: low income and high energy bills. Federal, state, local, and utility funding supports these programs as well as other, related programs that focus on health and safety, behavior, and education.[22]

Policymakers and program administrators design these programs to address high utility bills, inefficiencies in housing units, and lack of awareness in regard to energy efficiency programs and actions that customers can take.

TABLE 6. Policies and programs for addressing high energy burden

Program type	Program	Funding source
Bill assistance	Low Income Home Energy Assistance Program (LIHEAP)	Federal and state taxpayers
	Other low-income bill assistance programs	Utility ratepayers; private contributions
	Modified rate design, rate discounts or waivers, and modified billing methods	Utility ratepayers
Weatherization	Weatherization Assistance Program (WAP)	Federal and state taxpayers
Energy efficiency	Low-income energy efficiency programs[1]	Utility ratepayers[2]

[1] Customer benefit surcharges are collected through customer utility bills. Public utility commissions or city councils set these charges, and the utility uses this money to fund energy efficiency and energy education programs. [2] Non-utility entities can also fund low-income energy efficiency programs, such as the Regional Greenhouse Gas Initiative (RGGI), Qualified Energy Conservation Bonds (QECBs), state treasury funding, and general obligation bonds (EPC 2013b; RGGI 2015; Brown 2008).

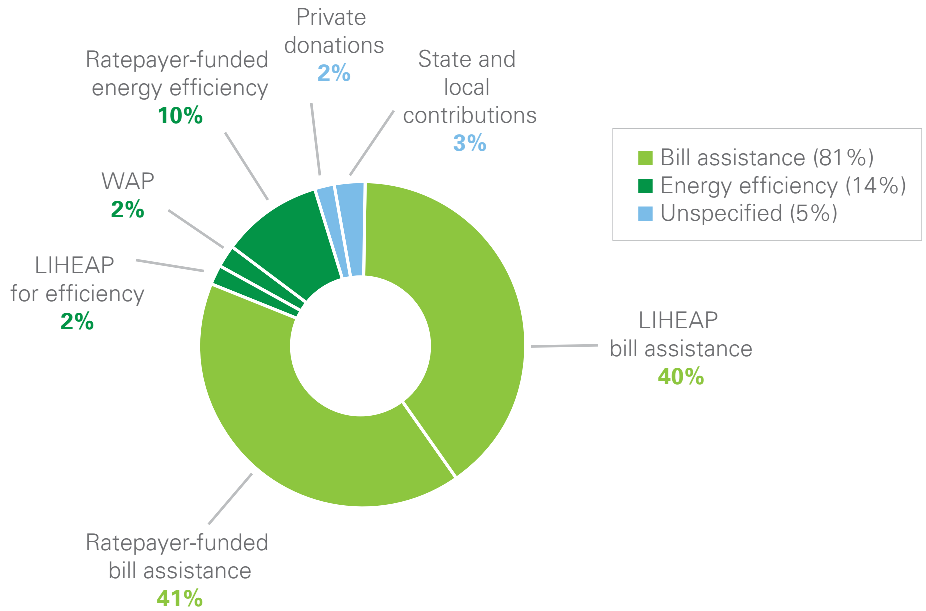
Funding for low-income programs varies by program type. Figure 6 illustrates the allocation of funding from ratepayer-funded bill assistance and energy efficiency programs, the Weatherization Assistance Program (WAP), and the Low Income Home Energy Assistance Program (LIHEAP). As indicated in the chart, the overwhelming majority of program support—about 81%, or $6.31 billion—goes toward helping customers pay their utility bills. Energy efficiency programs receive about 14% of program support ($1.17 billion), and the remaining 5% of program support ($38 million) is unspecified (LIHEAP Clearinghouse 2016). While bill assistance programs provide important, immediate relief to distressed households, energy efficiency investment appears to be an underutilized strategy for addressing energy affordability. Increased investment, expanded reach, and improved design of energy efficiency programs could better complement bill assistance and weatherization programs.

Increased investment, expanded reach, and improved design of energy efficiency programs could better complement bill assistance and weatherization programs.

Bill Assistance Programs

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. LIHEAP provides funding to states, based on a formula, and then states allocate this funding to qualified households according to established federal parameters. Funds can take the form of direct bill assistance, crisis assistance, support for weatherization programs, or other aid to reduce household energy needs (Perl 2012). The bulk of funding, however, goes toward energy bill assistance and ends up with utilities. States typically determine household eligibility for bill assistance as between 150% and 110% of the federal poverty line, or 60% of the state median income.

FIGURE 6. Support for low-income energy needs. Data on ratepayer-funded bill assistance, ratepayer-funded energy efficiency, WAP, 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. Data collected from the LIHEAP Clearinghouse in 2016. *Source:* Cluett, Amann, and Ou 2016.



LIHEAP serves between 20 and 25% of eligible households, about 7.6 million in 2009 and 8.3 million in 2010 (Jackson 2011). Other bill assistance programs help to meet the overwhelming need, such as voluntary utility customer contributions to cold weather funds and other forms of bill assistance, programs supported by charitable groups, and, in some cases, structured payment programs offered by utilities. Agencies that provide weatherization services may also deliver LIHEAP assistance. In these cases, LIHEAP eligibility can act as a gateway for weatherization and low-income energy efficiency programs. Bill assistance programs remain critical for alleviating the *immediate* energy burden that many households face, but they could be better coordinated with weatherization and other energy efficiency programs to provide upgrades that can reduce energy burden over the long term.

Weatherization Programs

Weatherization programs address the longer-term energy needs of households by making home repairs that reduce high energy bills. By upgrading the efficiency of homes, programs can then reach more customers who need immediate assistance with more persistent intervention. Weatherization programs consist of energy efficiency measures aimed at improving the building envelope, such as weather-stripping doors and windows, air sealing, and installing insulation. In some cases, weatherization includes upgrades or repairs to heating and cooling systems and the reduction of electric baseload consumption through energy efficiency measures such as lighting and appliances, but these measures are less common among typical weatherization programs.

The federal government, state governments, and utilities all fund and sponsor weatherization programs. The US Department of Energy's Weatherization Assistance Program (WAP) historically has been the largest funder of these programs. Because states can choose to allocate funding from LIHEAP toward weatherization programs, LIHEAP funding (as well as state and local funding) supplements WAP in many states. Households with income up to 200% of the federal poverty line qualify for WAP funding. WAP estimates that 38 million households qualify for the program and that of these, approximately 15 million are good candidates for cost-effective weatherization (WAPTAC 2016). Over the history of the program, WAP has served about 7 million households (Benefits.gov 2015). Numerous factors limit the reach of the federal program, such as funding, capacity of implementing agencies, and the necessity of making health and safety improvements before weatherization can begin.[23]

The most effective weatherization programs address the largest household energy uses with the longest sustained savings (e.g., heating and cooling systems), which often have the greatest impact on reducing energy burdens. Low-income housing units can also require substantial structural improvements before energy efficiency measures can be implemented; these can be costly and require large up-front investment. However many researchers have proved these programs to be cost effective in the long run. The Department of Energy determined that, on average, the value of efficiency upgrades is 2.2 times greater than their cost (DOE 2015). This value does not come from energy savings alone, as WAP also aims to improve health, safety, and security for participating households. When program evaluators include all of these multiple benefits into cost–benefit analyses, WAP proves to be a cost-effective solution to improving energy affordability.

Utility Energy Efficiency Programs

Many utilities provide energy efficiency programs that target low-income households. These programs are funded through customers (or "ratepayers"). Such programs generally have a very good record of delivering cost-effective energy savings as a resource to the entire utility system. Unlike bill assistance and most weatherization programs, utility energy efficiency programs can include a variety of program strategies.[24] Some utility energy efficiency programs operate in tandem with local or statewide weatherization efforts, using similar channels to reach customers.

When program evaluators include all of these multiple benefits into cost–benefit analyses, WAP proves to be a cost-effective solution to improving energy affordability.

Typical low-income programs focus on single-family whole-house retrofits (Cluett, Amann, and Ou 2016; Hoffman et al. 2015). These programs can mirror other residential energy efficiency programs offered by utilities or weatherization implementers; they often focus on specific measures and provide higher incentives. The most common low-income energy efficiency approaches are of two types: comprehensive weatherization, and the direct installation of low-cost energy efficiency measures (e.g., efficient lighting, high-efficiency showerheads and faucet aerators, and air infiltration reductions). Some utilities operate direct-install programs targeting multifamily rental buildings as part of their low-income program offerings. Other, less common low-income programs include conservation kits, product rebates, appliance recycling, and programs that promote behavioral change or provide information on home energy use (Cluett, Amann, and Ou 2016).

Low-income households in multifamily buildings can also be reached through whole-building programs that target these buildings and typically require the participation of only the building owner. In most cases, energy efficiency retrofits and measures provide energy bill reduction for both owner and residents. There are three types of program models that utilities typically use to serve their multifamily customers: direct install services, equipment and product rebates, and comprehensive energy retrofits for existing buildings and new construction (Johnson and Mackres 2013). In some cases, these programs are adapted to meet the needs of properties that house low-income residents by offering higher incentives or additional measures.

Despite the existence of such programs, low-income households remain a hard-to-reach group with many barriers to participation.

Despite the existence of such programs, low-income households remain a hard-to-reach group with many barriers to participation. Most utilities have found that their energy efficiency program strategies do not adequately reach these households (Rasmussen et al. 2014). Low-income households and owners of multifamily buildings that provide affordable housing may find it challenging to participate in residential low-income energy efficiency programs that require a copay. These households may also lack the time, resources, and up-front capital to register and participate. As a result, many low-income programs offer free or discounted direct-install measures, such as efficient lighting, low-flow showerheads, smart thermostats, and/or smart power strips in order to facilitate program participation.

22 At times, low-income programs that address health and safety issues are implemented in conjunction with weatherization programs to provide the most comprehensive offering. These programs make sure the house is fit from a health and safety perspective before it undergoes weatherization (Wilson and Katz 2010). Behavior and education programs can also supplement low-income assistance and energy efficiency programs. These programs typically provide educational material on energy saving behaviors, feedback on customer energy use, or games and other interactive measures to encourage energy savings (Mazur-Stommen and Farley 2013).

23 Spending on WAP is historically low. However, as a part of the American Recovery and Reinvestment Act of 2009, WAP received $5 billion over the course of 2009, 2010, and 2011, which is about 25 times the funding the program has received in each year since (LIHEAP Clearinghouse 2016).

24 For more information on best practices for low-income utility programs, see Cluett, Amann, and Ou 2016.

Benefits of Investing in Energy Efficiency in Low-Income Communities

Low-income energy efficiency programs provide benefits that go beyond reduced utility bills and beyond benefits experienced by direct participants. In table 7, we categorize these benefits as those received by participating low-income households, by utilities and ratepayers, and by the wider community. These values can justify policy decisions to increase such investments.

Low-income households participating in energy efficiency programs report direct benefits that improve their quality of life. For example, energy efficiency investments lower energy bills, which reduces energy burden, eases economic and social stresses, and provides families with more disposable income that can be spent on other necessities beyond energy (e.g., medicine, food, transportation) (Tonn et al. 2014). Building efficiency upgrades also increase property value and the reliability of appliances and HVAC equipment, which reduces maintenance costs and stress (Cluett and Amann 2015). Multiple case studies by the New York State Energy Research and Development Authority (NYSERDA) found that energy efficiency programs also increase tenant comfort and provide tenants with more control over their surroundings (NYSERDA 2013a; NYSERDA 2013b). These benefits occur as a result of both single- and multifamily energy efficiency projects, though some benefits—such as increased property value—accrue only to the building owner in cases where the household rents the unit (Russell et al. 2015).

In affordable multifamily housing, the cost of energy is typically the highest controllable operating expense. Reducing operating expenses allows affordable housing providers to maintain reasonable rents, invest in resident services, and make necessary building improvements. Energy efficiency can also help low-income households manage bills in the event of utility

TABLE 7. Energy efficiency benefits for low-income households, utilities, and communities

Benefit recipient	Energy efficiency outcome	Resulting benefit
Low-income program participants	Lower monthly utility bills	Lower household energy burden and greater disposable income
		Reduced stress and fewer trade-offs between energy and other necessities
		Reduced exposure to risk from utility rate increases
	Improvements in the efficiency of the housing stock	Improved health and safety and greater household comfort
		Increased property value, more reliable equipment, and lower maintenance costs
		Greater satisfaction with the building/unit and improved household and neighborhood stability
Utilities and ratepayers	Demand-side management (both gas and electric)	Avoided excess costs of increased generation, capacity, and transmission investments
		Contribution toward compliance with energy efficiency portfolio standards and other environmental legislation
	Cost savings to utilities and ratepayers	Reduced arrearages and cost of shutoffs, which lowers utility operating costs
		Improved customer service
Communities	Lower electric and gas demand	Reduced environmental pollutants and improved public health
	Lower monthly utility bills due to avoided utility costs	More money spent in the local economy due to greater household disposable income, with higher local multiplier effect
		Poverty alleviation and increased standard of living
	Improvements in the efficiency of the housing stock	Local job creation through weatherization programs and energy efficiency providers and trade allies
		Improved quality of life
		Increased property values and preservation of housing stock

price increases and variable seasons. In 2014, residential electricity prices rose to the highest level in six years, with average electric price increasing by 3.1% annually between 2008 and 2014 (EIA 2015). By improving household efficiency, individuals and communities can be more resilient in times of price increases.

Utilities operate energy efficiency programs because of the benefits that accrue not only to customers but also to the utility system. Investing in low-income energy efficiency can mean avoiding the excess costs of increased energy generation, capacity, and transmission due to reduced demand. The reduction in energy production due to efficiency also reduces environmental pollutants, which helps utilities comply with environmental legislation that limits emissions (Baatz 2015; Brockway, Kallay, and Malone 2014). Energy efficiency investments in low-income communities also reduce the risk of arrearages and the costs of shutoffs for families who have difficulty paying their bills. By lowering these costs, utilities can reduce overall tariffs and charges for their entire ratepayer base.

By improving household efficiency, individuals and communities can be more resilient in times of price increases.

Although not all low-income customers have the opportunity to participate in their utility's energy efficiency programs, research shows that energy efficiency benefits the whole community and can be used as a core strategy for increasing energy affordability and community resilience (Ribeiro et al. 2015a). Energy efficiency programs benefit the entire population by reducing environmental pollutants, which tend to impact low-income communities disproportionately (NAACP 2015; EPA 2012. Investments in energy efficiency also stimulate the local economy by providing individuals and families with greater disposable income, alleviating poverty, increasing purchasing power, and creating more local jobs (Bell 2014; IEA 2014).

Last, investing in energy efficiency allows communities to increase their percentage of renewable energy sources. Numerous state and local governments have invested in solar energy projects for low-income multifamily households; these include the Colorado Energy Office, the District of Columbia Department of Energy and Environment, and the Baltimore Office of Sustainability (Collins 2015; Shahan 2015). By using energy efficiency to lower a building's energy demand, utilities and local governments can maximize the percentage of a building's energy needs that can be met by renewables. Also, because energy efficiency is relatively inexpensive, it can help reduce the total cost per kWh of a combined renewable energy and energy efficiency project. As more states and local governments seek to advance renewable projects in low-income communities—and especially in multifamily housing—energy efficiency can and should play a crucial role in these efforts.

Energy efficiency programs benefit the entire population by reducing environmental pollutants, which tend to impact low-income communities disproportionately.

Strategies for Improving Energy Efficiency in Low-Income Communities

When developing energy efficiency policies and programs, policymakers and other stakeholders must consider the extent to which these investments will reach the target populations, especially those experiencing persistent and high energy burdens. Individuals or families experiencing high energy burdens vary in important ways relevant to program design: by ownership, income, building type, race/ethnicity, energy use per square foot, and languages spoken (Berelson 2014). Therefore, programs and policies should be designed, targeted, and implemented with the goal of reaching a wide variety of households facing high energy burdens.

Based on research, experience, and findings in other reports, we suggest the following strategies for improving energy efficiency in low-income communities:

- Improve and expand low-income utility programs
- Collect, track, and report demographic data on program participation
- Strengthen policy levers and more effectively leverage existing programs
- Utilize the Clean Power Plan to prioritize investment in low-income energy efficiency

Utilities and state and local governments can utilize these strategies to create more effective low-income energy efficiency programs. These strategies should be used in combination, and they should be prioritized according to the needs of the community.

Improve and Expand Low-Income Utility Programs

Take advantage of best practices in low-income energy efficiency program design and delivery

Utilities and other program administrators can increase the impact of their low-income programs by taking advantage of best practices in low-income energy efficiency program design and delivery. In doing so, they must recognize the diversity of the low-income housing stock, including renter- and owner-occupied housing as well as single- and multifamily units.

In regard to single-family housing, successful low-income energy efficiency programs have been found to

- offer a range of measures and services
- coordinate delivery with other organizations
- align and add on to existing weatherization efforts
- address health and safety issues when implementing efficiency measures
- incorporate strategies for customer energy efficiency education

Some programs may also coordinate efficiency with bill assistance programs and develop dual-fuel and fuel-blind programs to make program delivery seamless. Examples of utilities and other program administrators that run strong low-income energy efficiency programs include Southern California Edison, Efficiency Vermont, National Grid, and Pacific Power. For a more comprehensive discussion of successful low-income utility programs, see ACEEE's 2016 report *Building Better Energy Efficiency Programs for Low-Income Households* (Cluett, Amann, and Ou 2016).

To achieve greater savings within this sector, utilities can offer more comprehensive programs that meet the needs of a diverse low-income customer base. These programs could include direct-install and weatherization measures, as well as appliance, equipment, and electronics upgrades. Currently, the majority of low-income energy efficiency programs offered by utilities focus on the weatherization model and direct-install measures, with the most common ones including insulation, air sealing, and heating and cooling measures (Cluett, Amann, Ou 2016). Some utility programs go beyond weatherization and incorporate additional offerings, such as energy efficiency equipment upgrades and initiatives that encourage behavioral change.

Utilities are well positioned to serve low-income customers with energy efficiency programs. They already have built-in communication channels and relationships with households and building owners who receive their energy bills. Some utilities have also built 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 with other low-income services in order to streamline program delivery and maximize participation.

Develop Programs Targeted to Affordable Multifamily Housing

In many states the majority of low-income households are renters. Yet residential energy efficiency programs administered by states and utilities have historically focused on single-family, owner-occupied housing. Efficiency measures are far less likely to be installed in multifamily rentals than in any other type of housing, leaving significant unrealized energy savings (Pivo 2014). A recent study issued by Energy Efficiency for All estimates that energy efficiency in multifamily affordable housing could realistically cut the sector's electricity usage by as much as 26%, based on data from a sample of states (Mosenthal and Socks 2015).

Utilities and other program administrators should develop programs to target multifamily customers. In 2013, ACEEE completed a review of leading multifamily programs and identified 10 best practices among these programs (Johnson 2013):

- provide a one-stop shop for program services
- incorporate on-bill repayment or low-cost financing
- integrate direct installation and rebate programs
- streamline rebates and incentivize in-unit measures to overcome split incentives
- coordinate programs across electric, natural gas, and water utilities
- provide escalating incentives for achieving greater savings levels
- serve both low-income and market-rate multifamily households
- align utility and housing finance programs
- partner with the local multifamily housing industry
- offer multiple pathways for participation to reach more buildings

Program administrators designed these programs specifically to serve multifamily customers, often targeting building owners who have a budget for repairs and improvements. As a result, these programs often address the specific needs identified for this market.

Work with Utility Regulators and Utilities to Document and Recognize the Nonenergy Benefits of Low-Income Energy Efficiency Programs

Program administrators do not often include nonenergy benefits in their pre- and post-program cost–benefit analyses, even though programs often have purposes beyond energy savings, such as addressing health and safety measures and increasing energy affordability (Cluett, Amann, and Ou 2016). A 2012 ACEEE study found that less than one-third of sampled utilities included the multiple and nonenergy benefits of energy efficiency in their cost–benefit testing, although three-fourths did include all participant costs. Of the utilities that included multiple benefits, few included comprehensive nonenergy benefits, with utilities in Massachusetts and Rhode Island performing best in this regard (Kushler, Nowak, and Witte 2012).

Both public utility commissions and local governments can encourage or require cost-effectiveness screening and testing to take into account the multiple benefits of low-income energy efficiency programs.

When program administrators include the nonenergy benefits of energy efficiency alongside energy savings, the benefit–cost ratio can improve to up to 1.5 times the initial investment for single-family households and up to 3.5 times for multifamily households (Russell et al. 2015; Mosenthal and Socks 2015). Program managers and researchers have not yet come to an agreement on values for nonenergy benefits of energy efficiency, but studies show that these benefits, especially health-related ones, greatly increase the benefit-cost ratio (Skumatz 2014; Oppenheim and MacGregor 2014). Some utilities have found ways to account for these benefits, such as by using an adder in the cost–benefit calculation. An adder is a factor that adjusts the calculated benefit of an energy efficiency measure on the basis of its perceived value, including nonenergy benefits. In other words, while certain benefits may be difficult to measure, it is more accurate to use an approximation than to use zero.

When program administrators include the nonenergy benefits of energy efficiency alongside energy savings, the benefit–cost ratio can improve to up to 1.5 times the initial investment for single-family households and up to 3.5 times for multifamily households.

By including costs and excluding some benefits, the evaluation of low-income programs might not reflect their full value. If tests measure only energy-related benefits, then costs not associated with energy—such as health- and safety-related home repairs and job training—should not be included. In order to produce more accurate results, benefit–cost tests should include only costs and benefits related to energy savings or include all energy and nonenergy costs and benefits.

Some states—including Connecticut, California, and New Hampshire—acknowledge that low-income programs provide benefits beyond energy savings (Berelson 2014; Woolf et al. 2013). These states do not apply the same cost-effectiveness standards to low-income programs that they apply to the other energy efficiency programs throughout the state. They recognize difficult-to-measure nonenergy benefits, as well as the fact that the portfolio must include programs that reach low-income households even if those particular programs incur higher costs. Program administrators may set a lower cost-effectiveness threshold for low-income programs, or they may use adders to account for the non-monetized benefits (Cluett and Amann 2015). For example, cost–benefit testing of low-income programs in Colorado assumes an increase in benefits of 25%, and Vermont similarly increases benefits by 15% for low-income programs (Malmgren and Skumatz 2014).

Provide Financing Options to Households and Building Owners

Access to up-front capital is one of the many barriers to energy efficiency for low-income households and low-income multifamily property owners. Several utilities and public and community-based entities have developed financing programs to help these customers access credit to make cost-effective energy efficiency improvements. These programs have the potential to serve as a complement to energy efficiency programs for low-income customers. In the Southeast, electric cooperative utilities are increasingly offering financing programs that enable households to pay for energy efficiency upgrades via their utility bills. The bill reductions due to energy savings help cover the cost of upgrades (Marsh-Robinson 2016; Lundin 2016). While these programs are typically open to all customers, many low-income households participate.

On-bill financing programs, like most loan products, should include program terms with strong consumer protections. They should also strive to achieve bill neutrality, which means that energy savings from efficiency investments cover the monthly loan payments so the post-investment bill does not exceed the pre-investment amount.[25] With strong consumer protections in place, energy efficiency loans can prove beneficial for some households by providing a way to finance efficient and cost-saving measures.

Financing can also be critical to furthering energy efficiency investments in multifamily housing. Multifamily building owners, especially low-income housing providers, face increasing operational costs as their buildings age. Maintenance and improvement priorities often compete with energy efficiency upgrades for limited financial capital, and as a result, building owners often lack the up-front capital needed for energy efficiency retrofits. Low-interest financing or on-bill financing can limit or eliminate up-front costs, allowing building owners to undertake more substantial energy efficiency projects and repay loans with a portion of the energy savings.

Additionally, state housing finance agencies can support energy efficiency in both new and existing affordable multifamily buildings. Their financing programs can require energy efficiency standards in all new construction and rehabilitation that they support in this sector. They can also work with utilities that provide ratepayer-funded programs for multifamily building owners. Utility incentives can be applied to refinance or redevelopment loans to buy down some up-front costs and yield deeper, more comprehensive energy efficiency improvements throughout the affordable building stock.[26]

Collect, Track, and Report Demographic Data on Program Participation

By collecting demographic data on program participation, utilities can assess the extent to which their programs are serving different segments of the population, especially those customers known to experience high energy burdens. For example, many utilities do not track the percentage of multifamily customers that they serve relative to the eligible customer base, leaving themselves unaware of the extent to which they are adequately serving these customers. Utilities can rely on this information to inform program design and marketing and outreach strategies. Our research indicates that some of the household demographics that should be incorporated into program evaluation for these purposes include: income level, renter versus owner, multifamily versus single family, and race/ethnicity. These data points and/or evaluations should also be made available to the public for stakeholder review (Kallay et al. 2015).

Even though some utilities do collect demographic data on program participation, few utilities use this information during program evaluation. In a sample of California utility programs, the majority did collect demographic data and published these data in their evaluation reports, but only half of these utilities used the data to make program design recommendations, and even fewer used the data in the analysis of program impact (Frank and Nowak 2016 forthcoming). According to this study, utility program managers most commonly collected data on income and education, with data on home ownership, age, language spoken, and race/ethnicity collected less often.

While some utilities use segmentation to identify customers for specific programs using factors such as geography, income, and energy use per square foot to determine who should be targeted for certain programs, the majority of programs do not use demographic information for evaluation purposes. For many, collecting these data would be a first step toward better program design and measurement. To ensure that energy efficiency programs reach all types of households—especially those experiencing high energy burdens—program administrators should examine demographically identifiable participation gaps in past programs, adjust their program design to target these populations, and continue to collect and analyze these data to measure program success.

Strengthen Policy Levers and Leverage Existing Programs

Utility regulators and boards of publicly owned utilities should help utilities develop, promote, and execute strong low-income programs by approving and setting goals and guidelines for spending, savings, cost recovery, and cost-effectiveness testing. For municipally owned utilities, city boards and councils can require strong goals and targets for low-income energy efficiency savings and also incorporate cost-effectiveness testing into program evaluation. Even though public utility commissions (PUCs) set goals for investor-owned utilities (IOUs), state and local governments can still encourage PUCs to set low-income program goals and evaluation criteria and can advocate for improved program design and implementation.

Additionally, state and local governments can set policy directives that support low-income energy efficiency, disclosure and benchmarking policies for multifamily buildings, workforce development initiatives, state-level requirements for utility-delivered energy efficiency (e.g., energy efficiency resource standards [EERSs]), and other, related efforts.[27]

States can also set EERSs that include targets for the low-income sector. Currently, 25 states have an EERS in place, and some of these also have low-income energy-saving goals. Utilities in states that do not have an EERS could also create quantifiable performance indicators (QPIs) that include low-income efficiency programs as a measurement of success.[28] For example, Efficiency Vermont includes a minimum acceptable threshold for low-income household participation in programs as one of its QPIs, aiming for $7.5 million in spending on low-income single- and multifamily programs (Efficiency Vermont 2013). Local governments can support the development of low-income goals and performance indicators by advocating to their PUC, petitioning the utility itself for QPIs, or establishing targets for municipally owned utilities.

Some PUCs also set low-income energy savings goals and spending requirements. For example, the Maine Public Utilities Commission allocates 10% of energy efficiency funds to support low-income programs. Some stakeholders advocate for PUCs to adopt more-stringent goals. Massachusetts's Green Communities Act requires that energy efficiency program funds be allocated in proportion to the customer class from which the funds are contributed but also stipulates that at least 10% for electric and 20% for gas energy efficiency programs be spent on comprehensive low-income programs (Commonwealth of Massachusetts 2008). In Pennsylvania, many community-based organizations, city governments, and local utilities petitioned the PUC to raise its low-income goal. In June 2015, their efforts succeeded: the PUC increased its low-income target from 4.5% to 5.5% of energy efficiency savings by 2021 (Pennsylvania Public Utility Commission 2016).

Use the Clean Power Plan to Prioritize Investment in Low-Income Energy Efficiency

The Clean Power Plan, announced by President Obama on August 3, 2015, sets the first-ever limits on carbon pollution from power plants—the nation's largest source of the pollution driving dangerous climate

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change. The US Environmental Protection Agency (EPA) projects that by 2030, the Clean Power Plan will cut the electric sector's carbon pollution by 32% nationally, relative to 2005 levels (EPA 2016). Under the Clean Power Plan, states have the opportunity to develop state plans that apply emissions limits to their power plants. They face several choices in developing these plans, and they can, if they wish, prioritize low-income energy efficiency programs in this process.

To do so, states would first choose a plan approach that incentivizes low-income energy efficiency programs. One way to do this would be to adopt a mass-based plan, which limits the total amount of carbon pollution from the state's power plants. Under this system, the state issues a permit—called an allowance—for each ton of carbon pollution that its power plants are allowed to emit. These allowances have an economic value because they represent the right to emit one ton of a capped pollutant.

Next, states would distribute these allowances in a manner that allowed their value to be captured for public policy purposes, including low-income energy efficiency programs. There are three main ways states can do this. First, they can auction allowances and take in revenue, and then use some of this revenue to fund low-income energy efficiency programs. This is the approach used in the northeastern and mid-Atlantic states in the Regional Greenhouse Gas Initiative, which invested $1 billion of allowance auction revenue in energy efficiency programs between 2008 and 2013 (RGGI 2015). Second, in states where distribution utilities operate separately from power plant owners (known as deregulated states), allowances can be distributed to the distribution utility, which operates under public utility commission oversight. The distribution utility then sells these allowances and uses the revenue for regulator-approved activities, such as funding low-income energy efficiency programs. Third, states can allocate allowances directly to low-income energy efficiency programs, which can then sell them to generate revenue. All three strategies can be used to fund programs.

States can also opt in to the Clean Energy Incentive Program, which offers early credit for energy efficiency projects in low-income communities during the two years prior to the start of the compliance period. Without this program, projects could not receive credit until the start of the compliance period, currently slated for 2022. For each megawatt-hour of electricity that programs save in 2020 and 2021, eligible low-income energy efficiency programs will get two emission rate credits, or an equivalent number of allowances. Project developers can sell credits to power plant owners, gaining revenue to offset program costs.

Low-income energy efficiency providers should engage with state air agencies to help shape state plans. The Clean Power Plan provides a unique opportunity to drive investment in low-income energy efficiency programs and gives states additional incentive to act.

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25 For more information on consumer protections for on-bill financing programs, particularly for low-income households, see Burcat and Power 2013.

26 For properties financed through Low Income Housing Tax Credits (LIHTC), recapitalization windows present approximately every 15 years.

27 Disclosure and benchmarking policies refer to local laws that require owners of commercial and multifamily residential buildings to annually disclose their buildings' energy use and benchmark it relative to other buildings. An energy efficiency resource standard (EERS) establishes specific, long-term targets for energy savings that utilities or non-utility program administrators must meet through customer energy efficiency programs. For more information on EERSs, see aceee.org/topics/energy-efficiency-resource-standard-eers.

28 Quantifiable performance indicator (QPI) targets are set by the utility in order to measure how well its performance meets planned strategic goals and objectives. Low-income participation can be included as a QPI in order to make sure that attention to low-income households remains a priority for the utility.

Conclusion

Based on our analysis results, we determined that certain households—namely low-income, low-income multifamily, African-American, Latino, and renters—devote a disproportionate share of their income to energy expenses. Low-income households typically live in less efficient housing and are often more difficult to reach with information about energy efficiency programs.

Many of these households, due to lack of disposable income to invest in energy efficiency measures, have less ability to participate in their utility's energy efficiency programs. In order to overcome the barriers to participation that low-income customers face, governments and utilities should enhance their low-income program offerings, improve program design and implementation for low-income households, and better utilize existing channels and programs that target low-income households. Programs that address high energy burden also help alleviate poverty and provide other benefits to society beyond energy savings, such as economic development, employment, education, and public health.

Utility-led energy efficiency is an underutilized strategy that could complement bill assistance and weatherization programs to alleviate high household energy burdens in low-income communities. Energy efficiency programs in low-income communities need improved design and targeting in order to address long-term energy affordability needs. Local governments and utilities can work together to improve energy efficiency in these communities. We identified several strategies to ramp up energy efficiency, including improving current low-income program offerings, incorporating demographic data into program goals and evaluation, exploring financing options, and using additional policy levers.

This report has focused on improving low-income energy efficiency as a strategy for addressing high energy burdens. While this is an important strategy for reducing household energy use, it will not break cycles of poverty or completely eradicate high utility costs for all households. We estimate that energy efficiency investments (i.e., whole-home retrofits) for low-income households can make homes 25% more efficient than the average home, which means these investments have the potential to reduce the energy burden of a low-income household by nearly 30%.[29] Energy efficiency is a big part of the solution, but we still have a long way to go to ensure an equitable distribution of energy costs for all American families.

Due to changing regulatory policies, cities and states have additional urgency to ramp up efforts to increase low-income energy efficiency. In addition to the Clean Power Plan, the EPA has numerous potential rulemakings to limit the emissions of nitrogen oxides, sulfur dioxide, and carbon dioxide, which will increase states' obligations to reduce emissions. Energy efficiency remains a least-cost strategy for states to reduce multipollutant emissions. Under this approach, greater investment in low-income energy efficiency can cut emissions while improving energy affordability for those most in need.

Next Steps and Future Research

We encourage cities and other stakeholder groups to use this report's energy burden data and principles in their efforts to design and deliver energy efficiency policies and programs targeted toward the alleviation of high energy burdens. Cities can compare their median energy burden with the burdens of the groups in the study (Appendix B) and determine how their city or metro area stacks up regionally and nationally for each group studied (Appendix E). The energy burden data in this report is a snapshot of the current energy burden landscape, and stakeholders should use the data as a baseline for improvement.

While this report focuses on energy burdens in cities, rural communities experience acute energy burdens as well, and the severity of these burdens may differ from those experienced in cities. Although the strategies presented in this report can be applied to rural communities, future research should explore the landscape of rural energy burden and determine the specific policy needs of rural families that experience high energy burdens.

We hope that this report's findings and recommendations will act as conversation starters for cities and states that want to consider new energy affordability measures and determine how best to help their citizens obtain affordable and equitable access to energy. We have found that high energy bills, low household income, inefficient housing stock, and lack of access to efficiency programs contribute to energy burden. Cities and states should explore these drivers to determine why energy burden is higher in some regions and communities than in others.

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29 We assume 25% savings from energy efficiency upgrades based on the US Department of Energy's estimate (DOE 2014), and use the values in table 3 to calculate the 30% energy savings. A 30% savings for low-income households would reduce energy costs per square foot to $1.06, which reduces annual utility spending to $1,269 and energy burden to 5.1%. This is a reduction of 29.2% from the original energy burden of 7.2%. This savings estimate does not include the net costs for energy efficiency improvements.

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Appendix A. Sample Sizes

Table A1. Sample sizes used in energy burden calculations

City	Data year	All households	Low-income households	Low-income multifamily households	African-American households	Latino households	Renting households
Atlanta	2011	2,564	1,170	291	878	202	835
Austin	2013	2,794	1,178	326	206	692	1,145
Baltimore	2013	2,786	1,084	213	742	126	756
Birmingham	2011	2,876	1,397	212	809	91	717
Boston	2013	2,373	829	183	199	172	732
Charlotte	2011	2,816	1,326	263	716	214	888
Chicago	2013	766	388	128	176	128	288
Cincinnati	2011	2,401	1,141	246	271	66	683
Cleveland	2011	2,708	1,204	168	485	132	679
Columbus	2011	3,009	1,317	243	431	105	1,030
Dallas	2011	2,887	1,280	353	491	669	1,064
Denver	2011	2,714	1,171	354	144	482	884
Detroit	2013	2,530	1,063	186	445	77	628
Fort Worth	2011	3,095	1,435	309	426	671	1,052
Hartford	2013	2,817	1,105	210	252	303	659
Houston	2013	2,527	1,096	319	471	705	910
Indianapolis	2011	3,013	1,314	246	429	176	900
Jacksonville	2013	2,996	1,358	208	606	175	972
Kansas City	2011	2,974	1,430	216	356	164	876
Las Vegas	2013	2,496	1,186	294	284	564	1,112
Los Angeles	2011	3,001	1,773	635	290	1,161	1,591
Louisville	2013	2,916	1,218	204	370	98	822
Memphis	2011	2,870	1,348	220	1,280	119	900
Miami	2013	2,351	1,154	444	445	971	865
Milwaukee	2011	1,911	1,005	309	284	137	785
Minneapolis	2013	2,624	914	170	118	100	517
Nashville	2013	2,919	1,233	238	416	155	921
New Orleans	2011	2,800	1,407	191	901	210	911
New York City	2013	677	353	155	147	131	333
Oklahoma City	2013	3,304	1,310	214	354	319	1,034
Orlando	2013	3,031	1,284	276	444	719	1,101
Philadelphia	2013	2,893	1,322	163	602	215	730
Phoenix	2011	2,569	1,137	264	147	555	873
Pittsburgh	2011	2,758	1,203	128	210	50	642
Portland	2011	2,916	1,256	347	60	209	1,022
Providence	2011	2,666	1,143	110	105	195	672
Richmond	2013	2,916	1,193	189	791	134	868
Riverside	2011	2,816	1,400	216	232	1,105	1,063
Sacramento	2011	2,954	1,422	334	219	472	1,154
San Antonio	2013	3,357	1,499	273	212	1,659	1,142
San Diego	2011	3,123	1,497	498	169	732	1,404
San Francisco	2011	2,878	1,220	469	115	410	1,343
San Jose	2011	3,292	1,374	392	113	658	1,337
Seattle	2013	2,765	1,017	361	142	179	976
St. Louis	2011	2,663	1,224	201	541	71	748
Tampa	2013	2,225	883	211	234	293	680
Virginia Beach	2011	3,018	1,335	278	873	136	1,002
Washington, DC	2013	2,307	670	207	556	226	611
Total	N/A	129,662	57,266	12,665	19,187	17,333	42,857

Appendix B. City Median Energy Burdens

Table B1. Median gross household income and energy burdens for the median household in each group

City	Data year	Median household	Median low-income household	Median low-income multifamily	Median African-American household	Median Latino household	Median renter household
Atlanta	2011	4.97%	10.19%	8.31%	6.60%	6.60%	6.75%
Austin	2013	2.65%	5.47%	4.09%	3.47%	3.72%	3.14%
Baltimore	2013	3.12%	7.14%	4.80%	4.41%	3.29%	3.64%
Birmingham	2011	5.34%	10.92%	8.71%	7.68%	6.55%	7.30%
Boston	2013	2.76%	6.72%	4.40%	3.89%	3.28%	2.86%
Charlotte	2011	4.00%	7.89%	5.50%	5.14%	4.91%	4.78%
Chicago	2013	3.05%	6.73%	5.57%	6.56%	3.64%	4.12%
Cincinnati	2011	4.34%	8.45%	6.19%	6.86%	3.87%	5.96%
Cleveland	2011	4.22%	8.47%	5.36%	7.00%	4.64%	5.47%
Columbus	2011	3.95%	8.13%	6.52%	6.19%	5.00%	5.17%
Dallas	2011	4.25%	8.84%	6.51%	5.45%	5.97%	4.73%
Denver	2011	3.20%	6.59%	5.43%	4.81%	4.54%	4.18%
Detroit	2013	3.52%	7.98%	5.26%	5.78%	5.72%	4.56%
Fort Worth	2011	4.36%	8.02%	6.12%	5.24%	5.72%	5.04%
Hartford	2013	3.74%	8.16%	5.90%	6.03%	5.20%	4.92%
Houston	2013	3.24%	6.94%	5.22%	3.96%	3.81%	3.49%
Indianapolis	2011	3.70%	7.66%	6.51%	5.40%	4.13%	5.00%
Jacksonville	2013	3.87%	7.64%	5.56%	5.30%	4.33%	4.41%
Kansas City	2011	4.48%	8.49%	6.36%	7.91%	6.64%	6.11%
Las Vegas	2013	3.49%	6.11%	4.51%	4.08%	4.42%	3.71%
Los Angeles	2011	2.75%	4.60%	3.48%	3.72%	3.27%	2.73%
Louisville	2013	3.57%	7.60%	6.10%	4.66%	4.16%	4.77%
Memphis	2011	6.15%	13.22%	10.88%	9.65%	8.26%	8.64%
Miami	2013	3.32%	6.23%	4.80%	4.10%	3.73%	3.80%
Milwaukee	2011	4.08%	7.02%	5.54%	7.40%	4.46%	4.93%
Minneapolis	2013	2.32%	5.11%	3.05%	4.14%	3.14%	2.57%
Nashville	2013	3.11%	6.40%	5.18%	4.21%	4.45%	3.76%
New Orleans	2011	5.25%	9.79%	6.93%	8.06%	5.07%	6.31%
New York City	2013	3.67%	6.78%	5.68%	4.37%	4.87%	3.75%
Oklahoma City	2013	3.51%	7.36%	5.21%	4.98%	4.26%	4.27%
Orlando	2013	3.93%	7.55%	6.24%	5.27%	4.85%	4.14%
Philadelphia	2013	3.82%	8.82%	5.12%	6.46%	7.30%	4.70%
Phoenix	2011	4.18%	7.92%	6.09%	4.93%	6.00%	5.30%
Pittsburgh	2011	4.52%	9.42%	7.08%	8.31%	4.95%	6.00%
Portland	2011	2.81%	5.22%	4.16%	3.99%	3.53%	3.34%
Providence	2011	4.66%	9.46%	7.10%	6.03%	7.33%	6.18%
Richmond	2013	3.10%	6.54%	5.17%	4.24%	3.49%	3.97%
Riverside	2011	3.54%	5.74%	4.22%	3.81%	3.77%	4.14%
Sacramento	2011	2.93%	5.29%	3.60%	4.49%	3.45%	3.41%
San Antonio	2013	3.77%	7.80%	5.00%	3.99%	4.50%	3.95%
San Diego	2011	2.30%	3.90%	2.66%	2.24%	2.54%	2.27%
San Francisco	2011	1.41%	2.82%	1.89%	2.27%	1.83%	1.27%
San Jose	2011	1.78%	3.82%	2.28%	1.86%	2.35%	1.73%
Seattle	2013	2.05%	4.59%	3.08%	2.84%	2.22%	2.18%
St. Louis	2011	4.07%	8.37%	6.25%	7.40%	4.21%	5.90%
Tampa	2013	3.32%	7.28%	5.95%	3.97%	3.91%	3.64%
Virginia Beach	2011	3.85%	7.46%	5.39%	4.98%	3.75%	4.54%
Washington, DC	2013	2.12%	6.11%	4.28%	2.88%	2.67%	2.44%

Appendix C. Energy Burdens at the Median and Highest Energy Burden Quartile, by City

Table C1. Energy burdens for low-income and multifamily low-income households

City	Data year	Median household	Median low-income household	Highest energy burden quartile for low-income households	Median low-income multifamily household	Highest energy burden quartile for low-income multifamily households
Atlanta	2011	4.97%	10.19%	18.24%	8.31%	15.72%
Austin	2013	2.65%	5.47%	9.73%	4.09%	7.29%
Baltimore	2013	3.12%	7.14%	13.65%	4.80%	9.54%
Birmingham	2011	5.34%	10.92%	18.82%	8.71%	16.17%
Boston	2013	2.76%	6.72%	12.36%	4.40%	8.94%
Charlotte	2011	4.00%	7.89%	14.45%	5.50%	10.22%
Chicago	2013	3.05%	6.73%	13.41%	5.57%	14.59%
Cincinnati	2011	4.34%	8.45%	15.49%	6.19%	12.95%
Cleveland	2011	4.22%	8.47%	14.07%	5.36%	12.31%
Columbus	2011	3.95%	8.13%	12.93%	6.52%	11.17%
Dallas	2011	4.25%	8.84%	14.50%	6.51%	11.28%
Denver	2011	3.20%	6.59%	10.57%	5.43%	8.79%
Detroit	2013	3.52%	7.98%	15.26%	5.26%	9.76%
Fort Worth	2011	4.36%	8.02%	13.02%	6.12%	11.35%
Hartford	2013	3.74%	8.16%	14.49%	5.90%	11.75%
Houston	2013	3.24%	6.94%	11.84%	5.22%	9.18%
Indianapolis	2011	3.70%	7.66%	12.83%	6.51%	9.91%
Jacksonville	2013	3.87%	7.64%	13.48%	5.56%	9.06%
Kansas City	2011	4.48%	8.49%	14.60%	6.36%	11.08%
Las Vegas	2013	3.49%	6.11%	10.39%	4.51%	7.55%
Los Angeles	2011	2.75%	4.60%	8.84%	3.48%	6.67%
Louisville	2013	3.57%	7.60%	12.74%	6.10%	10.42%
Memphis	2011	6.15%	13.22%	25.47%	10.88%	21.73%
Miami	2013	3.32%	6.23%	11.04%	4.80%	7.99%
Milwaukee	2011	4.08%	7.02%	12.52%	5.54%	9.65%
Minneapolis	2013	2.32%	5.11%	8.20%	3.05%	5.77%
Nashville	2013	3.11%	6.40%	10.91%	5.18%	9.40%
New Orleans	2011	5.25%	9.79%	18.90%	6.93%	10.43%
New York City	2013	3.67%	6.78%	14.01%	5.68%	9.97%
Oklahoma City	2013	3.51%	7.36%	12.56%	5.21%	9.03%
Orlando	2013	3.93%	7.55%	11.51%	6.24%	9.39%
Philadelphia	2013	3.82%	8.82%	16.67%	5.12%	9.07%
Phoenix	2011	4.18%	7.92%	13.42%	6.09%	9.79%
Pittsburgh	2011	4.52%	9.42%	15.67%	7.08%	15.72%
Portland	2011	2.81%	5.22%	8.76%	4.16%	6.53%
Providence	2011	4.66%	9.46%	16.66%	7.10%	11.07%
Richmond	2013	3.10%	6.54%	11.51%	5.17%	9.26%
Riverside	2011	3.54%	5.74%	9.50%	4.22%	7.19%
Sacramento	2011	2.93%	5.29%	8.74%	3.60%	6.35%
San Antonio	2013	3.77%	7.80%	14.06%	5.00%	9.16%
San Diego	2011	2.30%	3.90%	6.74%	2.66%	4.80%
San Francisco	2011	1.41%	2.82%	5.24%	1.89%	3.26%
San Jose	2011	1.78%	3.82%	6.67%	2.28%	4.05%
Seattle	2013	2.05%	4.59%	8.05%	3.08%	5.61%
St. Louis	2011	4.07%	8.37%	14.78%	6.25%	12.87%
Tampa	2013	3.32%	7.28%	12.13%	5.95%	9.54%
Virginia Beach	2011	3.85%	7.46%	12.61%	5.39%	9.67%
Washington, DC	2013	2.12%	6.11%	11.70%	4.28%	7.68%

Table C2. Energy burdens for African-American and Latino households

City	Data year	Median household	Median African-American household	Highest energy burden quartile for African-American households	Median Latino household	Highest energy burden quartile for Latino households
Atlanta	2011	4.97%	6.60%	12.32%	6.60%	11.53%
Austin	2013	2.65%	3.47%	6.11%	3.72%	6.75%
Baltimore	2013	3.12%	4.41%	8.92%	3.29%	5.66%
Birmingham	2011	5.34%	7.68%	15.44%	6.55%	10.44%
Boston	2013	2.76%	3.89%	6.38%	3.28%	6.22%
Charlotte	2011	4.00%	5.14%	10.85%	4.91%	8.90%
Chicago	2013	3.05%	6.56%	15.27%	3.64%	7.14%
Cincinnati	2011	4.34%	6.86%	15.64%	3.87%	7.26%
Cleveland	2011	4.22%	7.00%	13.14%	4.64%	9.77%
Columbus	2011	3.95%	6.19%	10.93%	5.00%	9.56%
Dallas	2011	4.25%	5.45%	10.61%	5.97%	10.06%
Denver	2011	3.20%	4.81%	9.39%	4.54%	8.70%
Detroit	2013	3.52%	5.78%	14.78%	5.72%	10.19%
Fort Worth	2011	4.36%	5.24%	10.27%	5.72%	9.07%
Hartford	2013	3.74%	6.03%	12.47%	5.20%	11.10%
Houston	2013	3.24%	3.96%	8.56%	3.81%	6.87%
Indianapolis	2011	3.70%	5.40%	10.07%	4.13%	7.57%
Jacksonville	2013	3.87%	5.30%	10.06%	4.33%	6.68%
Kansas City	2011	4.48%	7.91%	16.22%	6.64%	11.96%
Las Vegas	2013	3.49%	4.08%	8.04%	4.42%	7.09%
Los Angeles	2011	2.75%	3.72%	9.47%	3.27%	6.38%
Louisville	2013	3.57%	4.66%	8.59%	4.16%	9.10%
Memphis	2011	6.15%	9.65%	19.36%	8.26%	15.93%
Miami	2013	3.32%	4.10%	8.63%	3.73%	6.36%
Milwaukee	2011	4.08%	7.40%	15.48%	4.46%	7.92%
Minneapolis	2013	2.32%	4.14%	7.90%	3.14%	6.10%
Nashville	2013	3.11%	4.21%	9.21%	4.45%	7.81%
New Orleans	2011	5.25%	8.06%	16.38%	5.07%	8.23%
New York City	2013	3.67%	4.37%	9.00%	4.87%	8.90%
Oklahoma City	2013	3.51%	4.98%	9.14%	4.26%	7.40%
Orlando	2013	3.93%	5.27%	8.53%	4.85%	7.55%
Philadelphia	2013	3.82%	6.46%	14.23%	7.30%	15.74%
Phoenix	2011	4.18%	4.93%	8.61%	6.00%	10.74%
Pittsburgh	2011	4.52%	8.31%	16.14%	4.95%	12.44%
Portland	2011	2.81%	3.99%	10.61%	3.53%	6.87%
Providence	2011	4.66%	6.03%	12.90%	7.33%	11.66%
Richmond	2013	3.10%	4.24%	7.99%	3.49%	6.28%
Riverside	2011	3.54%	3.81%	7.30%	3.77%	6.01%
Sacramento	2011	2.93%	4.49%	8.14%	3.45%	5.98%
San Antonio	2013	3.77%	3.99%	7.96%	4.50%	8.60%
San Diego	2011	2.30%	2.24%	4.29%	2.54%	4.40%
San Francisco	2011	1.41%	2.27%	4.22%	1.83%	3.33%
San Jose	2011	1.78%	1.86%	3.93%	2.35%	4.33%
Seattle	2013	2.05%	2.84%	6.08%	2.22%	4.65%
St. Louis	2011	4.07%	7.40%	14.41%	4.21%	7.32%
Tampa	2013	3.32%	3.97%	8.05%	3.91%	6.44%
Virginia Beach	2011	3.85%	4.98%	9.64%	3.75%	6.08%
Washington, DC	2013	2.12%	2.88%	5.78%	2.67%	4.57%

Table C3. Energy burdens for renting households

City	Data year	Median household	Median renting household	Highest energy burden quartile for renting households
Atlanta	2011	4.97%	6.75%	13.25%
Austin	2013	2.65%	3.14%	5.65%
Baltimore	2013	3.12%	3.64%	7.41%
Birmingham	2011	5.34%	7.30%	15.06%
Boston	2013	2.76%	2.86%	5.76%
Charlotte	2011	4.00%	4.78%	9.65%
Chicago	2013	3.05%	4.12%	10.01%
Cincinnati	2011	4.34%	5.96%	12.12%
Cleveland	2011	4.22%	5.47%	11.93%
Columbus	2011	3.95%	5.17%	9.82%
Dallas	2011	4.25%	4.73%	9.07%
Denver	2011	3.20%	4.18%	7.77%
Detroit	2013	3.52%	4.56%	10.20%
Fort Worth	2011	4.36%	5.04%	8.70%
Hartford	2013	3.74%	4.92%	10.24%
Houston	2013	3.24%	3.49%	6.83%
Indianapolis	2011	3.70%	5.00%	9.43%
Jacksonville	2013	3.87%	4.41%	8.21%
Kansas City	2011	4.48%	6.11%	11.68%
Las Vegas	2013	3.49%	3.71%	6.82%
Los Angeles	2011	2.75%	2.73%	5.97%
Louisville	2013	3.57%	4.77%	9.25%
Memphis	2011	6.15%	8.64%	18.48%
Miami	2013	3.32%	3.80%	6.62%
Milwaukee	2011	4.08%	4.93%	9.85%
Minneapolis	2013	2.32%	2.57%	5.52%
Nashville	2013	3.11%	3.76%	6.99%
New Orleans	2011	5.25%	6.31%	12.61%
New York City	2013	3.67%	3.75%	7.19%
Oklahoma City	2013	3.51%	4.27%	7.97%
Orlando	2013	3.93%	4.14%	7.90%
Philadelphia	2013	3.82%	4.70%	11.18%
Phoenix	2011	4.18%	5.30%	9.11%
Pittsburgh	2011	4.52%	6.00%	11.87%
Portland	2011	2.81%	3.34%	5.85%
Providence	2011	4.66%	6.18%	11.74%
Richmond	2013	3.10%	3.97%	7.03%
Riverside	2011	3.54%	4.14%	7.30%
Sacramento	2011	2.93%	3.41%	6.39%
San Antonio	2013	3.77%	3.95%	7.52%
San Diego	2011	2.30%	2.27%	4.03%
San Francisco	2011	1.41%	1.27%	2.50%
San Jose	2011	1.78%	1.73%	3.45%
Seattle	2013	2.05%	2.18%	4.25%
St. Louis	2011	4.07%	5.90%	12.93%
Tampa	2013	3.32%	3.64%	6.77%
Virginia Beach	2011	3.85%	4.54%	8.52%
Washington, DC	2013	2.12%	2.44%	5.22%

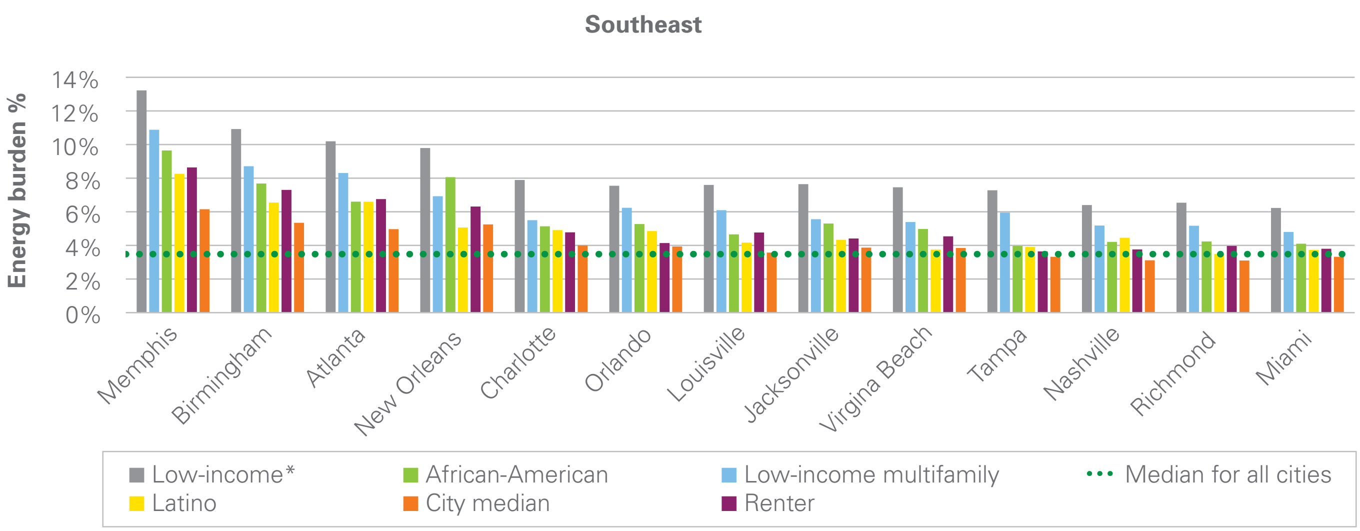
Appendix D. Households with Energy Burden At Least Twice the City Median

Table D1. Percentage of households in each group with energy burdens over two times the city median energy burden

City	Data year	All households	Low-income households	Low-income multifamily households	African-American households	Latino households	Renting households
Atlanta	2011	24.18%	51.45%	41.24%	32.57%	34.65%	33.77%
Austin	2013	23.55%	53.14%	36.81%	33.01%	34.68%	28.82%
Baltimore	2013	23.80%	56.83%	37.09%	36.12%	19.84%	28.84%
Birmingham	2011	25.31%	51.32%	41.51%	38.32%	23.08%	36.82%
Boston	2013	23.98%	50.54%	42.62%	30.65%	26.16%	25.82%
Charlotte	2011	23.76%	49.47%	32.70%	32.40%	29.44%	30.41%
Chicago	2013	29.11%	56.44%	48.44%	52.84%	28.13%	37.85%
Cincinnati	2011	24.32%	48.29%	36.99%	41.70%	22.73%	35.43%
Cleveland	2011	22.97%	50.08%	34.52%	41.03%	28.79%	36.38%
Columbus	2011	23.20%	51.40%	39.51%	40.37%	30.48%	32.43%
Dallas	2011	23.93%	52.19%	39.38%	33.60%	33.18%	27.16%
Denver	2011	23.25%	51.84%	40.40%	40.28%	35.27%	32.13%
Detroit	2013	25.26%	57.10%	36.02%	44.49%	38.96%	34.71%
Fort Worth	2011	21.55%	45.30%	33.33%	30.75%	27.57%	24.90%
Hartford	2013	22.97%	54.30%	38.57%	40.48%	37.29%	34.90%
Houston	2013	24.10%	53.28%	38.87%	34.39%	26.24%	26.37%
Indianapolis	2011	23.76%	52.82%	41.46%	34.97%	26.70%	34.00%
Jacksonville	2013	22.53%	48.97%	30.29%	33.50%	20.57%	26.54%
Kansas City	2011	22.66%	46.50%	34.72%	44.66%	34.15%	33.79%
Las Vegas	2013	20.95%	42.50%	27.89%	30.99%	25.71%	24.64%
Los Angeles	2011	26.22%	42.92%	32.44%	40.34%	30.15%	27.72%
Louisville	2013	22.98%	53.28%	41.67%	31.89%	30.61%	33.33%
Memphis	2011	26.10%	54.15%	43.64%	40.00%	32.77%	37.67%
Miami	2013	23.05%	46.10%	31.08%	32.36%	22.76%	24.74%
Milwaukee	2011	23.81%	43.08%	30.74%	46.13%	24.09%	30.19%
Minneapolis	2013	20.54%	56.46%	31.76%	46.61%	34.00%	29.01%
Nashville	2013	22.82%	52.23%	41.18%	34.38%	34.84%	29.21%
New Orleans	2011	23.71%	45.84%	24.08%	39.62%	17.14%	29.20%
New York City	2013	27.03%	47.03%	36.13%	29.25%	28.24%	24.62%
Oklahoma City	2013	22.19%	52.90%	36.92%	33.62%	26.96%	29.21%
Orlando	2013	20.59%	47.12%	34.42%	29.28%	22.95%	25.25%
Philadelphia	2013	27.03%	56.88%	31.29%	43.52%	47.44%	35.07%
Phoenix	2011	21.37%	46.53%	31.82%	25.85%	34.77%	28.29%
Pittsburgh	2011	23.57%	52.45%	40.63%	45.24%	34.00%	33.18%
Portland	2011	20.71%	45.86%	32.28%	40.00%	31.58%	26.91%
Providence	2011	22.66%	50.83%	34.55%	30.48%	38.46%	33.04%
Richmond	2013	22.53%	53.39%	39.68%	32.24%	25.37%	29.84%
Riverside	2011	20.10%	38.57%	25.93%	25.86%	20.45%	26.06%
Sacramento	2011	22.58%	43.74%	28.74%	36.53%	26.06%	29.12%
San Antonio	2013	24.13%	51.97%	31.14%	26.42%	29.42%	24.78%
San Diego	2011	21.07%	40.88%	26.10%	21.89%	23.91%	20.73%
San Francisco	2011	23.45%	49.92%	30.70%	40.00%	29.27%	21.67%
San Jose	2011	24.30%	53.78%	31.38%	28.32%	32.67%	24.61%
Seattle	2013	23.33%	55.36%	38.23%	38.03%	28.49%	26.33%
St. Louis	2011	24.30%	51.80%	38.81%	46.03%	19.72%	38.77%
Tampa	2013	22.47%	54.47%	41.23%	29.06%	23.55%	25.44%
Virginia Beach	2011	22.27%	48.39%	32.73%	32.42%	19.85%	28.34%
Washington, DC	2013	22.71%	68.06%	50.24%	32.91%	28.32%	29.30%

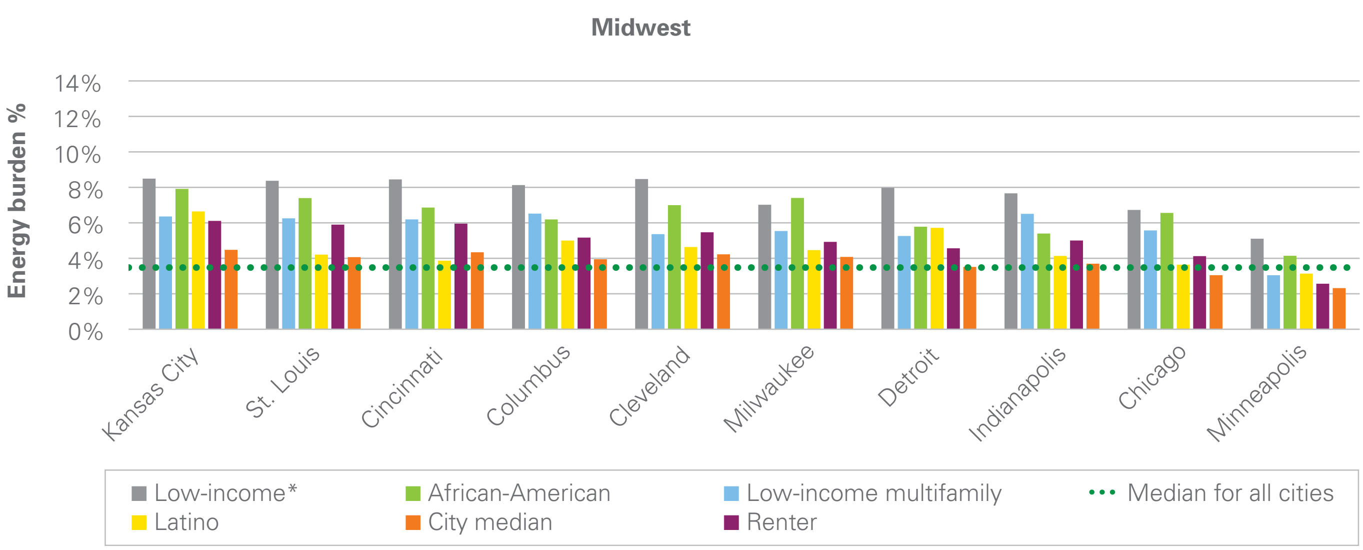
Appendix E. Regional Energy Burden

FIGURE E1. **Energy burden for median household from select groups in Southeast cities, ordered from highest to lowest based on the average of the median energy burdens across all groups.**



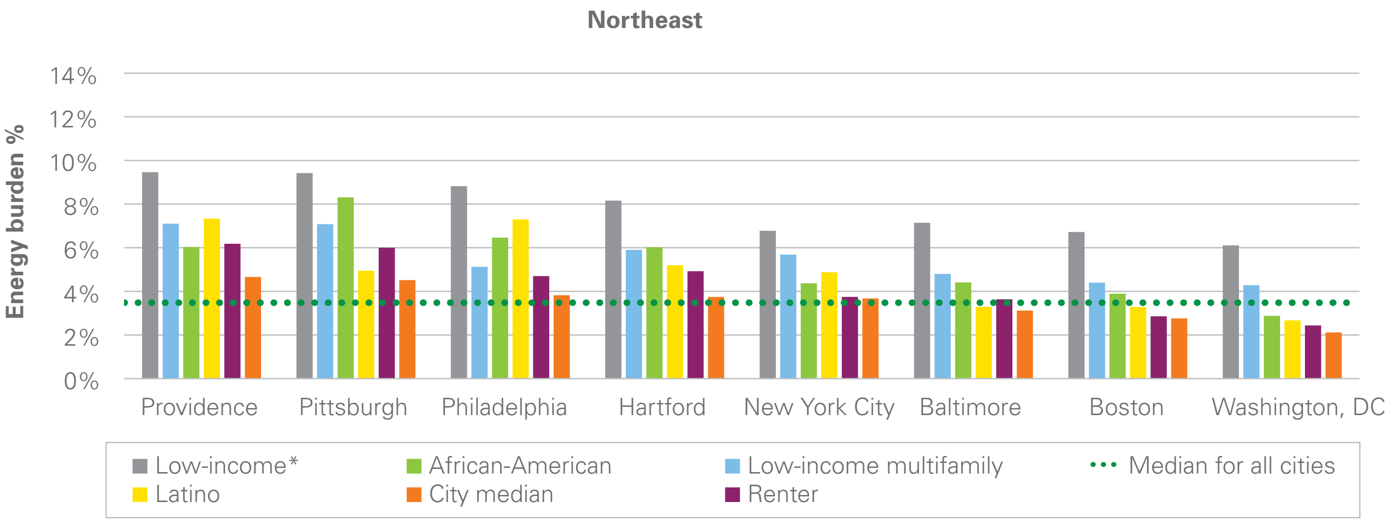
* Low-income includes both single- and multifamily households.

Figure E2. **Energy burden for median household from select groups in Midwest cities, ordered from highest to lowest based on the average of the median energy burdens across all groups.**



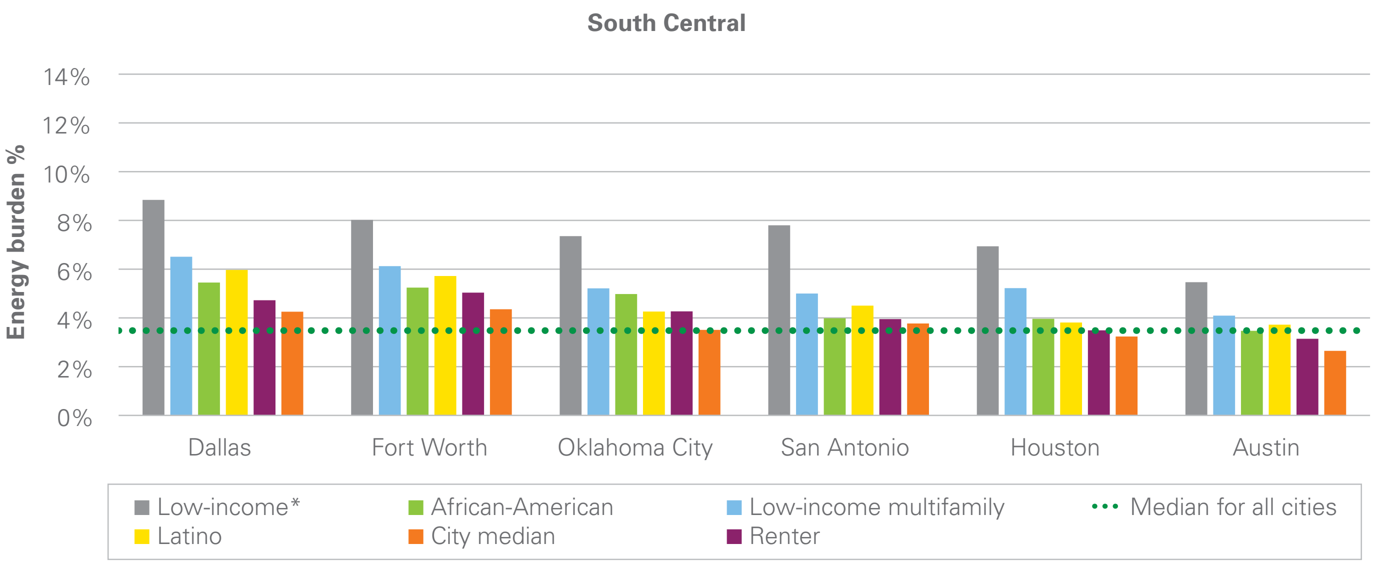
* Low-income includes both single- and multifamily households.

FIGURE E3. Energy burden for median household from select groups in Northeast cities, ordered from highest to lowest based on the average of the median energy burdens across all groups.



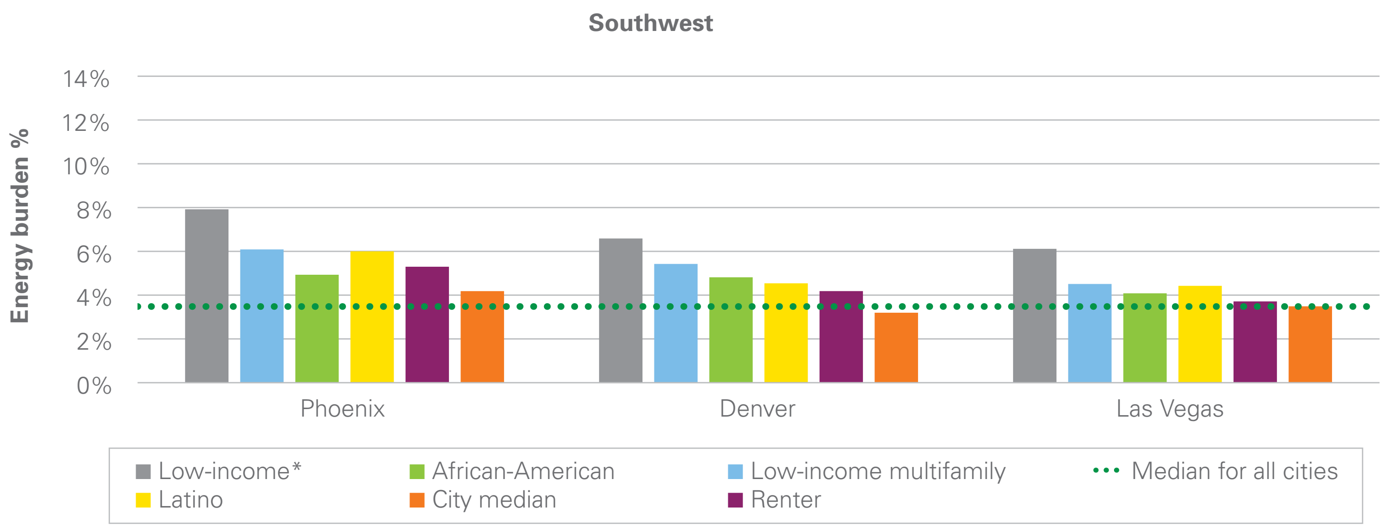
* Low-income includes both single- and multifamily households.

Figure E4. Energy burden for median household from select groups in South Central cities, ordered from highest to lowest based on the average of the median energy burdens across all groups.



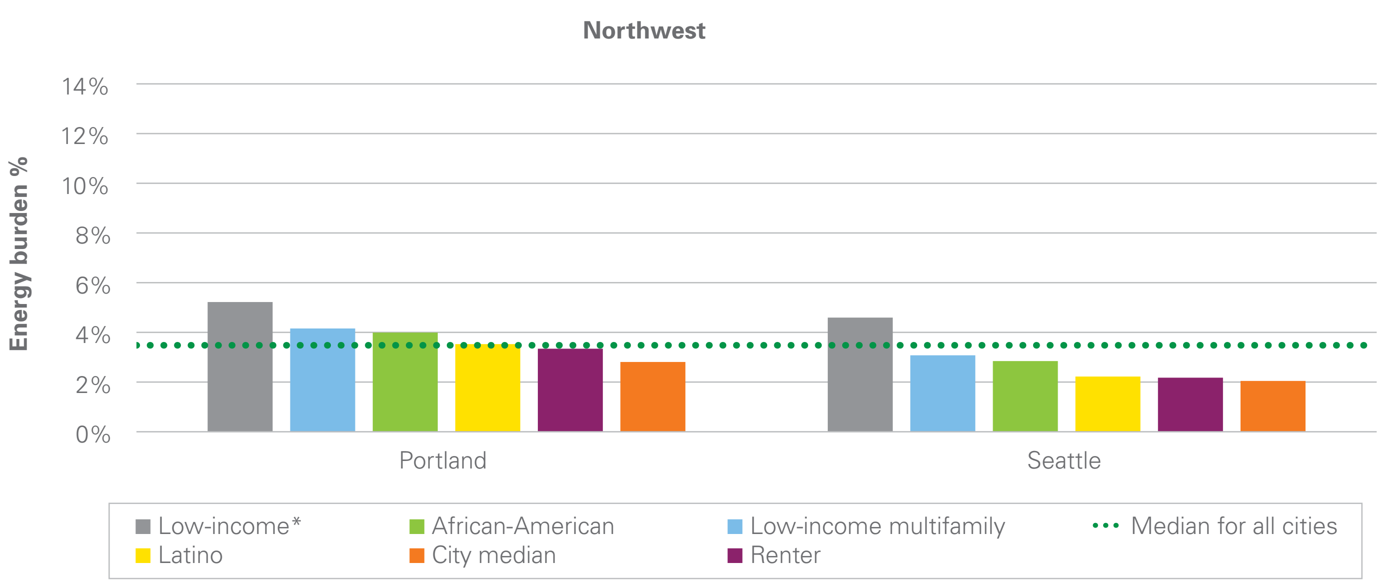
* Low-income includes both single- and multifamily households.

FIGURE E5. Energy burden for median household from select groups in Southwest cities, ordered from highest to lowest based on the average of the median energy burdens across all groups.



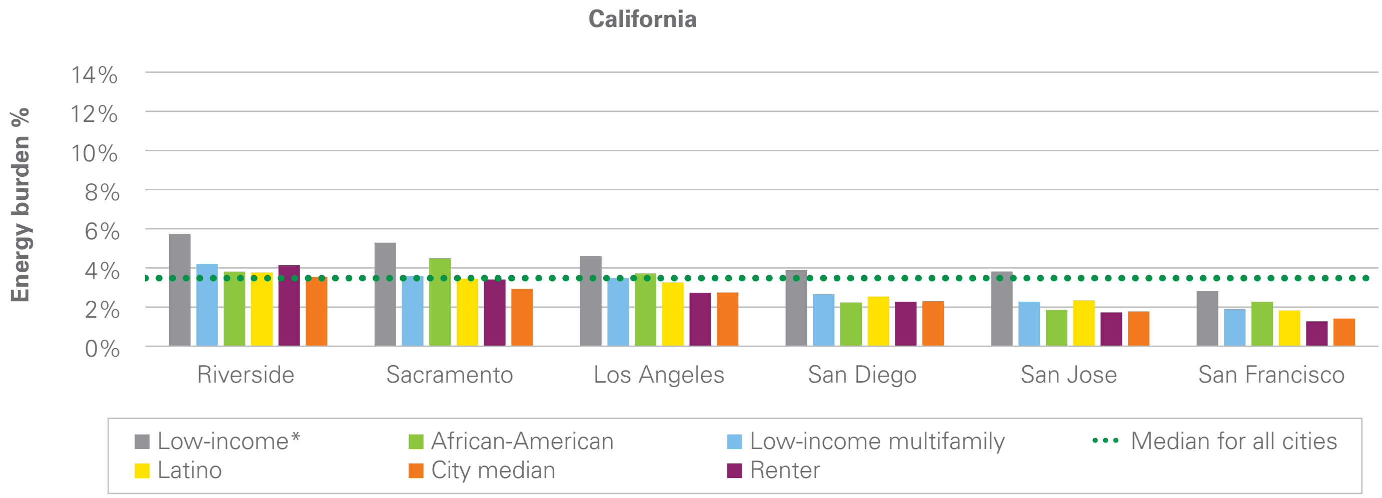
* Low-income includes both single- and multifamily households.

FIGURE E6. Energy burden for median household from select groups in Northwest cities, ordered from highest to lowest based on the average of the median energy burdens across all groups.



* Low-income includes both single- and multifamily households.

FIGURE E7. **Energy burden for median household from select groups in California cities, ordered from highest to lowest based on the average of the median energy burdens across all groups.**



* Low-income includes both single- and multifamily households.

ENERGY EFFICIENCY FOR ALL
energyefficiencyforall.org

ACEEE
American Council for an Energy-Efficient Economy
aceee.org

JUST ENERGY POLICIES: Model Energy Policies Guide

Environmental and Climate Justice Program, NAACP

National Association for the Advancement of Colored People
4805 Mount Hope Drive,
Baltimore, MD 21215
3/10/2017

JUST ENERGY POLICIES: MODEL ENERGY POLICIES GUIDE

Created by the NAACP Environmental and Climate Justice Program (ECJP)

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Acknowledgements

To our members whose leadership has influenced the development of this document.

TABLE OF CONTENTS

NAACP Energy Justice Resolutions
1974 - 2000

1974

1974

The Energy Crisis: calls for the expansion and protection of energy sector jobs, institution of price controls for the retail cost of energy, standards to ensure the provision of essential energy-related needs for low-income families, advocacy and solutions to energy needs in emergencies, and the appointment of African Americans to decision-making and regulatory bodies in the energy sector.

1976

Utility Rates - Regulatory Commissions Membership: calls for a moratorium on rate increases, broader based representation of consumer advocates on utility regulatory bodies, and for members to act as necessary to achieve this end.

1977

Energy: calls for the President of the United States and appropriate agencies to develop programs that protect access to energy for low income households and that the NAACP begin engaging in energy research with ally organizations to make recommendation for our energy future

1978

Energy: calls upon NAACP bodies to monitor all branches of government for the express purpose of assuring that the concept of energy as a vehicle either to depress the state of the American economy as to impose a further economic burden upon the poor and those who live on limited and fixed incomes in this nation

1977

Energy and Conversation Committee: calls upon the NAACP Board of Directors to create a special Energy and Conservation Committee comprised of youth and adult members to study the future jobs, vocational, economic, and educational opportunities that could benefit black youth in the energy sector

1978

Energy/Employment: called upon the Department of Energy to immediately implement its affirmative action program with a budget to recruit blacks for positions on all levels of that department.

1977

Energy Transportation Security Act of 1977: endorsed the enactment of the Energy Transportation Security Act of 1977 – H.R. 1037.

1978

Energy Policy and Socio-Economic Input Assessment: calls for the drafting of socio-economic impact assessment prior to decisions on energy matters, with respect to employment, health, the environment, housing, transportation, education and the general quality of life of black and other disadvantaged people of the United States.

2000

NAACP Energy Justice Resolutions 2001 - 2017

2001

2001

Environmental Protection Resolution: calls for state and local branches, as well as the assembly of a task force to examine the impacts of waste disposal policies and facilities in communities of color, such as incinerators

2003

Jobs vs. The Environment Myth Resolution: opposes any efforts that promise jobs to a community of color to coerce residents into accepting a polluting industry in their neighborhood and demands that environmentally regulated facilities fulfill job promises.

2006

Fossil Fuel Resolution: calls for President of the United States to roll back cost of fossil fuels and for Congress to enact emergency legislation that halts rising gas costs.

2007

Climate Change and Discriminatory Practices Resolution: commits to advocating for socially just solutions for the environment and global warming that will reduce racial and ethnic economic disparities.

2008

NAACP Supports Long-Term, Aggressive Energy Policy to Insulate US Against Future Situations Resolutions: calls on all interested parties to develop long-term strategies to reduce the global demand for gasoline

2008

NAACP Support for Present and Future Green Jobs Appropriations and Policies: advocates for the Green Job Act funding and inclusion of African Americans in emerging green energy sector.

2010

NAACP in Opposition to Expanded Offshore Drilling Without Adequate Safety Technology and Clean Energy Measures in Place: supports the exploration of clean energy alternative, including wind, solar, hydro, and geothermal solutions, in addition to energy conservation and reduction strategies.

2011

Clean Air Act — Greenhouse Gases — Coal Fired Plants: advocates health and sustainable alternatives to the current overreliance on coal for energy.

2012

To Set a Goal of 25% Renewable Energy by 2025 (Renewable Energy Resolution): commits to increase community involvement in ensuring that energy related policies and practices do no harm.

2014

Promoting Equitable Access to Clean Energy Alternatives: supports policies and programs that ensure affordable access to clean energy sources and advocates for sustainable job opportunities for low-to moderate-income communities.

2015

Advancing Clean Energy Resources: commits to support clean energy resources and advocates for affordable access to clean energy options for all.

2016

Resolution Against Natural Gas as a Climate Solution, or a "Bridge" Fuel to a Clean Energy Future: calls for authorities to protect vulnerable families from the pollution of fracking gas and stop the fossil fuel industry from burning natural gas-emitting methane.

2017

INTRODUCTION: NAACP MODEL ENERGY POLICIES

The rapid depletion of Earth's non-renewable resources coincides with increased energy consumption in the United States. With a growing understanding of the harmful impact of fossil fuel-based energy production on communities of color and low income communities, it is more important now than ever before that our communities take a stand to move our country to an energy efficient and clean energy future. Our intention in creating this compendium is that it will serve as a resource and will spur states to make sure their energy policies protect communities from harmful energy production processes while simultaneously providing equitable access to economic opportunities in energy efficiency and clean energy.

These model policies provide guidelines for state and local energy policies. Based on industry analysis, these standards are rigorous, yet attainable. If adopted nationwide, these policies will help to prevent climate change, as well as protect the well-being of communities.

NAACP'S ENVIRONMENTAL & CLIMATE JUSTICE PROGRAM

The three main objectives of the NAACP's Environmental and Climate Justice Program are:

1. **Reduce harmful emissions, particularly greenhouse gases:** Combines action on shutting down coal plants at the local level with advocacy to strengthen development, monitoring, and enforcement of regulations at the federal, state, and local levels. Also includes a focus on corporate responsibility and accountability.
2. **Advance energy efficiency and clean energy:** Works at the state level on campaigns to pass renewable energy and energy efficiency standards while simultaneously working at the local level with small businesses, unions, and others on developing demonstration projects to ensure that communities of color are accessing revenue generation opportunities in the new energy economy, while providing safer, more sustainable mechanisms for managing energy needs for our communities and beyond.
3. **Improve community resilience**: Ensures that communities are equipped to engage in climate action planning that integrates policies and practices on advancing food justice, advocating for transportation equity and upholding civil and human rights in emergency management.

Addressing pollution from non-renewable forms of energy and working on a just transition to energy efficient communities and use of clean energy while preserving health and livelihoods of community members are key components of the NAACP Energy Justice strategy.

THE JUST ENERGY POLICES INITIATIVE

The purpose of the NAACP's Renewable Energy Campaign is to engage communities of color and low income communities as leaders on advancing state legislation on Renewable Portfolio Standards, Energy Efficiency Resource Standards, and Distributed Generation Standards. The immense strength within these communities will build channels of support that advance environmental justice and social change. In addition, as part of its economic justice and equity agenda, the NAACP advocates for policies that advance equity in energy enterprise development to better support economic opportunities in the energy sector for people of color, low income persons, and women entrepreneurs and their communities and businesses. Communities of color historically have had disproportionately less access to jobs and wealth creation opportunities in the energy sector. As part of the effort to advance just energy policies and practices, it is essential to review state policy provisions to ensure that they foster economic growth for local communities.

PICTURE 1. NAACP MEMBERS GATHERED FOR AN ENERGY JUSTICE TRAINING IN BALTIMORE, MD
SOURCE: NAACP

The NAACP has identified five policies that advance the transition to a more inclusive, clean, and equitable energy economy. These focal policies include policies and programs include:

ENERGY FOCUSED POLICIES

Renewable Portfolio Standards (RPS): requires electric utility companies and other retail electric providers to supply a specific minimum amount of customer load with electricity from eligible renewable energy sources. In setting standards for the content of RPS, the NAACP goes further and distinguishes that our sources and processes must be clean energy, recognizing that not all renewable energy has been proven safe with minimal impact on the environment and communities. Under this definition, the focus on efforts on advancing solar, wind, and geothermal energy.

Energy Efficiency Resource Standards (EERS): establish a requirement for utility companies to meet annual and cumulative energy savings targets through a portfolio of energy efficiency programs. Given our current dependence on harmful energy production practices, we should reduce our demand for energy altogether.

Net Metering Standards, Distributed Generation, and Community Renewable Energy: require electric utility companies to provide retail credit for net renewable energy produced by a consumer. Meaning, if the consumer generates more energy from their solar panels or wind turbines than they use, they can sell it back to the utility at the same rate at which they purchase electricity. To incentivize clean energy practices at the consumer level, we need to offer the opportunity for revenue-generation for individuals and small businesses that contribute to the grid through their energy production. This often is seen in individual and community shared renewable energy.

EQUITY IN ENERGY ENTERPRISE POLICIES

Local Hire Provisions: goals or requirements for organizations and companies to hire people who live near their place of work. States achieve this goal by requiring contractors with publicly funded projects to recruit a specified proportion of residents as workers on the project. These provisions:

PICTURE 2. SOURCE: GRASSROOTSDC.ORG

1) Ensure that tax dollars are invested back into the local economy;
2) Reduce the environmental impact of commuting;
3) Foster community involvement; and
4) Preserve local employment opportunities in construction.

Disadvantaged Business Enterprise (DBE): a business that is at least 51 percent owner-operated and controlled by individuals who identify with specific ethnic minority, gender, disability, and other disadvantaged group classifications. DBE is an umbrella term for Minority Business Enterprise (MBE), Woman Business Enterprise (WBE), and other such distinctions. These groups can be self-identified, but are typically certified by a city, state, or federal agency. The predominant certifier for minority businesses is the National Minority Supplier Development Council. Often publicly funded projects set a requirement or goal to source DBEs as suppliers.

In this guide, you will find information on these policies and the various form they take across the United States, which will build your unit's knowledge and understanding of energy policies as you all prepare your Just Energy Policies Campaign.

Working independently or in partnerships and coalitions to advance model policies is a powerful way to bring about change. When thinking about what shape your unit's campaign will take and what energy justice policies and actions it will address, the companion document, *Just Energy Policies: Model Policies,* will be a useful resource. The framing in this document will be the basis of how of the *Just Energy Policies: Community Action Toolkit* can be used. These model policies can be tailored to the specific needs of your community and state and local contexts. The remainder of this guide introduces each of the NAACP Focal Energy Policies and provides discussion on their implementation across the U.S. and how they tie into the broader vision of an **energy democracy and living economy** that emphasizes **energy sovereignty**—the right to make one's own energy choices (Figure 1).

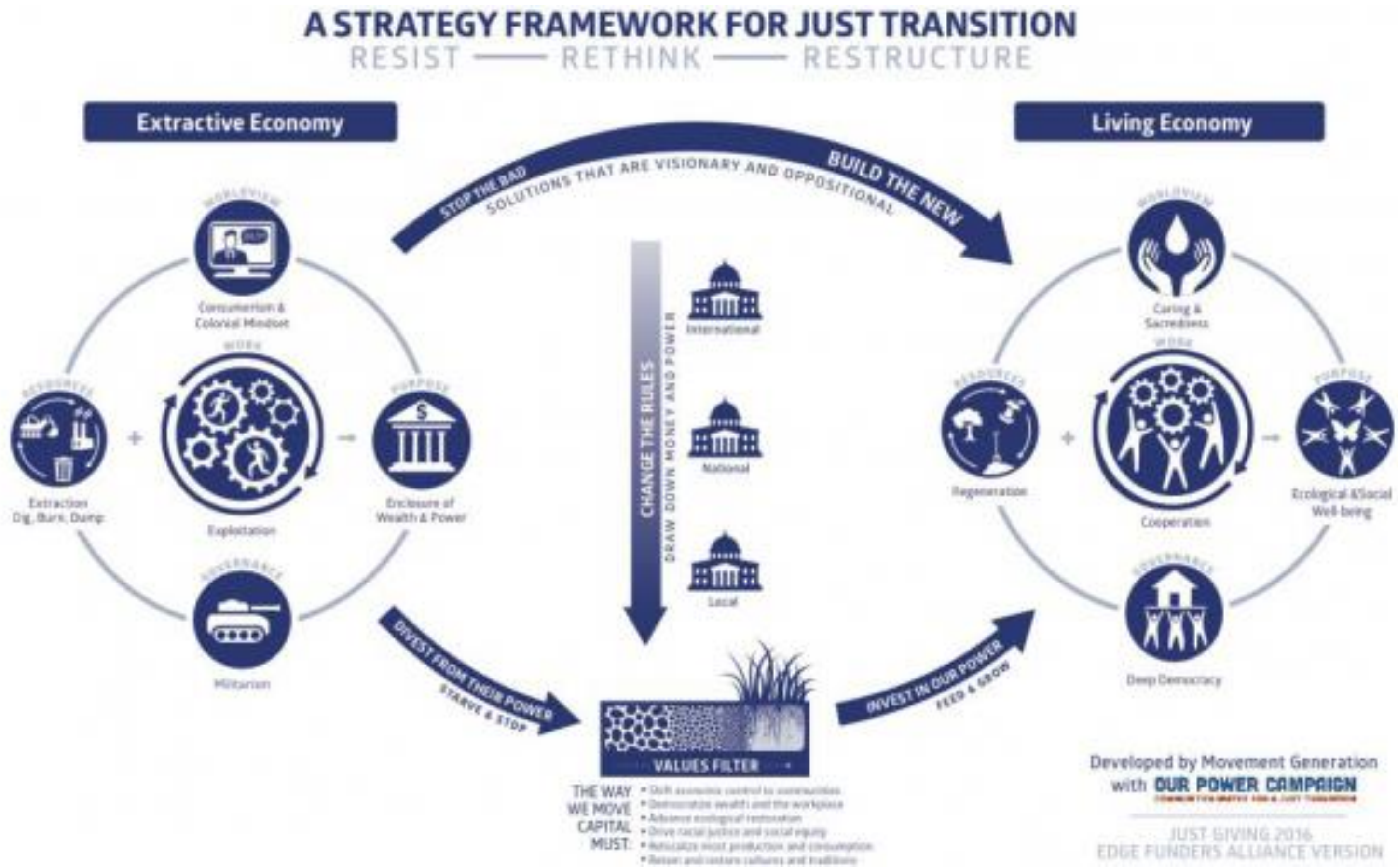

FIGURE 1. JUST TRANSITION STRATEGY FRAMEWORK SOURCE: OUR POWER CAMPAIGN, CLIMATE JUSTICE ALLIANCE

RENEWABLE PORTFOLIO STANDARDS (RPSS)

Utility companies provide power to the electric grid. Traditionally, utilities have burned fossil fuels to supply this power. A Renewable Portfolio Standard (RPS) requires electric utility companies and other retail electric providers to supply a specific minimum amount of power to the electric grid from eligible renewable energy sources instead of burning fossil fuels. A utility can satisfy a RPS by: (1) producing renewable energy itself or (2) purchasing renewable energy certificates (RECs) from another source producing renewable energy. REC's represent the property rights to the environmental, social, and other qualities of renewable electricity generation. As renewable generators produce electricity, they create one REC for every 1000 kilowatt-hours (kWh) of electricity sent to grid.[1] As of 2015, twenty-nine States and two territories have some type of RPS in place.[2]

NAACP MODEL RPS POLICY STANDARD

*All electric utility companies and other retail electric providers must supply a minimum of 25% of customer load with electricity from eligible **clean** renewable energy sources by the year 2025.*

Clean Energy requirement in the RPS standard: In setting standards for the content of RPS, the NAACP requires that renewable energy sources used to satisfy an RPS mandate must be clean energy sources. The NAACP recognizes that not all renewable energy has been proven safe with minimal impact on the environment and communities. Clean renewable energy includes renewable electric energy sources, which naturally replenish over a human, rather than geological, period. The clean energy sources the NAACP supports are wind, solar, and geothermal.

Model clean energy policy standard: Eligible renewable energy sources for purposes of satisfying the renewable portfolio standard shall include only wind, solar, and geothermal. Eleven states meet or exceed the NAACP RPS numeric target, but these states could improve their RPS standards by only permitting clean renewable energy sources to be used to meet their RPS targets. The eleven state examples that meet or exceed the NAACP recommended standard for RPS. These states and their RPSs are detailed in Table 1.

TABLE 1. STATE'S ALIGNED WITH THE NAACP'S MODEL RPS POLICY

State	RPS	Available Sources
California	33% renewable by 2020	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Geothermal Electric, Municipal Solid Waste, Energy Storage, Anaerobic Digestion, Small Hydroelectric, Tidal Energy, Wave Energy, Ocean Thermal, Biodiesel, Fuel Cells using Renewable Fuels
Colorado	Investor-owned utilities: 30% by 2020 Electric cooperatives: 20% by 2020, including solar carve-out for rural co-ops Municipal utilities serving more than 40,000 customers: 10% by 2020	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Recycled Energy, Anaerobic Digestion, Fuel Cells using Renewable Fuels
Connecticut	27% renewable by 2020	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Fuel Cells, Municipal Solid Waste,

		CHP/Cogeneration, Low E Renewables, Anaerobic Digestion, Tidal Energy, Wave Energy, Ocean Thermal, Fuel Cells using Renewable Fuels
Hawaii	100% renewable by 2045	Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Geothermal Heat Pumps, Municipal Solid Waste, CHP/Cogeneration, Hydrogen, Seawater AC, Solar AC, Anaerobic Digestion, Tidal Energy, Wave Energy, Ocean Thermal, Ethanol, Methanol, Biodiesel, Fuel Cells using Renewable Fuels
Illinois	25% renewable by 2025-2026	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Anaerobic Digestion, Biodiesel
Maine	40% renewable by 2017	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Fuel Cells, Municipal Solid Waste, CHP/Cogeneration, Tidal Energy, Fuel Cells using Renewable Fuels, Other Distributed Generation Technologies
Minnesota	31.5% renewable by 2020 Other IOUs: 26.5% by 2025 Other utilities: 25% by 2025	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Municipal Solid Waste, Hydrogen, Cofiring, Anaerobic Digestion
Nevada	25% renewable by 2025	Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Municipal Solid Waste, Waste Tires (using microwave reduction), Energy Recovery Processes, Solar Pool Heating, Anaerobic Digestion, Biodiesel, Geothermal Direct- Use
New York	29% renewable by 2015	Solar Water Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Fuel Cells, CHP/Cogeneration, Anaerobic Digestion, Tidal Energy, Wave Energy, Ocean Thermal, Ethanol, Methanol, Biodiesel, Fuel Cells using Renewable Fuels
Oregon	Large utilities: 25% renewable by 2025 Small utilities: 10% renewable by 2025 Smallest utilities: 5% renewable by 2025	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Municipal Solid Waste, Hydrogen, Anaerobic Digestion, Tidal Energy, Wave Energy, Ocean Thermal
Vermont	75% RPS by 2032	Solar Water Heat, Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Anaerobic Digestion, Fuel Cells using Renewable Fuels

Just as with energy efficiency resource standards, to be an effective advocate for a strong RPS in your state, it is helpful to understand what supporting policies need to be in place to achieve a strong RPS numeric target – i.e. what policies need to be in place to ensure that utilities will get on board and that those who already suffer from disproportionate environmental and economic burdens will not bear an unfair burden in the renewable energy transition.

RPS Supporting Policies: New York State

New York provides a great example of a state that has not only enacted a strong RPS, but also adopted, or is working to adopt, supporting policies that will help ensure the RPS target is achieved in practice without unfairly burdening people of color and low income individuals. Although New York could do better in terms of the content of its RPS – revising what counts as renewable energy to include only clean energy sources (solar, wind, geothermal) - New York has done a lot right. The remainder of this section details key supporting policies that your unit should consider advocating for as part of an RPS campaign. Energy policies accompanying the RPSs include:

1. Decoupling;
2. Performance-Based Rates;
3. Market Rules; and
4. Affordability Policies

DEFINITIONS: COUPLING AND DECOUPLING

Coupling: The linking of utilities' profits to the amount of power that they sell, where any reduction in customer energy consumption directly reduces the utilities' profitability. Coupling utilities' profits to the amount of power sold, creates a disincentive for utilities to encourage energy efficiency and distributed renewable energy because by decreasing energy usage, utilities are decreasing their profits.

Decoupling: Unlinking utilities' profits from the amount of power that it sells. Decoupling unlinks utilities' profits from the amount of power that they sell and, instead, links utility profits to the number of customers served.

DECOUPLING

Policies that create decoupling schemes allow customers to pay for electricity like they pay for their cable bill: a pre-determined monthly rate every month, even if they never turn on the television. If overall revenues fall below a utility's fixed costs, the rate is adjusted accordingly for all customers—some states are establishing rate caps to protect consumers. The overall result of decoupling policies is that a utility revenue is no longer tied directly to the amount of energy a utility sells.[3] Decoupling policies removes the incentive for utilities to fight energy efficiency and distributed renewable energy generation because, under once a utility is decoupled, reducing the amount of power it sells will no longer reduce its profits.[4] Figure 2 shows where decoupling policies have been instituted in the U.S. alongside other energy efficiency measures.

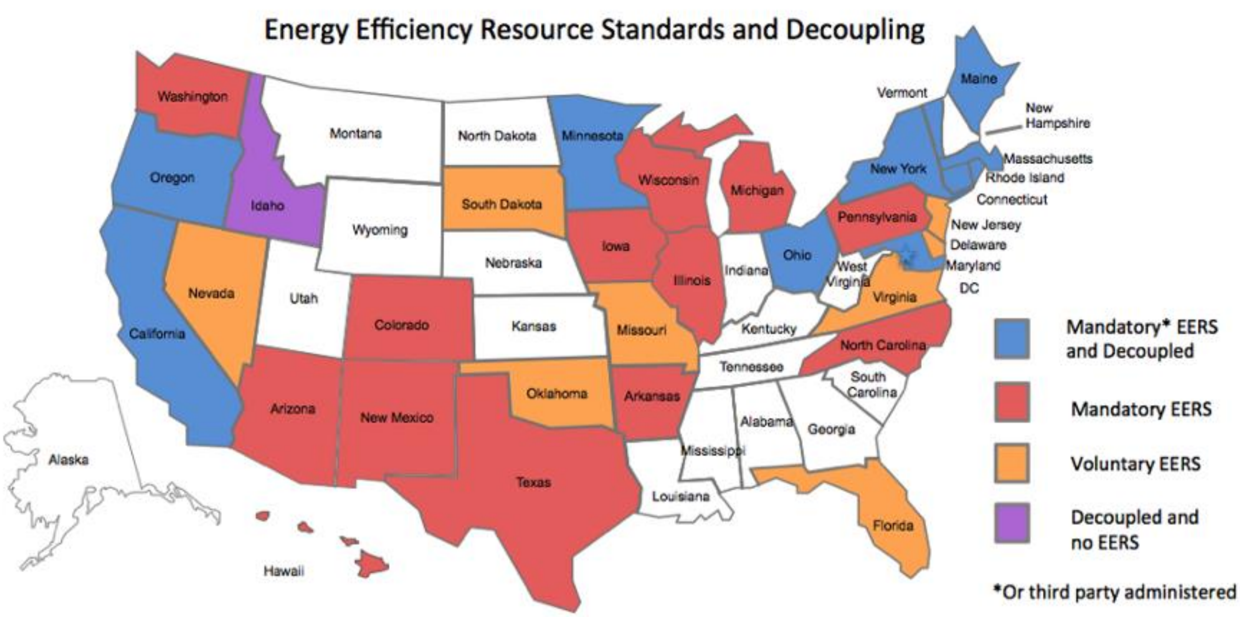

FIGURE 2. DECOUPLING POLCIES IN THE U.S.
SOURCE: FRESH ENERGY

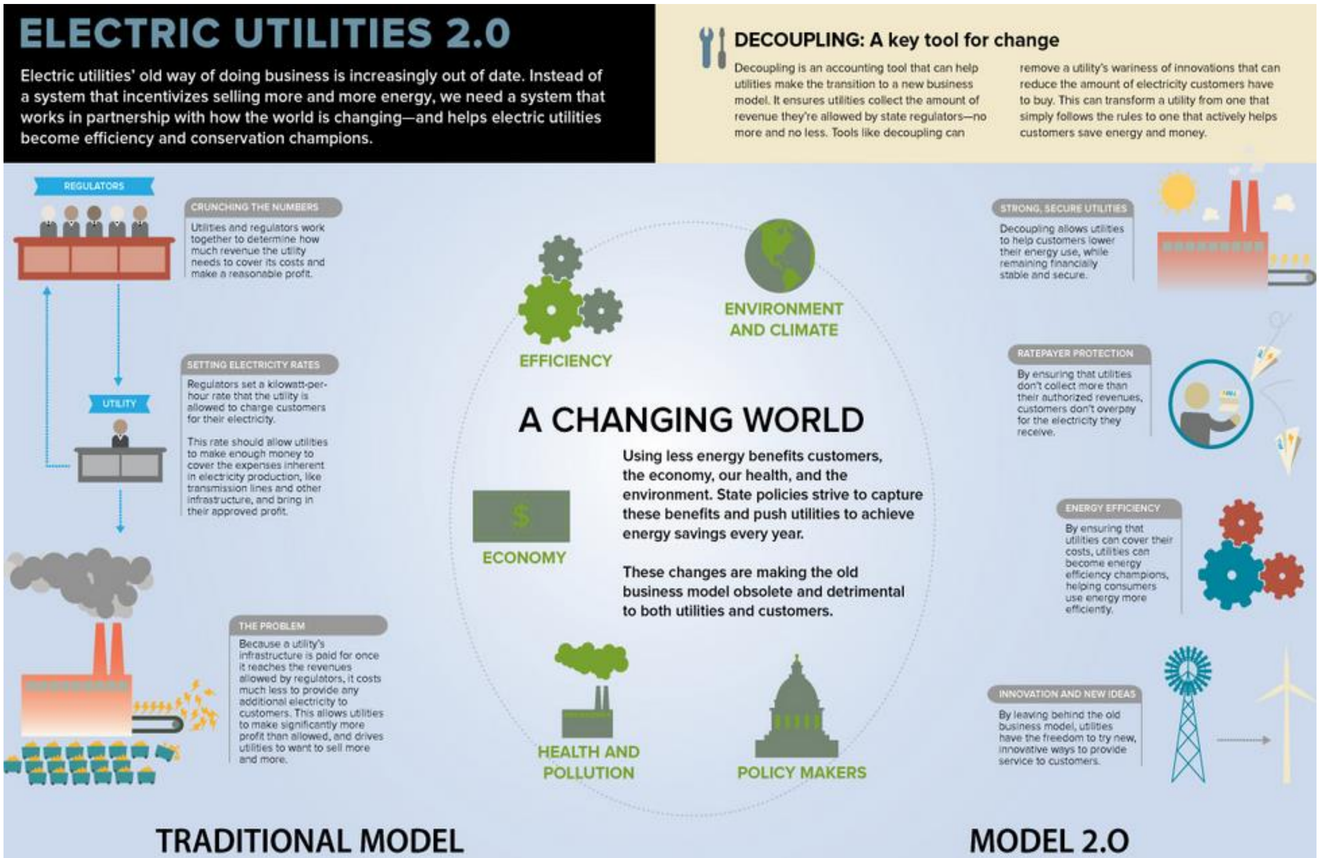

FIGURE 3. HOW DECOUPLING WORKS AND CREATES CHANGE
SOURCE: FRESH ENERGY

Decoupling can be an effective tool to create change, as detailed in Figure 3 above, however, these policies alone are not enough. Alone, decoupling mechanisms only remove the disincentive for utilities to support energy efficiency and solar energy. The most effective state energy models that promote energy efficiency and renewable energy policies link decoupling policies with performance based rate policies that tie utilities profits to their success in improving performance, reliability, and service.[5] This link is also seen in NY.

Performance Based Rates

Even after enacting decoupling policies, utilities do not have an affirmative incentive to encourage energy efficiency and still have a perverse incentive to make money by building expensive and unnecessary infrastructure (e.g. new power plants, transmission lines, etc.). Performance-based rates remove this incentive to profiteer—traditionally the cost of big infrastructure projects is recovered through increases to customers' utility bills—even if demand could be better met with efficiency and renewables.[6] Under performance-based rate schemes, a utility's revenue is based on how efficiently and effectively it distributes power.[7]

Performance-based rates discourage utilities from building new expensive and inefficient infrastructure and encourage utilities to embrace and increase energy efficiency and distributed renewable energy.

With performance-based rates, utilities increase their profits by increasing energy efficiency and renewable energy generation.

DISCUSSION: ENERGY UTILITY RESTRUCTURING (FIGURE 4)

Because utilities can be key stakeholders in energy efficiency, RPS or distributed generation campaigns, before beginning to do work on one of these campaigns, it is helpful to determine what type of utilities you have in your state. Utilities can be owned by municipalities, cooperatives, or investors.

Municipal and cooperative utilities generally own generation, transmission, and distribution assets. However, only some investor owned utilities (IOUs) own power plants, transmission, and distribution. When utilities own power plants, transmission and distribution they are called "vertically integrated" utilities. Other IOUs, in restructured (also known as deregulated) states, have sold off the generation and transmission parts of their business. There can be a mix of both restructured/ deregulated and regulated/ vertically integrated utilities within a state.

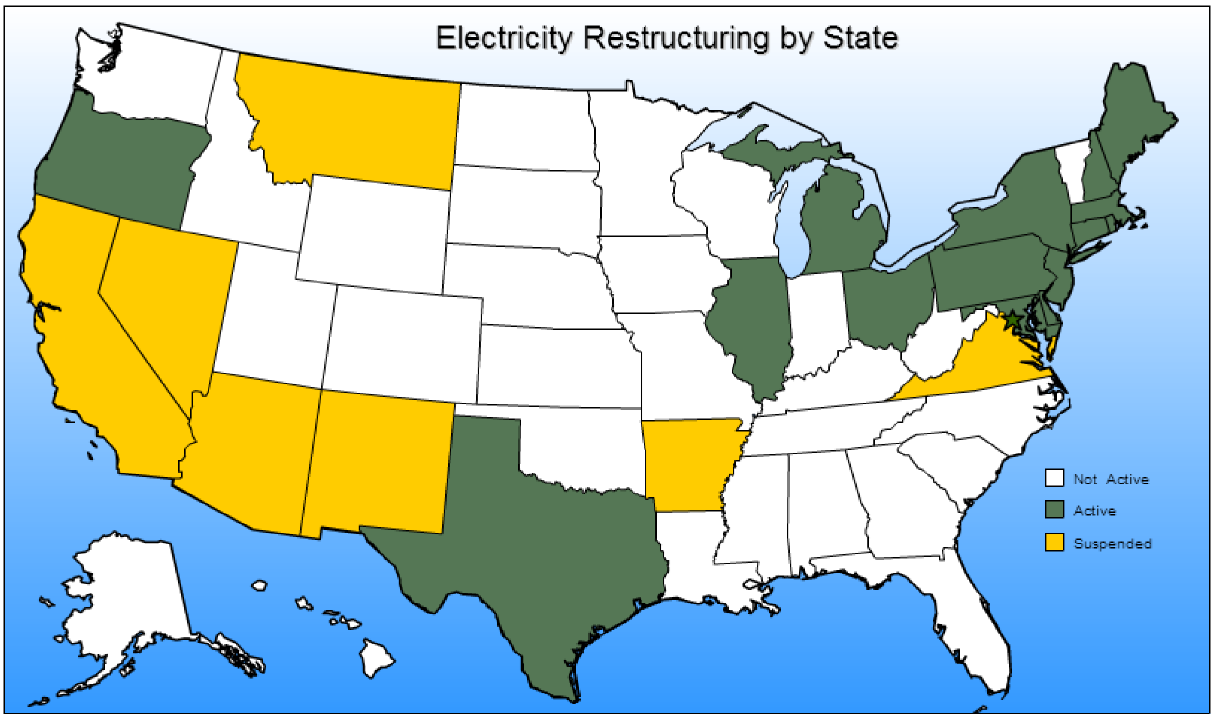

FIGURE 4. ELECTRICITY RESTRUCTURING BY STATE
SOURCE: UNITED STATES ENERGY INFORMATION ADMINISTRATION

MARKET RULES

Even after adopting decoupling and performance based rate policies, it is still possible for utilities to drive up prices by buying renewable energy systems, setting up their own distributed generation sites, and pushing smaller distributed generation businesses out of the market. This practice limits consumer options, increases renewable energy prices, and stifles innovation,[8] however, it can be counteracted with proper policy planning and restrictions on utilities. Market rules preventing utilities from owning local power generation are key.

PICTURE 3. SOURCE: UTAH SOLAR WORKS

As seen in NY, by restricting utilities from owning local power generation and other energy resources, customers will benefit from a more competitive market, with utilities working and partnering with other companies and service providers.[9] These regulations also serve to encourage and create pathways for community ownership of energy resources.

AFFORDABILITY POLICIES

Those who profit from continued use of fossil fuels argue that transitioning to renewable energy and encouraging distributed generation of renewable energy will cause a disproportionate economic hardship for people of color and low income individuals. This is false for two main reasons: RPS have positive economic benefits for states and local communities, and policies can be put in place to ensure the affordability of energy generated under RPSs.

According to the Union of Concerned Scientists, evidence shows that RPS have positive economic benefits for customers, especially low-income customers.[10] The organization's analysis of the economic benefits of a 25 percent renewable electricity standard found that such a policy would lead to 4.1 percent lower natural gas prices and 7.6 percent lower electricity prices by 2030.[11] States with RPS policies achieved more than 95 percent compliance with renewable energy requirements through 2010, with little to no impact on electricity rates in almost every state. Data recently reported by utilities and state agencies that implement state RPS standards shows the inherent cost-effectiveness of the policies:[12]

- In Michigan, a 2013 Public Service Commission (PSC) report found that: the state’s utilities are on track to meet the ten percent standard at lower costs than anticipated; the costs of all large-scale renewable energy projects are lower than the cost of new coal plants of similar size; and renewable energy contracts continue to show a downward pricing trend.[13]
- In Minnesota, renewable energy investments lowered electricity prices for customers of Xcel Energy—the state’s largest utility—by 0.7 percent from 2008 to 2009. Xcel also estimated that meeting the RES through 2025 would increase costs by just 1.4 percent.
- In Oregon, renewable energy investments spurred by the RES in 2011 lowered total annual costs for PacifiCorp by $6.6 million, and increased total costs for Portland General Electric by just $630,000 (or 0.04 percent).

- In North Carolina, Duke Energy's residential customers paid 21 cents per month in 2012 to support the state's RES, a six cent decrease from 2010, while Progress Energy's residential customers paid 41 cents per month in 2013, a fourteen cent decrease from 2011.
- In Rhode Island, compliance with the state's RES cost the average household 62 cents per month in 2010 and less than 50 cents per month for each of the three previous years.

Because many of these states were still in the early stages of compliance, cost impacts may have changed over time as RES requirements increase. Other factors, such as declining costs of renewable energy technologies, changes in fossil fuel prices, and the presence of federal incentives, could also affect the future impact of RES compliance on utilities and consumers.[14]

Increasing renewable energy also helps stabilize electricity rates, provide long-term savings, and economic development. Once a wind or solar facility is installed, the fuel is free. Fossil fuels, on the other hand, are subject to potentially volatile prices that can lead to significant fluctuations in electricity rates. In states across the country, RPS policies are also supporting growing renewable energy industries that provide jobs and bring investments, tax revenues, and other economic benefits to local communities. One key sector that has been effected is manufacturing, which has experience growth due to the increased demand of renewable energy technologies. This is driven in part by the demand created from state RPSs.[15]

While evidence suggests that enacting an RPS and encouraging a transition to renewables will not exacerbate or impose a new disproportionate economic burden on people of color and low income individuals, as a part of a just transition to energy efficiency and renewable energy, steps may need to be taken, by states, to alleviate existing disproportionate energy burdens. In the case of New York, the unaffordability of customers' electric bills is a historic problem that the state is addressing as it to transitions to more efficient and renewable energy.

In 2015, electric utility rates for residential customers in NY were roughly 59 percent higher than the national average. The result of these unaffordable electric rates was an increase in customer arrears—those who were more than sixty days in arrears owed the utilities approximately $800 million.[16] In 2014, New York State's energy utilities jointly issued 7.2 million service disconnection notices and shut off service to approximately 300,000 customers as a bill collection measure.[17]

The 2015 New York State Energy Plan followed adopted low-income rates to improve the affordability of energy utility rates. It also set statewide inclusion minimum of low-income customers in newly

Discussion: California's Electricity Affordability Policies

The California Alternative Rates for Energy (CARE) program substantially reduces bills for lower income customers with funding from California's *Public Goods Charge*, which also supports energy efficiency and renewable energy programs. California provides a statewide 20% CARE rate reduction for low-income customers and at times exempts CARE customers from certain charges, and has an explicit goal to enroll all eligible customers.

California also has a Family Electric Rate Assistance Program (FERA), which provide lesser reductions for customers with incomes slightly above CARE program limits. The California legislature also created a Low-Income Oversight Board to oversee affordability of service and monitor regulatory actions affecting low-income customers. These regulations and programs represent supporting energy policies that advance the path to an equitable energy democracy.

constructed distributed generation projects and reduced rates for these customers by 25 to 35 percent.[18] Such additional regulations that ensure the affordability of renewable energy development have been important in furthering the social and equity components of the green energy economy. Without the supporting policies, like those for affordability, RPSs are incomplete.

Conclusion

Energy efficiency is not enough. A transition to renewable energy is necessary to protect people and the environment. States must not only commit to strong numeric RPS targets, but also implement supporting policies that will break down the barriers to achieving an RPS and properly align utilities' incentives with those of the general population. Without putting into place strong supporting policies, achieving RPS targets will likely be much more difficult if not impossible. By starting with a review of the solar, wind and geothermal clean energy potential laid out in your state's Just Energy Policies Report and then familiarizing yourself with the RPS supporting policies, you can effectively advocate for achieving a minimum 25% RPS in your state.

ENERGY EFFICIENCY RESOURCE STANDARDS

Energy Efficiency Resource Standards (EERS) establish a requirement for utility companies or state agencies to meet annual and/or cumulative energy savings targets through a portfolio of energy efficiency programs. Energy efficiency programs are also known as demand side management programs. Energy efficiency/ demand side management programs reduce customer electricity use through activities or programs that promote electric energy efficiency or conservation, or more efficient management of electric energy loads. Given our current dependence on harmful energy production practices, we should reduce our demand for energy to the greatest extent possible. The long-term goals associated with an EERS establish the importance of energy efficiency in utility program planning for market actors. EERSs create a level of certainty that encourages large-scale, productive investment in energy efficiency technology and services.[19]

States with EERS (as of April 2015)

FIGURE 5. SOURCE: AMERICAN COUNCIL FOR AND ENERGY EFFICIENT ECONOMY

NAACP MODEL EERS POLICY STANDARD

Through the year 2025, all utility companies must attain 2% cumulative annual energy savings. Annual energy savings shall be measured as a percentage of a utility's retail energy sales in the Prior Calendar Year.

Examples of energy efficiency/demand side management programs that could be used to achieve the NAACP model policy standard include:

- Promoting high efficiency building practices;
- Promoting the purchase of energy efficient devices;

- Encouraging the transition from incandescent to more efficient lighting technologies;
- Encouraging customers to shift non-critical usage of electricity to off-peak hours;
- Remote utility control of customer appliances; and
- Promoting energy awareness and education.

PICTURE 4. SOURCE: SUSTAINABLE COMMUNITY DEVELOPMENT GROUP

The below description of actual state energy efficiency policies will flesh out some of these program options, and many more, in greater detail.

MODEL STATES

The below states are highlighted in the NAACP Just Energy Policies Report. These states have EERS comparable to or exceeding the NAACP recommended standard of a 2% annual reduction of the previous year's retail electricity sales:

TABLE 2. NAACP MODEL STATES' EERSS

STATE	ENERGY EFFICIENCY STANDARD
Arizona	All investor-owned utilities must achieve 1.25% annual electricity savings starting in 2011, ramping up to 2% beginning in 2013. result in 22% cumulative savings by 2020.
Hawaii	4,300 GWh reduction in electricity use by 2030 (net reduction of 30% of projected 2030 sales, approximate annual reduction rate of 1.4%)
Illinois	0.2% of electricity sales per year in 2008 and increases in steps up to 2.0% of sales per year by 2015
Indiana	0.3% GWh reduction of 2009 energy sales for 2010. Annual requirements increase to 2.0% reduction of prior year's energy sales by 2019. After obtaining 2.0% reduction by the year 2019, the electricity sales reduction percentage holds at 2.0% for every year thereafter.
Massachusetts	Annual electricity savings: 1.4% in 2010, 2% in 2011 2.4% in 2012, and 2.6% in 2015
New York	15% reduction relative to projected electricity use in 2015 (annual reduction rate of 1.88%); gas savings of 14.7% annually by 2020 (annual reduction rate of 1.12%)
Vermont	320,000 MWh electricity savings (2.3% annual reduction) within a 2-year goal from 2015-2017

The American Council for an Energy Efficient Economy (ACEEE) also provides a list of top energy efficiency states in its State Scorecard. Table 3 lists states receiving the highest ratings for their energy efficiency resource standards. [20] The Scorecard and report also ranks states based on their policy and program efforts, including performance, documentation of best practices, and leadership.

RESOURCES: AMERICAN COUNCIL FOR AN ENERGY EFFICIENT ECONOMY STATE SCORECARDS (LINK TO 2016 REPORT)

To be an effective advocate for an energy efficiency resource standard in your state, it can be helpful to know and be able to discuss what energy efficiency targets other states have set and how they have or are planning to achieve those targets. The ACEEE State Scorecard and accompanying report can help provide you with this information. The ACEEE "State Scorecard provides an annual benchmark of the progress of state energy efficiency policies and programs. It encourages states to continue strengthening their efficiency commitments to promote economic growth, secure environmental benefits, and increase their communities' resilience in the face of the uncertain cost and supply of the energy resources on which they depend." Table 3 summarizes the results of the 2016 report. See where your state lies and where other states in your region are.

TABLE 3. AMERICAN COUNCIL FOR AN ENERGY EFFICIENT ECONOMY (ACEEE) LIST OF TOP ENERGY EFFICIENCY STATES

Rank	State	Utility & public benefits programs & policies (20 pts.)	Trans-portation policies (10 pts.)	Building energy codes (7 pts.)	Combined heat & power (4 pts.)	State government initiatives (7 pts.)	Appliance efficiency standards (2 pts.)	TOTAL SCORE (50 pts.)	Change in rank from 2015	Change in score from 2015
1	California	15	10	7	4	7	2	45	1	1.5
1	Massachusetts	19.5	8.5	7	4	6	0	45	0	1
3	Vermont	19	7	7	2	5	0	40	0	0.5
4	Rhode Island	20	6	5	3.5	5	0	39.5	0	3
5	Connecticut	14.5	6.5	5.5	2.5	6	0.5	35.5	1	0
5	New York	10.5	8.5	7	3.5	6	0	35.5	4	3
7	Oregon	11.5	8	6.5	2.5	5.5	1	35	-3	-1.5
8	Washington	10.5	8	7	2.5	6.5	0	34.5	0	1
9	Maryland	9.5	6.5	6.5	4	5.5	0	32	-2	-3
10	Minnesota	12.5	4	6	2.5	6	0	31	0	0
11	Maine	10.5	5.5	3	3	5	0	27	3	3.5
11	Michigan	10.5	4	6.5	1.5	4.5	0	27	3	3.5
13	Illinois	8.5	5	7	2	4	0	26.5	-3	-4.5
14	Colorado	7.5	4.5	5	1	6	0.5	24.5	-2	0
15	District of Columbia	5.5	7.5	6	1	4	0	24	-1	0.5
15	Hawaii	11.5	4.5	4	1	3	0	24	4	2.5
15	Iowa	10	3	6	1.5	3.5	0	24	-3	-0.5
18	Arizona	10.5	3	3	1.5	3	0	21	-1	-1
19	Pennsylvania	3.5	5	4.5	2.5	5	0	20.5	-2	-1.5
20	Utah	7	2	5.5	1	4.5	0	20	3	3
21	New Hampshire	9.5	1.5	4	1	3.5	0	19.5	-1	0
22	Delaware	1	6.5	5.5	1.5	4.5	0	19	2	2.5
22	Wisconsin	8	1.5	4	1.5	4	0	19	0	1
24	New Jersey	4	6	4	1.5	2	0	17.5	-3	-1.5
25	Florida	1	5	5.5	1	3.5	0	16	2	0.5
25	Tennessee	1	5	3	1	6	0	16	6	3
27	Arkansas	7	1	4	0	3.5	0	15.5	4	2.5
27	Texas	0	2.5	7	1.5	4.5	0	15.5	-1	-0.5
29	Ohio	6.5	0	3	1.5	4	0	15	-2	-0.5
30	Kentucky	3	1	5	0.5	5	0	14.5	-1	0.5
30	North Carolina	2	3.5	4	1	4	0	14.5	-6	-2
32	Missouri	2	2.5	3	1	5	0	13.5	12	5
33	Idaho	3.5	1	5	0.5	3	0	13	-4	-1
33	Virginia	-0.5	4.5	4	0	5	0	13	-2	0
35	Georgia	1.5	4.5	3.5	0.5	2.5	0	12.5	2	0
35	New Mexico	4	0.5	3.5	1.5	3	0	12.5	-4	-0.5
37	Montana	2	0.5	5	1	3.5	0	12	-6	-1
37	Nevada	3	0.5	4	0.5	4	0	12	-6	-1
39	Alabama	2	0	6	0	3	0	11	2	1.5
40	South Carolina	1	3	3	0	3.5	0	10.5	0	0.5
41	Alaska	0	2	2	1	5	0	10	1	1
42	Indiana	4	1.5	2	0.5	1.5	0	9.5	-4	-1.5
42	Nebraska	1.5	0.5	5	0	2.5	0	9.5	0	0.5
44	Oklahoma	3.5	1	2	0	1.5	0	8	-6	-3
44	West Virginia	-0.5	3	4.5	0.5	0.5	0	8	1	0
46	Mississippi	1	1	1.5	0.5	3	0	7	1	-0.5
47	Louisiana	0.5	1.5	2.5	0.5	1.5	0	6.5	1	0.5
48	Kansas	0	1	1.5	0.5	3	0	6	-3	-2
49	South Dakota	2.5	0.5	0.5	0.5	1	0	5	-1	-1
50	Wyoming	0.5	1	1	0	2	0	4.5	0	-1
51	North Dakota	0	1	1	0.5	0.5	0	3	0	-1

ACEEE 2016 State Scorecard Rankings

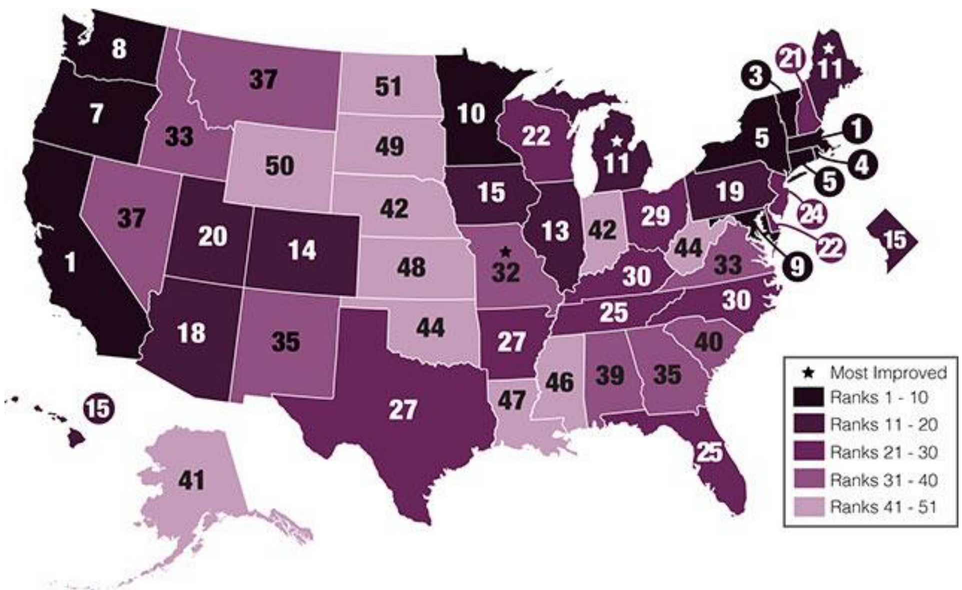

FIGURE 6. SOURCE: AMERICAN COUNCIL FOR AN ENERGY EFFICENT ECONOMY

As seen in Table 3, the ACEEE breaks down state energy efficiency scores into six categories: utility and public benefits programs & policies, transportation policies, building energy codes, combined heat and power, state government initiatives, and appliance efficiency standards. States are currently working to achieve their energy efficiency resource standards by implementing diverse programs in these categories. Table 3 also shows how states did in each of the ACEEE's energy efficiency categories.

These tables and chart can be used as guidance on where you should look for examples of certain types of energy efficiency policies. For example, if you were interested in appliance efficiency policies that your state could implement to help achieve its energy efficiency resource standard, you would do research on California's policies, given California received the highest score for energy efficiency programming in the appliance efficiency category.

In addition to ranking each of the states, the ACEE, in its State Scorecard, highlights best practices in each of the energy efficiency categories. Some of these best practices are listed below. Units should read through the below listed policies and consider which of them they may interested in advocating as a part of an energy efficiency campaign. The below descriptions are cursory. If your unit is interested in learning more about a policy, contact the state agency responsible for the program to ask where you can find a helpful fact sheet or overview of the law as well as any available data about the success of the law in saving energy.

TABLE 4. ACCEE 2016 SCORECARD TOP 10 STATES AND FREQUENCY IN THE TOP 10
SOURCE: AMERICAN COUNCIL FOR AN ENERGY EFFICENT ECONOMY

State	Years in top 5	Years in top 10
California	10	10
Massachusetts	9	10
Oregon	9	10
Vermont	8	10
New York	7	10
Connecticut	5	10
Rhode Island	4	9
Washington	1	10
Minnesota	0	9
Maryland	0	6
Illinois	0	2
Maine	0	2
New Jersey	0	2
Wisconsin	0	1

Utility & Public Benefits Programs/ Policies[21]

The utility sector is critical to the implementation of energy efficiency throughout the economy. Utilities' approaches to delivering energy efficiency may include;

1. Financial incentives such as rebates and loans;
2. Technical services such as audits, retrofits, and training for architects, engineers, and building owners; and
3. Educational campaigns about the benefits of energy efficiency improvements.

Below are some examples of utility energy efficiency programs from several states.

Massachusetts

- Passed the Green Communities Act, which established energy efficiency as the "first priority" energy resource.
- Created an Energy Efficiency Advisory Council to collaborate with utilities on developing statewide efficiency plans in three-year cycles.

Vermont

- Established the third-party administration model of implementing energy efficiency programs.[1]
- Efficiency Vermont, the state's "energy efficiency utility," runs energy efficiency programs for a wide range of customers and leads the nation in producing consistent energy savings.
- Vermont Public Service Board has a strong commitment to funding energy efficiency programs and has put into place policies, including an EERS and performance incentives[2], to encourage successful utility engagement in energy efficiency.

PICTURE 5. SOURCE: CRITICAL ELECTRIC SYSTEMS GROUP

Rhode Island

- Leads the nation in the amount of utility revenues invested in energy efficiency.
- Requires utilities to invest in all cost-effective energy efficiency.
- Requires utilities to have energy efficiency plans that are overseen by a stakeholder board with representatives from government agencies, environmental groups, businesses, and consumer advocates.

[1] The third-party model has been replicated in: Maine, New Jersey, Delaware, Oregon, and the District of Columbia.
[2] Performance incentives are financial incentives that reward utilities for reaching energy efficient goals. More than half of the states have performance incentives in place for electric utilities.
http://aceee.org/sites/default/files/publications/researchreports/u1408.pdf

Building Energy Code EERS Policies[22]

Buildings consume 74 percent of electricity and 41 percent of total energy used in the United States and account for 40 percent of U.S. carbon dioxide emissions, making buildings an essential target for energy savings. Because buildings have long lifetimes and are not easily retrofitted, it is crucial to encourage building efficiency measures during construction.

> **Discussion: Federal Building Code Policy - The American Recovery Reinvestment Act (ARRA) of 2009**
>
> The impact of ARRA on building code adoption has shown that federal policy can catalyze tremendous progress at the state level. ARRA called for each of the 50 states accepting ARRA funding for code implementation and compliance measurement to achieve compliance in 90% of its building stock with the ARRA minimum standard building energy code by 2017.

Mandatory building energy codes are one way to target energy efficiency by legally requiring a minimum level of energy efficiency for new residential and commercial buildings. Eleven states have officially adopted the latest standards for both residential and commercial buildings: California, Delaware, Florida, Illinois, Iowa, Maryland, Massachusetts, Montana, Nevada, Rhode Island, and Washington. The U.S. Department of energy determines the base codes for which states are required to comply. While no enforcement mechanism is in place to address noncompliance, within two years of the final determination states are required to send letters certifying their compliance, requesting an extension, or explaining their decision not to comply. Some recommended actions to ensure building energy efficiency through building codes include:

- Work with experts to develop and implement a study to determine actual rates of energy code compliance;
- Adopt a policy that engages utilities in supporting building code compliance; and
- Adopt a policy and fund training programs and outreach on code compliance for contractors and code officials.

NAACP Units may consider these as recommendations for state agencies and utilities as a part of their Just Energy Policy Campaigns.

Examples of State Policies related to Building Energy-Use Disclosure

Building energy-use disclosure policies require commercial and residential building owners to disclose building energy assessments (e.g. energy consumption data or energy asset ratings) to prospective buyers, lessees, or lenders.[23] Knowing this information about a property can be useful in understanding future energy bills for homeowners and renters.

Kansas

- Requires the disclosure of energy efficiency information for new homes.

- Developed a standard reporting format for builders and sellers of new homes in which the home's features are compared to the state's energy code guidelines.
- At time of house showing, sellers must make an energy efficiency checklist available to buyers or potential buyers.

DISTRICT OF COLUMBIA

- Commercial and multifamily buildings over 50,000 square feet report energy efficiency benchmarking[3] data to the District on a yearly basis.
- EPA's ENERGY STAR Portfolio Manager is used as standard for a building's energy performance, including total energy use, energy intensity, and carbon emissions. In the District, 266 buildings, representing 90 million square feet, have taken the next step and been certified with the ENERGY STAR label.

PICTURE 6. SOURCE: GRID ALTERNATIVES, SOLAR COST GUIDE

EXAMPLES OF GOVERNMENT ENERGY EFFICIENCY INITIATIVES

States have taken initiative in developing energy efficiency within government building stock by deploying energy savings targets[4] in new and existing state buildings, establishing benchmarking requirements for public facilities, developing energy savings performance contracting activities, and developing research and development programs dedicated to energy efficiency.[24] Some examples of state energy efficiency research and development programs are provided below.

COLORADO

- State universities have dedicated research centers and facilities to the development of energy efficiency and clean energy technologies.
- The Center for Renewable Energy Economic Development works to promote new clean tech companies throughout the state.

NEW YORK

- The New York State Energy Research and Development Authority (NYSERDA) is an outstanding model of an effective and influential research and development institution. NYSERDA's research

[3] A benchmarking policy refers to a requirement that all buildings undergo an energy audit or have their energy performance tracked using a recognized tool such as the EPA Portfolio Manager. An EPA benchmarking starter kit is available here: http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/get-started-benchmarking

[4] Energy savings targets commit state government facilities to a specific energy reduction goal over a distinct period. http://aceee.org/sites/default/files/publications/researchreports/u1408.pdf

and development activities fall under seven program areas: energy resources, transportation and power systems, energy and environmental markets, industry, buildings, transmission and distribution, and environmental research.

OREGON

- The Oregon Built Environment and Sustainable Technologies Center promotes cutting-edge technology related to energy efficiency and green buildings.
- The Energy Trust of Oregon provides funding for the testing of emerging technologies related to utilities.
- The Oregon Transportation Research and Education Consortium supports energy efficiency innovation in the areas of land use and transportation.

FLORIDA

- The Florida Institute for Sustainable Energy performs research on efficient construction and lighting.
- The Florida Solar Energy Center focuses on energy efficient buildings, schools, and standards.
- The Florida Energy Systems Consortium brings universities together to share their energy-related expertise.

EXAMPLES OF STATE POLICIES THAT ENABLE LOCAL ENERGY EFFICIENCY

Local efforts to increase efficiency in communities can be supported through effective collaboration between state and local governments. By working with local governments and stakeholders, state governments can make a particularly strong impact on land use and transportation, residential and commercial buildings, schools, and local government buildings and facilities through technical assistance, financial assistance, and legislative or regulatory mandates.[25]

Technical assistance: Resources, including guidebooks, online resources, and state staff, dedicated to assisting local government with increasing efficiency in municipal buildings and schools

Financial assistance: Incentives aimed at local governments to increase the efficiency of public facilities

Legislative or regulatory requirements: Requirements promulgated by the state requiring municipal fleets or buildings to achieve specific energy reductions[26]

MARYLAND

- The Maryland Smart Energy Communities program incentivizes local governments to adopt policies related to the energy efficiency of their buildings and fleets.

Colorado

- Colorado's school efficiency bill (SB 13-279) requires new or schools undergoing redesign that are receiving state funds to meet the highest practicable efficiency standards. The schools must use 33% less energy and 32% less water than their conventional counterparts.

Connecticut

- Connecticut extended its Small Business Energy Advantage program to state agencies and municipalities. Agencies and municipalities that install energy efficiency measures in their buildings can now pay for these investments over time as part of their utility bills, removing the significant barrier of upfront costs.

Minnesota

- Under its Guaranteed Energy Savings Program (GESP) or the Public Buildings Enhanced Energy Efficiency Program (PBEEEP), the Energy Savings Partnership (ESP) program allows local units of government and school districts throughout to use lease purchase agreement (LPA) financing to invest in energy efficiency projects. Local governments and school districts use their energy and operational savings to make payments under their LPA agreements- implementing energy efficiency on a budget-neutral basis.

Puerto Rico

- Puerto Rico's energy efficiency mandate requires municipalities to reduce their electrical energy consumption annually for three years.

Nebraska

- Nebraska will provide public school districts with 1% energy efficiency loans of up to $750,000 provided schools benchmark their energy efficiency during the term of the loan.

Appliance and Equipment EERS Policies

Every day in our homes, offices, and public buildings, we use appliances and equipment that are less energy efficient than other available models. While the energy consumption and cost for a single device may seem small, the extra energy consumed by less-efficient products collectively adds up to a significant amount of wasted energy. States have enacted laws mandating minimum energy efficiency standards for appliances and equipment and developed major financial incentive programs that encourage the purchase of energy-efficient products.

Appliance and Equipment Standards

Oregon

- Oregon has introduced legislation covering energy efficiency for 7 energy intensive appliances and equipment pieces including, *inter alia*: hot tubs, televisions, battery chargers, televisions, double-ended quartz halogen lamps, and certain consumer electronics.

California

- California has adopted energy efficiency standards on more than 50 products in 21 categories, and many have subsequently become federal standards. California has adopted standards for10 products that are not covered by federal standards.

Financial Incentives

Connecticut

- Connecticut's green bank, the Clean Energy Finance and Investment Authority (CEFIA) offers Smart-E Loans and Connecticut Property Assessed Clean Energy (C-PACE) financing.

Alaska

- Alaska's Home Energy Rebate Program provides rebates of up to $10,000 based on improved efficiency to eligible receipts. Energy ratings are required before and after the home improvements. The program also provides expert advice and tracks savings.

Tennessee

- Tennessee partnered with Pathway Lending to provide low-interest energy efficiency loans to businesses.
- Offers energy efficiency grants to state government agencies, businesses, and utility districts
- Provides tax credits for the manufacture of energy-efficient technologies.

Conclusion

There is no single correct path to energy efficiency. With each state acting as its own laboratory- testing out different energy efficiency initiatives – there is a growing number of examples of creative of energy initiatives that units can choose from and work to implement in their states. Start with the NAACP model EERS policy target and solicit input from your community and other relevant stakeholders to see what types of policies your state or municipality wants to experiment with to achieving the target.

NET METERING, DISTRIBUTED GENERATION, AND COMMUNITY SHARED RENEWABLE ENERGY

Distributed generation (DG) refers to electricity that is produced at or near the point where it is used.[27] Community shared renewable energy is one type of distributed generation and net metering is an important distributed generation enabling policy. Net metering makes community solar and other forms of distributed generation possible by providing additional economic benefits to people that are generating their own power. In addition to increasing energy efficiency and RPS, increasing energy autonomy and democracy by providing individuals and communities with the opportunity to generate their own power is important. Community solar gardens and net metering are key to achieving energy autonomy and democracy.

DEFINITIONS: NET METERING, DISTRIBUTED GENERATION, AND COMMUNITY SHARED RENEWABLE ENERGY

Net Metering: a system in which renewable energy generators are connected to a public-utility power grid and surplus power is transferred back to the grid, allowing customers to offset the cost of power consumed from utility sources.

Distributed Generation: energy generation at or near the point of consumption.

Community Shared Renewable Energy: arrangements that allow several energy customers to share the benefits of one local renewable energy power plant. The energy generation system is financed by multiple members of a community (i.e. private individuals, businesses, and/or organizations) and provides power and/or financial benefits to investors and members.

NAACP MODEL NET METERING POLICY STANDARD

All electric utility companies shall provide retail credit for net renewable energy produced by a consumer so long as the consumer's power generating system has a capacity of 2,000 kW or less.

Net metering is another important distributed generation policy that encourages energy autonomy and democracy. Net Metering Standards require electric utility companies to credit customers for net renewable energy that they produce. With a net metering policy in place, if a consumer generates more electricity from their solar panels or wind turbines than they use, they can sell it back to the utility and receive credit. Net metering policies make it cost effective for many people to generate their own electricity. Without the guarantee that they would receive compensation for the excess power that they contribute back to the grid, many people could not afford or would be less willing to produce their own power. To incentivize people to generate their own renewable energy, it is important to provide the opportunity for revenue generation for the excess electricity that they produce.

Most states have authorized net metering. States with net metering policies have enacted several supporting policies approaches to net metering supporting policies - capacity limits, net metering credit retention and renewable energy credit (REC) ownership vary.[28] As with EERS, RPS, and solar garden, these supporting policies are important parts of ensuring that net-metering provides the maximum intended benefit to consumers.

Supporting Policy #1: Capacity Limits

Capacity limits on net metering regulate the system size of generation installations in a variety of aspects.[29] These limits vary by state. The NAACP recommends that state net metering policies have a capacity limit that is not less than 2,000 kW. This means that if a customer's renewable energy system does not have a capacity above 2,000 kW, the utility is required to credit the customer for any net electricity that the customer generates and contributes back to the grid. State capacity limits are either based on system Kilowatt capacity or percentage of total system generation.[30] As of 2015, Arizona, New Jersey and Ohio are the only states to have authorized net metering with no capacity limit.[31] While nearly half of states with net metering policies authorize net metering for systems up to one MW in capacity.[32]

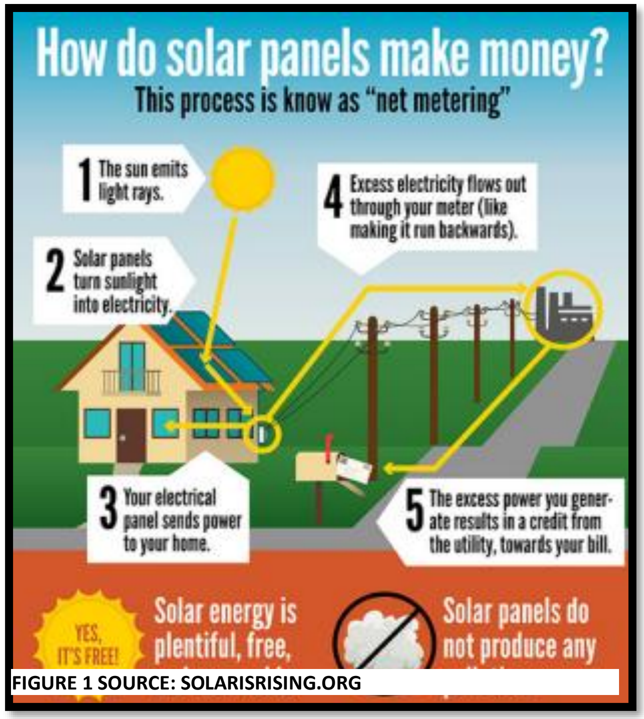

FIGURE 1 SOURCE: SOLARISRISING.ORG

FIGURE 7. SOURCE: SURYADAY

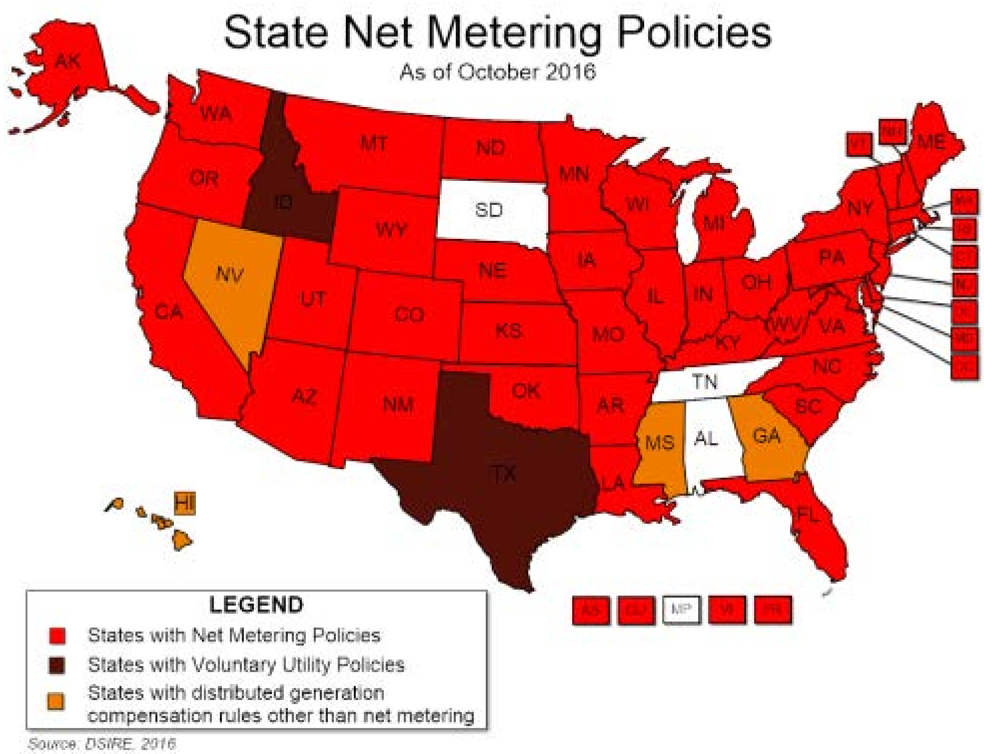

FIGURE 8. SOURCE: NATIONAL CONFERENCE OF STATE LEGISLATURES

Capacity limits often vary by customer type – municipality, non-residential, residential. And states may also have an aggregate capacity limit, often expressed as a percentage of a utility's electricity generation. Aggregate capacity limits state that, once distributed electricity generation among all the utility's customers reaches a certain level, the utility is not required to provide net metering credit to any new customers. The net metering policies, including capacity limits, of all 50 states and the District of Columbia are available in the NAACP Just Energy Policies Report.

Exemplary States

Only four states, Connecticut, Florida, Maryland, and Massachusetts, have net metering policies that explicitly require utilities to provide retail credit to customers with system capacities up to 2,000 kW. One state, New Mexico far exceeds the NAACP capacity limit recommendation. New Mexico has a has a mandatory net metering policy requiring retail electric credit for systems with capacities up to 80 MW.

Supporting Policy #2: Eligible Technology

States can choose what technologies are covered under their net metering policies. Most states' net metering policies cover solar, but they should also include wind and geothermal – the two other clean energy sources for which NAACP advocates.

Supporting Policy #3: Net Metering Credit Retention

As with capacity limits, states have not taken a uniform approach to the issue of credit retention—whether, or to what extent, system owners should be able to "roll over" the credits that they generate because of net metering. System owners generate credits when they produce more power than they use. The question is for how long people should be able to hold on to these credits. For context, it can be helpful to think about the similar issue that people face with cell phone companies (i.e. whether they can "roll over" unused cell phone minutes). Most states with net metering policies credit surplus generation to the next monthly billing period or allow customers to select this option.[33] Figure 8 shows how states differ in their credit retention policies.

Hawaii

- Hawaii's credit retention policies allow excess generation to be credited to a customer's next bill at the retail rate, however, excess credits are granted to the utility at the end of an annual billing cycle.

California

- California credits excess generation to a customer's next bill at retail rate; after a 12-month period customers can choose whether to roll credits over indefinitely or receive a payment for credits at the wholesale rate, and if no option is selected then credits are granted to the utility with no customer compensation."[34]

Varying Policies on Net Excess Power Generation (NEG) Under Net Metering

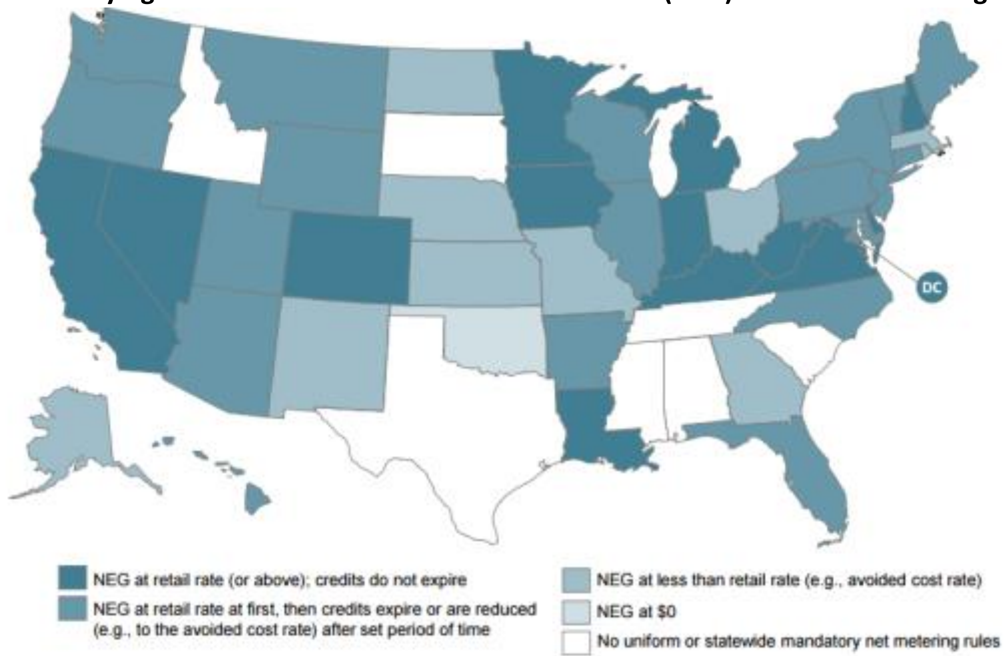

FIGURE 9. SOURCE: NATIONAL CONFERENCE OF STATE LEGISLATURES

Supporting Policy #4: Renewable Energy Certificate (REC) Ownership

States should specify who owns renewable energy certificates in their net metering policies, either the distributed generation customer or the utility. Most states with net metering policies have determined that distributed generation customers own RECs.[35] Ownership of these certificates is important as it enables customers to earn revenue from their RECs in addition to the excess power that they generate.

What Are Green Energy Credits?

Green energy credits represent electricity produced using environmentally friendly processes, such as solar, wind, and geothermal power, as well as power generated with small hydropower facilities, bio-fuels, and hydrogen-powered fuel cells. A facility generating a certain amount of green electricity qualifies for one or more certifications called *renewable energy certificates* (RECs). For example, a wind farm would be eligible for one REC per every megawatt hour of electrical energy it produces, whereas a megawatt hour provides one million watts of electricity per hour.

A designated agency certifies that the energy production requirement has been met and issues the appropriate number of RECs to the green facility. The green facility can then route the green energy produced to the commercial electrical grid managed by utility companies. The RECs can then be sold by the green facility to the utility companies to help satisfy requirements placed on the utility companies for renewable energy production. RECs can be sold across state lines so that green energy produced in one part of the country can be used to offset the use of fossil fuels in another state. RECs can also be purchased by businesses and individual consumers to reduce the harmful environmental impacts of their energy use. Supporters of green energy credits claim that pollutants and greenhouse gasses are overall reduced because of this trading system.

SUPPORTING POLICY #5: COMMUNITY AND CUSTOMER CHOICE AGGREGATION (CCA) PROGRAMS

Community Choice Aggregation (CCA) gives cities and counties the ability to combine the electric loads of residents, businesses and public facilities to facilitate the purchase and sale of electrical energy in a more competitive market.[36] CCAs can offer energy independence, price stability, more effective energy efficiency programs, opportunities for increased use of renewable and alternative energies, and enhanced local employment.[37] CCA programs can directly support renewable energy generation and open up avenues for customers to make deliberate choices about their energy suppliers.

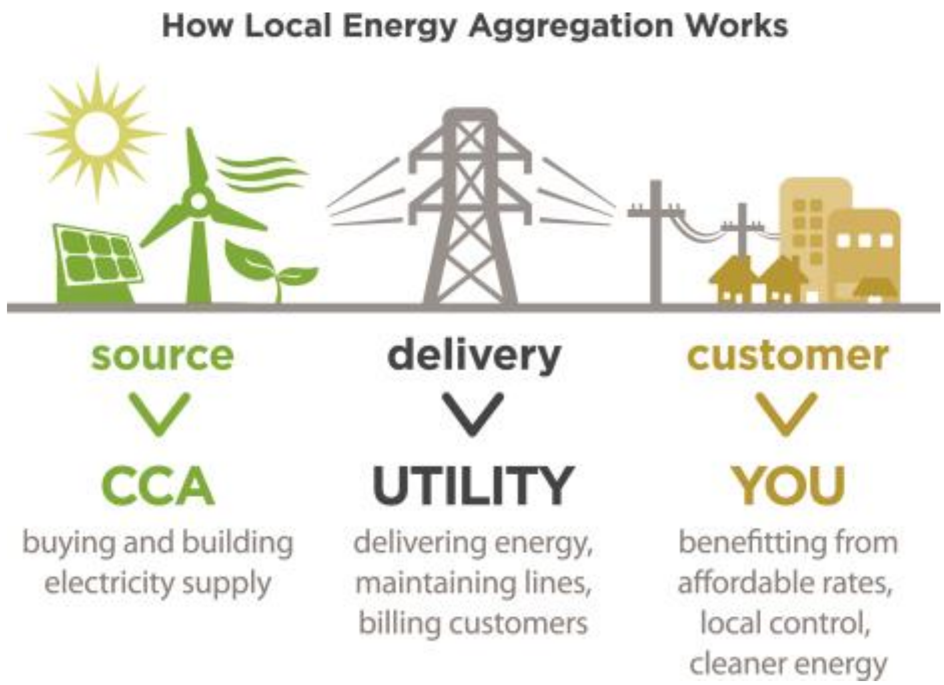

FIGURE 10. SIMPLIFIED EXPLANATION OF HOW CCA WORKS
SOURCE: LOCAL ENERGY AGGREGATION NETWORK

There are several benefits to CCA programs. These benefits include:

Local Control: One of the most prominent features of CCAs are that they provide communities with local control over energy decisions. Control over energy generation is shifted from the investor-owned utilities (IOUs) and put into the hands of cities, counties, or joint power authorities (JPAs).[38] JPAs are entities of two or more public authorities (e.g. local governments, utility, or transport districts), not necessarily located in the same state, that are permitted by state laws to jointly exercise some common power. CCAs allow customers to actively choose between energy service providers (ESPs) based on price and the source of energy generation.[39]

Lower Energy Rates: CCAs provide consumers with lower energy costs relative to other utilities through competition. These competitive markets often have higher yield cost savings.[40]

Renewable and Alternative Energy: With the ability to choose ESPs, CCAs can partner with an ESP that provides a specific portfolio of energy generation sources or procures renewable energy itself.[41]

Energy Efficient Production: A CCA can encourage the development of new energy generation facilities either through contracting with ESPs or by directly funding renewable energy projects. Development of new generation will displace production from old, inefficient sources, including coal or oil-fired plants, which can significantly reduce the environmental impacts of energy production.[42]

Energy Price Stability: CCAs may also provide consumers with energy price stability relative to. traditional energy sources, which are subject to limited supply and uncertain pricing. Reliance on alternative and renewable sources of energy allows some CCAs to buffer themselves from future energy spikes.[43]

Energy Efficiency Programs: Community Choice Aggregators would have the ability to apply to become administrators of energy efficiency programs, as well as issue proposals for tailored community programs. The CPUC may also consider ordering energy efficiency program administrators to direct more programs toward CCAs to guarantee equity in the distribution of energy efficiency benefits. Studies have found that energy efficiency programs administered by IOUs are less efficient than competitive programs.[44]

Allows Municipalities to Meet Other Objectives: Communities can use CCAs to meet other local objectives, including economic development, environmental issues, community health, and local employment. CCAs who administer programs, should require that they be managed locally, which employs local workers. Coordinating conventional and renewable energy projects would also direct additional funds into the local economy. Also, CCAs that rely on renewable energy generation will have an associated benefit of reduced local and regional air pollution and other environmental impacts.[45]

Where IS CAA Already an Option?

As of 2016 10 states have active or pending CAA legislation. These states include: California, Illinois, Massachusetts, Montana, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, and Utah. Table 8 details a few existing CCA projects and programs across the country.

Community Shared Renewable Energy

Community-owned clean energy can take several forms, the most common for communities being solar gardens, and wind farms. Solar gardens, also known as community solar and solar farms, and wind farms are renewable energy projects and installations that provide energy to more than one utility customer. Community solar gardens and wind farms allow members of a community to share the benefits of solar power even if they cannot or prefer not to install solar panels on their property. Figure 10, illustrates how community solar gardens, and community clean energy in general, works. Project participants benefit from the electricity generated by the community solar farm, which costs less than the price they would ordinarily pay to their utility. The projects are enabled by distributed generation and net metering policies.

Low-income Access

Low-income households in the United States spend a higher percentage of household income on energy costs. Their energy spending is more than twice the average for non-low-income households—8.3 percent compared to 2.9 percent—and four times the median national household energy burden—a median of 13.3 percent compared to 3.3 percent. Access to renewable energy generation, through distributed generation, can significantly reduce the energy burden of low-income households by providing electricity below local utility rates.[46] Household energy burden is the percentage of annual household income that is used to pay annual residential energy bills. The lower rates and energy savings that can be realized by community owned renewable energy generation are key foundations of the just energy transition.

FIGURE 11. HOW COMMUNITY SOLAR ARRAYS (GARDENS) WORK

Discussion: Solar Gardens

In states that permit community solar gardens, the size of solar gardens and the subscription requirements vary greatly. In Colorado, for example, solar gardens cannot exceed 2 megawatts, which could require up to 16 acres. And in Minnesota, gardens cannot exceed 1 megawatt. However, in California, solar gardens can be as big as 20 megawatts, which would require 160 acres.

Community solar gardens are groups of solar panels located in a central area. Electricity from solar gardens is divided between residential subscribers who purchase shares of the electricity generated from the garden. Residential subscribers who purchase electricity from a solar garden receive a credit on their monthly utility bills equal to the amount of power they purchase from the garden. This credit can offset all or part of a customer's monthly bill.

Unfortunately, the impressive expansion of solar power in the U.S. has been concentrated among middle and upper income households. While household renewable energy programs and projects are beneficial, there can be barriers to involvement. Some of these include the absence of an ideal project location, poor housing conditions, and high system costs. These factors, alongside systematic disenfranchisement, are key barriers for low-income neighborhoods, and communities and households of color to develop renewable energy projects. These groups often experience:

- Difficulty meeting credit requirements to obtain affordable financing for solar panels;
- Inability to take advantage of solar energy tax credits; and
- Lack of property or proper housing conditions on which to install solar panels.

Community-shared renewable energy programs (e.g. community solar gardens) are a viable solution to the lack of low and moderate income access. Community solar programs, instead of requiring individuals to have their own household solar installations, have community members purchase lower cost solar power generated on a nearby property. Community solar can help to more equitably distribute the benefits of solar power to low income households. Solar gardens can increase the accessibility of solar power by: allowing renters and tenants of multifamily housing access to solar energy and distributed generation; and helping to eliminate the need to obtain financing by, allowing the purchase of smaller amounts of a system/energy and reducing the price of solar panels via bulk purchasing. Currently, fourteen states and the District of Columbia have laws permitting community solar:

States with Community Solar Regulations and Campaigns

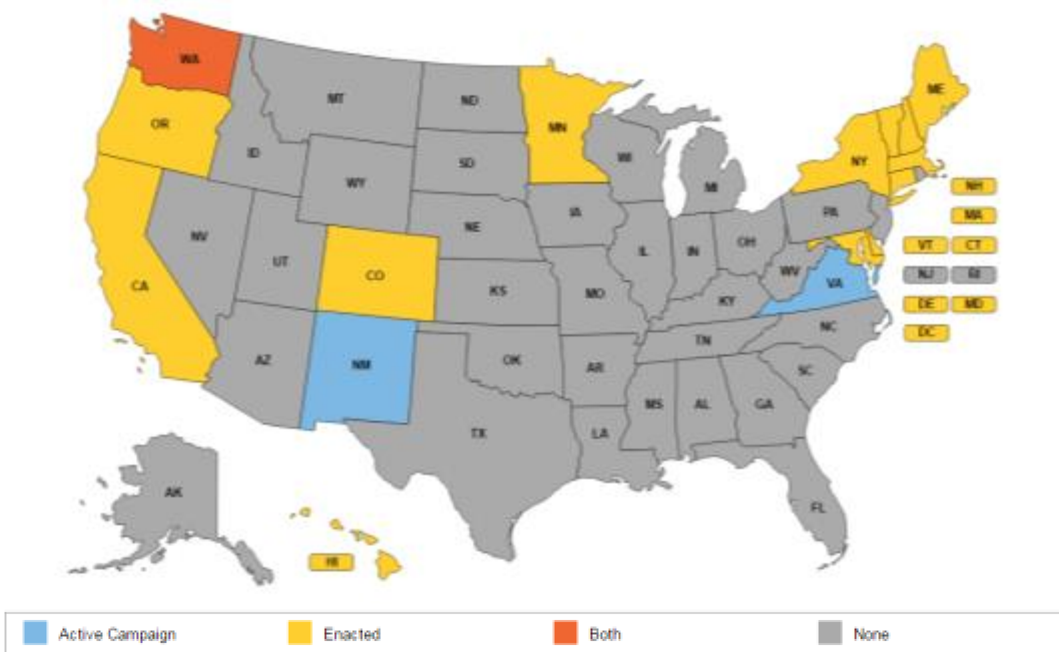

FIGURE 12. SOURCE: SHARED RENEWABLES HQ

State Solar Garden Laws

Below is a sample of state community solar laws from the Shared Renewables Headquarters. For more information on other states' policies visit their website: http://www.sharedrenewables.org/community-energy-projects/.

Colorado

Colorado's community solar regulation was first passed in 2010 as a pilot program (HB 10-1342). The program was so popular the state passed new legislation in 2015 to expand participation.

Key provisions of CO Community Solar Law:

- Community solar project cannot exceed two MW in size;
- Minimum of 10 participants, 25 for installations larger than 500 kilowatts;
- Subscriber must be located within the same county as the community solar project and within the service area of the utility purchasing the electricity;
- System shares cannot exceed 120% of the average annual electric consumption of each subscriber; and
- Community solar projects may be owned by utilities, for profit, or non-profit organizations.[47]

MINNESOTA

In 2013, Minnesota signed into law an energy bill, Minnesota's Omnibus Energy Bill (HF 2834), which required Xcel Energy, the state's largest utility, to file a plan with regulators for setting up and operating a community solar garden program. The bill also allowed investor-owned utilities to voluntarily establish plans.

Key provisions of MN Community Solar Law:

- Minimum of five subscribers required for each solar garden, with no member owning more than a 40 percent interest;
- Solar gardens cannot exceed one MW in size;[48] and
- Energy companies cannot cluster more than 51 MW projects in each location.[49]


PICTURE 7. SOURCE MIT ENERGY INITATIVE

MASSACHUSETTS

In Massachusetts, the Green Communities Act of 2008 authorized community solar projects in the state. Since that time, the MA Department of Energy Resources has established regulations allowing community shared solar generation units.

Key provisions of MA Community Solar Law:

- Each community solar project must provide net metering credits to three or more utility accounts;
- Each participant in a community solar project must have an interest in the production of the Generation Unit or the entity that owns the Generation Unit, in the form of formal ownership, a lease agreement, or a net metering contract;
- Community Solar project cannot exceed six MW in size;

- No more than two participants may receive net metering credits more than those produced annually by 25 kW of nameplate direct current capacity, and the combined share of said participants' capacity shall not exceed 50 percent of the total capacity of the Generation Unit;[50] and
- Community solar projects are eligible to generate Solar Renewable Energy Credits (SREC IIs) that can be sold to utilities.[51]

MARYLAND

In 2015, Maryland approved a law creating a three-year pilot program for community solar projects.

Key provisions of MD Community Solar Law:

- Community solar projects must be in the same electric service territory as its subscribers;
- Individual shares cannot exceed 200 percent of subscriber's baseline usage;
- Third parties may finance, build, own, or operate a community solar project;
- Electric companies must buy the virtual net excess generation, up to specified limits;
- Community solar project cannot exceed two MW in size;
- 200 kW subscriptions cannot constitute more than 60 percent of subscriptions in a community solar project;
- The Public Service Commission must initiate a stakeholder workgroup examining the program and make recommendation respecting a permanent community solar program
- Projects approved by the PSC during the pilot program may continue operating after the end of the pilot program regardless of whether a permanent program is established.[52]

Just as there supporting policies that help ensure the success of EERS and RPS, there is a supporting policy that is key to helping community solar succeed in any state: a community solar carve out. Community solar carve outs and/or credit multipliers provide powerful incentives for the development of community solar gardens.

SUPPORTING POLICY: COMMUNITY SOLAR CARVE OUTS/CREDIT MULTIPLIERS

Solar carve outs and credit multipliers are included in most Renewable Portfolio Standards (RPSs) because the programs favor lower cost renewable technologies Solar carve outs require a certain percentage of the RPS to satisfied by solar energy technologies, while credit multipliers offer additional credit toward compliance for energy derived from solar sources. Between 2005-2009, 65-81% of the total grid-connected solar generation systems in the United States occurred in states with active and pending solar carve outs.[53] Both Solar carve outs and solar credit multipliers also can encourage community solar, specifically. A few states have taken this next step of creating carve outs specifically targeting community solar.

Examples Community Solar Carve Out Policies

Colorado

- Colorado has a distributed generation (DG) carve out, requiring 3 percent of retail electricity sales to come from on-site sources by 2020.
- The state has a 200 percent credit multiplier available for electricity generated from community based projects (less than 30 MW), owned by community members, co-op, tribes, local government, etc. that generate.[54]

Minnesota

- In 2013, Minnesota enacted a 1.5 percent solar carve out. Ten percent of the standard is carved out for small solar projects up to 20 kW.

Conclusion

Distributed generation is key to achieving just energy policies. Community solar is an important part of distributed generation because it helps to ensure that the energy democracy and autonomy benefits of solar are equitably distributed. Net metering is key because it similarly increases the number of people who are willing and/or able to participate in generating their own power. To ensure maximum benefit from community solar gardens, community solar enabling laws and community solar carve outs are key supporting policies. And to ensure the maximum benefit from net metering policies, limits, if any, on capacity, eligible technology, credit retention, and REC ownership must be fair and appropriate.

EQUITY IN ENERGY ENTERPRISE POLICIES: LOCAL, PEOPLE OF COLOR AND WOMEN HIRE AND DBE POLICIES

In addition to advocating for energy efficiency, renewable energy, and distributed generation policies, it is important to advocate in favor of policies that will ensure equitable access to the jobs and revenue that these new just energy policies will create. The current energy infrastructure does not promote equitable access to employment, revenue, and other opportunities. According to the American Association of Blacks in Energy, in 2009, while African Americans spent $40 billion on energy, only 1.1 percent of African Americans held energy jobs and African Americans collected only .001 percent of energy revenue. To achieve economic justice and equity in the energy sector, key supporting economic policies must be in place. These policies include local hiring and person of color and woman owned business provisions.

PICTURE 8. SOURCE: BALTIMORE FISHBOWL

LOCAL, PEOPLE OF COLOR, AND WOMEN HIRE PROVISIONS

Local, people of color and women hiring policies set goals for increasing the number of local people, people of color, and women that are hired for state or federally funded projects. In addition to preserving local employment opportunities, local hire policies:

1. Ensure that tax dollars are invested back into the local economy;
2. Reduce the environmental impact of commuting; and
3. Foster community involvement.

State and federal funding, incentives and mandates for developing renewable energy and energy efficiency will continue to incentivize an ever-greater number of renewable energy and energy efficiency projects. Local, people of color and women hire provisions should be used to ensure equitable access to the employment and employment training opportunities created by new renewable energy and energy efficiency projects.

DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROVISIONS

Like the way in which local, people of color, and women hire provisions help increase individuals access to critical employment and training opportunities, Minority Business Enterprise (MBE), Woman Business Enterprise (WBE), and DBE provisions help ensure that people of color, women and socially or economically disadvantaged businesses get a fair opportunity to win contracts. Minority Business Enterprises are businesses that are at least 51 percent owner operated and controlled by individuals who identify with specific ethnic "minority" classifications, including African American, Asian American, Hispanic American, Native American, etc. MBEs can be self-identified, but are typically certified by a city, state, or federal agency. WBEs and DBEs are businesses that are at least 51percent owner operated and controlled by women or disadvantaged persons. Often publicly funded projects set a requirement or goal to source MBEs, WBEs or DBE as suppliers. Some state policies reference MBEs, WBEs, and DBEs separately. Often, DBE is used as an umbrella term that includes majority people of color or women business enterprises as well as economically disadvantaged business enterprises.

PICTURE 9. SOURCE: GREEN BUILDING ADVISOR

There are several creative ways that states can use policies to increase local people, people of color, women and DBE's access to the employment and training opportunities that will be created by state RPS, energy efficiency, and distributed generation policies. Some examples of possible policies include:

- Renewable Energy Certificate (REC) multipliers for utilities that use DBE and local, people of color and women hire provisions in agreements with contractors on renewable energy or energy efficiency projects;
- REC multipliers for utilities that build in-state generation plants or uses equipment manufactured in state;
- REC multipliers for a utility that makes an investment in an in-state energy generation plant;
- Bidding preferences for contractors that implement local, people of color and women hire policies; and
- Requiring the use of community benefit agreements (CBAs) for all renewable energy and energy efficiency projects.

Although no states currently include DBE policies within their energy efficiency, renewable energy or distributed generation policies, nine states currently have local hire provisions within their energy policies. Table 5 details the equitable enterprise policies of these nine states. These policies are a step toward advancing the energy democracy and sovereignty needed for communities of color and other disadvantaged groups.

TABLE 5. STATES WITH EQUITABLE ENTERPRISE POLICES IN PLACE (STATE AND/OR LOCAL)

State	Equitable Enterprise Policies
Arizona	• Extra Renewable Energy Certificate (REC) credit multipliers may be earned for in-state solar installation and in-state manufactured content. • If a utility makes an investment in an in-state solar electric manufacturing plant or provides incentives for a plant to be located in-state, the utility can acquire RECs for the main Renewable Portfolio Standard (RPS) tier equal to the capacity of the system multiplied by 2,190 hours.
California	• Approved a Clean Energy Job Creation Fund that directs up to $550 million each year into energy efficiency and renewable energy projects on public buildings.

	• San Francisco's 1998 First Source program requires that for all government assisted construction projects, employers must make a good faith effort to hire Economically Disadvantaged Residents referred by San Francisco's Workforce Development System.
Delaware	• Several compliance multipliers are currently available under the Delaware RPS. • There is an additional 10% REC credit for solar or wind installations sited in Delaware, for which at least 50% of the equipment or components are manufactured in Delaware. • There is an additional 10% credit for solar or wind installations sited in Delaware and installed with a minimum 75% state workforce.
District of Columbia	• The 1984 First Source Program requires that for all government assisted construction projects, 51% of all new jobs created on the project and at least 70% of all common laborer hours are filled by District Residents.
Maine	• The state established the Community-based Renewable Energy Pilot Program in 2009, which encourages the development of locally owned, in-state renewable energy resources. • To be eligible for incentives, a generating facility must be 51% locally owned, use renewable energy resources, be no larger than 10 MW in generating capacity, and be located in-state.
Massachusetts	• Boston's Neighborhood Jobs Trust directly funds job training through a city real estate development fee.
Michigan	• Michigan's RPS contains a series of bonus incentive renewable energy credits. • Renewable electricity produced using equipment manufactured within the state of Michigan receives an additional 1/10 credit per MWh. • Renewable electricity produced using a system which was constructed using an in-state workforce receives an additional 1/10 credit per MWh.
Minnesota	• Under the State's Community-Based Energy Development Tariff, each public utility in Minnesota is required to file with the state Public Utilities Commission (PUC) to create a 20-year power purchase agreement for community-owned renewable energy projects.
Montana	• The state's RPS includes provisions for community renewable energy projects to stimulate rural economic development (defined as renewable energy projects less than 25 MW where local owners have a controlling interest • For each year following 2014, utilities must purchase at least 75 MW in nameplate capacity. • Public utilities must enter contracts that include a preference for Montana workers.

Community Benefit Agreements

One way that states and municipalities can increase equitable access to employment and training for residents, people of color, women, and DBEs is with a community benefit law or ordinance that mandates the use of community benefits agreements in publicly subsidized energy projects.

A Community Benefits Agreement (CBA) is a project-specific agreement between a developer and a community or community coalition that identifies and details the project's contributions to the community. CBAs seek to ensure community support for the project, by addressing community issues in a legally binding and enforceable agreement. Terms from a CBA can be incorporated into an agreement between the local government and the developer, as a development agreement or lease, which gives the local government the power to enforce the community benefits terms.[55]

DISCUSSION: DETROIT'S COMMUNITY BENEFIT ORDINANCE PETITION

Detroit is an example of a city in which residents and members of the Detroit People's Platform and Equitable Detroit Coalition organized and advocated in favor of a municipal community benefits ordinance (CBO). On Pages X and X are samples from the 2014 petition and proposed CBO created by community members.

The proposed community benefit ordinance contains a "first source hiring program" provision. In this model ordinance, only local people and economically disadvantaged persons are included. However, communities could and should tailor hiring provisions to suit local needs and, to the greatest extent possible, to be inclusive of local persons, people of color, women, socially and economically disadvantaged persons and DBEs. Other relevant provisions included in the CBA ordinance but not shown below include: environmental remediation and conservation; housing relocation; and public safety, monitoring, and enforcement. http://www.detroitpeoplesplatform.org/resources/community-benefit-agreements/

EQUITABLE
DETROIT COALITION
Development for the Common Good

DETROIT People's PLATFORM
unitingdetroiters.org

Spring 2014
People's Petition for the Establishment of a Detroit Community Benefit Agreement (CBA) Ordinance

We the undersigned citizens and registered voters of Detroit seek to ensure that impacted neighborhoods and communities, residents, and business are beneficiaries and not victims of economic development projects that use public resources including grants, tax abatements, and other public subsidies provided from and through the City of Detroit, State of Michigan, and the federal government.

Community Benefit Agreements (CBAs) can establish a contractual relationship between directly impacted communities/neighborhoods and the developer of economic development projects that receive public grants, subsidies, and various tax supports as well.

We, the undersigned citizens and registered voters in the city of Detroit call upon the Detroit City Council to support the proposed Community Benefit Agreement (CBA) ordinance that will establish provisions for developers to ensure that Detroiters have access to jobs and employment opportunities, environmental mitigation, housing assistance, public safety enhancements and other measures. **Read more on the proposed CBA ordinance at unitingdetroiters.org**

Name	City Council District	Street Address	Registered Voter? y/n
1			
2			
3			

Community Benefits Ordinance In-Brief

Overview

The proposed Community Benefits Ordinance that has been put before City Council seeks to hold large scale developers that receive public money, grants, tax abatements, transfers of city owned land or property, or other forms of subsidy accountable to the communities its developments will most directly impact.

As a result, the ordinance is asserting that developments that fall within the category as defined above be subject to a Community Benefits Agreement (CBA) between the developer and the host community (the community most directly impacted by the development) **before** any agreements are executed between the Project Developer and the City of Detroit.

A Community Benefits Agreement is a binding contact negotiated between the host community and the project developer for purposes of fulfilling specific and meaningful benefits to the community in exchanges for the community's public support and approval of the project. The agreement is intended to create a partnership between the developer and the community in an effort to streamline the development process and get the community's buy-in for the development project.

The ordinance seeks to make standard minimum key provisions that must be included in every CBA while allowing for such agreements to be tailored to the needs of particular communities and what is practical on particular development projects.

Minimum Key CBA Provisions:

The following provisions as detailed in the ordinance are minimum requirements that should be included in every CBA between a project developer and host community:

- **Employment provisions which include a First Source Hiring Program**

  A **First Source Hiring Program** is to facilitate the employment of Targeted Job Applicants by Employers in the Development Project. It is a goal of the First Source Hiring Program that the processes will benefit employers by providing a pool of qualified job applicants, through a non-exclusive referral system, whose job training has been specifically tailored to the needs of employers in the project through a non-exclusive referral system.

  The First Source Hiring Program shall apply to hiring by all project employers during the site preparation, construction and operational phases of the Development Project, except for job openings where hiring procedures are governed by a bona fide collective bargaining agreement that conflicts with the First Source Hiring Program.

Targeted Job Applicants include the following three categories of individuals: First Priority: Residents from the Host Community and Displaced Workers. Second Priority: Low-income Individuals living within two miles of the project. Third Priority: Low-income Individuals living in census tracts throughout the City of Detroit.

CONCLUSION

Alone just energy policies surrounding the generation, distribution, and use of renewable energy is not enough to ensure a just transition to a cleaner, sustainable, and equitable energy economy. For the goals of creating an energy democracy, equitable enterprise policies play a critical role. In developing renewable energy projects—supported by RPSs, EERSs, and distributed generation policies—local, diverse hiring and DBE provisions must be in place. NAACP units advancing Just Energy Policies Campaign should incorporate these policies as well.

ADDITIONAL POLICY MECHANISMS

REBATES/INCENTIVES

The NAACP Just Energy Policies Report includes tables listing each state's financial incentives and rebates for energy efficiency and renewable energy. Each incentive has a short description and a hyperlink to more information. Incentives are broken down into four categories: statewide incentives, utility specific incentives, local incentives, and non-profit incentives:

Statewide Incentives Statewide incentives are generally rebates and loan programs that individuals and businesses may claim according to the provisions of state law. Incentives may also include Local Options enacted by municipal governments.

Utility-Specific Incentives This section relates to the incentives offered by specific utilities in each state, and in some cases interstate utilities. Some programs are only available to either electric or gas customers of a certain utility. Different programs are available for residential and commercial customers.

Local Incentives Local incentives are those offered by counties, cities, and towns. Although, not all states have local incentives.

Non-Profit Incentives Non-profit incentives are offered by non-profit organizations. These are only available in some states.

CONCLUSION

In addition to advocating for strong EERS, RPS and distributed generation policies, it is important to advocate in favor of robust energy enterprise policies – local, people of color and women hire and DBE provisions. Strong energy enterprise policies ensure a just transition to a green economy that promotes economic equity while it protects human health and well-being and the environment. Advocating for the use of REC multipliers, bidding preferences and community benefit agreements in publicly funded energy projects are all good ways to promote equitable access to the employment and training opportunities in the energy sector.

MOVING TOWARD AN ENERGY DEMOCRACY

The model policies outlined in this guide represent steps toward a cleaner, greener, more equitable future, marked by an energy economy based on energy sovereignty. In the long term, we must continue to push for systems change. It is time to not only eliminate the harmful utility practices, but to correct the extractive economy that we currently face. This guide serves as an introduction into the transformative advocacy work that the NAACP is known for. The *NAACP Just Energy Policies and Programs Action Toolkit* provides continued guidance on how to run your unit's Just Energy Policies Campaign.

The fight against the extractive economy is not about making things better for people who are poor; it is about eliminating poverty, racism, and other social and structural inequities that render households vulnerable. It is time to transition power to the people and anchor this necessary change in increased energy efficiency distributed generation of clean energy. There is an opportunity to reinvent the U.S. energy sector, to create a shared economy and move power back into the hands of citizens. It is time for a Just Transition to localized economies, grounded in ecological stewardship, community wellbeing, democratic decision-making, and locally control resources (Figure 11).[56]

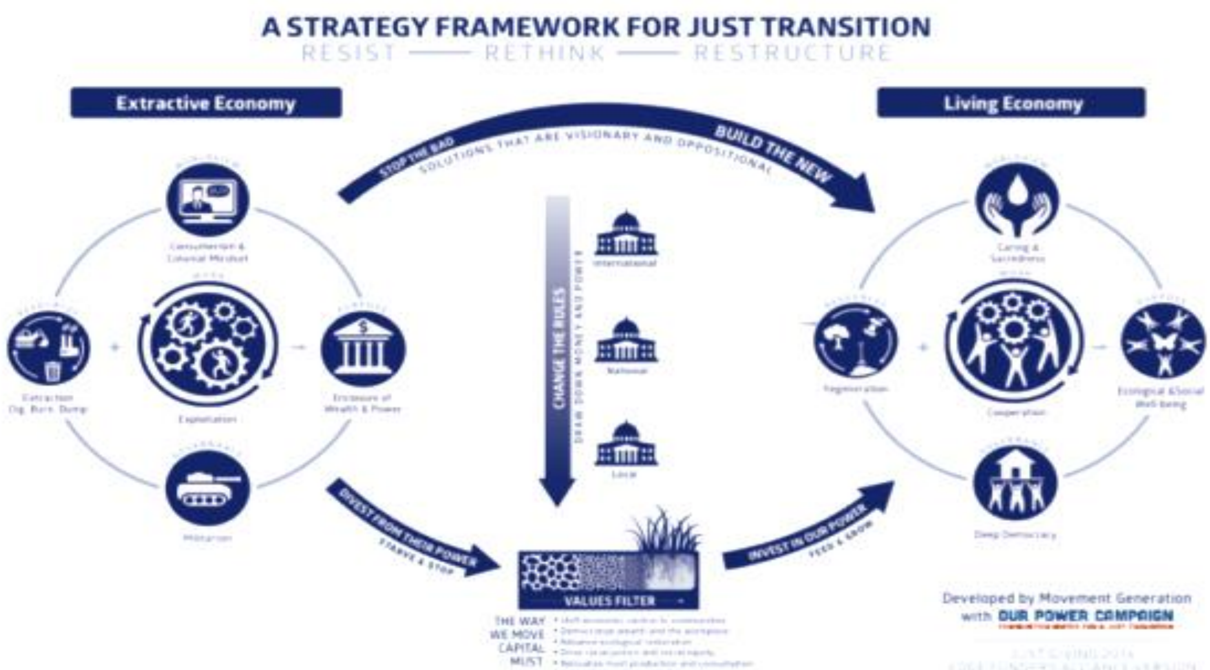

FIGURE 13. SOURCE: OUR POWER CAMPAIGN, CLIMATE JUSTICE ALLIANCE

JUST ENERGY POLICIES AND PRACTICES ACTION TOOLKIT

The NAACP *Just Energy Policies and Practices Action Toolkit* is a practical guide developed to provide the tools and information for NAACP Unit and State Conference just energy policies advocacy. This toolkit provides groups with the necessary structure and knowledge to act and be successful in the long term. The toolkit contains

Part One: Investigating Renewable Energy and Energy Efficiency Opportunities

This section guides units through the initial gathering information stage of the campaign. It provides resources for units to determine the scope of the problem, discern what information is needed to develop a plan for energy efficiency and renewable energy, and learn about key considerations that must be considered when advocating for just energy policies.

Part Two: Awareness-Raising and Education

This section features modules for activities to raise awareness and facilitate discussion in the community about options and opportunities in renewable energy and energy efficiency.

Part Three: Determining the Ask and Mapping the Plan

This section guides you through how to clarify campaign and project ask(s) or goal(s), and identify objectives and action steps that will help measure and guide you toward achieving your goal(s). It also guides you through identifying the systems and people that have the power, both positive and negative, to influence the outcomes that you seek to achieve.

Part Four: Developing Campaign Infrastructure

This section guides units through evaluating the level of engagement that is appropriate for your unit and how to explore potential partnerships and collaborations that could help strengthen and catalyze their work.

Part Five: Taking Action - Just Energy Organizing

This section provides units with some useful tools and resources for acting to bring about their desired policy outcomes.

Part Six: Overview of Community Ownership and Cooperative Models

This section covers the logistics –legal, practical, financial- of setting up a shared renewable energy and energy efficiency project and provides snapshots of examples of successful community-led programs and projects.

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Report on the Economic Well-Being of U.S. Households in 2018

May 2019

Board of Governors of the Federal Reserve System

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Preface

This survey and report were prepared by the Consumer and Community Research Section of the Federal Reserve Board's Division of Consumer and Community Affairs (DCCA).

DCCA directs consumer- and community-related functions performed by the Board, including conducting research on financial services policies and practices and their implications for consumer financial stability, community development, and neighborhood stabilization.

DCCA staff members Alex Durante and Lisa Chen were the lead contributors to this report and survey. Cassandra Duchan, Kimberly Kreiss, Ellen Merry, Barbara Robles, Claudia Sahm, and Mike Zabek were also key staff contributors. Federal Reserve staff members Eric Belsky, Anna Alvarez Boyd, Andrea Brachtesende, David Buchholz, Jeff Larrimore, Madelyn Marchessault, and Susan Stawick provided valuable comments on the survey and report. Katherine Abraham, Mary Burke, Julia Cheney, Keith Ernst, Andrew Figura, Geoff Gerdes, Lisa Lee, Gavin Miller, Joshua Montes, Shannon Nelson, Michael Scherzer, James Spletzer, Alison Weingarden, and Josh Winters provided helpful feedback on new survey questions. The authors would like to thank Bob Torongo, Marlene Rosas, Mansour Fahimi, Frances Barlas, Elisa Chan, and Sergei Rodkin for their assistance fielding the survey.

If you have questions about the survey or this report, please email SHED@frb.gov.

Contents

Executive Summary

This report describes the responses to the sixth annual Survey of Household Economics and Decisionmaking (SHED). The goal of the survey is to share the wide range of financial challenges and opportunities facing individuals and households in the United States.[1] For many, the findings are positive; however, areas of distress and fragility remain. The survey also reveals how households view their own financial lives and the many decisions they face, from education to retirement.

Most measures of economic well-being and financial resilience in 2018 are similar to or slightly better than in 2017. Many families have experienced substantial gains since the survey began in 2013, in line with the nation's ongoing economic expansion during that period. Even so, another year of economic expansion and the low national unemployment rates did little to narrow the persistent economic disparities by race, education, and geography.

A key theme in this year's report is exploring the sources and effects of financial fragility across several domains, from employment to banking to managing expenses. Results from the survey show that many adults are financially vulnerable and would have difficulty handling an emergency expense as small as $400. In addition, volatile income and low savings can turn common experiences—such as waiting a few days for a bank deposit to be available—into a problem for some. At the same time, there is evidence of coping strategies, such as supplementing income through gig work and seeking financial support from family members.

[1] The latest SHED interviewed a sample of over 11,000 individuals—with an online survey in October and November 2018. The anonymized data, as well as a supplement containing the complete SHED questionnaire and responses to all questions in the order asked, are also available at https://www.federalreserve.gov/consumerscommunities/shed.htm.

The survey continues to use subjective measures and self-assessments to supplement and enhance objective measures. One example is trying to understand how close the economy is to full employment. In addition to asking adults whether they are working, the survey asks if they want to work more and what impediments they see to them working. Health limitations, a lack of available work, and family obligations are often cited as reasons for not being fully employed.

Overall Economic Well-Being

A large majority of individuals report that, financially, they are doing okay or living comfortably, and overall economic well-being has improved substantially since the survey began in 2013. Even so, notable differences remain by race and ethnicity, educational attainment, and geography.

- When asked about their finances, 75 percent of adults say they are either doing okay or living comfortably. This result in 2018 is similar to 2017 and is 12 percentage points higher than 2013.
- Adults with a bachelor's degree or higher are significantly more likely to be doing at least okay financially (87 percent) than those with a high school degree or less (64 percent).
- Nearly 8 in 10 whites are at least doing okay financially in 2018 versus two-thirds of blacks and Hispanics. The gaps in economic well-being by race and ethnicity have persisted even as overall well-being has improved since 2013.
- Fifty-six percent of adults say they are better off than their parents were at the same age and one-fifth say they are worse off.
- Nearly two-thirds of respondents rate their local economic conditions as "good" or "excellent," with the rest rating conditions as "poor" or "only

Florida PSC, Docket Nos. 20190015-EG, 20190016-EG, 20190018-EG, 20190019-EG, 20190020-EG, 20190021-EG
2019 - Report on the Economic Well-Being
Exhibit FBW-4, Page 10 of 64

fair." More than half of adults living in rural areas describe their local economy as good or excellent, compared to two-thirds of those living in urban areas.

Income

Changes in family income from month to month remain a source of financial strain for some individuals. Financial support from family or friends to make ends meet is also common, particularly among young adults.

- Three in 10 adults have family income that varies from month to month. One in 10 adults have struggled to pay their bills because of monthly changes in income. Those with less access to credit are much more likely to report financial hardship due to income volatility.
- One in 10 adults, and over one-quarter of young adults under age 30, receive some form of financial support from someone living outside their home. This financial support is mainly between parents and adult children and is often to help with general expenses.

Employment

Most adults are working as much as they want to, an indicator of full employment; however, some remain unemployed or underemployed. Economic well-being is lower for those wanting to work more, those with unpredictable work schedules, and those who rely on gig activities as a main source of income.

- One in 10 adults are not working and want to work, though many are not actively looking for work. Four percent of adults in the SHED are not working, want to work, *and* applied for a job in the prior 12 months, similar to the official unemployment rate of 3.8 percent in the fourth quarter of 2018.
- Two in 10 adults are working but say they want to work more. Blacks, Hispanics, and those with less education are less likely to be satisfied with how much they are working.
- Half of all employees received a raise or promotion in the prior year.
- Unpredictable work schedules are associated with financial stress for some. One-quarter of employees have a varying work schedule, including 17 percent whose schedule varies based on their employer's needs. One-third of workers who do not control their schedule are not doing okay financially, versus one-fifth of workers who set their schedule or have stable hours.
- Three in 10 adults engaged in at least one gig activity in the prior month, with a median time spent on gig work of five hours. Perhaps surprisingly, little of this activity relies on technology: 3 percent of all adults say that they use a website or an app to arrange gig work.
- Signs of financial fragility—such as difficulty handling an emergency expense—are slightly more common for those engaged in gig work, but markedly higher for those who do so as a main source of income.

Dealing with Unexpected Expenses

While self-reported ability to handle unexpected expenses has improved substantially since the survey began in 2013, a sizeable share of adults nonetheless say that they would have some difficulty with a modest unexpected expense.

- If faced with an unexpected expense of $400, 61 percent of adults say they would cover it with cash, savings, or a credit card paid off at the next statement—a modest improvement from the prior year. Similar to the prior year, 27 percent would borrow or sell something to pay for the expense, and 12 percent would not be able to cover the expense at all.
- Seventeen percent of adults are not able to pay all of their current month's bills in full. Another 12 percent of adults would be unable to pay their current month's bills if they also had an unexpected $400 expense that they had to pay.
- One-fifth of adults had major, unexpected medical bills to pay in the prior year. One-fourth of adults skipped necessary medical care in 2018 because they were unable to afford the cost.

Banking and Credit

Most adults have a bank account and are able to obtain credit from mainstream sources. However, substantial gaps in banking and credit services exist among minorities and those with low incomes.

- Six percent of adults do not have a bank account. Fourteen percent of blacks and 11 percent of Hispanics are unbanked versus 4 percent of whites. Thirty-five percent of blacks and 23 percent of Hispanics have an account but also use alternative financial services, such as money orders and check cashing services, compared to 11 percent of whites.
- More than one-fourth of blacks are not confident that a new credit card application would be approved if they applied—over twice the rate among whites.
- Those who never carry a credit card balance are much more likely to say that they would pay an unexpected $400 expense with cash or its equivalent (88 percent) than those who carry a balance most or all of the time (40 percent) or who do not have a credit card (27 percent).
- Thirteen percent of adults with a bank account had at least one problem accessing funds in their account in the prior year. Problems with a bank website or mobile app (7 percent) and delays in when funds were available to use (6 percent) are the most common problems. Those with volatile income and low savings are more likely to experience such problems.

Housing and Neighborhoods

Satisfaction with one's housing and neighborhood is generally high, although notably less so in low-income communities. Renters face varying degrees of housing strain, including some who report difficulty getting repairs done or being forced to move due to a threat of eviction.

- While 8 in 10 adults living in middle- and upper-income neighborhoods are satisfied with the overall quality of their community, 6 in 10 living in low- and moderate-income neighborhoods are satisfied.
- People's satisfaction with their housing does not vary much between more expensive and less expensive cities or between urban and rural areas.
- Over half of renters needed a repair at some point in the prior year, and 15 percent of renters had moderate or substantial difficulty getting their landlord to complete the repair. Black and Hispanic renters are more likely than whites to have difficulties getting repairs done.
- Three percent of non-homeowners were evicted, or moved because of the threat of eviction, in the prior two years. Evictions are slightly more common in urban areas than in rural areas.

Higher Education

Economic well-being rises with education, and most of those holding a postsecondary degree think that attending college paid off. The net financial benefits of education are less evident among those who started college but did not complete their degree; the same is true among those who attended for-profit institutions.

- Two-thirds of graduates with a bachelor's degree or more feel that their educational investment paid off financially, but 3 in 10 of those who started but did not complete a degree share this view.
- Among young adults who attended college, more than twice as many Hispanics went to a for-profit institution as did whites. For young black attendees, this rate was five times the rate of whites.
- Given what they know now, half of those who attended a private for-profit institution say that they would attend a different school if they had a chance to go back and make their college choices again. By comparison, about one-quarter of those who attended public or private not-for-profit institutions would want to attend a different school.

Student Loans and Other Education Debt

Over half of young adults who attended college took on some debt to pay for their education. Most borrowers are current on their payments or have successfully paid off their loans. However, those who failed to complete a degree, and those who attended for-profit institutions, are more likely to have fallen behind on their payments.

- Among those making payments on their student loans, the typical monthly payment is between $200 and $299 per month.
- Over one-fifth of borrowers who attended private for-profit institutions are behind on student loan payments, versus 8 percent who attended public institutions and 5 percent who attended private not-for-profit institutions.

Retirement

Many adults are struggling to save for retirement. Even among those who have some savings, people commonly lack financial knowledge and are uncomfortable making investment decisions.

- Thirty-six percent of non-retired adults think that their retirement saving is on track, but one-quarter have no retirement savings or pension whatsoever. Among non-retired adults over the age of 60, 45 percent believe that their retirement saving is on track.
- Six in 10 non-retirees who hold self-directed retirement savings accounts, such as a 401(k) or IRA, have little or no comfort in managing their investments.
- On average, people answer fewer than three out of five financial literacy questions correctly, with lower scores among those who are less comfortable managing their retirement savings.

Economic Well-Being

The large number of people reporting that they are doing at least okay financially mirrors the results in the prior survey, maintaining the significant gains since the survey began in 2013.[2] This generally positive assessment of economic well-being is consistent with the continued economic expansion and the low national unemployment rate. Even so, the rate of improvement in well-being was small relative to some previous years, and disparities persist across education, race, and neighborhoods.

Current Financial Situation

Three-quarters of adults in 2018 indicate they are either "living comfortably" (34 percent) or "doing okay" financially (41 percent), similar to the rate in 2017. The rest are either "just getting by" (18 percent) or "finding it difficult to get by" (7 percent). The 1 percentage point increase in the fraction doing at least okay financially in 2018 is not statistically significant but leaves this fraction substantially higher than the 62 percent in 2013.

Despite the positive trend, notable differences in economic well-being remain among education and racial groups. Adults with a bachelor's degree or higher are significantly more likely to be doing at least okay financially (87 percent) than those with a high school degree or less (64 percent). Two-thirds of blacks and Hispanics report that they are doing at least okay financially, compared to nearly 8 in 10 whites. The racial disparities also exist within each level of educational attainment (figure 1).

Economic well-being also differs by income, family structure, and neighborhood (table 1). Fifty-six percent of adults with family income less than $40,000 say they are doing okay financially, versus 94 percent of adults with income greater than $100,000. Married individuals, in general, are more likely to report that they are doing at least okay financially (82 percent) than unmarried individuals (66 percent). Of those with children (under age 18), unmarried parents are much less likely to report a positive financial situation (52 percent) than married parents (78 percent). Finally, people living in low-

[2] The survey was fielded from October 11 to November 12, 2018, so references to "during 2018" in the report text are the 12-month period before the survey (typically from October 2017 through October 2018) rather than the precise calendar year.

Figure 1. At least doing okay financially (by education and race/ethnicity)

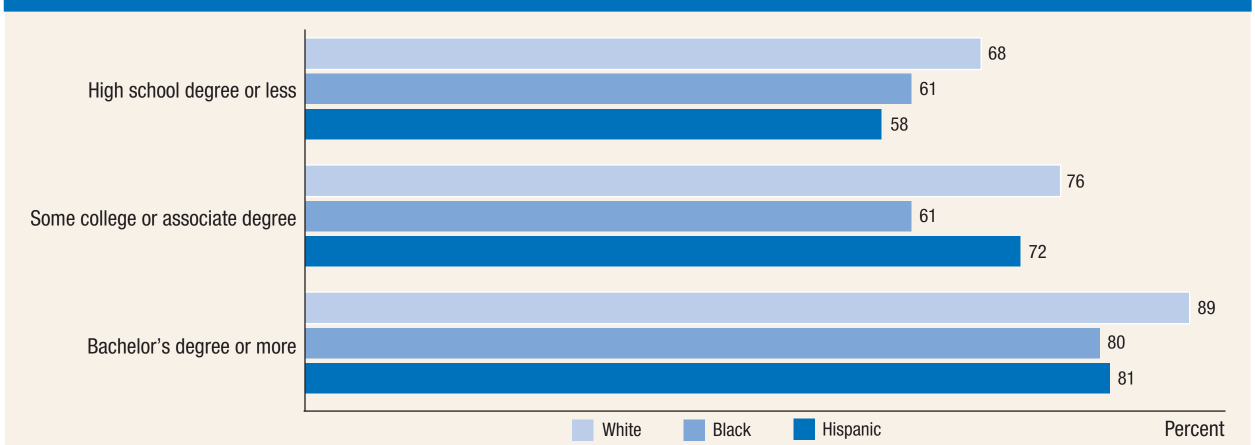


Table 1. Share of adults at least doing okay financially (by demographic characteristics)

Characteristic	Percent in 2018	Change since 2017	Change since 2013
Family income			
Less than $40,000	56	1	14
$40,000–$100,000	79	1	13
Greater than $100,000	94	0	12
Race/ethnicity			
White	78	1	13
Black	66	0	13
Hispanic	67	1	11
Urban/rural residence			
Urban	75	1	12
Rural	71	0	12
Neighborhood income			
Middle or upper income	78	1	n/a
Low or moderate income[1]	65	2	n/a
Family structure			
Married, no children	84	1	10
Married, children	78	3	17
Unmarried, no children	68	2	10
Unmarried, children	52	-4	10
Overall	**75**	**1**	**12**

Note: Census tracts were not included in the 2013 SHED so changes since 2013 are not available. Here and in subsequent tables and figures, percents may not sum to 100 due to rounding and question nonresponse.

[1] Low- or moderate-income neighborhoods are defined here as those census tracts with a median family income less than 80 percent of the national median income.

n/a Not applicable.

and moderate-income communities report lower levels of well-being than those living in middle- or upper-income communities.

To learn more about economic well-being, this year's survey also asked individuals to explain "in their own words" how they are managing financially. Text analysis of these responses highlights some of the nuances in how individuals think about their financial situation (box 1).

Changes in Financial Situation over Time

The average well-being in a handful of broad categories across survey years could mask the degree of change—both positive and negative—within specific families. When asked directly about *changes* in their finances, adults in 2018 are twice as likely to report that their finances improved over the prior 12 months (31 percent) than worsened (13 percent).

Table 2. Financial situation compared to parents (by education and race/ethnicity)
Percent

Characteristic	Better off	About the same	Worse off
High school degree or less			
White	52	28	19
Black	61	26	11
Hispanic	54	23	22
Overall	54	26	19
Some college or associate degree			
White	51	26	22
Black	62	21	17
Hispanic	58	19	23
Overall	54	24	21
Bachelor's degree or more			
White	58	24	17
Black	64	16	19
Hispanic	61	19	19
Overall	59	23	18
Overall	**56**	**25**	**19**

The remainder—55 percent of adults—say their finances are about the same as the prior year.

To get a longer perspective than year-to-year changes, individuals also compared their current economic well-being to their parents' at the same age. Looking across a generation, 56 percent of adults say they are better off financially than their parents were (table 2). One-fifth say they are worse off than their parents were. At all levels of education, blacks and Hispanics are more likely than whites to say that they are better off than their parents were. However, in some education groups, minorities are also more likely than whites to say they are worse off than their parents. On net, this measure shows some evidence of narrowing racial disparities across a generation. In addition, having a bachelor's degree or more is generally associated with greater upward economic mobility than having less education.

Local Economic Conditions

Along with questions about their own economic well-being, people are asked to assess their local economy. Nearly two-thirds of respondents rated local economic conditions as "good" or "excellent" in 2018, with the rest rating conditions as "poor" or "only fair."

The assessments differ widely by demographics and geography (table 3). Whereas 68 percent of whites

Table 3. Self-assessment of the local economy as good or excellent (by select characteristics)
Percent

Characteristic	Local economy
Race/ethnicity	
White	68
Black	47
Hispanic	60
Urban/rural residence	
Urban	66
Rural	52
Neighborhood income	
Middle or upper income	71
Low or moderate income	45
Overall	**64**

Note: See table 1 for definitions of low- or moderate-income neighborhoods.

view their local economic conditions as good or excellent, 47 percent of blacks and 60 percent of Hispanics rate their local economies favorably. Not surprisingly, adults who live in low- and moderate-income neighborhoods are much less likely to report favorable local economic conditions than those in middle- or upper-income neighborhoods. Looking across geography, more than half of adults living in rural areas rate their economy as at least good, compared to two-thirds of those living in urban areas.

Subjective measures of local economic conditions—like these self-assessments—can add to our understanding of individual experience. As one example, consider the 21 percent of adults in 2018 who personally know someone addicted to opioids or prescription painkillers. Some research has argued that economic decline in certain communities has contributed to the opioid epidemic.[3] In 2018, those personally exposed to the opioid epidemic are less likely to view the local economy as good or excellent (60 percent) than those not exposed (65 percent). Even after accounting for race, rural or urban status, and neighborhood income, the modest relationship between opioid exposure and self-assessed local economic conditions remains.

[3] See Jeff Larrimore et al., "Shedding Light on Our Economic and Financial Lives?" FEDS Notes (Washington: Board of Governors of the Federal Reserve System, May 22, 2018), https://www.federalreserve.gov/econres/notes/feds-notes/shedding-light-on-our-economic-and-financial-lives-20180522.htm.

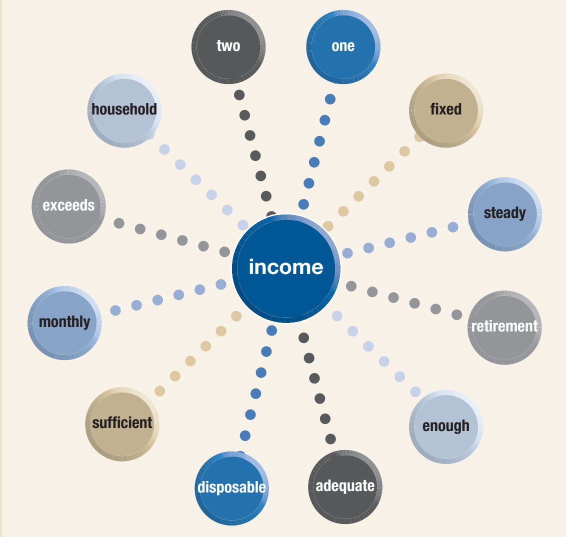
Box 1. Text Analysis of Self-Assessed Well-Being and Income

Surveys, like the SHED, pair most questions with a small set of possible answers from which respondents choose. In some cases, the survey complements these structured questions with open-ended questions, to which respondents answer in their own words. Open-ended questions can provide different insights into how individuals are faring, and can inform the creation of new structured questions. Because of the range of possible responses, however, the results from open-ended questions are challenging to interpret. This box describes one example of how to analyze such text responses in a rigorous and systematic way.

In this survey, everyone chooses from four pre-set answers ("finding it difficult to get by," "just getting by," "doing okay," and "living comfortably") to describe their financial situation. Then respondents are asked to explain in a sentence or two why they selected their response. To illustrate the uses of text analytics, consider explanations that include "income"—one of the most commonly used words. One in 10 adults who say that they are "doing okay" or "living comfortably" use the word "income" in their open-ended response. Those who are "just getting by" or "finding it difficult to get by" mention "income" twice as often.[1]

This text analysis uses word pairs—also referred to as bigrams—that include "income" to unpack these open-ended responses.[2] Bigrams are pairs of successive words. For example, the text response "my income covers my expenses" is broken into the following bigrams: "my income," "income covers," "covers my," and "my expenses."[3] Not surprisingly, the words individuals use to describe their income differ substantially across the pre-set choices of "finding it difficult to get by" or "living comfortably."

Figure A. Income-related word pairs among those "doing okay" or "living comfortably"



Descriptions of both the level and variability of income differ by self-assessed well-being. Among adults who say they are at least doing okay financially, common words include "adequate," "sufficient," and "exceeds" to describe their income (figure A).

(continued on next page)

1 Unlike the rest of the report, this analysis of open-ended text response questions is unweighted.

2 Studying the frequency of bigrams is one form of text analysis; see also Julia Silge and Dave Robinson's *Text Mining with R* at https://tidytextmining.com.

3 Bigrams where either the first or the second word does not provide contextual information, such as "the" and "are," are omitted.

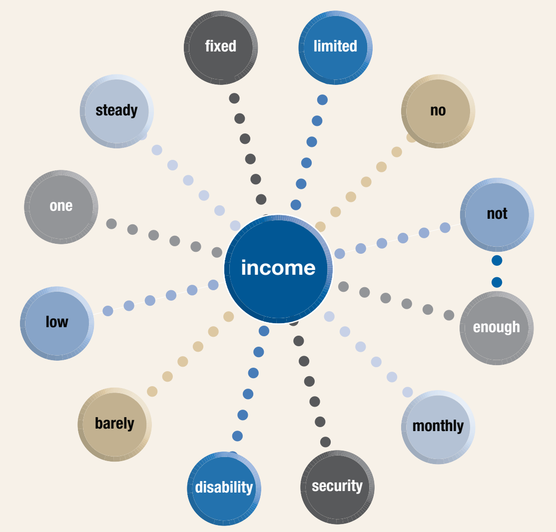
Box 1. Text Analysis of Self-Assessed Well-Being and Income—*continued*

On the other hand, those just getting by or worse use words like “low,” “limited,” and “barely” (figure B). Both well-being groups use “enough” and “steady” when talking about income, yet nearly every instance in the lower well-being group is preceded by the word “not,” “no,” or “need.”

The sources of income that individuals use to explain economic well-being also differ. Those who are not doing okay financially often mention “social security” and “disability” along with income, suggesting that social safety net programs are an important source of income for many of these respondents. Among those doing okay financially, “social security” is a common phrase, but they often mention it along with other retirement income sources like pensions or investment income. Those doing better financially are also more likely to point to having “two” incomes, such as from a spouse or partner also working, in their household. In contrast, “one” income is more common among those doing worse financially.

The kind of text analysis in this one example can be applied to other open-ended responses across a range of issues. This analysis often confirms what is understood from structured questions, but sometimes suggests nuances or new developments that merit further inquiry.

Figure B. Income-related word pairs among those “just getting by” or “struggling to get by”



Income

Income is central to most people's economic well-being. The ability to meet current expenses and save for the future typically depends on income being sufficient and reliable. Some families also depend on financial support from, or provide such support to, their family or friends. Frequent changes in the level of family income, referred to here as "income volatility," can be a source of economic hardship.

Level and Source

Family income in this survey is the income from all sources that the respondent and his or her spouse or partner received during the previous year. Income is reported in dollar ranges as opposed to exact amounts. One-quarter of adults had a family income of less than $25,000 during 2018, and 37 percent had less than $40,000 (figure 2).[4]

Wages and salaries are the most common source of family income: nearly 7 in 10 adults and their spouse or partner received wage income during 2018 (table 4). Yet, many families also receive non-wage income, and the sources of non-wage income vary substantially with age. Among young adults (ages 18 to 29), other paid activities—often referred to as

[4] The income distribution in the SHED is largely similar to the 2018 March Current Population Survey, although a higher fraction of adults in the SHED have family incomes above $40,000 and a lower fraction have incomes below $40,000. The higher income may partly reflect the fact that unmarried partners are treated as one family in the SHED, while the Current Population Survey treats them as two separate families.

Figure 2. Family income distribution

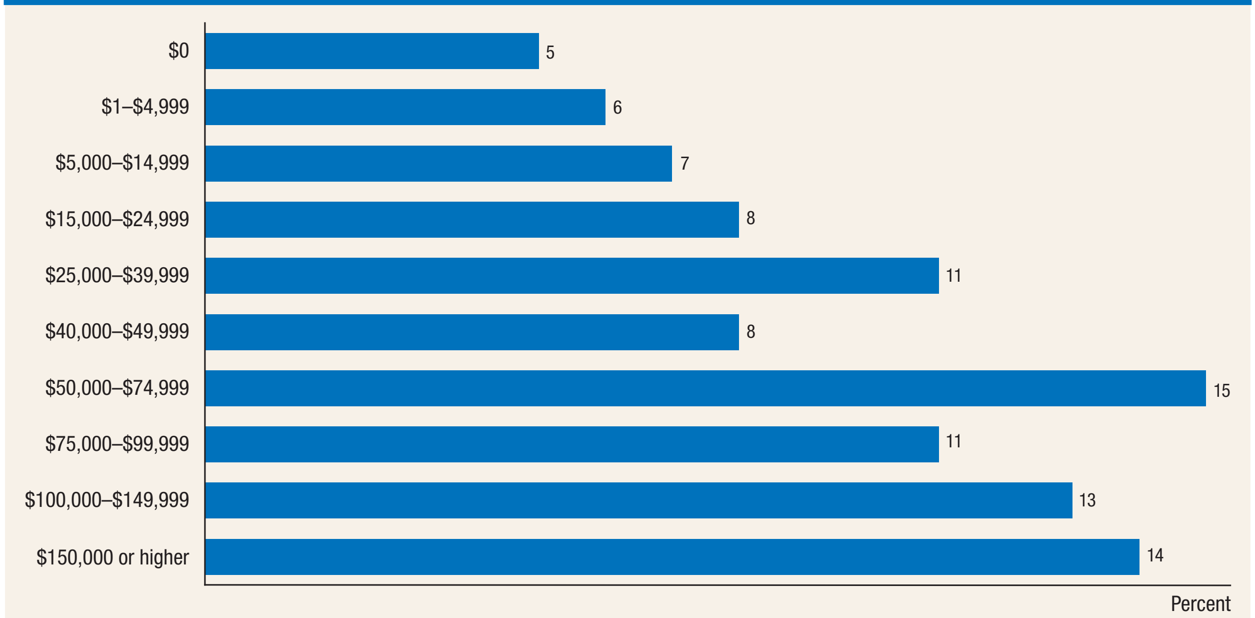


Table 4. Family income sources (by age)
Percent

Income source	18–29	30–44	45–59	60+	Overall
Wages or salaries	77	83	80	38	68
Self-employment	14	19	19	14	16
Other paid activities	19	13	9	7	12
Interest, dividends, or rental income	15	21	29	44	28
Social Security (including old age, SSI, and DI)	4	7	14	76	28
Unemployment income	3	3	3	2	3
Pension	1	2	9	51	18
Any other income	7	6	7	15	9

Note: Respondents can select multiple answers.

gig work—is the most common source of non-wage income. Among middle-age adults (ages 30 to 59), the percent with gig income is lower, while the percent with interest, dividend, and rental income is higher. Finally, 83 percent of adults age 60 and older received Social Security or pension income. The common sources of income and its distribution are similar to previous surveys.

Financial Support

One in 10 adults received some form of financial support during 2018 from someone living outside of their home. Over one-quarter of young adults receive such support (table 5). Among young adults with incomes under $40,000, nearly 4 in 10 receive some support from outside their home. Conversely, adults age 30 or older are more likely to provide financial support to individuals outside their home. Two in 10 adults ages 45 to 59 financially support others in this way.

This financial support is mainly between parents and adult children. Of those receiving family support, nearly two-thirds receive it from parents. Of those under age 30 who receive support, 8 in 10 receive it from parents. For many older adults, the flow reverses: among adults age 60 and older who receive family assistance, 6 in 10 receive it from their adult children.

Table 5. Receiving and providing financial support outside of the home (by age)
Percent

Age	Receive support	Provide support
18–29	27	9
30–44	9	13
45–59	5	21
60+	5	16
Overall	**11**	**15**

Financial support from family and friends takes many forms. Six in 10 of those receiving financial support receive money for general expenses, and over one-third receive help with their rent or mortgage (figure 3). In addition, nearly one-quarter of all recipients, and over one-third of recipients under age 30, receive help with educational expenses or student loan payments.

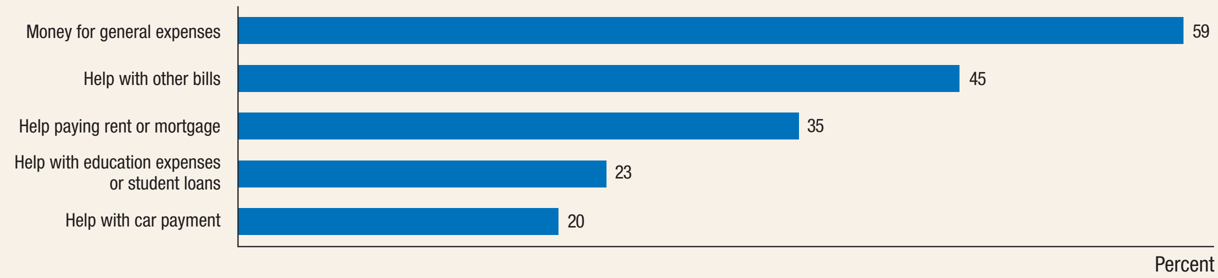
Income Volatility

The level of income during the year as a whole may mask substantial changes in income from month to month. The survey considers how mismatches between the timing of income and expenses lead to financial challenges.

Income in 2018 was roughly the same from month to month for 7 in 10 adults. It varies occasionally for 2 in 10, and varies quite often for 1 in 10. Some families can manage these frequent changes in income easily, but for others this may cause financial hardship. In fact, one-third of those with varying income, or 1 in 10 adults overall, say they struggled to pay their bills at least once in the prior year due to varying income.

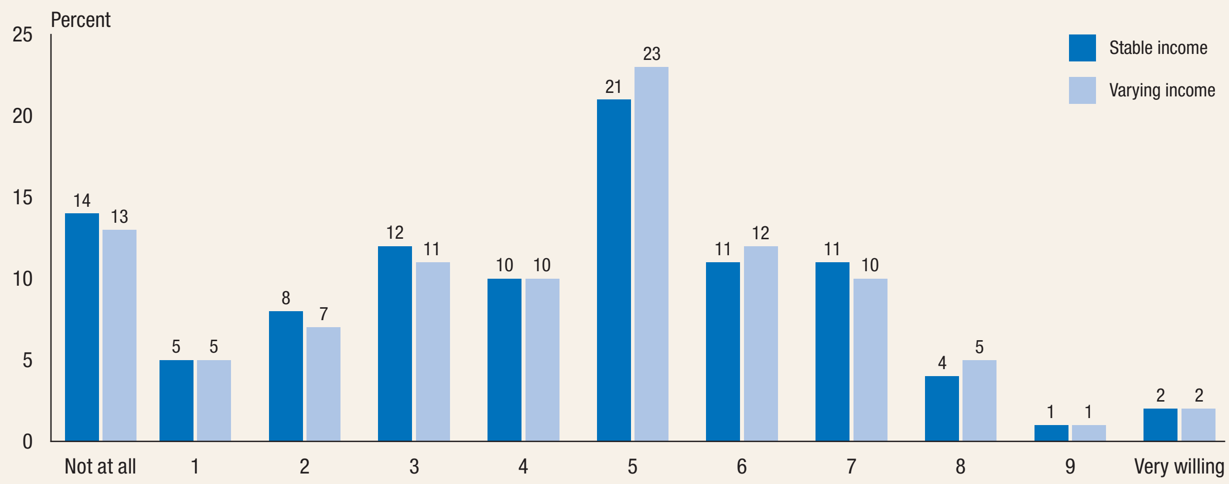
Those with less access to credit are much more likely to report financial hardship due to income volatility. For example, one-fourth of adults who are not confident in their ability to get approved for a credit card have experienced hardship from income volatility in the prior year, versus 6 percent of those who are con-

Figure 3. Forms of financial support received from someone outside of the home



Note: Among adults receiving any support from outside the home.

Figure 4. Willingness to take financial risks (by income volatility)



fident in their credit availability (table 6). (Access to credit is discussed further in the "Banking and Credit" section of this report.)

More risk-tolerant individuals may be willing to accept income that is more volatile. On a scale of zero to ten, with "zero" being unwilling to take risks and "ten" being very willing to take risks, more risk-tolerant individuals are somewhat more likely to have varying income than those who are less risk tolerant (figure 4). However, the difference in income volatility by risk tolerance is modest. This suggests that factors other than individual risk preferences likely drive income volatility.

Table 6. Income volatility and related hardship (by credit confidence)
Percent

Expect credit card application would be approved	Stable income	Varying income	
		No hardship	Causes hardship
Confident	73	20	6
Not confident	64	9	26
Overall	**71**	**19**	**9**

Note: Among adults receiving any support from outside the home.

Employment

In this survey, the majority of adults report working as much as they want, and half of employees received a raise or promotion during the prior year. Even with the strong labor market, some still face challenges in finding quality jobs. For example, variable work schedules, temporary contracts, and gig work activities as a main source of income are often associated with less financial security than are more traditional work arrangements.

Work and Well-Being

Two-thirds of adults report that they are working as much as they want—a sign that they are fully employed. One in 10 adults are not working and want to work, though many are not actively looking for work.[5] Four percent of adults in the SHED are not working, want to work, *and* applied for a job in the prior 12 months. Two in 10 adults are working but say they want to work more hours.

Individuals in these latter two groups, who want to work more, have less education than those working as much as they want. Notably, after several years of economic expansion, 38 percent of adults with less than a bachelor's degree want more work, versus 23 percent of adults with a bachelor's degree.

Education is not the only gap. Within education levels, racial differences in having as much work as desired are also evident (figure 5). Half of blacks and Hispanics with a high school degree or less want more work, versus 3 in 10 whites with the same education. Moreover, blacks and Hispanics with a bachelor's degree or more are about as likely as whites with a high school degree or less to want more work.

Work status affects individuals and their families in many ways. Those who want more work report lower levels of well-being than those who are satisfied with their working hours (table 7). For example, the group of adults who are not working and want to work is

[5] This statistic includes individuals who have not looked for work recently and thus is not directly comparable to the 3.8 percent national unemployment rate in the fourth quarter of 2018 (or alternate measures of labor utilization) published by the Bureau of Labor Statistics.

Figure 5. Want to work more than currently (by education and race/ethnicity)

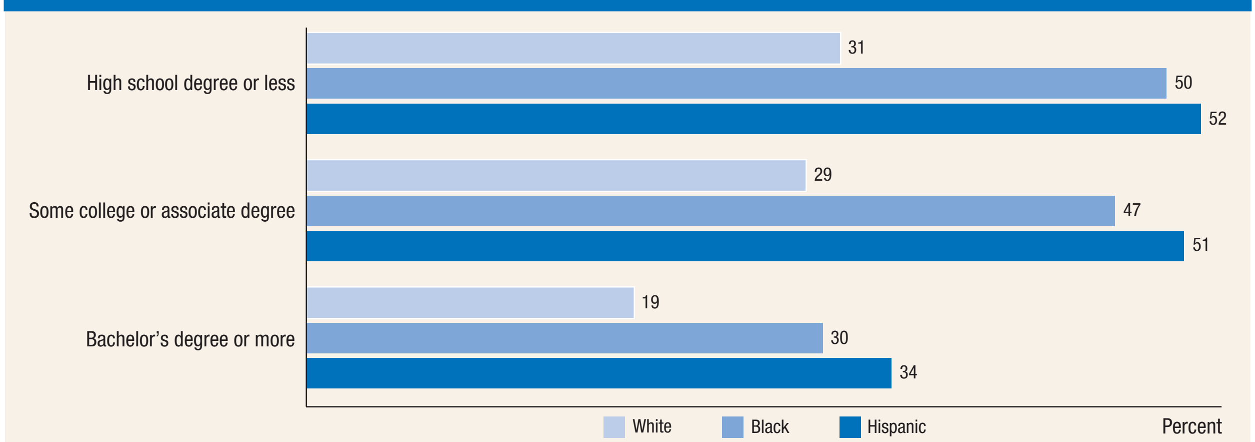


Table 7. Self-assessment of well-being and social class (by work status)
Percent

Form of employment	Not doing okay financially	Bottom half of social ladder	Worse off than parents
Not working, want work	51	60	27
Working, want more work	38	50	25
Not working, don't want more work	20	35	14
Working, don't want more work	14	26	17

three and a half times as likely to report that they are not doing okay financially (51 percent) than the group that is working and does not want more work (14 percent).

But work is not enough to guarantee economic well-being. Those who are working and want to work more hours are worse off than those who are not working and do not want to work. In terms of self-assessed social status, those who are not fully employed are more likely to view themselves on the bottom half of a social ladder. They are also more likely to say that they are worse off than their parents were at the same age. It is worth noting, however, that even among those who want more work, the vast majority see themselves as better off or the same as their parents were.

Given the importance of work, it is also worth understanding why some adults, particularly in their prime years (ages 25 to 54), are not working. Despite a strong labor market, 24 percent of prime-age adults in 2018 report not working in the month prior to the survey, split about evenly between those who want to work and those who do not.

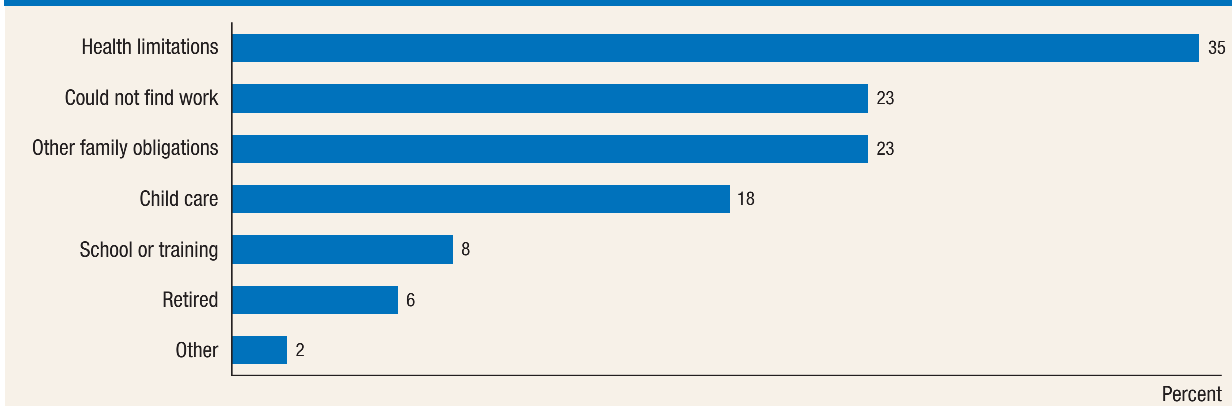
Over one-third of prime-age adults who are not working cite a health limitation as a reason, and nearly one-quarter say they could not find work (figure 6). Women not working in this age group are much more likely (42 percent) to cite child care or other family obligations as a reason than men (16 percent) are. Older adults (age 55 and older) are most likely to cite retirement as their reason for not working (80 percent), and younger adults (under age 25) are more likely to be out of the labor force because they are in school or training (60 percent).

Wage Growth and Work Arrangements

Wage growth is a key feature of a strong labor market. In 2018, half of all employees received a raise or promotion in the prior year, but some groups are less likely to experience such gains.

Blacks were less likely to have received a raise in the prior year than whites were, regardless of educational attainment (figure 7). Hispanics with some college education or a bachelor's degree were less likely than either whites or blacks with similar education to have received a raise. However, among workers with a high school degree or less, Hispanics were the most likely to have seen their wages rise. Beyond education and race, employees living in low- and moderate income neighborhoods were less likely to have received a raise (44 percent) than those living in more well-off communities (50 percent). The experi-

Figure 6. Reasons for not working among ages 25–54



Note: Respondents can select multiple answers.

Figure 7. Received a raise (by education and race/ethnicity)

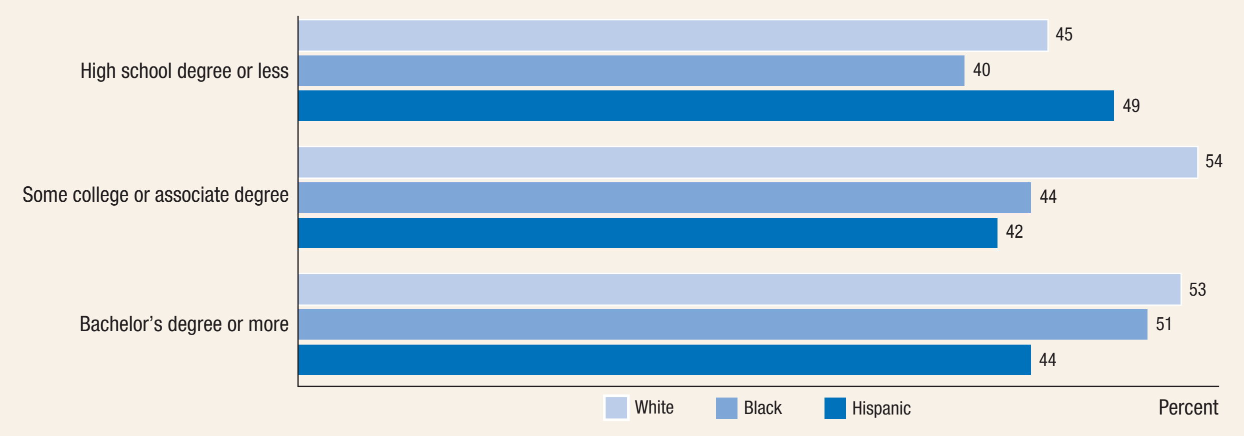


Figure 8. Employees "just getting by" or "finding it difficult to get by" (by work schedule)

ences were similar for those in urban (49 percent) and rural areas (48 percent).

Temporary work contracts are often associated with lower economic well-being than are more stable work arrangements. The same is true for work schedules that vary with little advance notice. Among those working, 8 percent say that their main job—the one from which they receive the most income—was a temporary job. The self-employed are more likely to view their work as temporary, but some employees also work on short-term contracts.[6]

Work schedules are another source of unpredictability. One-quarter of employees have a varying work schedule, including 17 percent whose schedule varies based on their employer's needs. Of the latter group of people who do not set their schedule, one-third say they are not doing okay financially (figure 8), versus one-fifth of employees with stable schedules or varying schedules that they control.

Workers with schedules that vary based on their employer's needs may report lower economic well-being because they receive short notice of when they will work. Among this group, nearly half are told when they will work three days or fewer in advance.

Those with less education are more likely to have these irregular schedules and receive short notice of when they will work. Of those with a high school degree or less, 22 percent had a job that varied by their employer's needs, compared to 11 percent of those with a bachelor's degree or higher. Workers with these types of irregular schedules are concentrated in certain industries. One-third of employees in the retail or accommodations (lodging and related services) sectors have a varying schedule set by their employer.

[6] The rates of temporary work in the SHED are higher than in some surveys. For example, the "Contingent Worker Supplement" from the Bureau of Labor Statistics in May 2017 found that 3.8 percent of all workers (including the self-employed) did not expect their current, main job to last.

Table 8. Share of adults with gig work

Activities	Percent
Service activities	
Child care or elder care services	5
Dog walking, feeding pets, or housesitting	3
House cleaning, yard work, or other property maintenance work	6
Driving or ride-sharing, such as with Uber or Lyft	3
Paid tasks online	2
Other personal tasks, such as deliveries, running errands, or helping people move	4
Goods activities	
Sold goods yourself at flea markets or garage sales	5
Sold goods at consignment shops or thrift stores	3
Sold goods online, such as on eBay or Craigslist	10
Rented out property, such as your car or house	4
Other activities	
Any other paid activities not already mentioned	2

Note: Respondents can select multiple answers.

Gig Work and Informal Paid Activities

Informal, infrequent paid activities—referred to here as gig work—are another source of income for some adults. In this survey, gig work covers personal service activities, such as child care, house cleaning, or ride-sharing, as well as goods-related activities, such as selling goods online or renting out property (table 8).[7] This definition of gig work includes both online and offline activities, underscoring the fact that most of these activities predate the internet. Many adults who engage in gig work use it to supplement their income, but some rely on it for their main source of income. Finally, these gig activities are often done occasionally and do not take much time, and thus may not fit neatly in a standard concept of what is considered to be "work."

Overall in 2018, 3 in 10 adults engaged in at least one of these gig activities in the month before the survey.[8] Fifteen percent of people engaged in a service activity, and 17 percent engaged in a goods activity. Younger individuals are more likely to perform gig work: 37 percent of those ages 18 to 29 performed gig work, but 21 percent of those age 60 or older did so (table 9).

Table 9. Gig work (by age)
Percent

Activities	18–29	30–44	45–59	60+
Service activities	23	17	13	9
Goods activities	19	22	16	12
Use website or mobile app to find customers	5	4	2	1
Any informal activities	**37**	**34**	**27**	**21**

Note: Respondents can select multiple answers.

The relatively high prevalence rates of gig work in this survey likely reflect the broad set of activities covered. Some studies of gig work, instead, focus only on those who use a website or mobile app to connect with customers. Using this narrower definition, 3 percent of adults in this survey say that they participated in gig work enabled by these technologies.[9]

It is not clear that all individuals who participate in gig activities view those activities as the equivalent of traditional paid work. In fact, over one-quarter of those doing gig activities had reported earlier in the survey that they do *not* "work for pay or profit."[10]

Workers participate in the gig economy for a variety of reasons. To earn extra money is the most common reason that individuals engage in gig work (figure 9).

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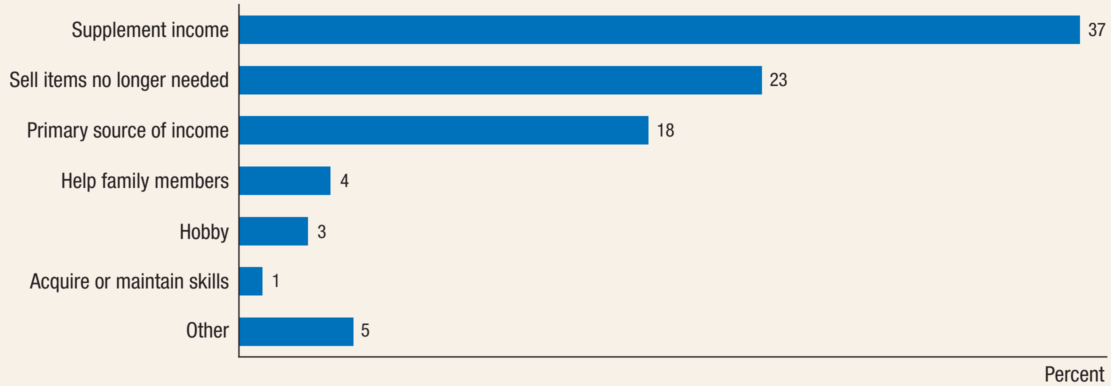
7 The list of gig activities is similar to those in Anat Bracha and Mary Burke, "Informal Work in the United States: Evidence from Survey Responses," *Current Policy Perspectives* (Boston: Federal Reserve Bank of Boston, 2014), https://www.bostonfed.org/publications/current-policy-perspectives/2014/informal-work-in-the-united-states-evidence-from-survey-responses.aspx. For the further development of the gig questions now used in the SHED, see Barbara Robles and Marysol McGee, "Exploring Online and Offline Informal Work: Findings from the Enterprising and Informal Work Activities (EIWA) Survey," Finance and Economics Discussion series 2016-089 (Washington: Board of Governors, October 2016), https://www.federalreserve.gov/econresdata/feds/2016/files/2016089pap.pdf.

8 The overall prevalence of gig work in 2018 was 2 percentage points lower than in 2017, but changes in the question wording complicate year-over-year comparisons. That said, 9 percent of adults reported spending more time on these activities relative to last year and 10 percent reported spending less time, a sign of slightly less gig work.

9 As a comparison, the JPMorgan Chase Institute study *The Online Platform Economy in 2018: Drivers, Workers, Sellers, and Lessors* by Diana Farrell, Fiona Greig, and Amar Hamoudi (https://www.jpmorganchase.com/corporate/institute/report-ope-2018.htm) found that 1.6 percent of families had received income from an online platform in the first quarter of 2018. Similarly, the "Contingent Worker Supplement" from the Bureau of Labor Statistics found that 1.0 percent of workers in May 2017 engaged in electronically mediated work.

10 Other surveys have also encountered challenges in measuring the gig economy, likely due to differences in terms and concepts. See Katherine Abraham and Susan Houseman, "Making Ends Meet: The Role of Informal Work in Supplementing Americans' Income," Working Paper (December 2018).

Figure 9. Main reason for gig work



Note: Among gig workers in the past month.

When asked about their main reason for engaging in gig activities, less than two-fifths of gig workers (11 percent of adults overall) are doing gig activities to supplement their income. For nearly one-fifth of gig workers (5 percent of adults), this is their primary source of income. Nearly one-quarter of gig workers (7 percent of adults) say that selling items that they no longer need is their main reason for gig work.

For most gig workers, this activity is occasional rather continuous, and for many, this work generates only a modest share of family income. Thirty percent of gig workers indicate that they earned income from these activities in all or most months during the year.

Among gig workers who say how much time they spend on gig activities, the median number of hours worked in the prior month was five. For 55 percent of gig workers, these activities account for under 10 percent of their family income. Six percent of the gig workers rely on these activities for 90 percent or more of their family income. However, gig workers with less education are more likely to rely on gig work for a larger fraction of their income. For gig workers with a high school degree or less, 14 percent rely on gig work for at least half of their income, compared to 8 percent for those with a bachelor's degree or higher. The extent to which individuals rely on gig work for income is also associated with differences in their financial fragility (box 2).

Box 2. Financial Fragility and Gig Work

A decade after the Great Recession, financial fragility and economic insecurity remain concerns for many households.[1] The adults engaged in gig activities are a segment of the population that may be experiencing heightened financial fragility.

Two measures of financial fragility are used here to examine gig workers: a) some difficulty handling a $400 unexpected expense and b) using alternative financial services, such as purchasing money orders or cashing a check at a place other than a bank. Adults doing gig work are slightly more likely to say they would borrow, sell something, or could not pay the $400 expense (42 percent) compared to those not doing gig work (38 percent). The use of alternative financial services is somewhat higher among gig workers (24 percent) relative to non-gig workers (16 percent).

The degree of financial fragility among gig workers varies considerably by the reasons for doing gig work. For those doing gig work as their *primary* source of income, 58 percent would have difficulty handling the unexpected expense, compared to 44 percent of those doing gig work to *supplement* their income (figure A). For adults doing gig work to sell items they no longer need, 36 percent would have difficulty with the unexpected expense—a lower fraction than those not doing gig work at all.

The use of alternative financial services, due to their nature and cost compared to bank and credit union services, is also sometimes viewed as an indicator of financial fragility. Use of alternative financial services by gig adults also varies by the motives for gig work (figure B). Those doing gig work as a primary income source (33 percent) use alternative financial services and products to a greater degree than those supplementing their income (26 percent) or selling items they no longer need (19 percent).

Gig work—on its own—is not a uniform sign of financial fragility. Doing gig activities to earn money, in particular as a primary source of income, is associated with more fragility, but selling items that are no longer needed is associated with about the same fragility as non-gig workers.

1 Andrea Hasler, Annamaria Lusardi, and Noemi Oggero, *Financial Fragility in the U.S.: Evidence and Implications* (Washington: Global Financial Literacy Excellence Center, the George Washington University School of Business, November 2017), https://www.nefe.org/_images/research/Financial-Fragility/Financial-Fragility-Final-Report.pdf.

Figure A. Gig work and some difficulty handling an unexpected expense (by reasons for doing gig work)

Note: Respondents can select multiple reasons for gig work. “Some difficulty” is defined as borrow, sell something, or cannot pay.

Figure B. Gig work and use of alternative financial services (by reasons for doing gig work)

Note: Respondents can select multiple reasons for gig work.

Dealing with Unexpected Expenses

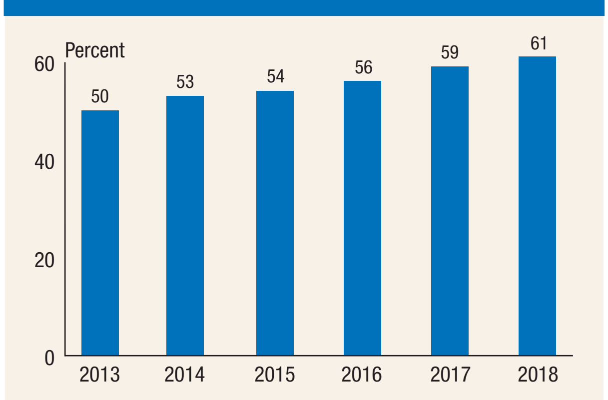
Results from the survey indicate that many adults are not well prepared to withstand even small financial disruptions, though the ability to pay current bills and to handle unexpected expenses has improved markedly since 2013. Despite the positive trends, financial challenges remain, especially for those with less education and for minorities.

Small, Unexpected Expenses

Relatively small, unexpected expenses, such as a car repair or replacing a broken appliance, can be a hardship for many families without adequate savings. When faced with a hypothetical expense of $400, 61 percent of adults in 2018 say they would cover it, using cash, savings, or a credit card paid off at the next statement (referred to, altogether, as "cash or its equivalent")—a 2 percentage point increase from 2017 (figure 10). In 2013, half of adults would have covered such an expense in the same way.

Among the remaining 4 in 10 adults who would have more difficulty covering such an expense, the most common approaches include carrying a balance on credit cards and borrowing from friends or family (figure 11). Twelve percent of adults would be unable to pay the expense by any means. Although so many incurring additional costs for a modest expense is disconcerting, it is possible that some would choose to borrow even if they had $400 available, preserving their cash as a buffer for other expenses.[11]

Figure 10. Would cover a $400 emergency expense using cash or its equivalent (by survey year)



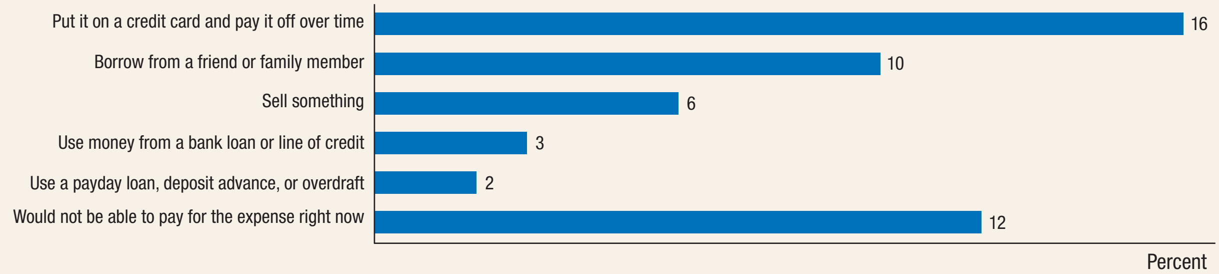
While the prior question asks about a hypothetical expense, the survey results indicate that a number of people struggle to pay their actual bills. Even without an unexpected expense, 17 percent of adults expected to forgo payment on some of their bills in the month of the survey. Most frequently, this involves not paying, or making a partial payment on, a credit card bill (table 10). Four in 10 of those who are not able to pay all their bills (7 percent of all adults) say that their rent, mortgage, or utility bills will be left at least partially unpaid.

Another 12 percent of adults would be unable to pay their current month's bills if they also had an unexpected $400 expense that they had to pay. Altogether, 3 in 10 adults are either unable to pay their bills or are one modest financial setback away from hardship, slightly less than in 2017 (33 percent).

Those with less education in particular are less able to handle these expenses. Thirteen percent of adults with a bachelor's degree or more do not expect to pay their current month's bills or would be unable to

[11] For example, Neil Bhutta and Lisa Dettling estimate in 2016, using the Survey of Consumer Finances, that 76 percent of households had $400 in liquid assets (even after taking monthly expenses into account), which is higher than the 56 percent of adults in the 2016 SHED who say they would cover a $400 expense with cash or its equivalent ("Money in the Bank? Assessing Families' Liquid Savings using the Survey of Consumer Finances," FEDS Notes (Washington: Board of Governors, November 19, 2018), https://www.federalreserve.gov/econres/notes/feds-notes/assessing-families-liquid-savings-using-the-survey-of-consumer-finances-20181119.htm). David Gross and Nicholas Souleles first identified the "credit card debt puzzle" in which some households hold both high-interest credit card debt *and* low-return liquid assets that could be used to pay down those debts ("Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data," *Quarterly Journal of Economics* 117, Issue 1 (February 2002): 149–85.)

Figure 11. Other ways individuals would cover a $400 emergency expense



Note: Respondents can select multiple answers.

Table 10. Bills to leave unpaid or only partially paid in the month of the survey
Percent

Bill	Among adult population	Among those who expect to defer at least one bill
Housing-related bills		
Rent or mortgage	4	22
Water, gas, or electric bill	6	33
Overall	7	39
Non-housing-related bills		
Credit card	7	42
Phone or cable bill	5	32
Student loan	2	12
Car payment	3	19
Other	1	3
Overall	11	67
Unspecified bills	4	25
Overall	**17**	**100**

Note: Respondents can select multiple answers. "Unspecified bills" reflects those who said they would not be able to pay bills in full but then did not answer the type of bill.

if faced with an unexpected $400 expense, versus 42 percent of those with a high school degree or less. Racial and ethnic minorities of each education level are even less able to handle a financial setback (figure 12).

Some financial challenges require more preparation and advanced planning than a relatively small, unexpected expense would. One common measure of financial preparation is whether people have savings sufficient to cover three months of expenses if they lost their job. Half of people have set aside dedicated emergency savings or "rainy day" funds. As was the case with smaller financial disruptions, some would deal with a larger shock by borrowing or selling assets; one-fifth say that they could cover three months of expenses in this way. In total, 7 in 10 adults could tap savings, would need to borrow or sell assets if faced with a financial setback of this magnitude.

Figure 12. Not able to fully pay current month's bills (by education and race/ethnicity)

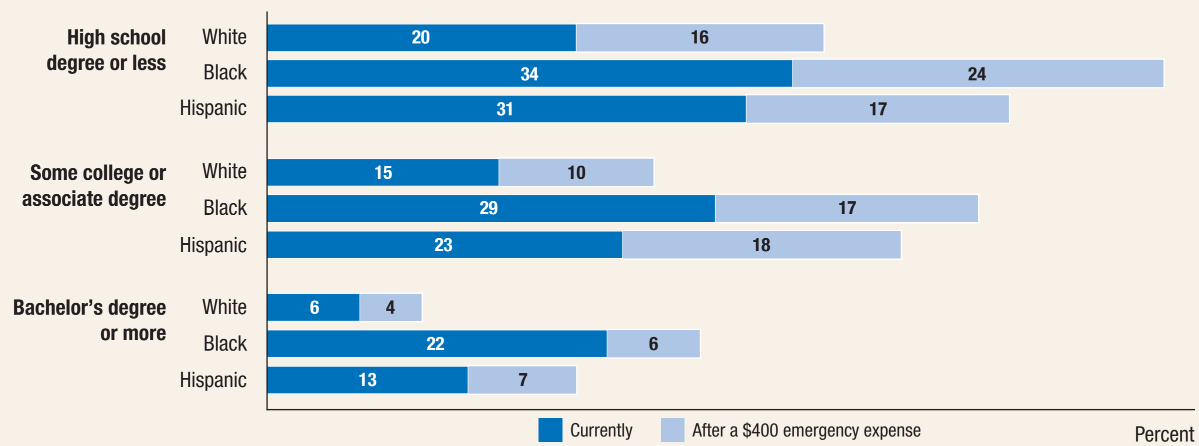
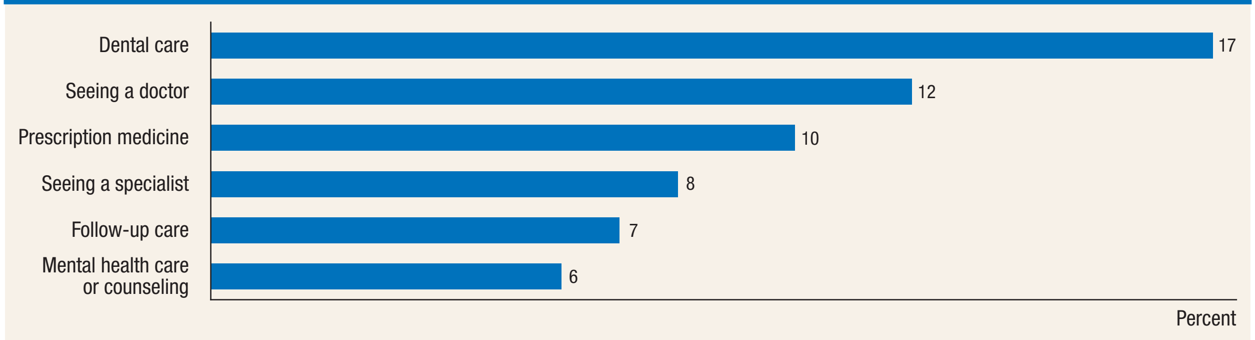


Figure 13. Forms of skipped medical treatment due to cost



Health Care Expenses

Out-of-pocket spending for health care is a common unexpected expense that can be a substantial hardship for those without a financial cushion. As with the small financial setbacks discussed above, many adults are not financially prepared for health-related costs. During 2018, one-fifth of adults had major, unexpected medical bills to pay, with the median expense between $1,000 and $4,999. Among those with medical expenses, 4 in 10 have unpaid debt from those bills.

In addition to the financial strain of additional debt, 24 percent of adults went without some form of medical care due to an inability to pay, down from 27 percent in 2017 and well below the 32 percent reported in 2013. Dental care was the most frequently skipped treatment (17 percent), followed by visiting a doctor (12 percent) and taking prescription medicines (10 percent) (figure 13).

There is a strong relationship between family income and individuals' likelihood of receiving medical care. Among those with family income less than $40,000, 36 percent went without some medical treatment in 2018, down from 39 percent in 2017. This share falls to 24 percent of those with incomes between $40,000 and $100,000 and 8 percent of those making over $100,000.

Health insurance is one way that people can pay for routine medical expenses and hedge against the financial burden of large, unexpected expenses. In 2018, 90 percent of adults had health insurance. This includes 57 percent of adults who have health insurance through an employer or labor union and 22 percent who have insurance through Medicare. Four percent of people purchased health insurance through one of the health insurance exchanges. Those with health insurance are less likely to forgo medical treatment due to an inability to pay. Among the uninsured, 38 percent went without medical treatment due to an inability to pay, versus 22 percent among the insured.[12]

[12] Since the survey asks respondents about their current health insurance status, but also asks about whether they missed medical treatments in the previous year, it is possible that some respondents who currently have insurance were uninsured at the point at which they were unable to afford treatment.

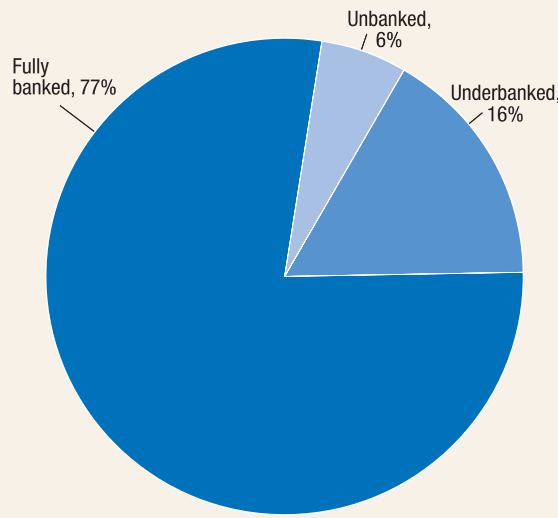
Banking and Credit

Most adults have a bank account and are able to obtain credit from mainstream sources, but notable gaps in access to basic financial services still exist among minorities and those with low incomes. On average, individuals with capacity to borrow on a credit card are more prepared for financial disruptions.

Unbanked and Underbanked

Although the majority of U.S. adults have a bank account and rely on traditional banks or credit unions to meet their banking needs, gaps in banking access remain. Six percent of adults do not have a checking, savings, or money market account (often referred to as the "unbanked"). Two-fifths of unbanked adults used some form of alternative financial service during 2018—such as a money order, check cashing service, pawn shop loan, auto title loan, payday loan, paycheck advance, or tax refund advance.[13] In addition, 16 percent of adults are "underbanked": they have a bank account but also used an alternative financial service product (figure 14).[14] The remaining 77 percent of adults are fully banked, with a bank account and no use of alternative financial products.

Figure 14. Banking status



Note: Fully banked individuals have a bank or credit union account and have not used an alternative financial service in the past year.

The unbanked and underbanked are more likely to have low income, less education, or be in a racial or ethnic minority group. One percent of those with incomes over $40,000 are unbanked, versus 14 percent of those with incomes under that threshold. Similarly, 14 percent of blacks and 11 percent of Hispanics are unbanked, versus 4 percent of whites (table 11).

Individuals who use alternative financial services (one-fifth of adults) may need or prefer to conduct certain financial transactions through providers other than traditional banks and credit unions. The vast majority (89 percent) of people using alternative financial services use transaction services such as purchasing a money order or cashing a check at a place other than a bank (table 12). Twenty-eight percent borrowed money using an alternative financial service product, including payday loans or

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[13] This fraction using alternate financial services was somewhat lower in 2018, but the latest survey clarified that only check cashing or money order services not conducted at a bank should be included. Thus, the two years of data are not directly comparable.

[14] The most recent FDIC National Survey of Unbanked and Underbanked Households in 2017 found that a similar 6.5 percent of households were unbanked and 18.7 percent of households were underbanked. However, the FDIC uses a broader underbanked definition, which includes international remittances and rent-to-own services as alternative financial services. See Federal Deposit Insurance Corporation, *2017 FDIC National Survey of Unbanked and Underbanked Households* (Washington: Federal Deposit Insurance Corporation, October 2018), https://www.economicinclusion.gov/surveys/2017household/.

Table 11. Banking status (by family income, education, and race/ethnicity)
Percent

Characteristic	Unbanked	Underbanked	Fully banked
Family income			
Less than $40,000	14	21	64
$40,000–$100,000	2	17	80
Greater than $100,000	1	7	92
Education			
High school degree or less	13	21	66
Some college or associate degree	4	18	77
Bachelor's degree or more	1	9	89
Race/ethnicity			
White	4	11	85
Black	14	35	50
Hispanic	11	23	66
Overall	**6**	**16**	**77**

paycheck advances, pawn shop or auto title loans, and tax refund advances.

Credit Outcomes and Perceptions

The majority of U.S. adults who applied for credit in 2018 were able to obtain it, but a sizable share report barriers or limitations to borrowing. During 2018, more than one-third of adults applied for some type of credit. Of those who applied for credit, 23 percent were denied at least once in the prior year, and 31 percent were either denied or offered less credit than they requested.

The incidence of denial or limitations on credit differs by the family income of the applicants and by their race and ethnicity. Lower-income individuals are substantially more likely to experience adverse outcomes with their credit applications than those with higher incomes. Among applicants with incomes under $40,000, 37 percent were denied credit, versus 10 percent of applicants with incomes over $100,000. Within each income bracket, black and Hispanic individuals are more likely to report an adverse credit outcome, relative to white adults (table 13).

Table 12. Forms of alternative financial services used
Percent

Alternative financial service	Among adult population	Among those using any alternative financial services
Money order, not from a bank	12	63
Cash a check, not at a bank	8	45
Transaction services	**16**	**89**
Payday loan or paycheck advance	3	17
Pawn shop or auto title loan	2	13
Tax refund advance	1	8
Borrowing services	**5**	**28**

Note: Respondents can select multiple answers.

Table 13. Credit applicants with adverse credit outcomes (by family income and race/ethnicity)
Percent

Characteristic	Denied	Denied or approved for less than requested
Less than $40,000		
White	31	40
Black	59	70
Hispanic	39	59
Overall	37	48
$40,000–$100,000		
White	16	22
Black	41	52
Hispanic	29	42
Overall	22	30
Greater than $100,000		
White	8	12
Black	21	28
Hispanic	17	23
Overall	10	15
All incomes		
White	18	24
Black	45	55
Hispanic	31	45
Overall	23	31

Note: Among adults who applied for some form of credit in the past 12 months.

Negative perceptions may be an additional barrier to credit. About 1 in 10 adults put off at least one credit application because they thought that their application would be denied. This includes 5 percent who applied for some credit, but opted against submitting additional applications because they expected to be denied and 3 percent who desired credit but did not apply at all for fear of denial.

Although some people are forgoing credit applications because they expect a denial, most adults (79 percent) are at least somewhat confident that they could obtain a credit card if they were to apply for one. Those with low incomes are substantially less confident about being approved than those with

Table 14. Confidence that a credit card application would be approved (by family income and race/ethnicity)
Percent

Characteristic	Confident	Not confident	Don't know
Less than $40,000			
White	67	24	9
Black	46	39	14
Hispanic	57	29	14
Overall	61	27	12
$40,000–$100,000			
White	88	8	3
Black	74	20	6
Hispanic	81	15	4
Overall	85	11	4
Greater than $100,000			
White	95	3	2
Black	91	6	2
Hispanic	93	5	1
Overall	95	3	2
All incomes			
White	84	12	5
Black	63	27	10
Hispanic	72	20	8
Overall	79	15	6

Note: "Confident" includes people reporting that they are either very confident or somewhat confident.

high incomes (table 14). Additionally, credit perceptions differ by race and ethnicity, although these gaps are at least partially attributable to other socioeconomic factors that also vary by race.[15] The patterns in 2018 are consistent with those seen in recent years.

Credit Cards

In people's financial lives, credit cards can serve different functions at different times. For people who pay their balances off each month, credit cards are mainly a form of payment convenience and can be thought of more or less the same as using cash. For those who carry a balance, however, the card represents borrowing and carries a cost in the interest payment and any fees that are incurred.

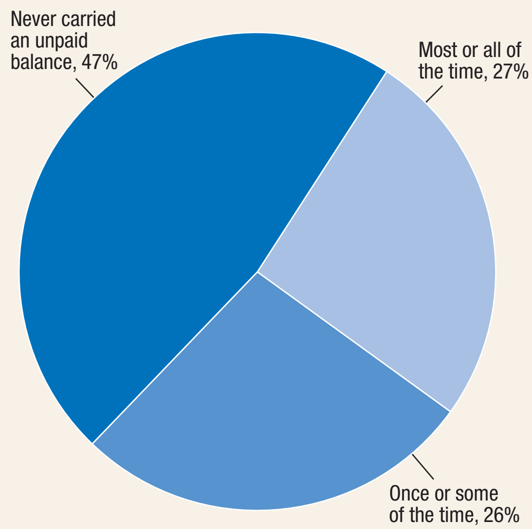
Overall, 8 in 10 adults have at least one credit card, and the share with a credit card is higher among those with higher incomes, more education, or who are white (table 15). Among those with a credit card, 47 percent had paid their bill in full every month in the prior year. One-quarter carried a balance once or some of the time in that year; the remaining 27 percent carried a balance most or all of the time (figure 15). The frequency of regular borrowing with credit cards during 2018 is similar to 2017.

Table 15. Has at least one credit card (by family income, education, and race/ethnicity)

Characteristic	Percent
Family income	
Less than $40,000	61
$40,000–$100,000	90
Greater than $100,000	98
Education	
High school degree or less	69
Some college or associate degree	80
Bachelor's degree or more	95
Race/ethnicity	
White	85
Black	68
Hispanic	72
Overall	**81**

On average, individuals with capacity to borrow on a credit card are more prepared for financial disruptions. Transactional users of credit cards who never carry a balance are much more likely to say that they would pay an unexpected $400 expense with cash or

Figure 15. Frequency of carrying a balance on one or more credit cards in the past 12 months



Note: Among adults with at least one credit card.

[15] In a regression including marital status, age, education, income, employment status, region, and urban/rural residence, the difference in confidence between black and white adults narrows but remains significant. The gap between Hispanics and white adults is largely accounted for by these demographic factors.

its equivalent, compared to those who carry a balance most or all of the time or who do not have a credit card (table 16).

Similar patterns are evident across these groups for other ways of coping with financial shocks, such as having a three-month rainy day savings fund and expressing confidence that their application for a credit card would be accepted. Financial buffers are also related to the incidence of problems in access to funds in a bank account (see box 3).

Table 16. Financial preparedness measures among adults (by credit card use)

Percent

Credit card access and payment patterns	Pay unexpected $400 expense with cash or equivalent	Have 3-month rainy day savings fund	Confident credit card application would be approved
Have a credit card, frequency of carrying balance			
Never carried an unpaid balance	88	78	95
Once or some of the time	63	53	87
Most or all of the time	40	29	78
Do not have a credit card	27	17	36
Overall	**61**	**51**	**79**

Note: “Confident” includes people reporting that they are either very confident or somewhat confident. Frequency of carrying a balance is for the past 12 months.

Box 3. Problems with Accessing Account Funds, Income Volatility, and Rainy Day Savings

Problems accessing funds in a bank account can affect anyone but may have consequences that are more serious for people with unpredictable incomes or low savings. New results from the 2018 survey show that people with volatile incomes are more likely to report problems accessing funds in a bank account. Adults with highly volatile incomes are more likely to have problems accessing a bank account even if their level of income is high or they have a buffer of savings.

With bank accounts, the timing of when deposited money is available to use depends on a number of different factors, and some delay is common. Withdrawals that occur when deposited money is not yet available for use can result in overdraft fees, and repeated overdrafts can lead to longer delays for future deposits.[1] Other circumstances that can restrict customer access to funds in an account include fraud or suspected fraud and outages of bank computer systems.

To learn about problems accessing funds, the survey asks individuals with a bank account if they had difficulty getting money out of their bank account in the prior 12 months. Overall incidence is relatively low: 13 percent of adults with a bank account report at least one problem in accessing account funds. Problems with a bank website or mobile app (7 percent) and deposit holds or other delays in when funds were available to use (6 percent) are the most common problems. Smaller shares report that an account was locked or frozen (3 percent) or had other problems (1 percent).

Incidence of problems accessing account funds is higher for younger adults and minorities, but is only moderately related to income (table A). Among adults with a bank account, 18 percent of adults under age 30 report a problem accessing funds in a bank account, more than twice the rate of adults age 60 or older. Nineteen percent of blacks and 17 percent of Hispanics with a bank account report difficulty accessing funds, compared to 11 percent of whites.

Table A. Adults reporting problems accessing funds in an account in the past 12 months

Characteristic	Percent
Age	
18–29	18
30–44	16
45–59	12
60+	8
Race/ethnicity	
White	11
Black	19
Hispanic	17
Family income	
Less than $40,000	15
$40,000–$100,000	14
Greater than $100,000	10
Overall	**13**

Note: Among adults with a bank account.

Low-income (less than $40,000) and middle-income ($40,000 to $100,000) adults with a bank account report problems at similar rates. A lower share of adults with high incomes (greater than $100,000) report problems.

Income volatility is more strongly associated with problems accessing funds than is the level of income (figure A). For each income group, the incidence of difficulties accessing funds is lowest for those who say their income was “roughly the same” from month to month, and increases for those who say their income “occasionally varies” or “varies quite often.” Among those who have the same degree of income volatility, the shares reporting a problem accessing funds are similar for those in the low- and middle-income groups. The high-income group is less likely to report problems for each degree of income volatility. Even so, high-income adults with highly volatile income report problems at about the same rate as low-income adults with stable income.

(continued on next page)

[1] For an overview of rules on deposit availability, see https://www.federalreserve.gov/pubs/regcc/regcc.htm.

Box 3. Problems with Accessing Account Funds—*continued*

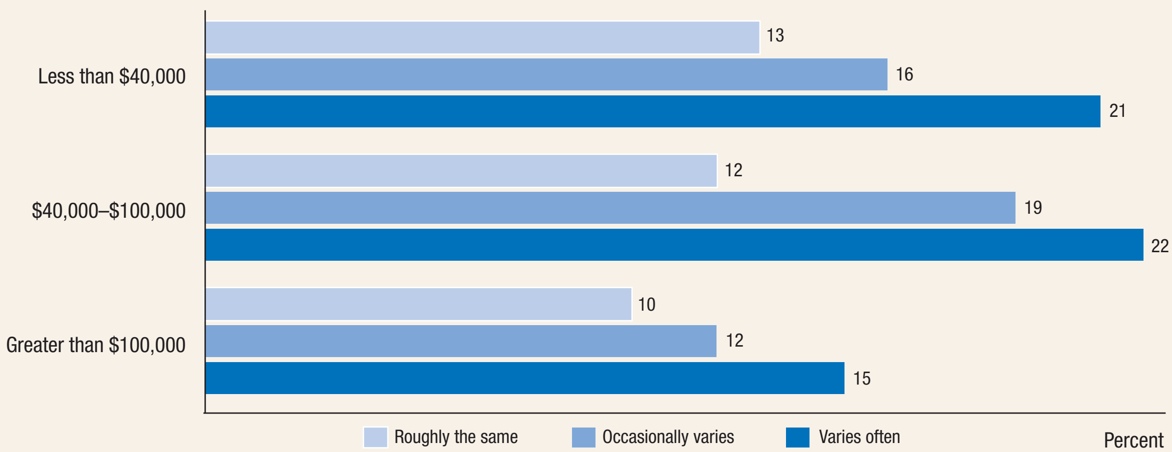
Having savings as a financial buffer helps some people manage fluctuations in income and reduce the urgency in accessing funds. Among those who say their income "occasionally varies," those who had three months of expenses set aside in "rainy day" savings are about half as likely (11 percent) to report difficulties accessing funds compared to those who did not have that financial buffer (21 percent).[2] However, among those account holders who say their income "varies quite often," a buffer of savings does not lower the incidence of problems accessing account funds.

[2] This result is consistent with the analysis from Farrell and Greig (2015) arguing that financial buffers are an important strategy for handling sizeable fluctuations in both income and consumption for households. See Diana Farrell and Fiona Greig, *Weathering Volatility: Big Data on the Financial Ups and Downs of U.S. Individuals* (JPMorgan Chase Institute, May 2015), https://www.jpmorganchase.com/content/dam/jpmorganchase/en/legacy/corporate/institute/document/54918-jpmc-institute-report-2015-aw5.pdf.

Financial service providers can help to mitigate some of these problems as well. Improvement to U.S. payment systems may benefit consumers with volatile incomes by making income available more quickly and increasing the transparency of the payments process.[3] Efforts by banks and other financial service providers to minimize outages of computer systems and to detect and quickly address fraudulent account activity also can have a positive impact, particularly on consumers who may have few options for substituting to another account and less ability to wait for problems to be resolved.

[3] For example, the Faster Payments Task Force, convened by the Federal Reserve, noted that "Unbanked and underbanked consumers might particularly benefit from faster, safe payment products with features such as faster access to funds and timely payment notification to facilitate easier cash-flow management." See Faster Payments Task Force, *The U.S. Path to Faster Payments, Final Report Part One: The Faster Payments Task Force Approach* (January 2017), https://fasterpaymentstaskforce.org/wp-content/uploads/faster-payments-final-report-part1.pdf.

Figure A. Had problem accessing funds in past 12 months (by family income and income volatility)



Note: Among adults with a bank account.

Housing and Neighborhoods

People's housing and living arrangements can affect their financial lives, access to desired amenities and resources, and overall happiness. Nearly three-quarters of adults are currently satisfied with their housing, and a similar share are satisfied with their neighborhood. However, satisfaction with either is notably lower in low-income communities. Renters, in particular, are less likely to be satisfied with their housing quality than homeowners, and some report difficulties with their landlords.

Living Arrangements

The decision of who to live with often relates to an individual's network of support. Fifteen percent of adults are living alone, and half are living in a household solely with their spouse or partner and/or children under age 18 (referred to as a nuclear family). The remaining one-third of adults have living arrangements with other people that extended beyond the traditional concept of a nuclear family. Twelve percent of adults live with their parents, 10 percent live with an adult child not in school, 7 percent live with extended family members, and 5 percent live with roommates (table 17).

For young adults, the transition from living with their parents to living independently often depends on economic circumstances. The majority of adults under age 25 still live with their parents, but that fraction falls to one-quarter in their late 20s and about 1 in 10 in their 30s (table 18). Black and Hispanic young adults (under age 30) are nearly twice as likely to live with their parents than white young adults. Adults in their late 20s who no longer live with their parents are much more likely to say that they are doing okay financially (76 percent) than those still living with their parents (54 percent).

A substantial majority of young adults living with their parents say that saving money is a reason for the living arrangement. As people age, however, the financial relationship flips for some families. Nearly two-fifths of young adults living with their parents in their late 20s provide financial assistance to their family. Of adults in their 30s who live with their parents, more than one-third choose this living arrangement at least in part to care for family members or friends.

The decision of whether to own or rent one's housing is another fundamental choice. Homeownership varies widely across the population (table 19). In 2018, 64 percent of adults own a home, 27 percent rent, and 9 percent have some other arrangement. Homeownership increases steadily with age, from nearly 3 in 10 young adults (ages 18 to 29) to 8 in 10 older adults (age 60 and older). In fact, the majority of

Table 17. People living in household

Category	Percent
Live alone	15
Spouse or partner	65
Children under age 18	26
Adult children (all in school full time)	4
Adult children (at least one not a full-time student or unknown)	10
Parents	12
Extended family	7
Roommates	5
Other	4

Note: Respondents (other than those who live alone) can select multiple answers.

Table 18. Reasons for living with parents (by age)
Percent

Category	18–21	22–24	25–29	30–39
To save money	63	83	86	60
To provide financial assistance	15	29	38	42
To care for family member or friend	13	20	25	36
To receive help with child care	3	5	8	14
Prefer living with others	31	37	33	20
Percent living with parents	**61**	**51**	**26**	**13**

Note: Reasons are among adults who live with their parents. Respondents can select multiple reasons for living with others.

Table 19. Housing tenure (by age and family income)
Percent

Characteristic	Own	Rent	Neither own nor rent
Age			
18–29	28	45	26
30–44	60	34	6
45–59	75	21	4
60+	81	16	3
Family income			
Less than $40,000	40	41	18
$40,000–$100,000	69	27	4
Greater than $100,000	88	11	1
Overall	**64**	**27**	**9**

adults over age 30 are homeowners. Young adults are the most likely to have other housing arrangements than owning or renting. Those with incomes under $40,000 are less than half as likely to be homeowners as those with incomes greater than $100,000.

Rental Affordability, Rental Repairs, and Eviction

Rental affordability is an issue for many. This is especially true for those with lower incomes, who are also more likely to rent than own their home. The median monthly rent is between $750 and $999, and among low-income renters whose income is below $40,000 per year, the median monthly rent is between $500 and $749. Over 7 in 10 low-income renters spend more than 30 percent of their monthly income on rent, which is a commonly used benchmark for measuring the financial burden of housing.[16] Among renters with incomes between $40,000 and $100,000, about one-quarter are rent burdened.

One way to assess the quality of rental housing is whether the landlord makes repairs promptly.[17] Over half of renters experienced a problem with their rental unit, such as a leak or a broken appliance, during the year prior, and one-fourth experienced at least a little difficulty working with their landlord to get the repair done. Fifteen percent of all renters (or 33 percent of those who requested a repair) experienced moderate or substantial difficulty.

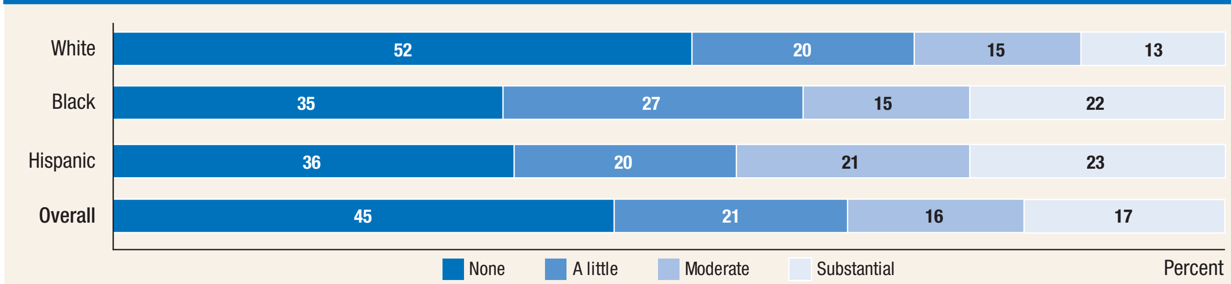
Among renters requesting a repair from their landlord, white renters are more likely to say that those repairs were completed without any difficulty. One-quarter of white renters (or half who requested a repair) had no problems getting it completed, compared to 17 percent of black renters and 14 percent of Hispanic renters. The extra burden on black and Hispanic renters shows up in the full range of difficulties to get repairs done (figure 16).

Eviction is a less common, but more acute, sign of strain among renters and among those who previously rented but now rely on others for housing. Three percent of non-homeowners were evicted or moved because of the threat of eviction in the prior two years—which represents 10 percent of all non-homeowners who moved from another rental unit over this time. These evictions contributed to slightly more moves in urban areas (11 percent) than in rural

[16] Rent-to-income ratios are calculated based on the midpoints of the ranged income and rent responses. Renters who report no income are excluded. Including those who report no income raises the fraction of rent burdened to 76 percent of low-income renters. See Jeff Larrimore and Jenny Schuetz, "Assessing the Severity of Rent Burden on Low-Income Families," FEDS Notes (Washington: Board of Governors, December 22, 2017), https://www.federalreserve.gov/econres/notes/feds-notes/assessing-the-severity-of-rent-burden-on-low-income-families-20171222.htm, for a discussion of rent burdens among low-income families.

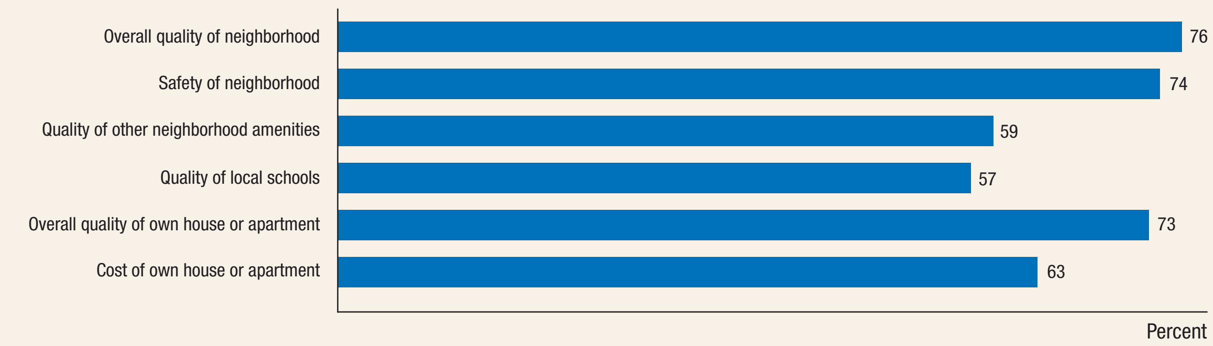
[17] Matthew Desmond, *Evicted: Poverty and Profit in the American City* (New York: Crown, 2016), highlights the challenges of rental housing repairs among low-income renters.

Figure 16. Difficulty getting landlord to fix problems with rental unit (by race/ethnicity)



Note: Among all renters who contacted their landlord about a repair.

Figure 17. Satisfied with local neighborhood and housing characteristics



Note: Satisfaction with the cost of own house or apartment excludes those who do not own and are not paying rent.

areas (9 percent). Overall, the frequency of eviction remains unchanged from 2017 to 2018.

Satisfaction with Neighborhoods and Housing

The quality of people's neighborhood, as well as the quality of their housing, is an important marker of both their current finances and their opportunities for the future. The neighborhood affects the quality of a child's school, personal safety, and the availability of important amenities like healthy, affordable food.

Overall, 76 percent of adults are either somewhat or very satisfied with the quality of their neighborhood, and a similarly high share are satisfied with the quality of their home or apartment. Most are also satisfied with specific aspects of their neighborhood—including local schools, safety, and other amenities (figure 17).

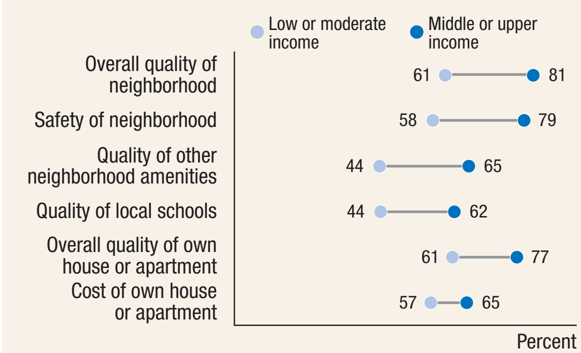
There are relatively small differences in how satisfied people are with their neighborhoods and with their housing in different parts of the country. People's satisfaction with their housing does not appear to vary much between more expensive and less expensive cities (see box 4). Additionally, people are about as satisfied with their neighborhoods in urban areas (76 percent) as in rural areas (73 percent).

There are big differences, however, in people's satisfaction with their housing across neighborhoods. Adults living in low- and moderate-income neighborhoods are much less likely to be satisfied with their neighborhood (61 percent) than those in middle- and upper-income communities (81 percent).[18] Satisfaction with specific amenities, such as neighborhood safety and the quality of local schools, also varies with neighborhood income (figure 18).

Neighborhood satisfaction is also lower among blacks and Hispanics than among whites, though this is also associated with differences in their own incomes and in the average income of their neighborhood. Eight in 10 whites are satisfied with their

[18] Low- and moderate-income neighborhoods are census tracts with median family income less than 80 percent of the national median income. Middle- and upper-income neighborhoods are those with family median income above the threshold. Neighborhood designations are calculated with the five-year averages from the 2012–16 American Community Survey. An alternate definition of low- and moderate-income neighborhoods based on average incomes relative to the surrounding area, rather than relative to national averages, produces similar results.

Figure 18. Satisfied with local neighborhood and housing characteristics (by neighborhood income)



Note: Satisfaction with the cost of own house or apartment excludes those who do not own and are not paying rent. See table 1 for definitions of low- or moderate-income neighborhoods.

Box 4. Housing Satisfaction in Expensive Cities

Who can find affordable housing in expensive cities like Washington, New York, or Los Angeles? Some researchers have begun to connect rising rents in these more expensive, "superstar cities" with the decreasing rates of mobility across metropolitan areas. Less geographic mobility can lead to persistent economic differences across the country and limit economic growth.[1]

Rising rents in more expensive cities force people to trade off the benefits of moving to economic opportunities in prosperous labor markets, on the one hand, against the higher costs of housing when those labor markets are in more expensive cities. This tradeoff may be particularly difficult for people with lower incomes since they tend to spend a higher portion of their income on housing. So it is helpful to understand how satisfied people with lower incomes are with their housing in more expensive and less expensive areas.

Despite higher housing costs, adults with low incomes relative to others in their metro or micropolitan area—low-relative income adults—report being slightly *more* satisfied with the quality of their housing and neighborhoods in more expensive cities than in less expensive cities (figure A).[2] And it does not appear that they are giving up other things to pay for housing. Adults with low-relative incomes in more expensive cities are as likely to say that they are doing at least okay financially as those in less expensive cities.

People appear satisfied with their housing in more expensive cities despite being less likely to own their homes and living in a city with higher rents. People with low-relative incomes are 4 percentage points less likely to own their own homes in expensive cities than in less expensive cities like Detroit, Charlotte, and San Antonio (figure B).[3] People, perhaps surprisingly, also are about as satisfied with the cost of their housing in a more expensive city. Again, the lower rate of homeownership does not translate to lower housing satisfaction or economic well-being.

Adults with relatively low income for their city are slightly more satisfied with their housing and neighborhoods in more expensive cities. So it seems that something besides high housing costs restricts people's geographic mobility. And it is important to understand other factors that keep people out of these higher cost cities.

Figure A. Satisfaction with housing and economic well-being among low-relative income adults (by type of city)

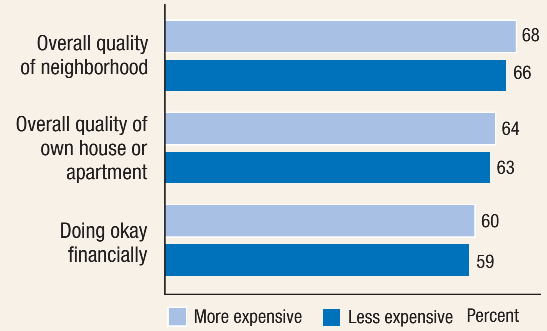
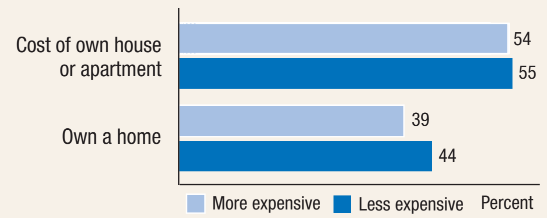


Figure B. Homeownership and satisfaction with cost of housing among low-relative income adults (by type of city)



Note: Satisfaction with the cost of own house or apartment excludes those who do not own and are not paying rent.

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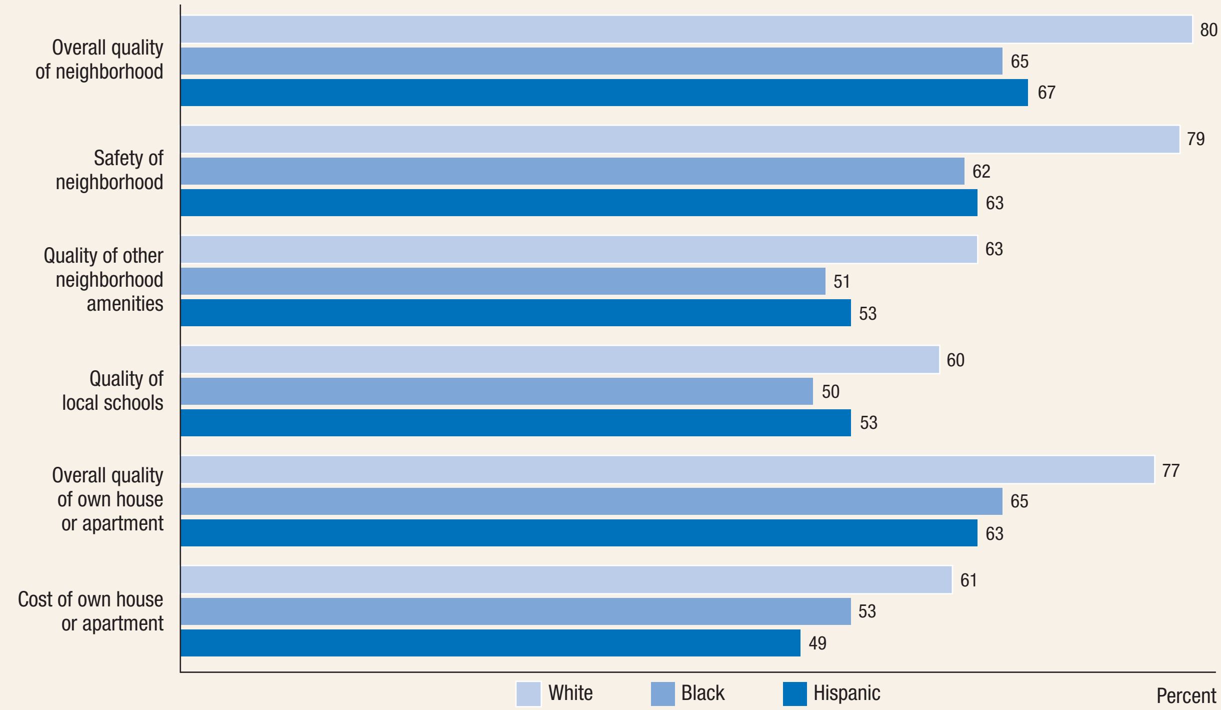
1 Several studies suggest that differences in housing costs have kept people out of economically productive areas. Most of these studies emphasize workers with lower incomes who tend to be less geographically mobile and who typically spend higher fractions of their budgets on housing. Among others, these include Chang Tsai Hsei and Enrico Moretti, "Housing Constraints and Spatial Misallocation," *American Economic Journal: Macroeconomics* (forthcoming); and Adrien Bilal and Esteban Rossi-Hansberg, "Location as an Asset," NBER Working Paper (2018).

2 "Cities," as used here, are metropolitan or micropolitan statistical areas (including suburbs) based on the boundaries used by the 2017 American Community Survey (https://www.census.gov/geographies/reference-files/time-series/demo/metro-micro/delineation-files.html), and median rents in the American Community Survey determine whether a city is more expensive or less expensive. Cities with median rents above the national median of $1,012 are classified as expensive. For example, Madison, Wisconsin, is slightly below and Nashville, Tennessee, is slightly above this number. Similarly, adults with low-relative incomes have family incomes below the median family income for SHED respondents who live in their city.

3 Neil Bhutta, Steven Laufer, and Daniel Ringo also find that homeownership among lower-income households is particularly sensitive to rising house prices in "Are Rising Home Values Restraining Homebuying for Lower-Income Families?" *FEDS Notes* (Washington: Board of Governors, September 28, 2017), https://www.federalreserve.gov/econres/notes/feds-notes/are-rising-home-values-restraining-home-buying-for-lower-income-families-20170928.htm.

Figure 19. Satisfied with local neighborhood and housing characteristics (by race/ethnicity)



Note: Satisfaction with the cost of own house or apartment excludes those who do not own and are not paying rent.

neighborhood, compared to two-thirds of blacks and Hispanics. The racial gaps in neighborhood satisfaction extend to specific amenities, including local schools and safety (figure 19).

In evaluating the desirability of neighborhoods, people focus on different amenities that are most important to their lifestyle. The importance of some specific amenities varies by age.

People of all ages think that it is at least moderately important to have a grocery store in their neighborhood and to have shops or restaurants nearby. However, while a local bank or credit union is important to those of all ages, it is less important to younger age cohorts than it is to those over age 60. Similarly, older age groups consider it more important to have a church or place of worship nearby. Conversely, younger adults—and especially those ages 30 to

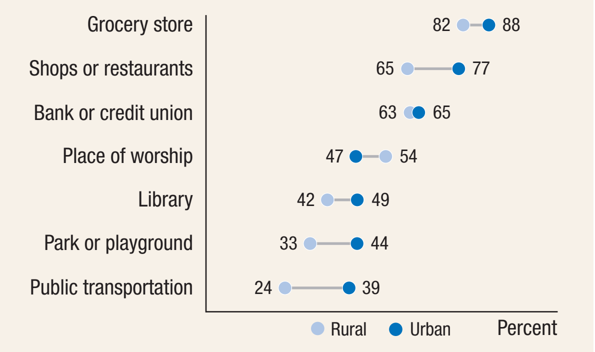
Table 20. Neighborhood amenities that are moderately or very important (by age)
Percent

Category	18–29	30–44	45–59	60+	Overall
Grocery store	88	84	87	90	87
Shops or restaurants	75	74	75	76	75
Bank or credit union	60	57	66	75	65
Place of worship	38	42	50	57	48
Library	47	52	46	48	48
Park or playground	49	53	40	32	43
Public transportation	39	38	36	34	37

44—place a higher premium on local parks and playgrounds than do older individuals (table 20).

The importance of neighborhood amenities also differs across urban and rural environments. Rural residents place a greater importance on a local church or place of worship than urban residents, but are less likely than urban residents to cite each of the other amenities considered as important to their location decision (figure 20).

Figure 20. Neighborhood amenities that are moderately or very important (by urban/rural residence)



Higher Education

A college education is widely recognized as a path to higher income and greater economic well-being. Indeed, two-thirds of graduates from private not-for-profit and public institutions view the financial benefits of their education as larger than the costs. To those who started college but did not complete their degree and to those who attended private for-profit institutions, however, the net benefits of their education are less clear-cut.

Value of Higher Education

Among all adults, 7 in 10 have ever enrolled in an educational degree program beyond high school and one-third have received a bachelor's degree. Economic well-being rises strongly with education. Those without any college are the least likely to be doing well financially. Associate degree holders are somewhat more likely to be at least doing okay financially than those with some college or less, although a larger increase is associated with a completion of a bachelor's (figure 21).

Among those who have attended at least some college, over half say that the lifetime financial benefits of their higher education exceed the financial costs, versus 1 in 5 who say that the costs are higher. The rest see the benefits as about the same as the costs.

Table 21. Self-assessed value of higher education (by education level)
Percent

Education	Benefits larger	About the same	Costs larger
Some college, not enrolled, and no degree	30	37	29
Associate degree	48	33	17
Bachelor's degree or more	66	17	16

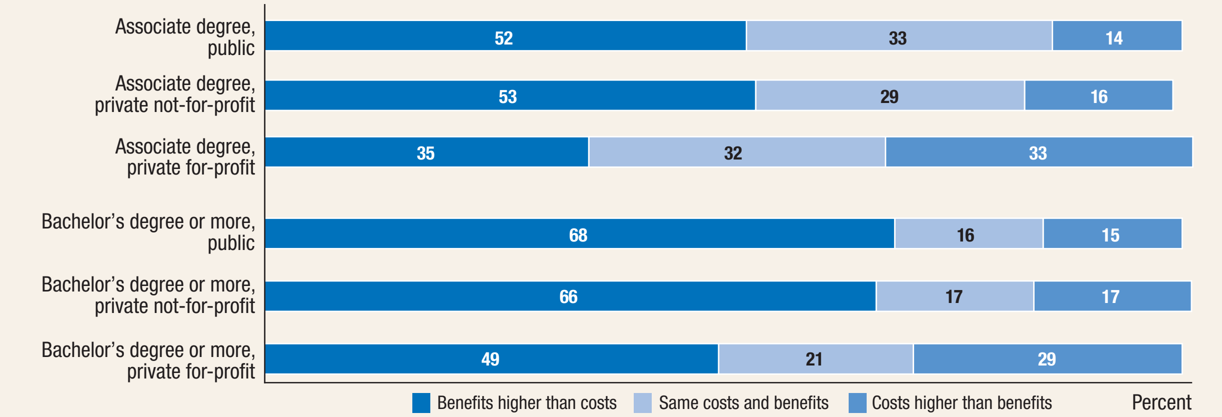
Note: Among adults who attended college.

These self-assessments of the value of education have changed little since the question was first asked in 2014.

The self-assessed value of higher education, while generally positive, depends on several aspects of a person's educational experience. Most importantly, those who complete their program and receive a degree are more likely to see net benefits than non-completers. For example, among those who previously attended college and did not complete at least an associate degree, 3 in 10 say that the benefits of their education were greater than the cost. This fraction jumps to nearly half of those with just an associate degree and two-thirds among those with at least a bachelor's degree (table 21).

Figure 21. At least doing okay financially (by education)

Figure 22. Self-assessed value of higher education (by degree and institution type)



Note: Among adults who completed at least an associate or bachelor's degree. Degree holders are asked specifically about the value of their associate or bachelor's degree, rather than their higher education as a whole.

The value of higher education also differs by the type of institution attended.[19] Two-thirds of those with bachelor's degrees from public and private not-for-profit institutions see their educational benefits as greater than their costs, versus half from for-profit institutions (figure 22).

This difference is not driven by for-profit schools being less selective in the students they admit. Public and private not-for-profit institutions that are less selective—based on lower standardized test scores of admitted students—also outperform less selective for-profit institutions on perceived value.[20] Among students who attended less selective institutions, 55 percent of graduates from public or private not-for-profit schools say the benefits of their education outweigh the costs, well above the 36 percent share of graduates from for-profit institutions with this view.

The self-assessed value of higher education also varies by field of study (figure 23). Among those who completed a bachelor's degree, the share reporting benefits larger than costs range from 81 percent for engineering to 55 percent for vocational or technical fields and the humanities.

Older adults are more likely to report net benefits from their education than are younger adults. Nearly 8 in 10 individuals age 50 or older with a bachelor's degree say that the lifetime benefits of their degree are larger than the costs, versus over half of those under age 30 (figure 24). The age differences could reflect smaller net benefits from education among younger graduates, or the fact that younger graduates have not had enough time to fully experience the financial benefits of their education.

Look Back on Education Decisions

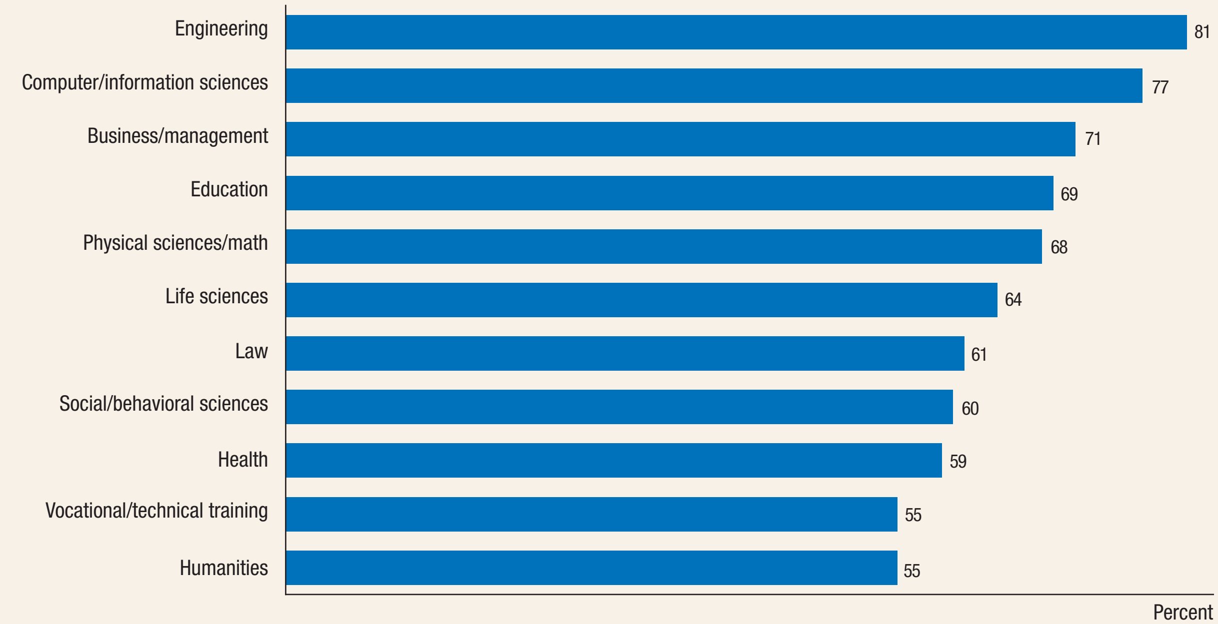
Most people value the education they have, yet with the benefit of hindsight and life experience, it is also common to think that different educational decisions would have been better. Among those without a college degree, nearly three-quarters would like to have completed more education, and 12 percent would rather have completed less education in general or not have attended college (table 22). The strong desire for additional education is similarly true among those who feel that the education they received did not pay off.

Likewise, among those who completed at least an associate degree, the most common desired change (40 percent) is to have completed more education, followed by choosing a different field of study (36 percent). Nine percent of those with an associate

19 Individuals do not self-report the type of institution in the survey. Instead, the institution type is assigned by matching the name and location of the college reported by the individual with data from the Center on Postsecondary Research at the Indiana University School of Education.

20 Selective institutions, as defined by the Carnegie Classification, are those whose first-year students' test scores are in the middle two-fifths of baccalaureate institutions; more selective institutions are in the top fifth of baccalaureate institutions. See also "Carnegie Classification of Institutes of Higher Education," web page, http://carnegieclassifications.iu.edu/. The remainder are referred to here as "less selective" institutions.

Figure 23. Benefits of education outweigh costs (by field of study)



Note: Among adults who completed at least a bachelor's degree.

degree, and 6 percent of those with at least a bachelor's degree, would prefer to have had less education.

The reassessment of education decisions also varies by the type of institution attended. Half of those who attended a private for-profit institution say they would like to have attended a different school, versus nearly one-fourth of those attending a private not-for-profit or public institution (figure 25). This difference remains even after accounting for the selectiveness of the institution, level of education completed, the parents' level of education, and demographic characteristics of the student.

College Attendance

Having parents who are college graduates noticeably increases one's own likelihood of obtaining a college degree. Among young adults (ages 22 to 29) who have a parent with a bachelor's degree, 7 in 10 received a bachelor's degree themselves, and less than 1 in 10 have a high school degree or less (figure 26).[21]

[21] Individuals ages 18 to 21 are excluded here from the category "young adults" to reflect that many individuals in that age cohort have not yet completed their education. Results are also similar if individuals up through age 24 are excluded.

Figure 24. Lifetime financial benefits of bachelor's degree exceed the costs (by age)

Note: Among adults who completed at least a bachelor's degree.

Table 22. Changes would make now to earlier education decisions (by education)
Percent

Change	No degree, not enrolled	Associate degree	At least a bachelor's degree
Completed more education	73	64	33
Not attended college or less education	12	9	6
Chosen a different field of study	39	33	37
Attended a different school	34	23	22

Note: Among adults who completed at least some college. "Degree" denotes at least an associate degree or a bachelor's degree. Respondents can select multiple answers.

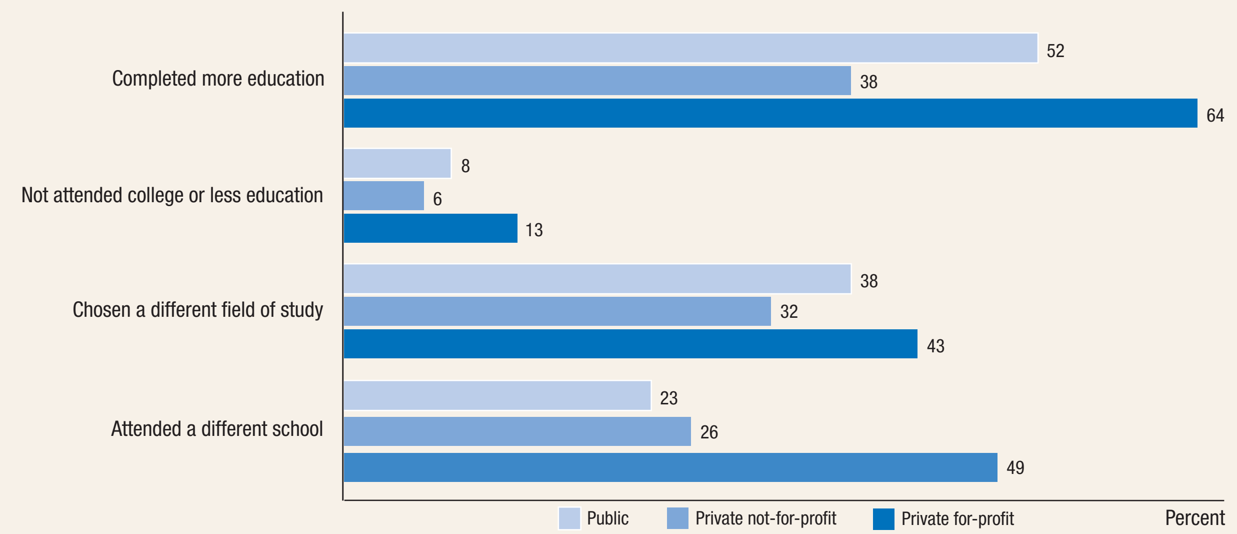
In contrast, 17 percent of young adults whose parents did not attend college obtained a bachelor's degree, and 6 in 10 have a high school degree or less.

The type of institution attended also varies with parental education. Young adults whose parents did not attend college are more likely to attend a private for-profit institution than those who have a parent with a bachelor's degree—13 percent versus 2 percent, respectively (figure 27).[22]

Across all racial and ethnic groups, the majority of young adults who attended college went to public institutions. Yet more than twice as many Hispanic young adults who attended college went to a for-profit institution compared to whites, and five times as many black college-goers did so (figure 28). Differences in the quality of institutions attended likely contribute to disparities in economic well-being by race and ethnicity, even within educational groups, as discussed elsewhere in this report.

[22] This gap is wider among people currently in their 30s, among whom over one-fifth of those with parents who did not go to college attended a for-profit, versus 7 percent of those with a parent who has a bachelor's degree.

Figure 25. Changes would make now to earlier education decisions (by institution type)



Note: Among adults who completed at least some college. Respondents can select multiple answers.

Figure 26. Educational attainment of young adults ages 22–29 (by parents' education)

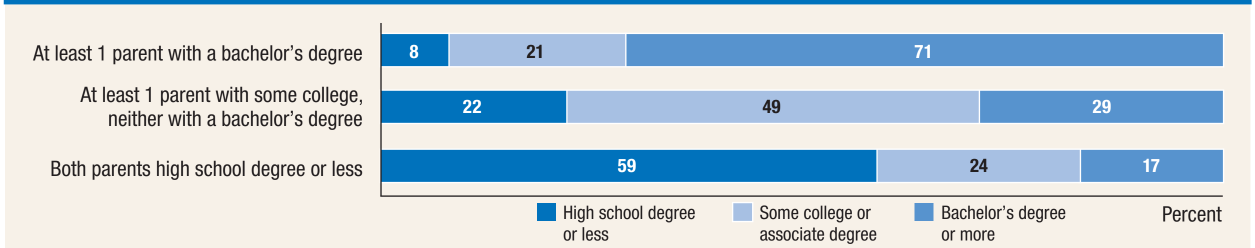
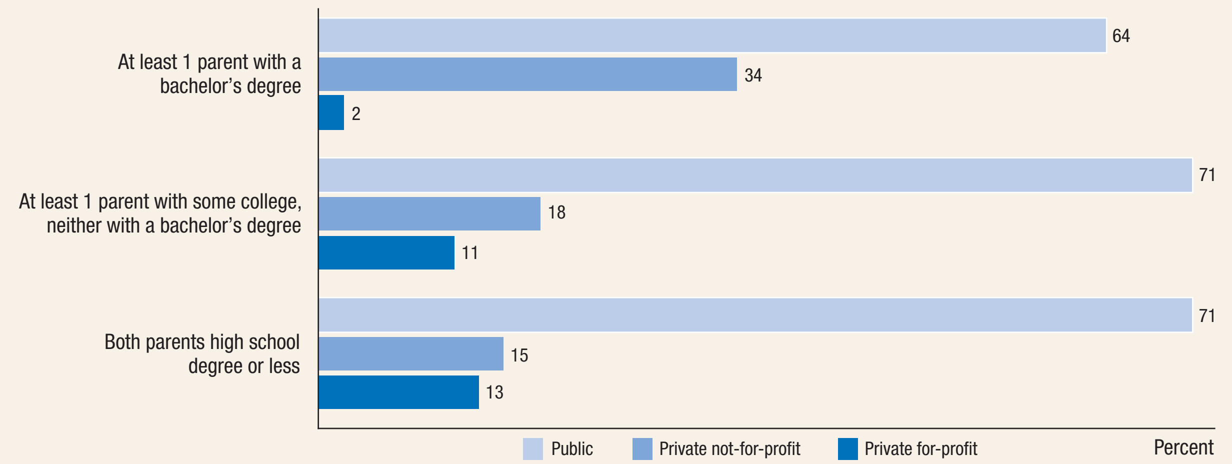
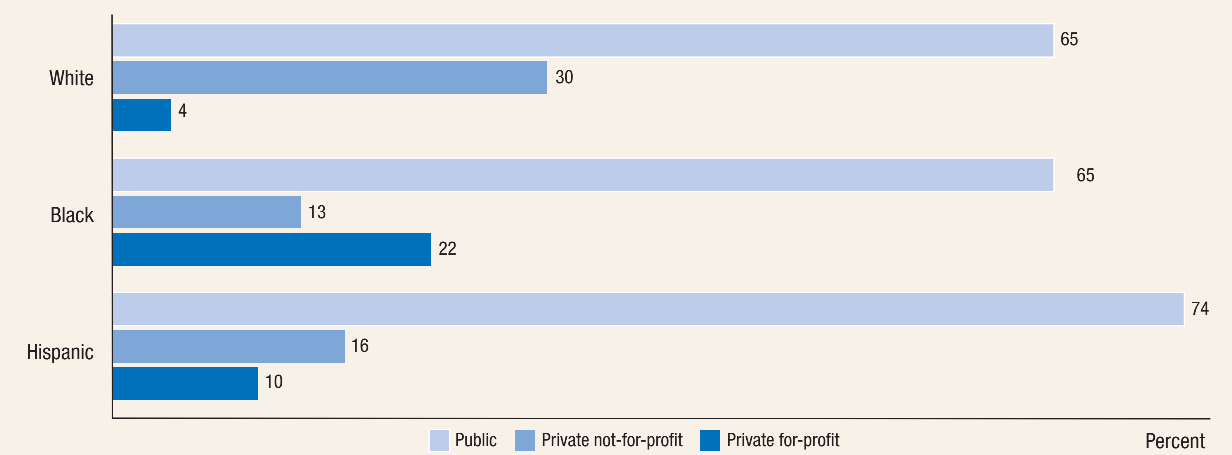


Figure 27. Institutions attended by young adults ages 22–29 (by parents' education)



Note: Among adults who completed at least some college.

Figure 28. Institutions attended by young adults ages 22–29 (by race/ethnicity)



Note: Among adults who completed at least some college.

No College Degree

A wide range of reasons including financial costs, life events, or a lack of interest can explain why some people do not attend college or complete a degree (table 23). Financial considerations, including costs being too expensive or a need to earn money, are the most common reasons, cited by 67 percent of young adults who did not attend college and 62 percent of those who did not complete their degree. A lack of interest in college, a desire to work, or family responsibilities such as child care are also important factors for some.

In some cases, women and men have different reasons for not attending college or not completing a college degree. For example, women are much more likely than men to cite family responsibilities as a factor. In contrast, men are more likely than women to indicate a lack of interest in college (table 24).

Table 23. Reasons for not attending college or not completing college degree
Percent

Reason	Did not attend college	Did not complete degree
Financial considerations		
Too expensive	47	39
Needed to earn money	38	48
Did not think benefits outweighed costs	23	19
Family responsibilities		
Had to take care of child(ren)	15	22
Supported or cared for parents or siblings	8	5
Lack of interest in college, desire to work		
Simply was not interested in college	29	30
Wanted to work	18	31
Educational ability		
Was not admitted	1	n/a
Low grades	n/a	15
Illness or health issues	13	13
Other	2	7

Note: Among adults ages 22 to 29. Among those who did not attend college or who went to college but did not complete their degree and are not currently enrolled in school. Respondents can select multiple answers.

n/a Not applicable.

Table 24. Reasons for not attending college or not completing college degree (by gender)
Percent

Reason	Men	Women
Financial considerations		
Too expensive	40	47
Needed to earn money	37	47
Did not think benefits outweighed costs	25	18
Family responsibilities		
Had to take care of child(ren)	5	30
Supported or cared for parents or siblings	6	6
Lack of interest in college, desire to work		
Simply was not interested in college	37	23
Wanted to work	25	21
Educational ability		
Was not admitted	*	2
Low grades	14	16
Illness or health issues	14	12
Other	1	7

Note: Among adults ages 22 to 29. Among those who did not attend college or who went to college but did not complete their degree and are not currently enrolled in school. Respondents can select multiple answers.

* Less than 1 percent.

Student Loans and Other Education Debt

Fifty-four percent of young adults who went to college took on some debt, including student loans, for their education. Repayment of this debt can be challenging. In 2018, 2 in 10 of those who still owe money are behind on their payments—little changed from the prior year. Individuals who did not complete their degree or who attended a for-profit institution are more likely to struggle with repayment than those who completed a degree from a public or private not-for-profit institution, even including those who took on a relatively large amount of debt.

Overview

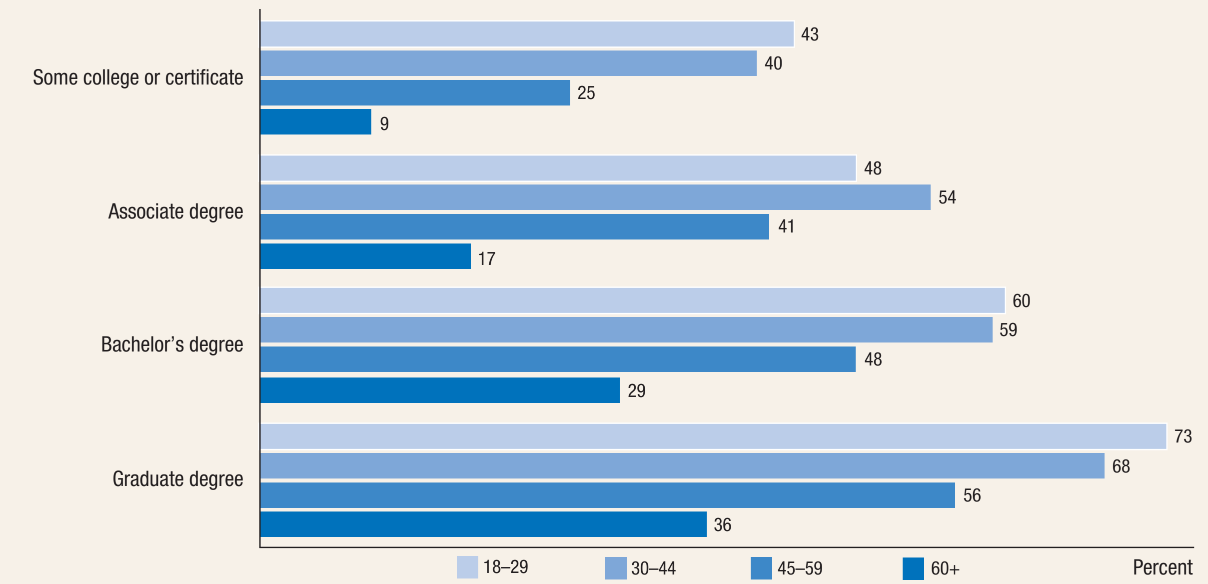
Forty-three percent of those who attended college, representing 30 percent of all adults, have incurred at least some debt for their education. This includes 22 percent of college attendees who still owe money and 21 percent who have already repaid their debt.

Adults under the age of 30 who attended college are more likely to have taken out loans than older adults, consistent with the upward trend in educational borrowing over the past several decades (figure 29).[23]

Many forms of debt finance education. Student loans are by far the most common form, held by 93 percent of those with their own education debt outstanding. In addition, 31 percent have some other form of debt for their education, including 24 percent who have borrowed with credit cards, 7 percent with a home equity line of credit, and 12 percent with some other form (table 25). The typical amount

[23] Student loan borrowing has declined since its peak in 2010–11 but remains substantially above the levels from the mid-1990s (Sandy Baum, Jennifer Ma, Matea Pender, and Meredith Welch, *Trends in Student Aid 2017* (New York: The College Board, 2017), https://trends.collegeboard.org/sites/default/files/2017-trends-student-aid.pdf).

Figure 29. Acquired debt for own education, including repaid (by age and highest degree completed)



Note: Among adults who attended college.

Table 25. Type of education debt (by whose education funded)
Percent

Form of debt	Own education	Child's/ grandchild's education
Student loan	93	81
Credit card	24	15
Home equity loan	7	11
Other loan	12	9

Note: Among adults who have at least some debt outstanding for their own education or a child's or grandchild's education. Some people have more than one type of debt.

of education debt in 2018 among those with any outstanding was between $20,000 and $24,999.[24]

Nearly 3 in 10 adults with outstanding education debt are not currently required to make payments on their loans. Such deferments are common for those still in college. Of those who are making payments, the typical monthly payment is between $200 and $299 per month.

Education debt is also taken out to assist family members with their education (either through a co-signed loan with the student or a loan taken out independently). Although this is less frequent than borrowing for one's own education, 5 percent of adults owe money for a spouse's or partner's education, and 6 percent have debt that paid for a child's or grandchild's education. Similar to debt outstanding for the borrower's education, debt for a child's or grandchild's education can be in forms other than a student loan (table 25).

Student Loan Payment Status

Among those with outstanding student loans from their own education, 2 in 10 adults are behind on their payments. Those who did not complete their degree are the most likely to be behind. Thirty-seven percent of adults with college student loans outstanding, not enrolled, and less than an associate degree are behind. This compares to 21 percent of borrowers with an associate degree. The delinquency rate is even lower among borrowers with a bachelor's degree (10 percent) or graduate degree (6 percent).

Perhaps counterintuitively, those with more debt are not more likely to have difficulty with repayments. This is likely to be the case because the level of education, and the associated earning power, generally rise with debt levels. Eighteen percent of borrowers with less than $10,000 of outstanding debt, and 22 percent of those with between $10,000 and $24,999 of debt, are behind on their payments. Among those with $100,000 of debt or more, 16 percent are behind on payments.

Among those who ever incurred debt for their education, including those who have completely repaid that debt, 10 percent are currently behind on their payments, 43 percent have outstanding debt and are current on their payments, and 48 percent have completely paid off their loans.

Borrowers who were first-generation college students are more likely to be behind on their payments than those with a parent who completed college.[25] Among borrowers under age 30, first-generation college students are more than twice as likely to be behind on their payments as those with a parent who completed a bachelor's degree (figure 30).

Difficulties with repayment also vary by race and ethnicity. Black and Hispanic education borrowers are more likely than white borrowers to be behind on their loan repayment and are also less likely to have repaid their loans (figure 31). These patterns partly reflect differences in rates of degree completion, wages, and family support.

Repayment status also differs by the type of institution attended. Over one-fifth of borrowers who attended private for-profit institutions are behind on student loan payments, versus 8 percent who attended public institutions and 5 percent who attended private not-for-profit institutions (table 26).

[24] Education debt levels and monthly payments are asked in ranges rather than exact dollar amounts.

[25] First-generation college students are defined here as those who do not have at least one parent who completed a bachelor's degree.

Greater difficulties with loan repayment among attendees of for-profit institutions may partly reflect the lower returns on these degrees.[26] It could also relate to differences in the aptitude and educational preparation of students across institutions, which in turn could affect earnings potential and repayment ability.

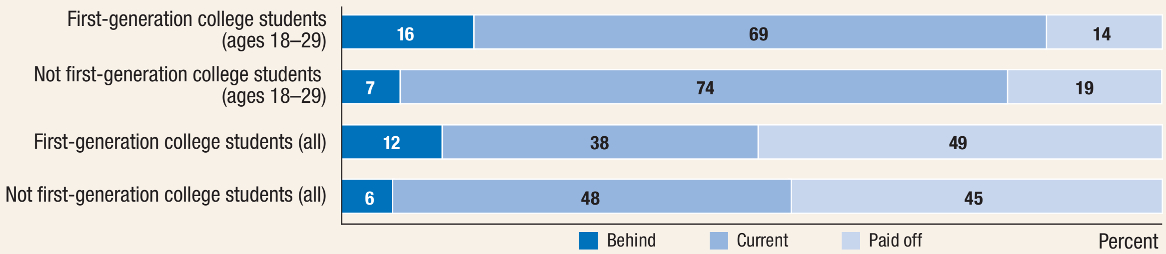
[26] See David J. Deming, Claudia Goldin, and Lawrence F. Katz, "The For-Profit Postsecondary School Sector: Nimble Critters or Agile Predators?" *Journal of Economic Perspectives* 26, no. 1 (Winter 2012): 139–64, for a discussion of the rates of return by education sector.

Table 26. Payment status of loans for own education (by institution type)
Percent

Characteristic	Behind	Current	Paid off
Public	8	44	48
Private not-for-profit	5	42	53
Private for-profit	22	40	38
Overall	**8**	**43**	**48**

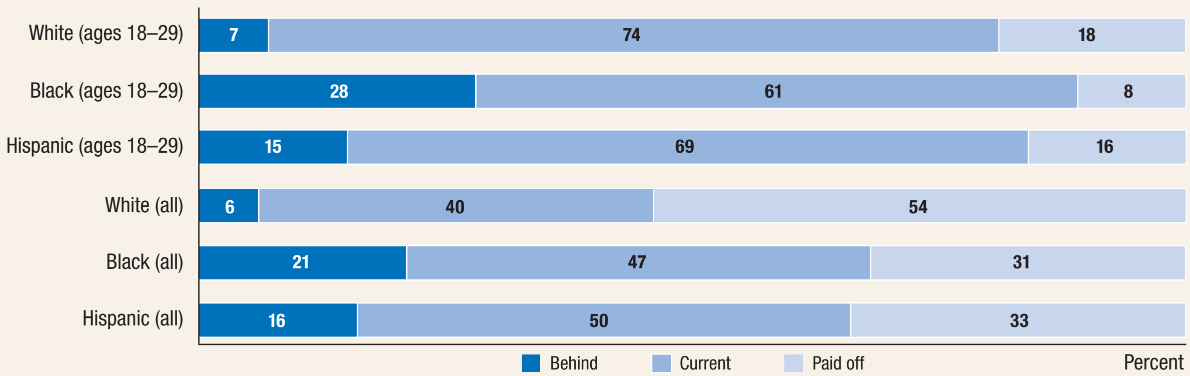
Note: Among adults who borrowed to pay for their own education.

Figure 30. Payment status of loans for own education (by parents' education and current age)



Note: Among adults who borrowed for their own education.

Figure 31. Payment status of loans for own education (by current age and race/ethnicity)



Note: Among adults who borrowed for their own education.

Retirement

Many adults are struggling to save for retirement and feel that they are not on track with their savings. While preparedness for retirement increases with age, concerns about inadequate savings are still common for those near retirement age. Current retirees are, on average, managing somewhat better financially than non-retirees, but economic well-being in retirement varies substantially with the reason for retirement.

Retirement Savings

Because retirement saving strategies differ by circumstances and age, survey respondents are asked to assess whether or not they feel that they are on track, however they define that for themselves. Thirty-six percent of non-retired adults think their retirement saving is on track, 44 percent say it is not on track, and the rest are not sure.

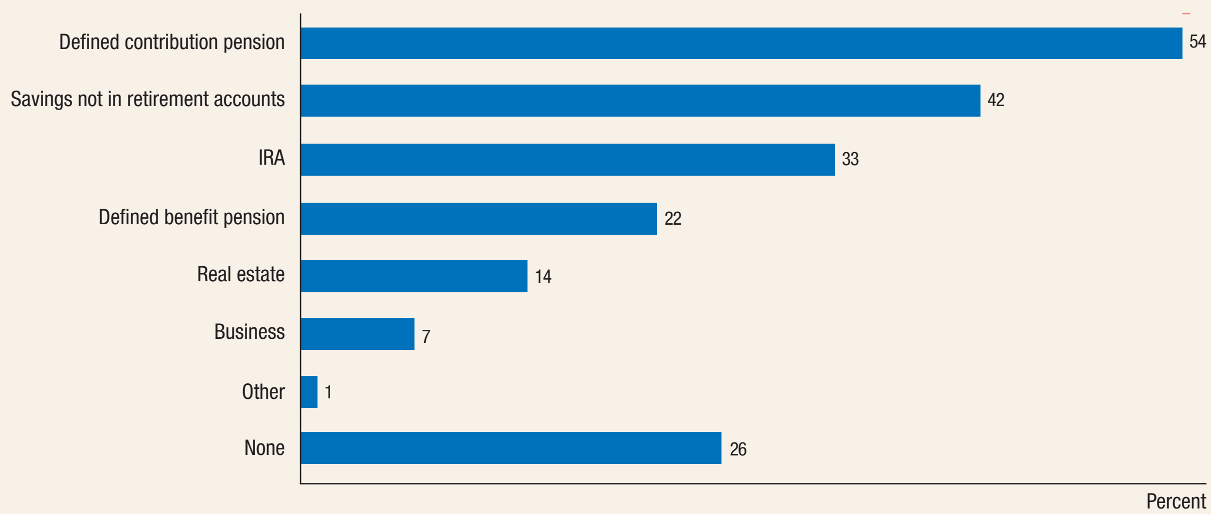
The amount currently saved for retirement is another way to assess preparedness. One-quarter of the non-retired indicate that they have no retirement savings or pension whatsoever. Of the non-retired age 60 and older, 13 percent have no retirement savings or pension.

Among those non-retirees who do have retirement savings, a “defined contribution” plan, such as a 401(k) or 403(b) plan, is the most common type. Fifty-four percent of non-retirees have money in this form (figure 32). These accounts are more than twice as frequent as traditional “defined benefit” plans, such as a pension, which are held by 22 percent of non-retirees.

Older adults are more likely to have retirement savings and to view their savings as on track than younger adults. Nevertheless, even among non-retirees in their 60s, 13 percent do not have any retirement savings and 45 percent think their retirement savings are on track (figure 33).

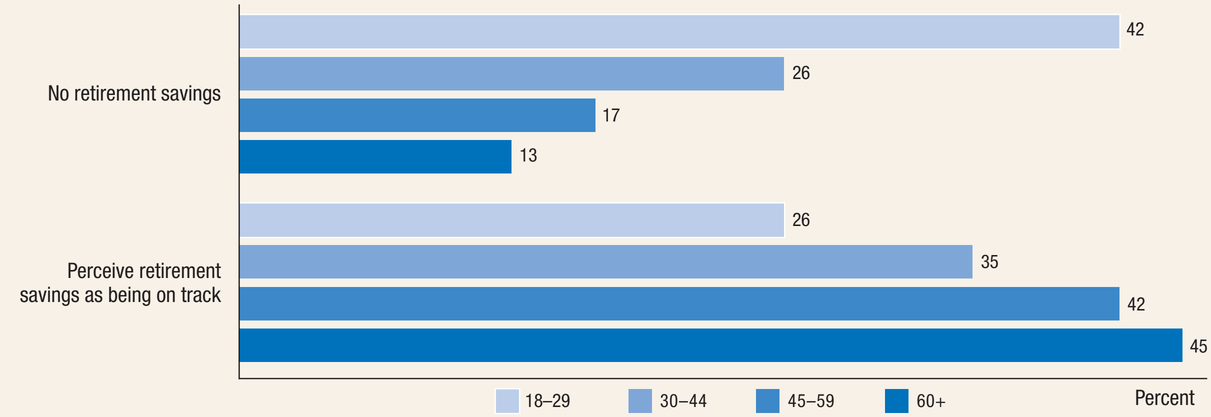
Additionally, retirement savings differ by race and ethnicity. Blacks and Hispanics are more likely than whites to have no retirement savings, and are less

Figure 32. Forms of retirement savings among non-retirees



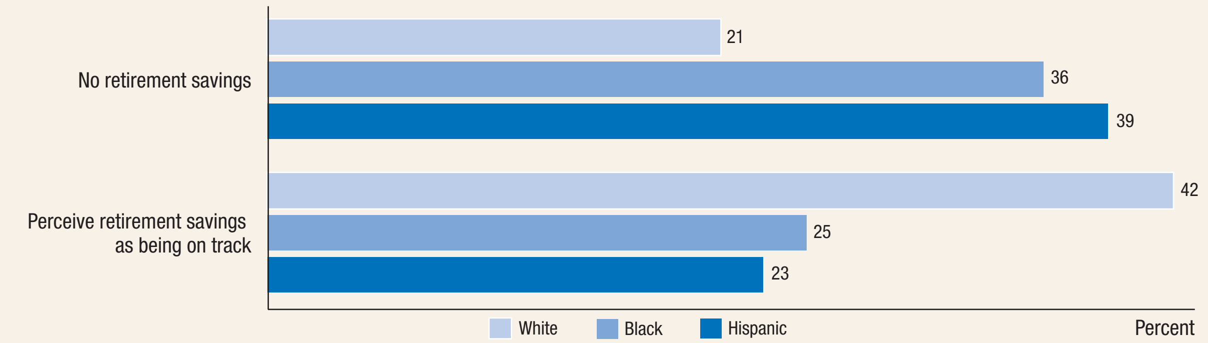
Note: Among non-retirees. Respondents can select multiple answers.

Figure 33. Lack of retirement savings and self-assessed preparedness (by age)



Note: Among non-retirees.

Figure 34. Lack of retirement savings and self-assessed preparedness (by race/ethnicity)



Note: Among non-retirees.

likely to view their retirement savings as on track (figure 34). This partly reflects the fact that blacks and Hispanics are, on average, younger than whites; however, even within age cohorts, significant differences remain in retirement savings by race and ethnicity.

Self-assessments of retirement preparedness vary with the amount of current savings and with time remaining until retirement. Young adults under age 30 typically believe that their savings are on track if they have at least $10,000 set aside for retirement (table 27).[27] The amount of retirement savings required for most to report being on track increases with age. Adults ages 45 to 59 who say their retirement savings are on track typically have at least $250,000 saved.

Just over 2 in 10 non-retirees under age 45 have retirement savings that meet their age-specific "on track" thresholds. The fraction rises with age to 27 percent of adults ages 45 to 59. The threshold for most to view savings as on track rises more rapidly

Table 27. Retirement savings in self-directed accounts are on track (by age)

Category	18–29	30–44	45–59
Amount seen as on track by majority	$10,000 or more	$100,000 or more	$250,000 or more
Percent with on track amount saved	22	22	27

Note: Among non-retirees. Value of any defined benefit pensions, real estate, or business not included in the retirement savings amounts.

[27] These results only refer to non-retired adults with retirement savings in self-directed accounts, including 401(k)s, IRAs, and savings outside of retirement accounts.

with age than the fraction reaching that level of retirement savings.

Some people withdraw money from their retirement accounts early for purposes other than retirement, despite the fact that they may incur a substantial tax penalty. Overall, 5 percent of non-retirees have borrowed money from their retirement accounts in the prior year, 4 percent have permanently withdrawn funds, and 1 percent have done both. Those who have withdrawn early are less likely to view their retirement savings as on track than those who have not—27 percent versus 37 percent.

Investment Decisions and Financial Literacy

Those with self-directed retirement savings (nearly 7 in 10 non-retired adults) have to make decisions about how the money is invested. The level of comfort in managing these investments varies. Six in 10 non-retirees with these accounts expressed low levels of comfort in making investment decisions with their retirement accounts.

On average, women of all education levels, and less-educated men, are less comfortable managing their retirement investments (figure 35). While 58 percent of men with at least a bachelor's degree are mostly or very comfortable making these investment decisions, 38 percent of men with a high school degree or less are that comfortable. Women with any level of education are less comfortable making investment decisions than men. Thirty-two percent of women with a bachelor's degree are comfortable managing their investments. Women's comfort with investing does rise with additional educational attainment, but this increase is markedly more muted than is the case with men.

Self-assessed comfort in financial decisionmaking may or may not correlate with actual knowledge about how to do so. To get some sense of individuals' financial acumen, respondents are asked five questions commonly used as measures of financial literacy (table 28).[28] The average number of correct answers is 2.8, and 22 percent of adults get all five correct.

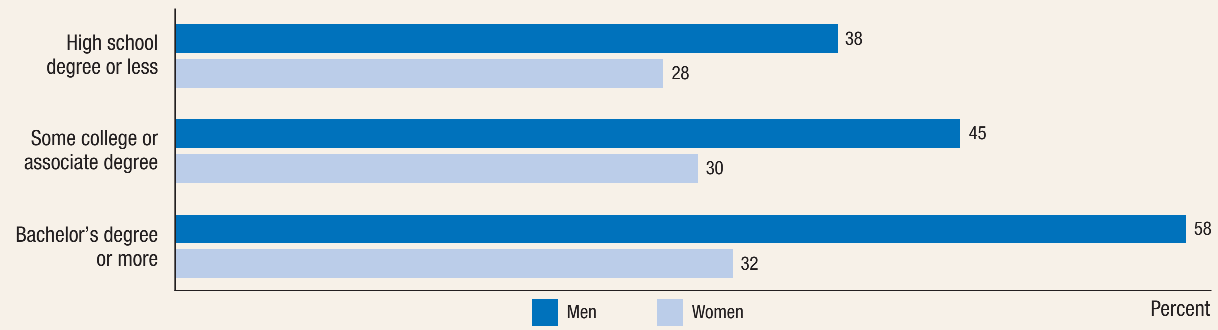
Using these measures, it appears that those expressing more comfort managing their retirement accounts also demonstrate more financial knowledge. Among those who have self-directed retirement accounts, those who express decisionmaking comfort answer more questions (3.7 out of 5) correctly, on average, than those who express little or no comfort (2.9 out of 5) (table 29).

Notably, the number of incorrect answers does not vary with investment comfort. Instead, the number of "don't know" responses falls as investment comfort rises. Overall, however, non-retirees with such accounts still answer more financial literacy questions correctly, on average, than either non-retirees who do not have such accounts or people who are already retired.

Gender differences in financial literacy mirror differences in being comfortable with the investment

[28] Three of these questions were developed by Annamaria Lusardi and Olivia Mitchell (see "Financial Literacy around the World: An Overview," *Journal of Pension Economics and Finance* 10, no. 4 (2011): 497–508) and have been widely used to study financial literacy.

Figure 35. Mostly or very comfortable investing self-directed retirement savings (by gender and education)



Note: Among non-retirees with a self-directed retirement account.

Table 28. Financial literacy questions
Percent

Question	Correct	Incorrect	Don't know
Housing prices in the United States can never go down. (False)	61	17	22
Buying a single company's stock usually provides a safer return than a stock mutual fund. (False)	47	3	49
Considering a long time period (for example, 10 or 20 years), which asset described below normally gives the highest returns? (Stocks)	42	18	39
Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account? (Less than today)	59	12	27
Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? (More than $102)	70	11	18
Overall	**56**	**12**	**31**

Note: Correct answers provided in parentheses. For each question, less than 2 percent of respondents did not reply.

Table 29. Financial literacy (by retirement savings and comfort investing)
Number of answers out of five

Investment comfort and presence of retirement savings	Correct	Incorrect	Don't know
Has self-directed retirement savings	3.2	0.5	1.2
Mostly or very comfortable investing	3.7	0.5	0.8
Not or slightly comfortable investing	2.9	0.6	1.5
No self-directed retirement savings	1.8	0.7	2.5
Retired	2.9	0.7	1.5
Overall	**2.8**	**0.6**	**1.6**

decisions. Women, on average, answer fewer financial literacy questions correctly (2.5) than men (3.1). Women are also more likely to select "don't know" (1.9) than men (1.3). As a result, women, on average, express less comfort making retirement investment decisions and exhibit somewhat lower levels of financial literacy. Some evidence suggests that one driver of this gender difference may relate to different levels of experience with financial decisions.[29]

[29] Some of the gender gap in financial literacy might be due to specialization in financial tasks within a household, with women being less likely to handle the finances. Joanne W. Hsu finds that women's financial literacy increases after the death of a spouse (see "Aging and Strategic Learning: The Impact of Spousal Incentives on Financial Literacy," *Journal of Human Resources* 51, no. 4 (Fall 2016): 1036–67).

Table 30. Reasons for when to retire (by age retired)
Percent

Reason	Don't know	61 or earlier	62–64	65+
Wanted to do other things	47	55	56	58
Wanted to spend more time with family	50	51	53	55
Poor health	57	40	31	27
Family responsibilities	44	32	31	25
Didn't like the work	30	30	24	21
Forced to retire or lack of available work	35	21	24	18

Note: Among retirees. Respondents can select multiple answers.

Well-Being in Retirement

Over one-quarter of adults consider themselves to be retired. This report's discussion of current retirees includes everyone who considers themselves to be retired, even though some also report that they are still working in some capacity. Seventeen percent of retirees (5 percent of all adults) say that they had done some work for pay or profit in the prior month. Retirees are somewhat more likely to report that they are at least doing okay financially (78 percent) than non-retirees (74 percent). Retirees who are still working report even higher levels of well-being.

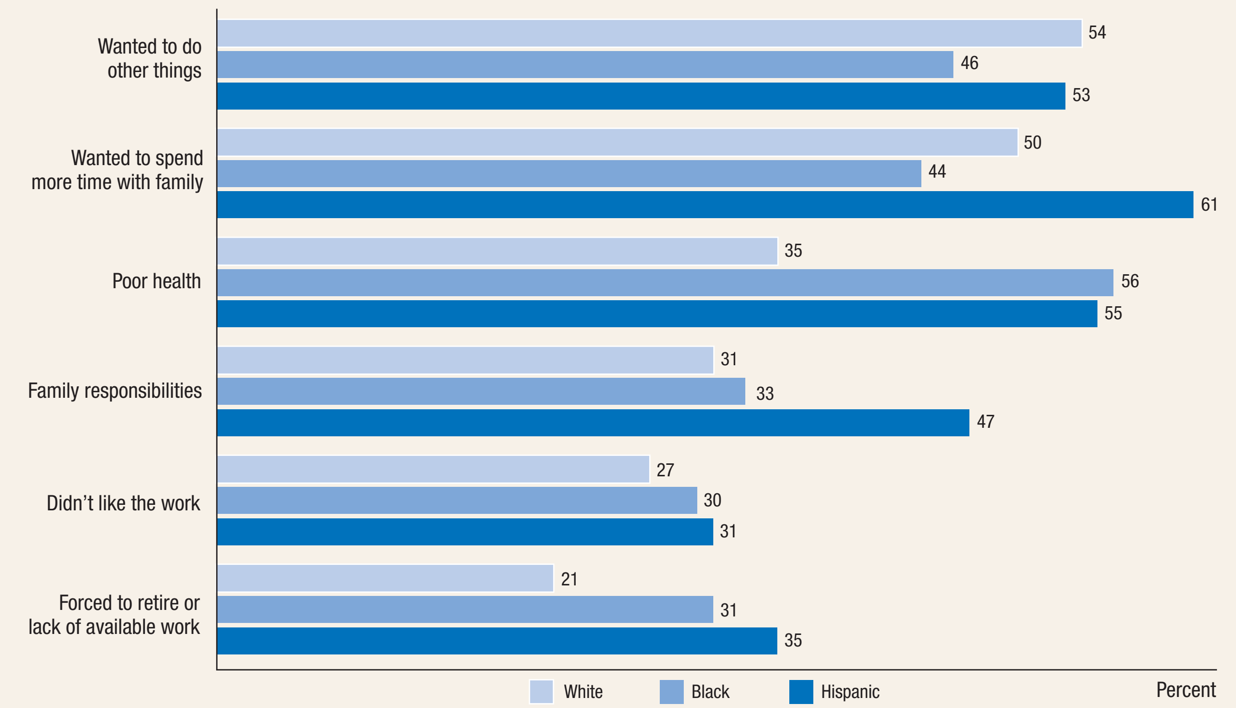
Nearly half of retirees in 2018 retired before age 62, and one-fourth retired between the ages of 62 and 64.[30] Average retirement ages differ by race and ethnicity, with black and Hispanic retirees more likely to have retired before age 62 (61 percent and 55 percent, respectively) than white retirees (45 percent). Overall, early retirees report similar levels of economic well-being as later retirees.

In deciding when to retire, a desire to do other things than work, or to spend time with family, are the most common factors. In addition, 4 in 10 retirees before age 62—and 3 in 10 between ages 62 and 64—say poor health contributed to their retirement. More than one-fifth of those who retired before age 65 say the lack of available work contributed to their decision (table 30).

Economic well-being varies considerably by the reasons for retirement. Nine in 10 retirees who say doing something else was very important in their retirement decision are at least doing okay finan-

[30] The tabulations of retirement ages exclude the 14 percent of retirees who do not know the age at which they retired.

Figure 36. Reasons for early retirement (by race/ethnicity)



Note: Among retirees who retired before age 65.

cially, versus more than half of those who retired due to poor health.

Among blacks and Hispanics who retired early (before age 65), health concerns are a more common factor than among white early retirees (figure 36). Conversely, whites who retired early are more likely to have retired, at least in part, because they wanted to do other things than work.

Description of the Survey

The Survey of Household Economics and Decisionmaking was fielded from October 11 through November 12, 2018. This is the sixth year of the survey, conducted annually in the fourth quarter of each year since 2013.[31] Staff of the Federal Reserve Board write the survey questions in consultation with other Federal Reserve System staff, outside academics, and professional survey experts.[32]

Ipsos, a private consumer research firm, administers the survey using its KnowledgePanel, a nationally representative probability-based online panel. Ipsos selects respondents for the KnowledgePanel based on address-based sampling (ABS).[33] SHED respondents are then selected from this panel.

Survey Participation

Participation in the 2018 SHED depends on several separate decisions made by respondents. First, they agreed to participate in Ipsos' KnowledgePanel and then they completed an initial demographic profile survey. According to Ipsos, 12.5 percent of individuals contacted to join KnowledgePanel agreed to join (recruitment rate), and 64.2 percent of recruited participants completed the initial profile survey and became a panel member (profile rate). Finally, selected panel members agreed to complete the 2018 SHED.

Of the 21,137 panel members contacted to take the 2018 SHED, 11,440 (excluding breakoffs) participated, yielding a final-stage completion rate of 54.1 percent. All the stages taken together, the cumulative response rate is 4.3 percent. The final sample used in the report includes 11,316 respondents.[34]

Targeted Outreach and Incentives

To increase survey participation and completion among hard-to-reach demographic groups, Board staff and Ipsos developed a new communication plan and targeted monetary incentives. The target groups—young adults ages 18 to 29, adults with less than a high school degree, and minorities—received frequent email reminders and text messages, as well as increasing monetary incentives. The incentives to take the survey for these groups started at $5 and in some cases increased modestly. Respondents outside the target groups received less frequent communication and a nominal monetary incentive.

Of the nonrespondents in the target groups—slightly more than one-quarter of the survey sample—who were offered an incentive, 14.5 percent took the survey and received the incentive. Half accepted the second offer, while the rest split about evenly between the first and third offers.

Targeted incentives markedly improved the completion rate for the target groups (table 31). More than 53.4 percent of the target groups as a whole completed the survey, up from 43.7 percent achieved in the 2017 survey, a nearly 10 percentage point increase. The increase in completion rates was largest for those with less-than-high-school-degree group (13.5 percentage points) and young adults (12.8 percentage points). The completion rate for minorities increased 6.0 percentage points.

Altogether, the new communication plan and targeted incentives reduced the differences in response

31 Data and reports of survey findings from all past years are available at https://www.federalreserve.gov/consumerscommunities/shed.htm.

32 The survey instrument was also available for public comment through the Federal Reserve Board's website.

33 Prior to 2009, respondents were also recruited using random-digit dialing.

34 Of the 11,440 respondents who completed the survey, 124 are excluded from the analysis in this report due to either leaving responses to a large number of questions missing, completing the survey too quickly, or both.

Table 31. Survey completion rate by incentive groups

Characteristic	2017			2018		
	Number sampled	Completed responses	Completion rate (percent)	Number sampled	Completed responses	Completion rate (percent)
Target group	9,432	4,121	43.7	8,812	4,707	53.4
Ages 18–29[1,2]	3,862	1,471	38.1	2,879	1,466	50.9
Less than high school degree[1,2]	815	338	41.5	886	487	55.0
Minorities[2]	4,755	2,312	48.6	5,047	2,754	54.6
Non-target group	12,923	8,125	62.9	12,325	6,733	54.6
Overall	**22,355**	**12,246**	**54.8**	**21,137**	**11,440**	**54.1**

Note: To avoid double counting, any panel member who could be in more than one target group is counted in the following order: ages 18 to 29, less than high school degree; minorities.

1 This group received a modest, non-contingent payment prior to the survey in 2018.

2 Nonrespondents in this group were offered incentives in 2018.

rates across subpopulations and improved the quality of the final data.

Survey Questionnaire

The median time to complete the survey in 2018 was 21 minutes, 3 minutes shorter than the previous survey. The shorter interview length reflects an effort to lessen respondent burden. The number of questions was reduced and the length of the questionnaire was shortened. Working with survey design experts at NORC at the University of Chicago, Board staff also made the question wording clearer to improve comprehension. Most new survey questions went through this technical review, as well as review by subject-matter experts, to minimize potential confusion among respondents.

Because one motivation for the survey is to understand where there may be vulnerabilities or weaknesses in the economy, one priority in selecting questions is to provide information on the financial experiences and challenges among low- and moderate-income populations. The questions are intended to complement and augment the base of knowledge from other data sources, including the Board's Survey of Consumer Finances. In addition, some questions from other surveys are included to allow direct comparisons across datasets.[35] The full survey questionnaire can be found in appendix A of the supplemental appendixes to this report (see https://www.federalreserve.gov/consumerscommunities/shed_publications.htm).

Survey Mode

The SHED is administered to respondents entirely online. Online interviews are less costly than telephone or in-person interviewing, and can still be an effective way to interview a representative population.[36] Ipsos' online panel offers some additional benefits. Their panel allows the same respondents to be re-interviewed in subsequent surveys with relative ease, as they can be easily contacted for several years.

Furthermore, internet panel surveys have numerous existing data points on respondents from previously administered surveys, including detailed demographic and economic information. This allows for the inclusion of additional information on respondents without increasing respondent burden. The respondent burdens are further reduced by automatically skipping irrelevant questions based on responses to previous answers.

The "digital divide" and other differences in internet usage could bias participation in online surveys, so recruited panel members who do not have a computer or internet access are provided with a laptop and access to the internet to complete the surveys. Even so, individuals who complete an online survey

35 For a comparison of results to select overlapping questions from the SHED and Census Bureau surveys, see Jeff Larrimore, Maximilian Schmeiser, and Sebastian Devlin-Foltz, "Should You Trust Things You Hear Online? Comparing SHED and Census Bureau Survey Results," FEDS Notes (Washington: Board of Governors, October 15, 2015), https://www.federalreserve.gov/econresdata/notes/feds-notes/2015/comparing-shed-and-census-bureau-survey-results-20151015.html.

36 See David S. Yeager et al., "Comparing the Accuracy of RDD Telephone Surveys and Internet Surveys Conducted with Probability and Non-Probability Samples," *Public Opinion Quarterly* 75, no. 4 (2011): 709–47.

Table 32. Survey sample and response disposition

Sample type	Number sampled	Completed responses	Completion rate (percent)
Main	17,232	9,547	55.4
Lower-income oversample	3,905	1,893	48.5
Overall	**21,137**	**11,440**	**54.1**

may have greater comfort or familiarity with the internet and technology than the overall adult population.

Sampling and Weighting

The SHED sample is designed to be representative of adults ages 18 and older living in the United States. It includes a main sample and an oversample (table 32) of individuals with a household income less than $40,000 per year ("lower-income oversample"). The completion rate is somewhat lower among the lower-income oversample (48.5 percent) than the main sample (55.4 percent), reflecting the fact that these lower-income adults are harder to reach in surveys.

The Ipsos methodology for selecting a general population sample from KnowledgePanel ensures that the resulting sample behaves as an equal probability of selection method (EPSEM) sample. This methodology starts by weighting the entire KnowledgePanel to the benchmarks in the latest March supplement of the Current Population Survey along several geodemographic dimensions. This way, the weighted distribution of the KnowledgePanel matches that of U.S. adults. The geo-demographic dimensions used for weighting the entire KnowledgePanel include gender, age, race, ethnicity, education, census region, household income, homeownership status, and metropolitan area status.

Using the above weights as the measure of size (MOS) for each panel member, in the next step a probability proportional to size (PPS) procedure is used to select study specific samples. Since this survey includes a lower-income oversample, the departures caused by this oversample from an EPSEM design are corrected by adjusting the corresponding design weights accordingly with the Current Population Survey benchmarks serving as reference points.

After the survey collection is complete, statisticians at Ipsos adjust weights in a post-stratification process that corrects for any survey nonresponse as well as any non-coverage or under- and over-sampling in the study design. The following variables were used for the adjustment of weights for this study: age, gender, race, ethnicity, census region, residence in a metropolitan area, education, and household income. Demographic and geographic distributions for the noninstitutionalized, civilian population age 18 and older from the March Current Population Survey are the benchmarks in this adjustment.

Although weights allow the sample population to match the U.S. population (not in the military or in institutions, such as prisons or nursing homes) based on observable characteristics, similar to all survey methods, it remains possible that non-coverage, nonresponse, or occasional disparities among recruited panel members result in differences between the sample population and the U.S. population. For example, address-based sampling likely misses homeless populations, and non-English speakers may not participate in surveys conducted in English.[37]

Despite an effort to select the 2018 SHED sample such that the unweighted distribution of the sample more closely mirrors that of the U.S. adult population, the result shows that there is room for further improvement. This likely reflects the fact that the distribution of the survey respondents is influenced by the composition of the KnowledgePanel, from which the survey sample is drawn, and is the final step of a multistage process.

[37] For example, while the survey does weight to match the race and ethnicity of the entire U.S. adult population, there is evidence that the Hispanic population in the survey is somewhat more likely to speak English at home than the overall Hispanic population in the United States. Sixty-five percent of Hispanics who responded to the SHED speak Spanish at home, versus 72 percent of the overall Hispanic population who do so based on the 2017 American Community Survey. See table B16006 at https://factfinder.census.gov.

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Park Size

- Small (<50)
- Medium (51-100)
- Large (>100)

- City
- Primary Roadways

Data Sources

Primary roadway and cities via U.S. Census Bureau available at https://www.census.gov/cgi-bin/geo/shapefiles/index.php

Mobile / manufactured home park information (size, name, location, and management contact info) via Homeland Security Infrastructure Program (HSIP) available at: https://hifld-geoplatform.opendata.arcgis.com/datasets/mobile-home-parks

State-Level Strategies for Tackling High Energy Burdens: A Review of Policies Extending State- and Ratepayer-Funded Energy Efficiency to Low-Income Households

Weston Berg and Ariel Drehobl, American Council for an Energy-Efficient Economy

ABSTRACT

Research has found that low-income households tend to be less efficient and devote a greater percentage of their incomes to energy bills than non-low-income households. Research has also found that low-income households spend three times more of their average household income on energy costs, forcing some families to make trade-offs between energy and other basic necessities. Low-income households also face challenges when participating in low-income programs, such as the difficulty of paying upfront costs for efficiency investments, a lack of access to information about efficiency programs and behaviors, and barriers to engaging multifamily landlords and tenants in efficiency investments. State regulators can play a key role in encouraging utilities to carefully consider and expand the role of low-income energy efficiency programs within their efficiency portfolios. This research reviews the policy landscape to highlight the mix of different strategies that state energy offices and utility commissions have undertaken to extend energy efficiency benefits to low-income customers, including goal setting, cost-effectiveness testing, and other best practices for complementing federal and local efforts to reach disadvantaged households.

Introduction

Low-income households experience higher energy burdens—the percentage of household income spent on energy bills—as compared to other households. Research has found that low-income households pay up to three times as much as the average household for home energy costs; renting, multifamily, African American, and Latino households also face disproportionately high energy burdens (Drehobl and Ross 2016). High energy burdens may force some families to make trade-offs between energy and other basic necessities, such as food, childcare, and healthcare. Levy and Sledge (2012) identify utility bills as the most common driver for households to obtain small-dollar credit (e.g., payday loans), which often comes with high fees or interest rates that can cause borrowers to fall into a cycle of repeat usage and debt.

A variety of factors can exacerbate home energy burdens. Many low-income households live in older, poorly insulated homes with inefficient heating systems. In addition, people living in rental households may lack control over heating and/or cooling systems and appliances, making it difficult to take control of home energy use. While high energy burdens can be driven by low incomes, ACEEE research has found that energy efficiency is part of the solution for reducing high energy burdens (Drehobl and Ross 2016). Beyond simply lowering energy bills, efficiency upgrades can also improve health and comfort and provide families with more disposable income for nonenergy necessities. In fact, in its evaluation of the Weatherization Assistance Program, the Department of Energy (DOE) found that the value of nonenergy benefits greatly exceeded the value of energy savings (Tonn et al. 2014a).

Efforts to improve the reach of energy efficiency programs to low-income customers face several unique challenges. For example, traditional efficiency programs tend to require upfront investment costs (e.g. rebates) that can prevent customers without this upfront capital to participate. In addition, low-income households are more likely to live in multifamily buildings. When it comes to making efficiency investments, renters and landlords often face split incentives. Landlords who do not pay for their tenants' utilities tend to lack motivation to invest in efficiency upgrades, and tenants whose landlords do pay for their utilities tend to lack motivation to save energy (Samarripas, York, and Ross 2017). To help overcome these challenges, state and utility regulators can play a key role in encouraging utilities to carefully consider and expand the role of low-income energy efficiency programs within their energy efficiency portfolios. The goal of this paper is to provide state-level strategies for expanding energy efficiency to low-income households, such as policies that establish low-income spending requirements, cost-effectiveness provisions, as well as other policy levers.

Data Collection and Limitations

In an effort to improve the diversity and effectiveness of low-income efficiency strategies employed by state policymakers, ACEEE leveraged data collection efforts associated with the *2017 State Energy Efficiency Scorecard.* We collected information about regulations and rules guiding state and utility administration of low-income energy efficiency programs from state energy offices and utility commissions across the United States. Research efforts also included reviews of program annual reports, as well as legislation and utility commission rules. Follow-up interviews were also conducted with several program administrators to learn more about specific challenges, state-utility coordination efforts to standardize and improve services, as well as priorities for future program updates. Questions posed to respondents generally addressed three policy mechanisms:

1. Legislation or regulations establishing a minimum level of spending or committed funding stream dedicated to energy efficiency programs serving low-income customers
2. Existence of utility rules, policies, or practices that tailor application of cost-effectiveness screening to recognize the unique nonenergy benefits of low-income energy efficiency programs
3. Efforts to coordinate utility and state administration of programs delivering low-income energy efficiency programs and weatherization services

In cases where state energy offices or utility commissions did not respond to our data request, we independently collected data on these policies. This paper's findings include policies current as of 2017. Approximately 40 states responded to our questions, either through their state energy office, their utility regulatory commission, or both.

A Review of State Policies Promoting Investment in Low-Income Programs

In an effort to provide a reference of best practices for state-led support of low-income efficiency programs, our review provides a selection of regulatory language and strategies for: (1) administering low-income programs with a reliable level of funding, and (2) addressing the unique challenges and benefits of low-income programs within cost-effectiveness screening. Table 1 provides a summary of our policy findings for a selection of states. Previous ACEEE research has found that these policies, along with leading interagency coordination, are key policy tools states can leverage to spur successful development of low-income programs (Gilleo, Nowak, and Drehobl 2017).

Table 1. State funding requirements and cost-effectiveness provisions supporting low-income energy efficiency programs

State	Requirements for minimum level of state or utility support for low-income energy efficiency programs	Special cost-effectiveness provisions for low-income energy efficiency programs
CA	CA Public Utilities Code Section 382(e) sets a goal to provide low-income energy efficiency measures to 100% of eligible and willing customers by 2020. A. 14-11-007 (2016) strengthened the goal and updates interpretation of the “willing and feasible to participate (WFTP)” factor.	Applies the Energy Savings Assistance Program Cost Effectiveness test (ESACET) and the Total Resource Cost test to the low-income program. These tests incorporate nonenergy benefits and are used for informational purposes only, with no set minimum threshold for C/E.
CT	Public Act 11-80, Section 33 establishes a goal of weatherizing 80% of homes by 2030. Utilities are required to allocate budgets to low-income programs in parity with revenues expected to be collected from that sector.	Regulators have repeatedly approved low-income programs that were not cost-effective; however, no explicit adjustments to cost-effectiveness rules are in place for low-income programs.
DC	The Clean and Affordable Energy Act (CAEA) of 2008 established a separate Energy Assistance Trust Fund (EATF) to fund: “(1) the existing low-income programs in the amount of $3.3 million annually; and (2) the Residential Aid Discount subsidy in the amount of $3 million annually.” For the 2017–2021 program cycle the low-income spending requirement was adjusted to 20% of expenditures.	Though not specific to low-income programs, a 5% adder is applied to program benefits to account for additional nonenergy benefits such as comfort, noise reduction, aesthetics, and health and safety. Non-cost-effective programs may be included in the portfolio as long as overall the portfolio is cost-effective under societal cost test.
DE	SB 106 (2009) specifies that 20% of charges assessed toward energy savings goals be allocated to the Weatherization Assistance Program.	In 2016, the Delaware Energy Efficiency Advisory Council approved the EM&V subcommittee’s proposed estimates of low-income nonenergy benefits.
IL	In 2016 the Future Energy Jobs Bill (SB 2814) directed utilities to implement low-income energy efficiency measures of at least $25 million per year for electric utilities that serve more than 3 million retail customers in the state (ComEd), and at least $8.35 million per year for electric utilities that serve fewer than 3 million, but more than 500,000 retail customers in the state (i.e. Ameren).	Section 8-103B (Energy Efficiency and Demand-Response Measures) of SB 2814 excludes low-income energy efficiency measures from the need to satisfy the total resource cost (TRC) test.
MA	The 2008 Green Communities Act specified that 10% of electric funds and 20% of natural gas funds be spent on low-income efficiency.	D.P.U. 08-50-B specifies that program administrators must develop energy efficiency plans that include calculations of nonenergy benefits for low-income customers.
MD	No minimum level identified.	In Order No. 87082, the PUC requires C/E screening for limited-income programs but indicates the programs may still be implemented without satisfying the test.
ME	LD-1559, passed in June 2013, states that Efficiency Maine Trust shall “target at least 10% of funds for electricity conservation collected under subsection 4 or 4-A or $2,600,000, whichever is greater, to programs for low-income residential consumers, as defined by the board by rule.”	Cost-effectiveness tests for all programs require consideration of nonenergy benefits including “…reduced operations and maintenance costs, job training opportunities and workforce development, general economic development and environmental benefits, to the extent that such benefits can be accurately and reasonably quantified and attributed to the program or project.”

State	Requirements for minimum level of state or utility support for low-income energy efficiency programs	Special cost-effectiveness provisions for low-income energy efficiency programs
MI	SB 438 (2016), which extended the state's 1% annual electric savings requirement through 2021, directs that each customer rate class funding contribution to low-income programs be in proportion to that rate class's contribution to the total energy efficiency portfolio.	While it requires energy waste reduction plans to be cost-effective, SB 438 excludes residential low-income residential customer programs from this requirement.
MN	Municipal gas and all electric utilities must spend at least 0.2% of their gross operating revenue from residential customers on low-income programs. Legislation in 2013 raised the minimum low-income spending requirement for gas IOUs from 0.2% to 0.4% of their most recent three-year average gross operating revenue from residential customers.	Subd 7(e) of MN Statute 216B.241 directs that "costs and benefits associated with any approved low-income gas or electric conservation improvement program that is not cost-effective when considering the costs and benefits to the utility may, at the discretion of the utility, be excluded from the calculation of net economic benefits for purposes of calculating the financial incentive to the utility."
MO	While no legislation or regulations have been adopted to require a specific level of utility spending for low-income energy efficiency programs, the commission has ordered a number of regulated utilities to include specified levels of funding for low-income weatherization programs in their rates. The Division of Energy requested this in cases to assure continuous funding levels rather than subjecting WAP funding levels to voluntary Missouri Energy Efficiency Investment Act (MEEIA) programs.	Missouri specifies the total resource cost (TRC) test as the primary test for cost effectiveness. The tests are required for portfolio and total program level screening, although state regulations for utilities allow for low-income programs to have a TRC ratio of less than one (4 CSR 240-20.094(2)). Section 393.1075.4 of Missouri Code also specifies that low-income programs do not need to fulfill the cost-effectiveness test, "so long as the commission determines that the program or campaign is in the public interest."
MT	SB 150 (2015) increased a public utility's minimum annual funding requirement for low-income energy and weatherization assistance from 17% to 50% of the public utility's annual electric universal system benefits (USB). A cooperative utility's minimum annual funding requirement for low-income energy and weatherization assistance remains at 17% of its annual USB funding.	Specifies the TRC to be its primary test for decision making. The benefit-cost tests are required for the individual measure level for program screening, but there are exceptions for low-income programs, pilots, and new technologies.
NH	Order No. 25,932 (2016) established a statewide energy efficiency resource standard (EERS) and provides for an increase in the minimum low-income share of the overall energy efficiency budget from 15.5% to 17%.	NH uses the TRC test framework for all programs, including low-income programs. However low-income programs that do not screen with b/c ratios greater than 1.0 may still be approved if the programs are otherwise well designed.
NJ	No specific legislative/statutory spending requirements. Annual program budgets for NJ's low-income Comfort Partners program do specify annual goals for customers serviced: 4,400 electric customers and 4,090 gas customers on a 12-month basis from July 1, 2016, to June 30, 2017.	The NJBPU does not require that the low-income Comfort Partners Program meet any cost-effectiveness requirements.
NM	HB 267 (2013) directs that no less than 5% of the amount received by a public utility for program costs shall be specifically directed to energy efficiency programs for low-income customers.	As specified in 17.7.2.9 NMAC, in developing the utility cost test (UCT) for low-income efficiency programs, utilities shall assume that 20% of the calculated energy savings is the reasonable value of reductions in working capital, reduced collection costs, lower bad-debt expense, improved customer service, effectiveness, and other appropriate factors qualifying as utility system economic benefits.
NV	SB 150 (2017) directed the public utility commission to establish annual energy savings goals for NV Energy and requires utilities set aside 5% of efficiency program budgets for low-income customers.	None identified.

State	Requirements for minimum level of state or utility support for low-income energy efficiency programs	Special cost-effectiveness provisions for low-income energy efficiency programs
NY	The January 2016 PSC Order authorizing the Clean Energy Fund Framework requires that NYSERDA must invest at least $234.5 million of Market Development funds in Low-to-Moderate Income (LMI) initiatives over the initial three-year period. The new policy is intended to limit energy costs for low-income residents to no more than 6% of household income (NY PSC 2016).	New York's TRC test does not explicitly address nonenergy benefits of low-income programs; however, the NY PSC has generally recognized and considered low-income-specific benefits in deciding on funding for utility low-income programs.
OR	Senate Bill 1149 (1999) requires the electric industry to allocate 13% of the public purpose charge to low-income weatherization through the Energy Conservation Helping Oregonians (ECHO) program.	Docket UM 551, Order 94-590, lays out a number of situations where the PUC may make exceptions to the standard societal test calculation. In Order 15-200 (2015), the commission adopted the recommendation of staff that cost-effectiveness requirements do not apply to low-income weatherization programs, such as the Weatherization Assistance for Qualified Customers Program (WAQC).
PA	Phase III of Act 129's Energy Efficiency and Conservation Program requires each utility to obtain a minimum of 5.5% of their total consumption reduction target from the low-income sector.	As described in Order M-2015-2468992, Pennsylvania relies on the TRC test and considers it its primary cost-effectiveness test. A benefit-cost test is required for portfolio-level screening, but a separate TRC test calculation is not required for the low-income sector.
RI	No minimum level identified.	RI relies on Massachusetts' benefit valuation work, as they have similar program types (Woolf et al. 2013).
TX	As amended by SB 1434 in June 2011, Substantive Rule § 25.181 states "…each utility shall ensure that annual expenditures for the targeted low-income energy efficiency program are not less than 10% of the utility's energy efficiency budget for the program year."	In September 2012 Order (Project No. 39674), the PUC directed that low-income programs would not be required to meet the cost-effectiveness standard in Substantive Rule § 25.181, but rather would only need to meet standards required by the Savings-to-Investment ratio (SIR) test.
VT	Requires Efficiency Vermont to achieve minimum levels of low-income spending of $10.5 million for 2015–2017. Legislation from 1990 also funds weatherization through a 0.5% gross-receipts tax on all non-transportation fuels sold. In addition, at least 17% of the total Thermal Energy and Process Fuel Fund must fund low-income services.	Vermont utilizes the societal cost test as their primary test. A 15% adjustment is applied to the cost-effectiveness screening tool for low-income customer programs. This is in addition to a 15% adder applied for other nonenergy benefits.
WA	While no specific spending or savings requirements were identified, utilities have provided $15–20 million in recent biennium cycles towards weatherization. The Washington State legislature has invested an additional $15 million from 2015–2017 towards the Matchmaker Program, which matches state dollars with utility and other programs' investments to double the value of state capital funds spent on low-income weatherization.	Per WAC 480-109-100, a utility may exclude low-income conservation from portfolio-level cost-effectiveness calculations. In 2015 the Commission in General Order R-578 clarified rules to allow, rather than require, utilities to pursue low-income conservation that is cost-effective "…in recognition that low-income conservation programs have significant nonenergy benefits." Washington also applies an additional 10% benefit to account for non-quantifiable externalities, consistent with the *Northwest Power Act*.
WI	Three sources provide funding for the low-income energy portion of the public benefits fund: (1) an electric utility charge determined by statute (16.957) and administrative rules (Chapter Adm 43); (2) a monthly low-income assistance fee collected on all customer bills—the statute provides that the charge is to be a fixed charge, with 70% of the total revenue being collected from the residential customer class and 30% being collected from non-residential customers (Wisc. Stat. §16.957(4)(b)(2) (2007)); (3) current year's federal LIHEAP and weatherization allocations.	Administrative code requires programs for residential and non-residential program portfolios to each pass portfolio-level cost-effectiveness. One of the established reasons for setting portfolio-level testing rather than program- or measure-level testing is to provide more flexibility for low-income programs.

While Table 1 illustrates the diverse state policies to better reach underserved households, these data contain some significant limitations and implementation gaps that are important to highlight. For example, 14 of the 15 states with the highest poverty rates (Alabama, Arkansas, Arizona, Florida, Georgia, Kentucky, Louisiana, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and West Virginia)—many of which are in the southeastern United States—lack the policies included in the table (US Census 2017). In addition, state utility regulatory commissions, which regulate investor-owned utilities, establish many of these rules, but often lack oversight over smaller rural cooperatives and municipal utilities. Given that cooperative and municipal utilities serve the majority of households in rural areas, states should consider policies and programs to address the unique challenges these smaller providers face, including resource access and the high infrastructure costs associated with maintaining transmission and distribution across a diffuse customer base.

Setting Targets for Low-Income Programs

States can utilize a variety of policy tools to ensure that low-income energy efficiency program spending and savings requirements meet a minimum threshold. In most cases, states that have set thresholds have done so through a required spending set-aside adopted in legislation or by public utility commissions (PUCs). These requirements can take the form of a dedicated funding stream, receiving a minimum annual contribution from ratepayers or taxpayers, or a requirement that utilities spend a minimum amount or percentage of their resources on low-income efficiency programs. States can also establish an annual utility savings target specific to low-income programs, although as of 2017 only two states—Pennsylvania and California—have done so.

Spending threshold for low-income energy efficiency programs. The most common instrument states employ to mobilize investment in, and provide stable funding for, low-income energy efficiency programs is to legislate a required annual expenditure amount or a fixed percent contribution from the customer public benefit charge. As of 2017, 18 states have adopted such a mechanism. Among the top spenders on a low-income resident basis was Massachusetts, which under the *2008 Green Communities Act* commits 10% of electric and 20% of natural gas program funds to low-income programs. Vermont, meanwhile, established a goal in 2007 to weatherize an additional 20,000 low-income homes by 2020. Multiple funding streams contribute to this goal, but most support comes from a dedicated 0.5% contribution from the gross receipts tax on retail sales of non-transportation fuels, established in 1990. The remaining funds are provided through a surcharge on electric bills, levels of which are determined according to three-year low-income spending targets approved by the Vermont Public Service Board (State of Vermont PSB 2014).

Several states have incorporated low-income targets as part of legislation establishing a broader energy efficiency resource standard (EERS). Recently, New Hampshire established EERS targets that include low-income spending requirements. In August 2016, the NH PUC approved a settlement agreement establishing an EERS of 3.1% cumulative savings (as a percentage of delivered 2014 kWh sales) from 2018–2020, including an increase in the minimum low-income share of the overall energy efficiency budget from 15.5% to 17% (NH PUC 2016). Nevada, which became the latest state to lay groundwork for an EERS after the adoption of SB

150 in June 2017, now requires NV Energy to set aside 5% of efficiency budgets for low-income customers (Nevada Senate 2017).

The Illinois's Future Energy Jobs Bill provided one of the most significant recent policy advancements to increase low-income energy efficiency investment. Passed in late 2016, the bill both ramped up utility savings targets and also tripled levels of low-income program spending (to $25 million for ComEd and $8 million for Ameren). Low-income advocates have credited the increase to the inclusion of environmental justice community representatives among the core group of negotiators developing the final bill (Lydersen 2016). However ComEd has announced plans to far exceed this target by spending $42 million per year, according to its 2018–2022 Energy Efficiency Plan.

To avoid significant sacrifice or disruptions to other effective energy efficiency or clean energy offerings, policymakers and program administrators should be careful to coordinate with relevant stakeholders when setting or increasing targets for low-income customers. Montana's SB 150, adopted in 2015, raised low-income energy and weatherization assistance from 17% to 50% of NorthWestern Energy's annual electric universal system benefits (USB) level. However it did so without a corresponding increase to the overall USB, such that energy efficiency and renewable energy programs serving other customer classes were drastically reduced. While some celebrated the legislation for improving energy affordability for customers in need at a time of decreasing federal funding for weatherization, others criticized the legislation as an effort to weaken the USB and undermine expansion of overall distributed generation in Montana (Montana Senate Committee on Energy and Telecommunications 2015).

Customer participation goals. In some states, long-term participation targets have helped to guide program design to meet low-income energy needs. In 2011, the Connecticut state legislature adopted a goal to weatherize 80% of homes by 2030 (CT Public Act 11-80, Section 33). While this particular goal is not specific to the low-income sector, low-income programs help achieve this goal. In addition, utilities are required to allocate limited-income budgets in parity with the revenues that are expected to be collected from that sector. Also, as part of the Performance Management Incentive (PMI) calculation, Connecticut utilities are required to spend at least 95% of their low-income program budget annually. Connecticut's main ratepayer-funded low-income energy efficiency program is the Home Energy Solutions–Income-Eligible (HES-IE) program, which is run by the state's energy efficiency administrator, Energize CT. Several funding streams contribute to HES-IE, primarily the ratepayer-funded Connecticut Energy Efficiency Fund (CEEF), as well as revenues from the Regional Greenhouse Gas Initiative (RGGI) and the ISO New England forward capacity market.

Historically, California has been guided by a 2007 goal—established by the PUC in D.07-12-051 and later codified—to provide all eligible customers the opportunity to participate in low-income energy efficiency programs by 2020. However, the Commission has found it challenging to ensure the interpretation of the goal does not have the unintended effect of excluding a significant number of income-eligible Californians who have still never participated in the Energy Savings Assistance Program (ESAP). This was partly due to a narrow legal interpretation of customers deemed "willing to participate" under D.08-11-031. In addition, a 2002 Commission order adopting a three measure minimum (3MM) rule which limited ESAP participation to households that qualified for three eligible measures or met an energy savings goal if less than three measures were needed, as well as the Go-back rule which prohibited the counting of retreatment of households that received eligible measures, resulted in both rules contributing to the difficulty in achieving the 2007 goal. A 2016 order addressed these challenges by eliminating both the 3MM rule and the Go-back rule, and by adopting specific low-income energy savings targets.

Savings target for low-income energy efficiency programs. Requirements setting specific savings targets for the low-income sector are far less common. As of early 2018, only Pennsylvania and California have set low-income savings targets. In Pennsylvania, Act 129 has long required that each utility's energy efficiency plan include specific energy efficiency measures for low-income households in proportion to that sector's share of the total energy usage. In addition, a 2015 Implementation Order for Phase III programs under Act 129 went further to require that utilities obtain a minimum of 5.5% of their total consumption reduction target from the low-income sector (Pennsylvania PUC 17105-3265). These programs are administered through the mandated Low-Income Usage Reduction Programs (LIURP), also known as Smart Comfort, WARM Program, WRAP, or WARM Choice, depending on the utility. In response to the new mandate, each utility's Phase III (2016–2021) plans have outlined efforts to significantly ramp up low-income services and work with community-based organizations and private contractors to better capture electric energy savings as part of measure delivery.

In late 2016, following two years of legal proceedings and stakeholder input, the California PUC issued an order significantly improving and expanding its low-income offerings, known as the Energy Savings Assistance (ESA) Program (CPUC 2016). Among the major changes to the program was a commitment of $80 million in new efficiency funds to multifamily buildings. The order also established specific annual electric and natural gas savings targets for Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric, and SoCalGas for 2017 and 2018; each of which will increase 5% in 2019 and 2020.[1] These targets are based largely on the anticipated number of households treated, and were also informed by extensive stakeholder input, review of accomplished savings from prior program cycles, and an energy efficiency potential study (Navigant 2016).

Other policy approaches. Multiple states support or supplement ratepayer-funded low-income programs with taxpayer-subsidized programs. For example, in the absence of significant utility energy efficiency programs, the Alaska Housing Finance Corporation annually contributes significant, albeit varying, levels of state funds toward weatherization assistance, often exceeding $30 million (NASCP 2017). In addition to more than $25 million provided by utility ratepayer funds, Maryland also supplements its weatherization program with close to $200,000 in additional state funds. The state's Department of Housing and Community Development administers ratepayer-funded low-income programs through the EMPOWER Maryland program. In addition, the state Energy Administration makes available up to an additional $9 million a year through its Clean Energy Communities Low-to-Moderate Income Grant Program. The program, funded through proceeds from the Regional Greenhouse Gas Initiative, assists local

[1] Targets are set at 47.0 GWh of electric and 2.0 MMTherms of gas for PG&E, 30.8 GWh of electric for SCE, 6.25 GWh of electric and 0.4 MMTherms of gas for SDG&E, and 4.6 MMTherms of gas for SoCalGas.

governments and not-for-profit organizations to fund energy efficiency projects specifically designed to benefit underserved customer classes.

New York is in the midst of developing new approaches to incentivizing low-income energy efficiency programs through its Reforming the Energy Vision (REV) proceeding aimed at transforming the electric grid and energy markets to develop new business models. In an order approved in early 2016, the state Public Service Commission approved a 10-year, $5 billion Clean Energy Fund, a core component of REV, which includes a set-aside of $234.5 million in initiatives for low-to-moderate income (LMI) New Yorkers during the first three years. The CEF will implement a three-pronged strategy for LMI communities that will include traditional incentives, market development initiatives, and interagency coordination of programs. Stakeholder engagement and recommendations from the Clean Energy Advisory Council's LMI Working Group will inform planning and implementation of programs (NYSERDA 2017).

Cost-Effectiveness Rules that Incorporate Multiple Benefits of Energy Efficiency

The type and level of cost-effectiveness evaluation applied to a utility's portfolio of programs is a key factor guiding the investment of ratepayer dollars in efficiency. In contrast to traditional residential ratepayer-funded programs, low-income programs often seek to address a wider range of challenges beyond simply achieving energy savings; these can include health and safety issues, home durability, arrearage reduction, electricity terminations and reconnections, and costs associated with bill payment assistance programs (Gaffney 2011). For this reason, low-income energy efficiency programs are not usually held to the same cost-benefit requirements or thresholds as other programs. Nevertheless, program administrators are still responsible for demonstrating the value of low-income programs and their individual measures (Kushler, Nowak, and Witte 2012).

In order to better understand the variation in methods for recognizing the unique challenges and costs that low-income energy efficiency programs face, we collected information on how states quantify additional nonenergy benefits and the types of cost-effectiveness valuation practices applied to low-income programs. Generally, we found that these efforts take one of several forms: (1) an explicit (or in some cases, implied) exemption from achieving cost-effectiveness, (2) the application of a generic percentage "adder" to approximate the additional health and safety benefits they provide, or (3) efforts to more specifically calculate and quantify associated nonenergy benefits into the cost-effectiveness calculation.

Note that our research did not include a closer analysis of the primary type(s) of screening test used by utilities in each state. Commonly used screening types include the utility cost test (UCT), total resource cost test (TRC), and the societal cost test (SCT), each typically tailored by regulators to meet state-specific policy priorities or goals. Each of these tests can vary in how, and to what extent, they consider (or don't consider) program impacts to low-income customers. These variations in C/E test design are important for regulators to understand when making decisions about programs and their effectiveness in serving customers. For example, examining low-income customer impacts from a utility perspective will tend to focus more on avoided low-income subsidies, while a participant perspective will tend to focus more on health and safety benefits and economic development concerns (NEEP 2014). The *National Standard Practice Manual* (NSPM), developed by the National Efficiency Screening Project and E4TheFuture, is a helpful resource for regulatory staff designing a primary cost-effectiveness test to meet their needs; the manual provides a step-by-step guide for addressing common technical issues, estimating utility system impacts, and accounting for external impacts (NESP 2017).

Cost-effectiveness exemption. By far the most common practice by states to recognize multiple benefits of efficiency is to simply exempt low-income programs from cost-effectiveness requirements, either explicitly through legislation or commission order, or implicitly in practice. Approximately half of states were found to treat low-income programs this way, though only 11 state respondents cited specific regulatory or legislative language demonstrating this formalized practice. These include Arizona, Illinois, Iowa, Indiana, Kentucky, Maryland, Michigan, Minnesota, Missouri, Oklahoma, and Oregon.

Many states require separate cost-effectiveness requirements or exemptions for low-income programs. For example, Michigan's comprehensive energy bill PA 342 passed by the Michigan legislature in December 2016, extended energy savings targets through 2021 and required that utility waste reduction programs must be collectively cost-effective but excluded low-income programs from this calculation. Similarly, Illinois excludes low-income energy efficiency measures from the need to satisfy the total resource cost (TRC) test within Section 8-103B of the recent Future Energy Jobs Act. Other states such as Oregon and Maryland have established similar exemptions through commission rulings. These exemptions can also come with qualifications, such as in a 2012 order by the Texas Public Utility Commission, which does not require low-income programs to meet the same cost-effectiveness standard it applies to other programs, but still requires the programs to have a savings-to-investment ratio (SIR) that is cost-effective.

Lowered thresholds and/or percentage adders. Program administrators may also lower the cost-effectiveness threshold for low-income programs or incorporate a percentage adder to approximate the nonenergy benefits into cost-effectiveness calculations. For example, the Vermont Public Utility Commission (formerly the Public Service Board), applies a portfolio-wide 15% adder to account for nonenergy benefits associated with its energy efficiency programs, as well as an additional 15% adder for unique benefits associated with low-income sector programs (Vermont Public Service Board 2012). These adjustments were established by the PSB in a 2012 Order, which also directed that the PSB revisit these adders in biennial avoided-cost proceedings. The PSB's decision was informed by a combination of significant stakeholder input through a 2009 workshop on cost-effectiveness screening and an expanded effort to capture the latest research on the valuation and incorporation of nonenergy benefits, which occurred at the same time that other states—like Colorado and New York—were considering similar adders (Malmgren & Skumatz 2014).

In addition, Colorado's low-income adder, originally set at 20% in a 2008 order, was increased to 25% in 2011 (Malmgren and Skumatz 2014). New Mexico adopted a similar adder, with a 20% adjustment to account for benefits such as reductions in working capital, reduced collection costs, lower bad-debt expenses, and improved customer service (17.7.2.9 New Mexico Administrative Code).

Quantifying nonenergy benefits. An increasing number of states have taken steps to go beyond an approximation of low-income nonenergy benefits in an effort calculate a quantifiable value associated with the health- and safety-related impacts of these programs. Massachusetts has long included quantifiable nonenergy impacts (NEIs) in cost-benefit analyses. However, a 2011 NMR Group study estimating a host of NEIs for the state's residential and low-income programs expanded on these efforts. The study included a literature review, in-depth interviews, and telephone surveys with program participants (NMR 2011) to recommend NEIs that have since been formalized through incorporation into the Massachusetts Technical Reference Manual. Examples of recommended health-related NEIs include asthma reductions, thermal stress reductions, productivity improvements due to fewer missed work days and improved sleep, reduced risk of carbon monoxide poisoning, reduced risk of fire, and reduced reliance on high-interest, predatory loans (MA Program Administrators 2015).

Several of these NEIs were revisited and updated for Massachusetts program administrators in a 2016 study by Three^3 and NMR, building upon a 2015 evaluation of the US Department of Energy's Weatherization Assistance Program (Three^3 & NMR 2016; Tonn et al. 2014b). These efforts have also been instrumental in informing similar efforts in other states. In Delaware, the Energy Efficiency Advisory Council approved low-income nonenergy benefit values recommended by the Council's EM&V subcommittee, which included NEIs outlined in the 2016 study by Three^3 and NMR.

California also incorporates low-income NEIs into its total resource cost (TRC) test and a tailored low-income program cost-effectiveness screening procedure known as the Energy Savings Assistance Program Cost Effectiveness Test (ESACET). These two tests are used for information purposes only, with no set required threshold. The CPUC convenes a Cost-Effectiveness Working Group that regularly reviews and recommends NEI values.

Coordination of Ratepayer-Funded Low-Income Programs with Weatherization Assistance Program Services

States can also help coordinate utility, state, and federal funds for low-income weatherization. The Department of Energy's Weatherization Assistance Program (WAP) uses federally-allocated funds to weatherize low-income homes. These funds can be supplemented and coordinated with other state and utility funds to provide more robust and unified programs.

Some states have created statewide administrators to coordinate funds between programs to better serve low-income households. For example, Massachusetts's Low-Income Energy Affordability Network (LEAN) provides a one-stop-shop model for low-income program coordination. LEAN works to standardize eligibility requirements, procedures, and standards to enable delivery of various programs through community action agencies throughout the state. In New Jersey, the state's low-income energy efficiency program—New Jersey Comfort Partners—arose out of 1999 restructuring legislation that designated a systems benefit charge as the funding source for energy efficiency programs. The program coordinates funds from seven utility partners throughout the state to provide one uniform program to customers.

In addition, Ohio's Home Weatherization Assistance Program (HWAP) has long been recognized for its effective combination and coordination of federal weatherization funds and utility resources to provide comprehensive, streamlined services to low-income families. In addition, the state's Electric Partnership Program (EPP), typically funded with approximately $15 million from electric rider revenues, provides in-home audits and energy efficiency measures for low-income households. The Ohio Development Services Agency (ODSA) administers the EPP, along with federal weatherization funding. Most of Ohio's gas utilities also have weatherization programs, typically coordinated with HWAP.

Washington State's Matchmaker Program provides another example of coordination of funds. The Matchmaker Program matches state dollars with utility and other program investments in weatherization. From 2015 to 2017, Washington State invested $15 million through the program and also reserved $4.3 million for its new Weatherization Plus Health initiative, which combines efficiency and health measures targeted to improve home environments for children and adults with asthma.

States are well-positioned to offer coordination between energy efficiency and weatherization resources by establishing a statewide program administrator. States can also convene stakeholders to improve and coordinate low-income program offerings and also leverage sources of funding and implementation.

Additional Strategies for Improving Low-Income Program Impacts

While our research focused primarily on state-level policy mechanisms designed to strengthen overall investment in and implementation of efficiency programs serving low-income households, additional opportunities and policy levers exist to bring stakeholders together to further extend service to hard-to-reach customers. These practices include the following.

Target and support multifamily and rental energy efficiency. Multifamily households and renters tend to be underserved by energy efficiency programs due to a number of barriers, such as split incentives between landlords and renters, time and resource constraints, complex decision-making structures, and marketing and outreach to landlords (Ross, Jarrett, and York 2016). PUCs can allow multifamily and renter-eligible programs to count towards low-income program goals, as many multifamily and renter households are also income-qualified. States can also pass enabling legislation to allow financing tools like Commercial Property Assessed Clean Energy (C-PACE) to help lower the upfront costs associated with multifamily efficiency upgrades. In addition, states can work to address energy efficiency in low-income housing tax credit properties through a variety of options, such as requiring LIHTC property applicants to conduct energy/water audits or evaluations of future energy and water needs (Bartolomei 2017).

Apply a portion of LIHEAP funds towards weatherization. States have the flexibility to allocate up to 15% (or up to 25% after receiving a waiver) of Low-Income Home Energy Assistance Program (LIHEAP) funds towards the DOE Weatherization Assistance Program (WAP) (LIHEAP Clearinghouse 2018). While LIHEAP funds are needed to meet the high need for bill assistance, states can also address long-term energy affordability issues by ramping up weatherization and efficiency efforts.

Coordinate federal, state, and local resources through one-stop-shop models. States can provide a one-stop-shop model to coordinate federal, state, utility, and other resources for weatherization and efficiency programs. This model provides participants with a single point of contact to guide them through the application, planning, implementation, and verification processes. Some states that provide this one-stop-shop model include Massachusetts, New Jersey, Wisconsin, and New York.

Streamline approval for low-income weatherization or efficiency programs through automatic enrollment with other low-income services. In order to reduce the administrative costs of confirming income qualifications for low-income program participation, other low-income qualifications can be used to enroll customers. Customers who enroll in certain income-qualified programs can also be automatically enrolled in weatherization programs. For example, some utilities can automatically qualify customers to enroll in their low-income programs if they are already enrolled in certain federal income-qualified programs.[2] States can require that utilities streamline eligibility requirements for participation in low-income efficiency and that weatherization programs match other low-income program definitions in order to facilitate program enrollment.

Allocate funds to maximize participation by addressing health and safety issues. Many states allocate a proportion of the weatherization or utility ratepayer funds to address health and safety issues. This allows the program to attribute funds to nonenergy saving measures and also reduce households that must be deferred from program participation due to health and safety concerns in their home. For example, the Washington State Matchmaker program—which matches state dollars with utility and other programs' investments in weatherization—reserves $4.3 million of its $15 million budget to address health and safety issues in homes during weatherization.

Conclusion

Our review highlights a diversity of approaches states have undertaken to strengthen and stabilize services to improve the energy efficiency of low-income households. While state policies to direct dedicated and consistent levels of funding to low-income customers—either through legislation, regulation, or commission order—are among the most powerful for ensuring these programs have the necessary resources, a variety of additional tools are available to strengthen accountability, achieve higher levels of savings, and target underrepresented customers. Another key determinant of program success is the degree to which state policymakers exercise authority to set program priorities and convene stakeholders to communicate shared challenges, identify resource needs, and develop plans in service of state goals. In future research we hope to extend our analytical focus beyond policies to strengthen levels of investment in these programs, to look closer at more intricate efforts to optimize stakeholder networks and leverage complementary program support to identify and fill program and policy gaps.

[2] For example, some utilities streamline enrollment to their low-income programs with federal programs, such as the Supplemental Nutrition Assistance Program (SNAP); Women, Infants, and Children (WIC); Supplemental Security Income (SSI); Tribal Energy Program; Temporary Assistance for Needy Families (TANF); Children's Health Insurance Program (CHIP); Veterans Affairs Supportive Housing (VASH); National School Lunch Program (NSL); Medicaid; and Lifeline Assistance programs (Drehobl and Castro-Alvarez 2017).

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Dianne M. Triplett
Deputy General Counsel
Duke Energy Florida, LLC

March 1, 2019

VIA ELECTRONIC FILING

Mr. Adam Teitzman, Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: *Demand Side Management Annual Report for Calendar Year 2018*; Undocketed

Dear Mr. Teitzman:

In accordance with Rule 25-17.0021(5), Florida Administrative Code, attached please find for filing in Undocketed Matters Duke Energy Florida, LLC's Demand Side Management Annual Report for the year 2018.

Thank you for your assistance in this matter. Please feel free to call me at (727) 820-4692 should you have any questions concerning this filing.

Respectfully,

/s/ Dianne M. Triplett

Dianne M. Triplett

DMT/cmk
Enclosure

cc: Trip Coston, FPSC Division of Economics
Judy Harlow, FPSC Division of Economics

DUKE ENERGY FLORIDA, LLC (DEF)
SUMMARY OF 2018 DEMAND SIDE MANAGEMENT ACHIEVEMENTS

The Commission Approved Goals for 2015-2024 presented in the "Comparison of Cumulative Achieved MW & GWH Reductions with Public Service Commission Established Goals" represent DEF's annual DSM goals as established by the Commission in Order PSC-2014-0696-FOF-EU.

The Total Achievements represent the actual MW and GWH savings achieved in each of the respective years. The achievements are based on the programs and the measures included in the 2015 DSM Program Plan (Plan) that was approved by the Commission (Docket 20150083, PSC 2015-0332-PAA-EG) on August 20, 2015.

The energy and capacity savings DEF's DSM programs delivered in 2018 exceeded the Commission approved 2018 winter MW, summer MW and GWH goals for both the residential and commercial sector. DEF performed 34,900 home energy audits in 2018 resulting in incentives to residential customers for the installation of 26,201 energy efficiency measures. DEF added 6,426 residential customers to its residential demand response program. DEF also supported residential low income customers through the installation of energy efficiency measures in the homes of 4,486 customers through its Neighborhood Energy Saver Program (NES) and in the homes of 204 customers through its Low Income Weatherization Assistance Program (LIWAP).

The Commission approved requested modifications to DEF's LIWAP and NES programs to allow DEF to transition from providing a combination of CFL and LED light bulbs to customers to exclusively providing LED light bulbs. The Commission also approved two proposed modifications to DEF's Better Business Program. The first was for air cooled and water-cooled chillers. The need for the modifications was driven by updates to the minimum efficiency requirements in the Florida Building Code that went into effect January 1, 2018. The second approved modification was to the processes for incentive payments to customers. This change allows DEF to pay incentives directly to Trade Allies provided the customer provides signed authorization conveying the incentive to the Trade Ally or if the Trade Ally discounts the incentive on the invoice at the point of sale. Incorporating this change streamlines the process for providing incentives to customers.

DEF exceeded the 2018 commercial summer MW, winter MW and GWH goals. DEF performed 668 commercial energy audits and provided incentives to commercial customers for 550 energy efficiency measures through its commercial Better Business program.

DEF continues to promote and market its energy conservation programs to customers through a variety of channels including direct mail, e-mail, bill inserts, web promotions, and radio and television advertising. DEF also participates in home shows, trade shows, community events, and works through trade allies to effectively promote its portfolio of programs and educate its customers about energy efficiency.

DUKE ENERGY FLORIDA
2018
COMPARISON OF CUMULATIVE ACHIEVED MW & GWH REDUCTIONS at the Generator
PUBLIC SERVICE COMMISSION ESTABLISHED GOALS ORDER PSC-14-0696-FOF-EU

RESIDENTIAL

	WINTER PEAK MW REDUCTION			SUMMER PEAK MW REDUCTION			GWH ENERGY REDUCTION		
YEAR	TOTAL ACHIEVED**	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED**	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED**	COMMISSION APPROVED GOAL*	% VARIANCE
2015	41	58	-29%	25	26	-4%	39	26	55%
2016	94	112	-16%	55	50	10%	87	49	76%
2017	148	160	-8%	86	73	18%	133	70	90%
2018	193	203	-5%	112	93	20%	176	87	103%
2019		241			110			100	
2020		273			126			109	
2021		301			140			116	
2022		325			152			119	
2023		348			163			121	
2024		369			174			123	

COMMERCIAL / INDUSTRIAL

	WINTER PEAK MW REDUCTION			SUMMER PEAK MW REDUCTION			GWH ENERGY REDUCTION		
YEAR	TOTAL ACHIEVED**	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED**	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED**	COMMISSION APPROVED GOAL*	% VARIANCE
2015	28	5	411%	35	12	191%	36	15	150%
2016	100	11	821%	120	24	409%	64	28	127%
2017	126	16	667%	172	35	397%	99	40	148%
2018	169	22	687%	232	45	421%	138	50	176%
2019		27			54			58	
2020		32			62			64	
2021		37			69			68	
2022		41			75			70	
2023		46			80			72	
2024		51			85			72	

Total

	WINTER PEAK MW REDUCTION			SUMMER PEAK MW REDUCTION			GWH ENERGY REDUCTION		
YEAR	TOTAL ACHIEVED**	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED**	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED**	COMMISSION APPROVED GOAL*	% VARIANCE
2015	69	64	8%	60	38	57%	76	40	89%
2016	193	122	58%	176	74	137%	151	77	94%
2017	274	177	55%	258	107	141%	232	110	111%
2018	362	225	61%	344	137	151%	315	137	129%
2019		267			164			158	
2020		305			188			173	
2021		337			208			183	
2022		367			227			190	
2023		394			243			193	
2024		419			259			195	

*2015-2024 Goals are based on ORDER NO. PSC-14-0696-FOF-EU issued December 16, 2014
Figures are rounded to the nearest whole number and are at the Generator

DUKE ENERGY FLORIDA
2018
COMPARISON OF ANNUAL ACHIEVED MW & GWH REDUCTIONS BASED ON PSC-14-0696-FOF-EU WITH PUBLIC SERVICE COMMISSION ESTABLISHED ANNUAL GOALS*

RESIDENTIAL

	WINTER PEAK MW REDUCTION			SUMMER PEAK MW REDUCTION			GWH ENERGY REDUCTION		
YEAR	TOTAL ACHIEVED	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED	COMMISSION APPROVED GOAL*	% VARIANCE
2015	41	58	-29%	25	26	-4%	39	26	55%
2016	52	53	-1%	30	24	25%	47	24	99%
2017	54	49	11%	31	22	38%	46	21	123%
2018	45	43	4%	26	20	28%	43	17	155%
2019		38			18			13	
2020		32			16			9	
2021		28			14			6	
2022		25			12			4	
2023		22			11			2	
2024		21			11			1	

COMMERCIAL / INDUSTRIAL*

	WINTER PEAK MW REDUCTION			SUMMER PEAK MW REDUCTION			GWH ENERGY REDUCTION		
YEAR	TOTAL ACHIEVED	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED	COMMISSION APPROVED GOAL*	% VARIANCE
2015	28	5	411%	35	12	191%	36	15	150%
2016	72	5	1232%	85	12	635%	28	14	103%
2017	26	6	370%	52	11	371%	35	12	195%
2018	43	5	750%	60	10	503%	39	10	290%
2019		5			9			8	
2020		5			8			6	
2021		5			7			4	
2022		5			6			2	
2023		5			6			1	
2024		5			5			1	

Total*

	WINTER PEAK MW REDUCTION			SUMMER PEAK MW REDUCTION			GWH ENERGY REDUCTION		
YEAR	TOTAL ACHIEVED	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED	COMMISSION APPROVED GOAL*	% VARIANCE	TOTAL ACHIEVED	COMMISSION APPROVED GOAL*	% VARIANCE
2015	69	64	8%	60	38	57%	76	40	89%
2016	124	59	113%	115	36	224%	75	37	100%
2017	81	54	48%	82	33	148%	82	33	149%
2018	88	48	83%	86	30	186%	82	27	205%
2019		43			27			21	
2020		37			24			15	
2021		33			21			10	
2022		29			18			6	
2023		27			17			4	
2024		25			16			2	

*2015-2024 Goals are based on ORDER NO. PSC-14-0696-FOF-EU issued December 16, 2014
Figures are rounded to the nearest whole number and are at the Generator

Demand Side Management Annual Report

Utility: DUKE ENERGY FLORIDA, LLC.
Program Name: Home Energy Check
Program Start Date: 1991
Reporting Period: 2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	1,520,916	1,456,095	35,706	2.45%	30,901	30,901	2%	-4,805
2016	1,544,620	1,475,736	70,222	4.76%	32,172	63,073	4%	-7,149
2017	1,568,452	1,498,230	102,589	6.85%	37,059	100,132	7%	-2,457
2018	1,591,324	1,524,441	132,240	8.67%	34,900	135,032	9%	2,792
2019	1,612,908	1,550,890	159,041	10.25%				
2020	1,634,061	1,577,609	183,222	11.61%				
2021	1,654,509	1,603,523	205,252	12.80%				
2022	1,674,417	1,628,202	225,672	13.86%				
2023	1,693,168	1,650,717	244,991	14.84%				
2024	1,711,369	1,671,630	263,616	15.77%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings	Per Installation		Program Total	
(during the reporting period)	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.165	0.175	5,743	6,101
Winter kW Reduction	0.253	0.269	8,840	9,391
Annual kWh Reduction	592	629	20,657,189	21,944,681

Utility Cost per Installation: $139
Total Program Cost of the Utility ($000): $4,853
Net Benefits of Measures Installed During Reporting Period ($000): N/A

Demand Side Management Annual Report

Utility: DUKE ENERGY FLORIDA, LLC.
Program Name: Residential Incentive Program (f/k/a Home Energy Improvement)
Program Start Date: 1996 with modifications approved in 2006 and 2015
Reporting Period: 2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program/Measure Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program/Measure Participants	Actual Cumulative Number of Program/Measure Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	1,520,916	1,520,916	19,806	1.30%	53,179	53,179	3%	33,373
2016	1,544,620	1,544,620	37,827	2.45%	33,128	86,307	6%	48,480
2017	1,568,452	1,568,452	53,529	3.41%	26,190	112,497	7%	58,968
2018	1,591,324	1,591,324	66,300	4.17%	26,201	138,698	9%	72,398
2019	1,612,908	1,612,908	75,994	4.71%				
2020	1,634,061	1,634,061	82,864	5.07%				
2021	1,654,509	1,654,509	87,409	5.28%				
2022	1,674,417	1,674,417	90,216	5.39%				
2023	1,693,168	1,693,168	91,834	5.42%				
2024	1,711,369	1,711,369	92,705	5.42%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings (during the reporting period)	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.30	0.32	7,824	8,311
Winter kW Reduction	0.58	0.62	15,317	16,271
Annual kWh Reduction	427	454	11,186,049	11,883,237

Utility Cost per Installation: $316
Total Program Cost of the Utility ($000): $8,268
Net Benefits of Measures Installed During Reporting Period ($000): $1,383

Demand Side Management Annual Report

Utility:	DUKE ENERGY FLORIDA, LLC.
Program Name:	Low Income Weatherization Assistance
Program Start Date:	May 2000 with modifications approved in 2005, 2015, 2017 & 2018
Reporting Period:	2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program/Measure Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program/Measure Participants	Actual Cumulative Number of Program/Measure Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	1,520,916	416,016	500	0.12%	337	337	0%	-163
2016	1,544,620	423,836	1,000	0.24%	392	729	0%	-271
2017	1,568,452	432,323	1,500	0.35%	320	1,049	0%	-451
2018	1,591,324	440,980	2,000	0.45%	204	1,253	0%	-747
2019	1,612,908	449,809	2,500	0.56%				
2020	1,634,061	458,815	3,000	0.65%				
2021	1,654,509	468,002	3,500	0.75%				
2022	1,674,417	477,372	4,000	0.84%				
2023	1,693,168	486,929	4,500	0.92%				
2024	1,711,369	496,678	5,000	1.01%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings	Per Installation		Program Total	
(during the reporting period)	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.71	0.76	146	155
Winter kW Reduction	1.42	1.51	289	307
Annual kWh Reduction	1,127	1,197	229,969	244,302

Utility Cost per Installation:	$1,273
Total Program Cost of the Utility ($000):	$260
Net Benefits of Measures Installed During Reporting Period ($000):	$13

Demand Side Management Annual Report

Utility:	DUKE ENERGY FLORIDA, LLC.
Program Name:	Neighborhood Energy Saver
Program Start Date:	2007 with modifications approved in 2015 & 2018
Reporting Period:	2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	1,520,916	416,016	19,500	4.69%	3,420	3,420	1%	-16,080
2016	1,544,620	419,836	39,000	9.29%	19,786	23,206	6%	-15,794
2017	1,568,452	428,323	58,500	13.66%	21,171	44,377	10%	-14,123
2018	1,591,324	436,980	78,000	17.85%	20,906	65,284	15%	-12,716
2019	1,612,908	445,809	97,500	21.87%				
2020	1,634,061	454,815	102,000	22.43%				
2021	1,654,509	464,002	106,500	22.95%				
2022	1,674,417	473,372	111,000	23.45%				
2023	1,693,168	782,929	115,500	14.75%				
2024	1,711,369	492,678	120,000	24.36%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings (during the reporting period)	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.16	0.17	3,363	3,573
Winter kW Reduction	0.21	0.23	4,485	4,764
Annual kWh Reduction	420	447	8,787,906	9,335,626

Utility Cost per Installation:	$112
Total Program Cost of the Utility ($000):	$2,333
Net Benefits of Measures Installed During Reporting Period ($000):	$75

Demand Side Management Annual Report

Utility:	DUKE ENERGY FLORIDA, LLC.
Program Name:	Residential Energy Management
Program Start Date:	January 1981 , revision approved May 2000, 2nd revision approved 2006, 3rd revision approved 2015
Reporting Period:	2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	1,520,916	971,698	10,000	1.03%	5,025	5,025	1%	-4,975
2016	1,544,620	986,842	18,700	1.89%	8,634	13,659	1%	-5,041
2017	1,568,452	1,002,068	27,400	2.73%	9,561	23,220	2%	-4,180
2018	1,591,324	1,016,681	36,100	3.55%	6,426	29,646	3%	-6,454
2019	1,612,908	1,030,471	44,800	4.35%				
2020	1,634,061	1,043,985	53,500	5.12%				
2021	1,654,509	1,057,049	62,200	5.88%				
2022	1,674,417	1,069,768	70,900	6.63%				
2023	1,693,168	1,081,748	79,600	7.36%				
2024	1,711,369	1,093,377	88,300	8.08%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083
f Annual Number of Program Participants represents new accounts added to the program each year.

Annual Demand & Energy Savings	Per Installation		Program Total	
(during the reporting period)	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	1.09	1.16	7,004	7,441
Winter kW Reduction	2.09	2.22	13,430	14,267
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation: *	$101
Total Program Cost of the Utility ($000):**	$43,389
Net Benefits of Measures Installed During Reporting Period ($000):	$9,227

Utility cost per Installation is based on the total, cumulative number of year-end participants.
*****Utility program costs for this program include incentives paid to eligible participants.***

Total Program Participants at End of Year 435,223

Demand Side Management Annual Report

Utility: DUKE ENERGY FLORIDA, LLC.
Program Name: Business Energy Check
Program Start Date: 1991
Reporting Period: 2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	171,935	167,335	2,500	1.49%	1,486	1,486	1%	-1,014
2016	174,479	169,449	4,347	2.57%	699	2,185	1%	-2,162
2017	177,027	172,680	6,027	3.49%	640	2,825	2%	-3,202
2018	179,468	175,940	7,507	4.27%	668	3,493	2%	-4,014
2019	181,752	178,592	8,822	4.94%				
2020	183,977	181,182	9,863	5.44%				
2021	186,117	183,761	10,550	5.74%				
2022	188,190	186,462	10,970	5.88%				
2023	190,125	189,018	11,220	5.94%				
2024	191,987	191,317	11,376	5.95%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings	Per Installation		Program Total	
(during the reporting period)	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.16	0.17	105	110
Winter kW Reduction	0.12	0.13	83	87
Annual kWh Reduction	834	874	557,220	583,882

Utility Cost per Installation: $816
Total Program Cost of the Utility ($000): $545
Net Benefits of Measures Installed During Reporting Period ($000): N/A

Demand Side Management Annual Report

Utility: DUKE ENERGY FLORIDA, LLC.
Program Name: Better Business
Program Start Date: April 1996 with modifications approved in 2006, 2015, 2016 and 2018
Reporting Period: 2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	171,935	171,935	2,089	1.21%	1,030	1,030	1%	-1,059
2016	174,479	174,479	3,878	2.22%	760	1,790	1%	-2,088
2017	177,027	177,027	5,437	3.07%	635	2,425	1%	-3,012
2018	179,468	179,468	6,705	3.74%	550	2,975	2%	-3,730
2019	181,752	181,752	7,668	4.22%				
2020	183,977	183,977	8,350	4.54%				
2021	186,117	186,117	8,801	4.73%				
2022	188,190	188,190	9,080	4.82%				
2023	190,125	190,125	9,241	4.86%				
2024	191,987	191,987	9,327	4.86%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings (during the reporting period)	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	31.82	33.34	17,501	18,339
Winter kW Reduction	3.71	3.89	2,040	2,138
Annual kWh Reduction	46,171	48,381	25,394,247	26,609,329

Utility Cost per Installation:	$5,762
Total Program Cost of the Utility ($000):	$3,169
Net Benefits of Measures Installed During Reporting Period ($000):	$1,719

Demand Side Management Annual Report

Utility:	DUKE ENERGY FLORIDA, LLC.
Program Name:	Florida Custom Incentive Program (formerly Innovative Incentive)
Program Start Date:	1991
Reporting Period:	2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	171,935	171,935	10	0.01%	7	7	0%	-3
2016	174,479	174,479	47	0.03%	4	11	0%	-36
2017	177,027	177,027	82	0.05%	4	15	0%	-67
2018	179,468	179,468	115	0.06%	29	44	0%	-71
2019	181,752	181,752	146	0.08%				
2020	183,977	183,977	174	0.09%				
2021	186,117	186,117	199	0.11%				
2022	188,190	188,190	229	0.12%				
2023	190,125	190,125	254	0.13%				
2024	191,987	191,987	274	0.14%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings	Per Installation		Program Total	
(during the reporting period)	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	138.5	145.1	4,017	4,209
Winter kW Reduction	51.5	53.9	1,492	1,564
Annual kWh Reduction	387,703	406,254	11,243,380	11,781,361

Utility Cost per Installation:	$26,310
Total Program Cost of the Utility ($000):	$763
Net Benefits of Measures Installed During Reporting Period ($000):	N/A

Demand Side Management Annual Report

Utility:	DUKE ENERGY FLORIDA, LLC.
Program Name:	Commercial Energy Management
Program Start Date:	April 1996 - (Closed to new participants effective May 2000)
Reporting Period:	2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	171,935	0	0	0.00%	0	0	0%	0
2016	174,479	0	0	0.00%	0	0	0%	0
2017	177,027	0	0	0.00%	0	0	0%	0
2018	179,468	0	0	0.00%	0	0	0%	0
2019	181,752							
2020	183,977							
2021	186,117							
2022	188,190							
2023	190,125							
2024	191,987							

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings (during the reporting period)	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	---	---	0.0	0.0
Winter kW Reduction	---	---	0.0	0.0
Annual kWh Reduction	---	---	0.0	0.0

Utility Cost per Installation:	$10,196
Total Program Cost of the Utility ($000): *	$591
Net Benefits of Measures Installed During Reporting Period ($000):	N/A

**** Utility cost per Installation is based on the total, cumulative number of year-end participants.***
***** Utility program costs for this program include incentives paid to eligible participants.***

****Total NET Participants at the End of the Year*** 58

Demand Side Management Annual Report

Utility: DUKE ENERGY FLORIDA, LLC.
Program Name: Interruptible Service
Program Start Date: November 1992 - (Rate Schedule IS-1 is closed to new customers, and IS-2 became effective June 1996.)
Reporting Period: 2018

a Year	b Total Number of Customers	c Total Number of Eligible Customers	d Projected Cumulative Number of Program Participants	e Projected Cumulative Penetration Level % [(d/c)x100]	f Actual Annual Number of Program Participants	g Actual Cumulative Number of Program Participants	h Actual Cumulative Penetration Level % [(g/c)x100]	i Actual Participation Over (Under) Projected Participants (g-d)
2015	171,935	464	1	0.22%	2	2	0%	1
2016	174,479	472	2	0.42%	1	3	1%	1
2017	177,027	479	3	0.63%	3	6	1%	3
2018	179,468	485	4	0.82%	42	48	10%	44
2019	181,752	491	5	1.02%				
2020	183,977	497	6	1.21%				
2021	186,117	503	7	1.39%				
2022	188,190	509	8	1.57%				
2023	190,125	514	9	1.75%				
2024	191,987	519	10	1.93%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings	Per Installation		Program Total	
(during the reporting period)	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	778.3	815.5	32,688	34,252
Winter kW Reduction	821.1	860.4	34,486	36,136
Annual kWh Reduction	0.0	0.0	0	0

Utility Cost per Installation: * $217,430
Total Program Cost of the Utility ($000): ** $36,963
Net Benefits of Measures Installed During Reporting Period ($000): $31,233

**** Utility cost per Installation is based on the total, cumulative number of year-end participants.***
***** Utility program costs for this program include incentives paid to eligible participants.***

Total NET Participants at End of Year 170

Demand Side Management Annual Report

Utility: DUKE ENERGY FLORIDA, LLC.
Program Name: Standby Generation
Program Start Date: April 1993 with revisions approved 2006, 2015 and 2016
Reporting Period: 2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	171,935	549	10	1.82%	25	25	5%	15
2016	174,479	557	20	3.59%	147	172	31%	152
2017	177,027	566	30	5.30%	28	200	35%	170
2018	179,468	574	40	6.97%	12	212	37%	172
2019	181,752	581	50	8.61%				
2020	183,977	592	60	10.14%				
2021	186,117	596	70	11.74%				
2022	188,190	602	80	13.29%				
2023	190,125	608	90	14.80%				
2024	191,987	614	100	16.29%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings (during the reporting period)	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	273	286	3,273	3,430
Winter kW Reduction	273	286	3,273	3,430
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation: * $25,954
Total Program Cost of the Utility ($000):** $4,620
Net Benefits of Measures Installed During Reporting Period ($000): $1,685

**** Utility cost per Installation is based on the total, cumulative number of year-end participants.***
***** Total program costs for this program include incentives paid to eligible participants.***

Total NET Participants at End of Year 178

Demand Side Management Annual Report

Utility:	DUKE ENERGY FLORIDA, LLC.
Program Name:	Curtailable Service
Program Start Date:	November 1992 - (Rate Schedule CS-1 is closed to new customers, and CS-2 became effective June 1996.)
Reporting Period:	2018

a	b	c	d	e	f	g	h	i
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants*	Actual Cumulative Number of Program Participants**	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	171,935	910	0	0.00%	0	0	0%	0
2016	174,479	925	0	0.00%	0	0	0%	0
2017	177,027	938	1	0.11%	0	0	0%	-1
2018	179,468	951	1	0.11%	0	0	0%	-1
2019	181,752	963	1	0.10%				
2020	183,977	975	2	0.21%				
2021	186,117	986	2	0.20%				
2022	188,190	997	2	0.20%				
2023	190,125	1,008	3	0.30%				
2024	191,987	1,018	3	0.29%				

cols b,c,d,e are based on DEF's 2015 Program Plan approved by the Commission in Docket 150083

Annual Demand & Energy Savings (during the reporting period)	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	---	---	0.0	0.0
Winter kW Reduction	---	---	0.0	0.0
Annual kWh Reduction	---	---	0.0	0.0

Utility Cost per Installation: *	$544,450
Total Program Cost of the Utility ($000): **	$2,178
Net Benefits of Measures Installed During Reporting Period ($000):	$0

**** Utility cost per Installation is based on actual 2017 program costs divided by the number of accounts participating in this program.***
***** Utility program costs for this program include incentives paid to eligible participants.***

Total NET Participants at End of Year 4

AUSLEY MCMULLEN
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TALLAHASSEE, FLORIDA 32301
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March 1, 2019

VIA: ELECTRONIC MAIL

Mr. Greg Shafer, Director
Division of Economics
Florida Public Service Commission
Room 225E – Gerald L. Gunter Building
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Re: Tampa Electric Company's Summary of 2018 DSM Program Accomplishments

Dear Mr. Shafer:

Enclosed for filing is Tampa Electric Company's Summary of 2018 Demand Side Management Program Accomplishments, including an Appendix A (DSM Energy Education and Awareness Activities of 2018).

Thank you for your assistance in connection with this matter.

Sincerely,

James D. Beasley

JDB/pp
Enclosure

cc: Paula K. Brown (w/o enc.)

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AN EMERA COMPANY

2018

DEMAND SIDE MANAGEMENT PROGRAM ACCOMPLISHMENTS

FILED: March 1, 2019

TAMPA ELECTRIC COMPANY - SUMMARY OF 2018 DEMAND SIDE MANAGEMENT PROGRAM ACCOMPLISHMENTS

Tampa Electric received approval of its 2015-2024 Demand Side Management ("DSM") goals in Docket No. 130201-EI, Order No. PSC-14-0696-FOF-EU, issued December 16, 2014. The company received approval of its 2015-2024 DSM Plan on August 11, 2015 in Docket No. 150081-EG, Order No. PSC-15-0323-PAA-EG. Tampa Electric transitioned to the DSM programs within the 2015-2024 DSM Plan on November 3, 2015 pursuant to receiving final approval of the supporting DSM standards on September 24, 2015.

For 2018, Tampa Electric achieved all the annual and cumulative residential, commercial/industrial ("Comm/Ind") and combined DSM goals. The company achieved the following summer demand ("SkW"), winter demand ("WkW") and annual energy ("AE") reductions identified at the generator:

2018 Residential Goals		Actual Residential DSM Achieved	
SkW:	2.7 MW	SkW:	5.6 MW
WkW:	6.5 MW	WkW:	8.0 MW
AE:	6.1 GWh	AE:	17.1 GWh

2018 Comm/Ind Goals		Actual Comm/Ind DSM Achieved	
SkW:	3.3 MW	SkW:	15.0 MW
WkW:	1.7 MW	WkW:	13.0 MW
AE:	9.2 GWh	AE:	33.7 GWh

2018 Combined Goals		Actual Combined DSM Achieved	
SkW:	6.0 MW	SkW:	20.5 MW
WkW:	8.2 MW	WkW:	21.0 MW
AE:	15.3 GWh	AE:	50.8 GWh

In 2018, Tampa Electric also received approval for and initiated the new Street and Outdoor Lighting conversion program. During 2018, the company converted 31,936 street and outdoor lighting luminaires to Light Emitting Diode ("LED") technology. While this program does not supplement the company's conservation efforts toward achieving the Commission's annual demand and energy goals above, these luminaire replacements contributed the following additional demand and annual energy savings at the generator:

SkW:	0.00 MW
WkW:	4.247 MW
AE:	18.395 GWh

In 2018, the company also continued to make progress with Research and Development ("R&D") efforts with battery storage and finalized the commercial low-income weatherization analysis. In addition, Tampa Electric continued collaborating with the other FEECA utilities in the development of the Technical Potential which will be used as the basis for the next set of goals the company's petitions the Commission for approval in 2019. A summary of 2018 energy education and awareness activities is included as an appendix to this report. The R&D report for commercial low-income weatherization is also included as an appendix to this report.

For 2019, Tampa Electric remains committed to offering DSM programs that advance the policy objectives of FEECA, are directly monitorable and yield measurable results and are cost-effective to deliver. The company will continue its advertising campaign of bill inserts, print media and television advertisements aimed at educating customers on opportunities to participate in programs to assist in meeting their energy efficiency requirements.

The attached pages present individual program participation levels and summaries that demonstrate the company achieved its annual residential, commercial and combined DSM goals as described in Rule 25-17, (4), Florida Administrative Code.

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL ALTERNATE AUDIT (aka Walk-Thru Audit or EA Free)
Program Start Date: May 1981
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,392	8,400	6,000	1.0%	8,304	8,304	1.3%	2,304
2016	640,090	640,090	8,400	12,000	1.9%	6,902	15,206	2.4%	3,206
2017	651,770	651,770	7,800	18,000	2.8%	5,501	20,707	3.2%	2,707
2018	662,917	662,917	6,000	24,000	3.6%	7,667	28,374	4.3%	4,374
2019									
2020									
2021									
2022									
2023									
2024									

3

Annual Demand and Energy Savings - 2018, Note 1 Participants 7,667

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.07	0.08	536.69	575.87
Winter kW Reduction	0.08	0.09	621.03	666.36
Annual kWh Reduction	395	417	3,028,465	3,198,059

Utility Cost per Installation ($):	246
Total Program Cost of the Utility ($000):	1,888.2
Net Benefits of Measures Installed During Reporting Period ($000):	(1,907.0)

Note 1: Demand and energy savings not included in achievements

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL CUSTOMER ASSISTED AUDITS
Program Start Date: June 1996
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,392	1,390	500	0.1%	658	658	0.1%	158
2016	640,090	640,090	1,200	1,000	0.2%	1,017	1,675	0.3%	675
2017	651,770	651,770	500	1,500	0.2%	409	2,084	0.3%	584
2018	662,917	662,917	800	2,000	0.3%	27,734	29,818	4.5%	27818
2019									
2020									
2021									
2022									
2023									
2024									

4

Annual Demand and Energy Savings - 2018, Note 1 Participants 27,734

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.05	0.06	1,469.90	1,577.20
Winter kW Reduction	0.06	0.07	1,691.77	1,815.27
Annual kWh Reduction	296	313	8,209,264	8,668,983

Utility Cost per Installation ($): 14
Total Program Cost of the Utility ($000): 398.0
Net Benefits of Measures Installed During Reporting Period ($000): 864.7
Note 1: Demand and energy savings not included in achievements

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL RCS AUDIT (Computer Assisted - Paid)
Program Start Date: January 1981
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,392	0	1	0.0%	5	5	0.0%	4
2016	640,090	640,090	4	2	0.0%	9	14	0.0%	12
2017	651,770	651,770	10	3	0.0%	4	18	0.0%	15
2018	662,917	662,917	10	4	0.0%	2	20	0.0%	16
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 2

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.07	0.08	0.14	0.15
Winter kW Reduction	0.08	0.09	0.16	0.17
Annual kWh Reduction	395	417	790	834

Utility Cost per Installation ($): 824
Total Program Cost of the Utility ($000): 1.6
Net Benefits of Measures Installed During Reporting Period ($000): (5.0)
Note 1: Demand and energy savings not included in achievements

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL CEILING INSULATION
Program Start Date: November 1982
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	494,802	7,200	1,000	0.2%	3,057	3,057	0.6%	2,057
2016	640,090	491,745	2,760	2,000	0.4%	1,293	4,350	0.9%	2,350
2017	651,770	490,452	1,255	3,000	0.6%	945	5,295	1.1%	2,295
2018	662,917	489,507	1,300	4,000	0.8%	594	5,889	1.2%	1,889
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 594

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.26	0.28	153.85	165.08
Winter kW Reduction	0.37	0.40	220.97	237.10
Annual kWh Reduction	848	895	503,712	531,920

Utility Cost per Installation ($): 367
Total Program Cost of the Utility ($000): 217.9
Net Benefits of Measures Installed During Reporting Period ($000): 518.2

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility:	Tampa Electric Company
Program Name:	RESIDENTIAL DUCT REPAIR
Program Start Date:	September 1992
Reporting Period:	Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	480,750	1,680	750	1.9%	1,895	1,895	0.8%	1,145
2016	640,090	478,855	2,040	1,500	1.9%	1,293	3,188	0.8%	1,688
2017	651,770	477,562	1,530	2,250	1.9%	1,176	4,364	0.8%	2,114
2018	662,917	476,386	1,300	3,000	1.9%	1,997	6,361	0.8%	3,361
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018

Participants 1,997

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.17	0.18	341.49	366.42
Winter kW Reduction	0.22	0.23	433.35	464.98
Annual kWh Reduction	298	315	595,106	628,432

Utility Cost per Installation ($):	178
Total Program Cost of the Utility ($000):	356.2
Net Benefits of Measures Installed During Reporting Period ($000):	275.6

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL ELECTRONICALLY COMMUTATED MOTORS
Program Start Date: November 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,392	0	5	0.0%	4	4	0.0%	(1)
2016	640,090	640,090	0	15	0.0%	0	4	0.0%	(11)
2017	651,770	651,770	0	35	0.0%	0	4	0.0%	(31)
2018	662,917	662,917	0	70	0.0%	0	4	0.0%	(66)
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.15	0.16	0.00	0.00
Winter kW Reduction	0.14	0.15	0.00	0.00
Annual kWh Reduction	388	410	0	0

Utility Cost per Installation ($): 0
Total Program Cost of the Utility ($000): 0.0
Net Benefits of Measures Installed During Reporting Period ($000): 0.1

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: ENERGY EDUCATION, AWARENESS AND AGENCY OUTREACH
Program Start Date: May 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,392	2,000	500	0.1%	1,412	1,412	0.2%	912
2016	640,090	640,090	2,000	1,000	0.2%	461	1,873	0.3%	873
2017	651,770	651,770	500	1,500	0.2%	975	2,848	0.4%	1,348
2018	662,917	662,917	750	2,000	0.3%	806	3,654	0.6%	1,654
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 806

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.03	0.03	21.76	23.35
Winter kW Reduction	0.05	0.05	39.49	42.38
Annual kWh Reduction	377	398	303,862	320,878

Utility Cost per Installation ($): 153
Total Program Cost of the Utility ($000): 123.5
Net Benefits of Measures Installed During Reporting Period ($000): (95.0)

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: ENERGY STAR for NEW MULTI-FAMILY RESIDENCES
Program Start Date: June 2017
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	0	0	0	0	0.0%	0	0	0.0%	0
2016	0	0	0	0	0.0%	0	0	0.0%	0
2017	201,074	3,820	600	600	15.7%	0	0	0.0%	(600)
2018	207,026	5,952	600	600	10.1%	0	0	0.0%	(600)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.36	0.39	0.00	0.00
Winter kW Reduction	0.24	0.26	0.00	0.00
Annual kWh Reduction	1,239	1,308	0	0

Utility Cost per Installation ($): 0
Total Program Cost of the Utility ($000): 1.2
Net Benefits of Measures Installed During Reporting Period ($000): 0.0

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: ENERGY STAR for NEW HOMES (formerly RESIDENTIAL NEW CONSTRUCTION)
Program Start Date: Closed New Construction and opened ENERGY STAR November 2015
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	4,361	2,400	100	2.3%	2,494	2,494	57.2%	2,394
2016	640,090	3,870	1,200	300	7.8%	403	2,897	74.9%	2,597
2017	651,770	2,953	1,000	550	18.6%	640	3,537	119.8%	2,987
2018	662,917	9,544	1,000	800	8.4%	823	4,360	45.7%	3,560
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 823

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.53	0.57	437.01	468.91
Winter kW Reduction	0.49	0.53	403.27	432.71
Annual kWh Reduction	2,489	2,628	2,048,447	2,163,160

Utility Cost per Installation ($): 892
Total Program Cost of the Utility ($000): 734.4
Net Benefits of Measures Installed During Reporting Period ($000): 496.0

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL HEATING AND COOLING
Program Start Date: July 2000
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,392	3,840	1,000	0.2%	5,214	5,214	1.0%	4,214
2016	640,090	640,090	3,480	2,000	0.3%	3,693	8,907	1.0%	6,907
2017	651,770	651,770	4,200	2,950	0.5%	3,341	12,248	1.0%	9,298
2018	662,917	662,917	4,000	3,850	0.6%	3,371	15,619	1.0%	11,769
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 3,371

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.10	0.11	343.84	368.94
Winter kW Reduction	0.33	0.36	1,122.54	1,204.49
Annual kWh Reduction	371	392	1,250,641	1,320,677

Utility Cost per Installation ($): 162
Total Program Cost of the Utility ($000): 544.9
Net Benefits of Measures Installed During Reporting Period ($000): 1,298.2

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: NEIGHBORHOOD WEATHERIZATION
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	109,703	6,600	5,000	4.6%	7,912	7,912	7.2%	2,912
2016	640,090	111,745	7,250	10,750	9.6%	5,495	13,407	12.0%	2,657
2017	651,770	113,784	6,250	17,000	14.9%	6,550	19,957	17.5%	2,957
2018	662,917	115,730	7,000	23,750	20.5%	7,389	27,346	23.6%	3,596
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018 Participants 7,389

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.25	0.26	1,810.31	1,942.46
Winter kW Reduction	0.34	0.36	2,504.87	2,687.73
Annual kWh Reduction	1,255	1,325	9,273,195	9,792,494

Utility Cost per Installation ($): 574
Total Program Cost of the Utility ($000): 4,237.9
Net Benefits of Measures Installed During Reporting Period ($000): (6,643.6)

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: ENERGY PLANNER
Program Start Date: September 2007
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,392	1,000	1,000	0.2%	1,088	1,088	0.2%	88
2016	640,090	640,090	1,000	2,000	0.3%	910	1,998	0.3%	(2)
2017	651,770	651,770	1,000	3,000	0.5%	574	2,572	0.4%	(428)
2018	662,917	662,917	1,000	4,000	0.6%	747	3,319	0.5%	(681)
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018

Participants 747

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	2.01	2.16	1,502.96	1,612.68
Winter kW Reduction	3.13	3.36	2,341.10	2,512.00
Annual kWh Reduction	242	256	180,774	190,897

Utility Cost per Installation ($) Note 1:	4,748
Total Program Cost of the Utility ($000):	3,546.9
Net Benefits of Measures Installed During Reporting Period ($000):	8,779.6

Note 1: Utility costs based upon total program costs and total participation

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL WALL INSULATION
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,329	20	28	0.0%	122	122	0.0%	94
2016	640,090	639,905	12	56	0.0%	5	127	0.0%	71
2017	651,770	651,580	7	84	0.0%	5	132	0.0%	48
2018	662,917	662,722	10	112	0.0%	2	134	0.0%	22
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 2

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.10	0.11	0.21	0.22
Winter kW Reduction	0.23	0.24	0.45	0.48
Annual kWh Reduction	399	421	798	843

Utility Cost per Installation ($): 156
Total Program Cost of the Utility ($000): 0.3
Net Benefits of Measures Installed During Reporting Period ($000): 1.2

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL WINDOW REPLACEMENT
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	619,895	1,608	500	0.1%	1,811	1,811	0.3%	1,311
2016	640,090	629,783	1,584	1,000	0.2%	1,417	3,228	0.5%	2,228
2017	651,770	640,046	1,800	1,500	0.2%	1,482	4,710	0.7%	3,210
2018	662,917	649,710	1,600	2,000	0.3%	1,817	6,527	1.0%	4,527
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018 Participants 1,817

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.31	0.33	565.09	606.34
Winter kW Reduction	0.21	0.23	385.20	413.32
Annual kWh Reduction	1,121	1,184	2,036,857	2,150,921

Utility Cost per Installation ($):	442
Total Program Cost of the Utility ($000):	803.5
Net Benefits of Measures Installed During Reporting Period ($000):	1,918.9

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL WINDOW FILM
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	625,431	324	1,200	0.2%	379	379	0.1%	(821)
2016				Program was retired on November 3, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL HVAC RE-COMMISSIONING
Program Start Date: November 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	627,437	180	7,500	1.2%	138	138	0.0%	(7,362)
2016				Program was retired on November 3, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: FREE COMMERCIAL/INDUSTRIAL AUDIT
Program Start Date: July 1983
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	888	700	0.9%	913	913	1.1%	213
2016	80,875	80,875	860	1,400	1.7%	764	1,677	2.1%	277
2017	81,532	81,532	870	2,150	2.6%	1,211	2,888	3.5%	738
2018	81,740	81,740	1,200	2,950	3.6%	797	3,685	4.5%	735
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 797

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.09	0.10	74.12	79.31
Winter kW Reduction	0.09	0.10	74.92	80.16
Annual kWh Reduction	817	859	651,149	685,009

Utility Cost per Installation ($): 356
Total Program Cost of the Utility ($000): 283.6
Net Benefits of Measures Installed During Reporting Period ($000): (189.9)
Note 1: Demand and energy savings not included in achievements

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMPREHENSIVE COMMERCIAL/INDUSTRIAL AUDIT
Program Start Date: May 1981
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	6	4	0.0%	1	1	0.0%	(3)
2016	80,875	80,875	10	8	0.0%	4	5	0.0%	(3)
2017	81,532	81,532	8	12	0.0%	0	5	0.0%	(7)
2018	81,740	81,740	4	16	0.0%	1	6	0.0%	(10)
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018, Note 1 Participants 1

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.09	0.10	0.09	0.10
Winter kW Reduction	0.09	0.10	0.09	0.10
Annual kWh Reduction	817	859	817	859

Utility Cost per Installation ($): 725
Total Program Cost of the Utility ($000): 0.7
Net Benefits of Measures Installed During Reporting Period ($000): (3.0)
Note 1: Demand and energy savings not included in achievements

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL CEILING INSULATION
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,026	57	50	0.1%	41	41	0.1%	(9)
2016	80,875	79,985	50	100	0.1%	14	55	0.1%	(45)
2017	81,532	79,971	15	150	0.2%	5	60	0.1%	(90)
2018	81,740	79,966	8	200	0.3%	8	68	0.1%	(132)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 8

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.28	0.30	2.26	2.42
Winter kW Reduction	0.01	0.01	0.06	0.06
Annual kWh Reduction	2,661	2,799	21,288	22,395

Utility Cost per Installation ($): 1,110
Total Program Cost of the Utility ($000): 8.9
Net Benefits of Measures Installed During Reporting Period ($000): 50.7
Note 1: Savings from measured data

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL CHILLERS
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	7,733	10	5	0.1%	7	7	0.1%	2
2016	80,875	8,851	10	10	0.1%	5	12	0.1%	2
2017	81,532	8,887	11	15	0.2%	7	19	0.2%	4
2018	81,740	9,023	8	20	0.2%	1	20	0.2%	0
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018, Note 1 Participants 1

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	8.54	9.13	8.54	9.13
Winter kW Reduction	6.40	6.85	6.40	6.85
Annual kWh Reduction	16,354	17,204	16,354	17,204

Utility Cost per Installation ($): 1,487
Total Program Cost of the Utility ($000): 1.5
Net Benefits of Measures Installed During Reporting Period ($000): 49.0
Note 1: Savings from measured data

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

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Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: CONSERVATION VALUE
Program Start Date: April 1991
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	4	2	0.0%	4	4	0.0%	2
2016	80,875	80,875	4	4	0.0%	2	6	0.0%	2
2017	81,532	81,532	3	6	0.0%	0	6	0.0%	0
2018	81,740	81,740	2	8	0.0%	0	6	0.0%	(2)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	185.40	198.38	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	19,244	20,245	0	0

Utility Cost per Installation ($): 0
Total Program Cost of the Utility ($000): 0.0
Net Benefits of Measures Installed During Reporting Period ($000): 199.5
Note 1: Savings from measured data

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL COOL ROOF
Program Start Date: May 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,128	35	20	0.0%	45	45	0.1%	25
2016	80,875	80,681	25	40	0.0%	25	70	0.1%	30
2017	81,532	81,313	25	60	0.1%	13	83	0.1%	23
2018	81,740	81,508	20	80	0.1%	21	104	0.1%	24
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018, Note 1 Participants 21

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	13.18	14.10	276.80	296.18
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	41,977	44,160	881,517	927,356

Utility Cost per Installation ($): 9,550
Total Program Cost of the Utility ($000): 200.5
Net Benefits of Measures Installed During Reporting Period ($000): 89.7
Note 1: Savings from measured data

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL COOLING - DX
Program Start Date: July 2000
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	127	100	0.1%	234	234	0.3%	134
2016	80,875	80,875	130	200	0.2%	9	243	0.3%	43
2017	81,532	81,532	16	300	0.4%	0	243	0.3%	(57)
2018	81,740	81,740	5	400	0.5%	25	268	0.3%	(132)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 25

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	3.34	3.57	83.48	89.32
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	6,107	6,425	152,675	160,614

Utility Cost per Installation ($): 211
Total Program Cost of the Utility ($000): 5.3
Net Benefits of Measures Installed During Reporting Period ($000): 8.7
Note 1: Savings from measured data

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL COOLING - PTAC
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	18	35	0.0%	0	0	0.0%	(35)
2016			This portion of Commmercial Cooling was retired on November 3, 2015.						
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL DEMAND RESPONSE
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	12,302	1	1	0.0%	4	4	0.0%	3
2016	80,875	12,937	1	2	0.0%	0	4	0.0%	2
2017	81,532	13,383	1	3	0.0%	0	4	0.0%	1
2018	81,740	13,730	1	4	0.0%	1	5	0.0%	1
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 1

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	1,645.00	1,760.15	1,645.00	1,760.15
Winter kW Reduction	1,645.00	1,760.15	1,645.00	1,760.15
Annual kWh Reduction	123,375	129,791	123,375	129,791

Utility Cost per Installation ($), Note 2:	39,716
Total Program Cost of the Utility ($000):	3,931.9
Net Benefits of Measures Installed During Reporting Period ($000):	1,191.3

Note 1: Savings from measured data
Note 2: Utility costs based upon total program costs and total participation

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL DUCT REPAIR
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	70,369	550	250	0.4%	257	257	0.4%	7
2016	80,875	70,112	300	500	0.7%	96	353	0.5%	(147)
2017	81,532	70,016	130	750	1.1%	3	356	0.5%	(394)
2018	81,740	70,013	25	1,000	1.4%	6	362	0.5%	(638)
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018, Note 1 Participants 6

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	1.55	1.66	9.31	9.96
Winter kW Reduction	0.02	0.02	0.10	0.10
Annual kWh Reduction	6,862	7,219	41,172	43,313

Utility Cost per Installation ($): 186
Total Program Cost of the Utility ($000): 1.1
Net Benefits of Measures Installed During Reporting Period ($000): 361.3
Note 1: Savings from measured data

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL ELECTRONICALLY COMMUTATED MOTORS
Program Start Date: November 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	10	5	0.0%	85	85	0.1%	80
2016	80,875	80,875	10	10	0.0%	1,225	1,310	1.6%	1,300
2017	81,532	81,532	20	15	0.0%	202	1,512	1.9%	1,497
2018	81,740	81,740	200	20	0.0%	0	1,512	1.8%	1,492
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1

Participants 0

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.24	0.25	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	32	34	0	0

Utility Cost per Installation ($): 0
Total Program Cost of the Utility ($000): 0.0
Net Benefits of Measures Installed During Reporting Period ($000): 378.0
Note 1: Savings from measured data

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: INDUSTRIAL LOAD MANAGEMENT
Program Start Date: September 1999
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	79,457	820	0	1	0.1%	1	1	0.1%	0
2016	80,875	848	0	2	0.2%	0	1	0.1%	(1)
2017	81,532	816	0	3	0.4%	0	1	0.1%	(2)
2018	81,740	954	0	4	0.4%	1	2	0.2%	(2)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 1

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	5,060.25	5,414.47	5,060.25	5,414.47
Winter kW Reduction	4,756.50	5,089.46	4,756.50	5,089.46
Annual kWh Reduction	1,184,085	1,245,657	1,184,085	1,245,657

Utility Cost per Installation ($), Note 2: 517,539
Total Program Cost of the Utility ($000): 17,596.3
Net Benefits of Measures Installed During Reporting Period ($000): 1,779.0
Note 1: Savings from measured data
Note 2: Utility costs based upon total program costs and total participation

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL LIGHTING - CONDITIONED SPACE
Program Start Date: January 1991
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	6	25	0.0%	86	86	0.1%	61
2016	80,875	80,875	57	50	0.1%	159	245	0.3%	195
2017	81,532	81,532	75	75	0.1%	228	473	0.6%	398
2018	81,740	81,740	110	100	0.1%	193	666	0.8%	566
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 193

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	22.68	24.27	4,377.24	4,683.65
Winter kW Reduction	17.65	18.89	3,406.45	3,644.90
Annual kWh Reduction	103,027	108,384	19,884,211	20,918,190

Utility Cost per Installation ($): 3,048
Total Program Cost of the Utility ($000): 588.2
Net Benefits of Measures Installed During Reporting Period ($000): 9,870.1
Note 1: Savings from measured data

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL LIGHTING - UNCONDITIONED SPACE
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	2	5	0.0%	16	16	0.0%	11
2016	80,875	80,875	13	10	0.0%	60	76	0.1%	66
2017	81,532	81,532	50	15	0.0%	338	414	0.5%	399
2018	81,740	81,740	50	20	0.0%	246	660	0.8%	640
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 246

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	7.05	7.54	1,734.05	1,855.44
Winter kW Reduction	7.05	7.54	1,734.05	1,855.44
Annual kWh Reduction	36,922	38,842	9,082,812	9,555,118

Utility Cost per Installation ($): 729
Total Program Cost of the Utility ($000): 179.4
Net Benefits of Measures Installed During Reporting Period ($000): 792.0
Note 1: Savings from measured data

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL STREET AND OUTDOOR LIGHTING CONVERSION
Program Start Date: February 2018
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	0	0	0	0	0.0%	0	0	0.0%	0
2016	0	0	0	0	0.0%	0	0	0.0%	0
2017	0	0	0	0	0.0%	0	0	0.0%	0
2018	209,821	209,821	42,115	42,115	20.1%	31,936	31,936	15.2%	(10,179)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 31,936

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.13	0.14	4,247.49	4,544.81
Annual kWh Reduction	576	606	18,395,136	19,351,683

Utility Cost per Installation ($): 119
Total Program Cost of the Utility ($000): 3,795.5
Net Benefits of Measures Installed During Reporting Period ($000): 1,521.9
Note 1: Demand and energy savings not included in achievements

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL OCCUPANCY SENSORS
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	20	15	0.0%	2	2	0.0%	(13)
2016	80,875	80,875	15	30	0.0%	12	14	0.0%	(16)
2017	81,532	81,532	15	45	0.1%	4	18	0.0%	(27)
2018	81,740	81,740	12	60	0.1%	7	25	0.0%	(35)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 7

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	37.60	40.23	263.21	281.64
Winter kW Reduction	30.08	32.19	210.57	225.31
Annual kWh Reduction	80,892	85,098	566,244	595,689

Utility Cost per Installation ($): 3,498
Total Program Cost of the Utility ($000): 24.5
Net Benefits of Measures Installed During Reporting Period ($000): 10.0
Note 1: Savings from measured data

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL LOAD MANAGEMENT- EXTENDED
Program Start Date: January 1988
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	0	1	0.0%	0	0	0.0%	(1)
2016	80,875	80,875	0	2	0.0%	0	0	0.0%	(2)
2017	81,532	81,532	0	3	0.0%	0	0	0.0%	(3)
2018	81,740	81,740	0	4	0.0%	0	0	0.0%	(4)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	92.00	98.44	0.00	0.00
Winter kW Reduction	60.00	64.20	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($): 0
Total Program Cost of the Utility ($000): 0.0
Net Benefits of Measures Installed During Reporting Period ($000): 0.0

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL LOAD MANAGEMENT- CYCLIC
Program Start Date: January 1988
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	0	1	0.0%	0	0	0.0%	(1)
2016	80,875	80,875	0	2	0.0%	0	0	0.0%	(2)
2017	81,532	81,532	0	3	0.0%	0	0	0.0%	(3)
2018	81,740	81,740	0	4	0.0%	0	0	0.0%	(4)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	13.20	14.12	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($), Note 1: 1
Total Program Cost of the Utility ($000): 7.0
Net Benefits of Measures Installed During Reporting Period ($000): 0.0
Note 1: Utility costs based upon total program costs and total participation

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL/INDUSTRIAL REFRIGERATION (ANTI-CONDENSATE)
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	8,028	2	1	0.0%	0	0	0.0%	(1)
2016	80,875	8,088	2	2	0.0%	0	0	0.0%	(2)
2017	81,532	8,153	2	4	0.0%	0	0	0.0%	(4)
2018	81,740	8,174	2	6	0.1%	0	0	0.0%	(6)
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018

Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.80	0.86	0.00	0.00
Winter kW Reduction	1.32	1.41	0.00	0.00
Annual kWh Reduction	12,933	13,606	0	0

Utility Cost per Installation ($): 0
Total Program Cost of the Utility ($000): 0.3
Net Benefits of Measures Installed During Reporting Period ($000): 0.0

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: STANDBY GENERATOR
Program Start Date: January 1991
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	2,304	0	1	0.0%	4	4	0.2%	3
2016	80,875	2,449	1	2	0.1%	0	4	0.2%	2
2017	81,532	2,430	1	3	0.1%	6	10	0.4%	7
2018	81,740	2,486	1	4	0.2%	1	11	0.4%	7
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018, Note 1 Participants 1

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	429.00	459.03	429.00	459.03
Winter kW Reduction	429.00	459.03	429.00	459.03
Annual kWh Reduction	42,900	45,131	42,900	45,131

Utility Cost per Installation ($), Note 2: 3,738,152
Total Program Cost of the Utility ($000): 3,738.2
Net Benefits of Measures Installed During Reporting Period ($000): 7,323.3
Note 1: Savings from measured data
Note 2: Utility costs based upon total program costs and total participation

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: THERMAL ENERGY STORAGE
Program Start Date: November 2015
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	7,733	1	1	0.0%	0	0	0.0%	(1)
2016	80,875	7,791	6	3	0.0%	0	0	0.0%	(3)
2017	81,532	7,845	3	6	0.1%	1	1	0.0%	(5)
2018	81,740	7,865	3	11	0.1%	1	2	0.0%	(9)
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018 Participants 1

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	101.00	108.07	101.00	108.07
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	468	492	468	492

Utility Cost per Installation ($): 56,500
Total Program Cost of the Utility ($000): 56.5
Net Benefits of Measures Installed During Reporting Period ($000): 85.1

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL WALL INSULATION
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	1	2	0.0%	0	0	0.0%	(2)
2016	80,875	80,875	1	4	0.0%	0	0	0.0%	(4)
2017	81,532	81,532	1	6	0.0%	0	0	0.0%	(6)
2018	81,740	81,740	1	8	0.0%	0	0	0.0%	(8)
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018

Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.50	0.54	0.00	0.00
Winter kW Reduction	0.39	0.42	0.00	0.00
Annual kWh Reduction	682	717	0	0

Utility Cost per Installation ($): 0
Total Program Cost of the Utility ($000): 0.0
Net Benefits of Measures Installed During Reporting Period ($000): 0.0

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL WATER HEATING
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	1	1	0.0%	0	0	0.0%	(1)
2016	80,875	80,875	1	2	0.0%	0	0	0.0%	(2)
2017	81,532	81,532	3	3	0.0%	0	0	0.0%	(3)
2018	81,740	81,740	3	4	0.0%	0	0	0.0%	(4)
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018

Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.63	0.68	0.00	0.00
Winter kW Reduction	0.33	0.35	0.00	0.00
Annual kWh Reduction	4,735	4,981	0	0

Utility Cost per Installation ($):	0
Total Program Cost of the Utility ($000):	0.8
Net Benefits of Measures Installed During Reporting Period ($000):	0.0

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL WINDOW FILM
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	18	40	0.0%	18	18	0.0%	(22)
2016				Program was retired on November 3, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL/INDUSTRIAL EFFICIENT MOTORS
Program Start Date: March 2008
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	12,302	10	50	0.4%	0	0	0.0%	(50)
2016				Program was retired on November 3, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018

Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL LIGHTING - EXIT SIGNS.
Program Start Date: May 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	72	540	0.7%	2	2	0.0%	(538)
2016				Program was retired on November 3, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation @ Meter	Per Installation @ Generator	Program Total @ Meter	Program Total @ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL HVAC RE-COMMISSIONING
Program Start Date: November 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	225	490	0.6%	250	250	0.3%	(240)
2016				Program was retired on November 3, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL ENERGY RECOVERY VENTILATION
Program Start Date: May 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	5	44	0.1%	0	0	0.0%	(44)
2016				Program was retired on November 3, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: COMMERCIAL ROOF INSULATION
Program Start Date: May 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	2	5	0.0%	2	2	0.0%	(3)
2016				Program was retired on November 3, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018

Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RESIDENTIAL PV
Program Start Date: April 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,392	0	60	0.0%	53	53	0.0%	(7)
2016				Program was retired on December 31, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018

Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RENEWABLE - SOLAR WATER HEATING
Program Start Date: April 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	628,392	0	15	0.0%	54	54	0.0%	39
2016				Program was retired on December 31, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RENEWABLE - LOW-INCOME WATER HEATING
Program Start Date: April 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	628,392	125,678	0	5	0.0%	0	0	0.0%	(5)
2016				Program was retired on December 31, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: Commercial PV
Program Start Date: April 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	80,277	80,277	0	5	0.0%	1	1	0.0%	(4)
2016				Program was retired on December 31, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018

Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RENEWABLE - PV FOR SCHOOLS
Program Start Date: April 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	79,457	301	0	1	0.3%	1	1	0.3%	0
2016				Program was retired on December 31, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

Annual Demand and Energy Savings - 2018 Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

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TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Demand Side Management Annual Report

Utility: Tampa Electric Company
Program Name: RENEWABLE - PV FOR SCHOOLS
Program Start Date: April 2011
Reporting Period: Annual 2018

a	b	c	d	e	f	g	h	i	j
Year	Total Number of Customers	Total Number of Eligible Customers	Total Number of Projected Participants	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % [(d/c)x100]	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % [(g/c)x100]	Actual Participation Over (Under) Projected Participants (g-d)
2015	79,457	301	0	1	0.3%	1	1	0.3%	0
2016				Program was retired on December 31, 2015.					
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									

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Annual Demand and Energy Savings - 2018

Participants 0

	Per Installation		Program Total	
	@ Meter	@ Generator	@ Meter	@ Generator
Summer kW Reduction	0.00	0.00	0.00	0.00
Winter kW Reduction	0.00	0.00	0.00	0.00
Annual kWh Reduction	0	0	0	0

Utility Cost per Installation ($):
Total Program Cost of the Utility ($000):
Net Benefits of Measures Installed During Reporting Period ($000):

TAMPA ELECTRIC COMPANY
UNDOCKETED
DSM ACCOMPLISHMENTS
FILED: MARCH 1, 2019

Comparison of Annual Achieved kW and kWh Reductions
with Public Service Commission Established Goals
Savings at the Generator

Utility: TAMPA ELECTRIC COMPANY

Residential

	Winter Peak MW Reduction			Summer Peak MW Reduction			GWh Energy Reduction		
Year	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance
2015	12.3	2.6	473.1%	10.8	1.1	981.8%	21.2	1.8	1,177.8%
2016	7.7	4.1	187.8%	5.1	1.6	318.8%	13.2	3.5	377.1%
2017	6.9	5.2	132.7%	4.7	2.2	213.6%	14.9	4.8	310.4%
2018	8.0	6.5	123.0%	5.6	2.7	205.7%	17.1	6.1	280.3%
2019									
2020									
2021									
2022									
2023									
2024									

Commercial/Industrial

	Winter Peak MW Reduction			Summer Peak MW Reduction			GWh Energy Reduction		
Year	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance
2015	8.1	1.2	675.0%	11.7	1.7	688.2%	12.5	3.9	320.5%
2016	2.9	1.3	223.1%	4.4	2.5	176.0%	17.8	6.0	296.7%
2017	9.2	1.6	575.0%	10.4	2.7	385.2%	30.2	8.0	377.5%
2018	13.0	1.7	767.1%	15.0	3.3	453.6%	33.7	9.2	365.9%
2019									
2020									
2021									
2022									
2023									
2024									

Combined

	Winter Peak MW Reduction			Summer Peak MW Reduction			GWh Energy Reduction		
Year	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance
2015	20.4	3.8	536.8%	22.5	2.8	803.6%	33.7	5.7	591.2%
2016	10.6	5.4	196.3%	9.5	4.1	231.7%	31.0	9.5	326.3%
2017	16.1	6.8	236.8%	15.1	4.9	308.2%	45.1	12.8	352.3%
2018	21.0	8.2	256.5%	20.5	6.0	342.1%	50.8	15.3	331.8%
2019									
2020									
2021									
2022									
2023									
2024									

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Comparison of Cumulative Achieved kW and kWh Reductions
with Public Service Commission Established Goals
Savings at the Generator

Utility: TAMPA ELECTRIC COMPANY

Residential

	Winter Peak MW Reduction			Summer Peak MW Reduction			GWh Energy Reduction		
Year	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance
2015	12.3	2.6	473.1%	10.8	1.1	981.8%	21.2	1.8	1,177.8%
2016	20.0	6.7	298.5%	15.9	2.7	588.9%	34.4	5.3	649.1%
2017	26.9	11.9	226.1%	20.6	4.9	420.4%	49.3	10.1	488.1%
2018	34.9	18.4	189.6%	26.2	7.6	344.1%	66.4	16.2	409.9%
2019									
2020									
2021									
2022									
2023									
2024									

Commercial/Industrial

	Winter Peak MW Reduction			Summer Peak MW Reduction			GWh Energy Reduction		
Year	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance
2015	8.1	1.2	675.0%	11.7	1.7	688.2%	12.5	3.9	320.5%
2016	11.0	2.5	440.0%	16.1	4.2	383.3%	30.3	9.9	306.1%
2017	20.2	4.1	492.7%	26.5	6.9	384.1%	60.5	17.9	338.0%
2018	33.2	5.8	573.1%	41.5	10.2	406.6%	94.2	27.1	347.5%
2019									
2020									
2021									
2022									
2023									
2024									

Combined

	Winter Peak MW Reduction			Summer Peak MW Reduction			GWh Energy Reduction		
Year	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance	Total Achieved	Commission Approved Goal	% Variance
2015	20.4	3.8	536.8%	22.5	2.8	803.6%	33.7	5.7	591.2%
2016	31.0	9.2	337.0%	32.0	6.9	463.8%	64.7	15.2	425.7%
2017	47.1	16.0	294.4%	47.1	11.8	399.2%	109.8	28.0	392.1%
2018	68.1	24.2	281.6%	67.6	17.8	379.9%	160.6	43.3	370.8%
2019									
2020									
2021									
2022									
2023									
2024									

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TAMPA ELECTRIC COMPANY-SUMMARY OF 2018 DEMAND SIDE MANAGEMENT PROGRAM ACCOMPLISHMENTS

Appendix A

DSM Energy Education and Awareness Activities of 2018

Tampa Electric Company participated in over 80 designated energy education and awareness events across the company's service area in 2018. These events do not include the daily interactions of energy education that Tampa Electric Team Members have with customers through email or phone calls, one-on-one discussions nor with customers that are participating in one of Tampa Electric's Commission approved DSM programs. These events cover educating all ages, income classes and rate classes of customers on energy education and awareness. Several highlighted events include:

- Plant City MLK Festival
- MM Fitness
- Continuous Improvement Showcase
- Strawberry Ridge Vendor Fair
- Steam Night
- CPSA Family Fun Night
- Farm Night BBQ
- Fiesta Day
- GRCC Monthly Membership Meeting Luncheon
- Chester W. Taylor Jr. Elementary School
- Crime Free Multi Housing Class- Presentation
- Taste of Winter Haven
- Ruby Lake Annual HOA meeting
- Springhill Park Community Center
- Southshore Chamber 26th Annual Apollo Beach Manatee 3/10
- Go Green at the Amalie
- Forest Hill Park Community Center
- Lifestyles After 50 Fun Fest
- Kids Rock Science
- New Tampa Regional Library
- The Great American Teach-In
- The Greater Temple Terrace Chamber of Commerce Business Expo
- 2nd Annual Wimauma Heart of Hillsborough
- Solar Fair 2018
- Spring Trade Show
- Lawton Chiles Elementary
- MetLife Earth Day Fair
- Brandon Lions Club
- YMCA at Big Bend Rd
- YMCA at Valrico – Camp Family

- ECO Fest
- Grow Financial Earth Day
- Lifestyles After 50 Hurricane Preparedness
- Walk A Mile in Her Shoes
- Let's Beat Ovarian Cancer
- Clean Air Fair
- Traditions Clubhouse Vendor Fair
- TECO Energy Safety, Health & Emergency Preparedness
- Lawton Chiles Elementary Science Night
- 2018 Hillsborough County Neighborhoods Conference
- Lawton Chiles Elementary – Solar Car Race
- Summer Family Resource Fair
- College Hill Church of God in Christ
- Four Lakes Coffee Talk
- Kids with a Call, INC
- Richard's Father's Day Walk
- Coffee at Lake Ashton
- Valrico Lake Advantage Academy
- Manufactured Homes
- Swindle Medical Arts Center – Plant City
- Lennard High School – Ruskin
- Bowers Whitley Career Center – University
- Middleton High School – East Tampa
- Kids Day 2018
- Howard W. Blake High School – West Tampa
- Tampa Home Show 8/25
- City of Oldsmar 8/31
- Lifestyles After 50 Fun Fest
- Crop Mania – Joshua House
- Girl Scouts of West Central Florida
- South Tampa Chamber of Commerce
- Community Picnic – Health Fair
- Temple Terrace National Night Out
- Sun City Center Chamber of Commerce – Fall Business Expo
- Bloomingdale Medical Assoc.
- Birding & Nature Festival
- Cub Scouts
- Hillsborough Country Building
- How to Fix It
- Valencia Lakes Fraud Prevention Day
- Haunted Happenings
- Fall Festival
- 30th Annual Ruskin Seafood Festival
- Brandon Chamber Luncheon

- Wellness & Benefit Fair – DART
- A Walk for Life
- Great American Teach-In

Tampa Electric's
Commercial Low-Income Weatherization Research & Development Project
2017 - 2018

Purpose:

Determine the potential summer and winter demand, annual energy savings, and feasibility of offering a commercial weatherization demand side management ("DSM") program designed toward small to midsize commercial customers operating businesses in low-income areas within Tampa Electric's service territory.

Table of Contents:

Background:

Tampa Electric has proven success with facilitating the residential Weatherization DSM program. In the beginning of 2017, Tampa Electric's Regulatory Staff requested the company's Commercial Energy Management Services Team to develop and implement a Research and Development ("R&D") project that would provide a series of energy conservation measures that would directly reduce the weather sensitive peak for small to midsize commercial customers that operated within low-income areas within Tampa Electric's service territory. This project would identify the summer and winter demand and associated annual energy savings to the installed energy conservation measures in addition to determining the feasibility of potentially offering a commercial low-income weatherization DSM program.

Project Scope:

Evaluate the energy and demand savings of an energy saving kit offering energy efficiency measures for small to midsize commercial customers in low-income areas.

Tampa Electric's Commercial Energy Management team initially identified 12 potential energy efficiency measures that could be utilized in a kit for small commercial business. This initial list was compiled based on the team's knowledge and experience gained from performing energy audits.

The initial energy efficiency measures that were identified were:

- Duct seal
- Insulation
- LED lighting
- Weather-stripping for conditioned to non-conditioned space doors
- Seal and caulk windows
- Programmable thermostats
- Insulation of air conditioner refrigerant lines
- Ceiling tile repair/replacement
- Occupancy sensor
- Hot water pipe insulation/wrap
- HVAC recommissioning
- Refrigerator gaskets and seals

The Commercial Energy Management team determined that further validation was required in order to establish what measures would effectively work as a kit in a potential DSM program offering. Because the types of small commercial businesses varies significantly, as well as having quite different demand and energy usage profiles, it was essential to refine the potential energy efficiency measures. To perform this refinement, the team determined that this would could be effectively accomplished by performing energy audits to obtain information and data from a sampling of small commercial businesses.

The Commercial Energy Management team determined that to obtain an effective sample, the company would need to perform approximately 30 energy audits. Of these facilities that received an energy audit, the team decided that approximately 10 of these sites would be selected to receive the energy efficiency measures that would be identified as the final kit. The team utilized Florida Census Tract data to determine low-income target areas for the performance of the energy audits. The team then canvassed the target areas to create a pool of 30 businesses which would be used to establish the final R&D participants.

Each of the 30 business owners were contacted personally and received a detailed explanation of the energy audit and also potential participation in the R&D project. In the performance of the energy audit, the customers received the same comprehensive high-quality commercial walk-through energy audit, performed by a Tampa Electric commercial energy analyst, the company performs on a daily basis. The commercial energy analyst evaluated energy-consuming equipment at the customer's facility. Recommended low-cost/no-cost measures, as well as measures with short and longer paybacks. The commercial energy analyst followed up with a detailed report of energy saving opportunities along with billing history, energy usage graphs, energy usage and cost forecasting, as well as benchmarking and greenhouse gas emissions information. In the process of performing the audit, the commercial energy analyst also identified a list of measures that would reduce the weather sensitive peak to that specific customer.

After the performance of the energy audits, the specific energy efficiency measures identified that could potentially become part of the kit were evaluated. Each measure was examined to determine which ones would have the best opportunity for energy and demand savings, which of these measures were applicable to most or all of these businesses and finally which ones could effectively be part of a potential energy kit offering. From this evaluation, the following energy efficiency measures were chosen:

- Duct seal
- Ceiling and wall insulation
- LED lighting (screw in type)
- Weather-stripping for conditioned to non-conditioned space doors
- Programmable thermostats

Once this final list of measures was established for the kits, the Commercial Energy Management team met with Regulatory to present the findings and to receive approval to move forward with the installation of the energy efficiency measures identified. In this meeting and several additional follow-up meetings, the company selected 11 businesses that would receive the energy efficiency measures. The market segments of these businesses provided a good cross section for the R&D project. The market segments varied from grocery store, retail, photography, restaurant and office space. The company procured a weatherization contractor that would install the needed measures for that specific business. If the business already had one of the selected measures, the business would receive the remaining other measures.

Each customer that was selected was contacted, and an appointment was scheduled to install the applicable measures. At each installation, a Tampa Electric Commercial Energy Analyst was also at the business to monitor the installation of the measures.

Following the installation of the energy efficiency measures, the Commercial Energy Management team reviewed the monthly demand and energy usage three months after the measures were installed and again after six months. This data was used to validate the potential demand and energy savings. During this time, Tampa Electric's Commercial Energy Analysts conducted site visits to each site to verify any changes in the participating businesses. The analysts reported any changes and made recommendations that would aide the participating business.

The final measure and verification was completed in December 2018 and the findings are enclosed in this report. They were obtained utilizing the monthly electric meter data. Two of the initial participants had limited data because they relocated their business from the original site location.

While there were some favorable results, a majority of the participants demonstrated an increase in energy and/or demand use. Seven of the original 11 participants showed an increase and four participants showed a decrease in their energy usage. Base on the data collected and analyzed, it would indicate that a prescribed kit type program is not advantageous at this time. The factors found during the commissioning follow-up visits indicated:

- Poor use of thermostat equipment had the highest negative effect. The team found that customers would manually override the programmable thermostats and leave them on this inefficient setting.
- Incompatible equipment. The company found that some programmable thermostats do not communicate effectively with some existing HVAC equipment thus making the system inefficient.
- Damage to facility. In two cases, facility damage prevented the facility from receiving the full benefits of the energy efficiency measures.
- Volatility in the market for low-income area businesses. While it is evident that a program like this is advantageous, from offering it as a DSM program has concerns for reliable demand and sustained energy savings over time.
- It also appeared that with the energy efficiency measures installed, some customers took advantage of the higher energy efficiency of the overall site but changed temperature setpoints, causing more energy and demand to be consumed.

Instrumentation:

Electric meter data collected monthly and historical billing data.

Weather:

The weather climate during the monitoring period was similar and thus not a factor in the evaluation process. This was validated using degree day information at the National Climate Data Center (NCDC) at http://www.ncdc.noaa.gov .

Results:

Business Type	Current Trend	Increase or Decrease (kWh)	kWh Change	Increase or Decrease (SkW)	SkW Change	Increase or Decrease (WkW)	WkW Change
Apartment Clubhouse/Office	Upward	Increase	6,248	Increase	1.3	Increase WkW	2.2
Apartment Clubhouse/Office	Downward	Increase	3,893	Note 1		Note 1	
Auto tire Store	Upward	Increase	309	Note 1		Note 1	
Retail Consignment Shop	Upward	Increase	1,985	Decrease	-0.3	Decrease	-0.6
Maternity Photography	Downward	Decrease	-500	Note 1		Note 1	
Neighborhood Food Market	Stable	Decrease	-16,977	Decrease	-1.6	Decrease	-3.6
Historical Museum Office	Upward	Increase	3,403	Note 1		Note 1	
Retail Seafood	Downward	Decrease	-6,310	Note 1		Note 1	
Sushi Restaurant	Upward	Decrease	-6,549	Note 1		Note 1	
Computer Software	Upward	Increase	4,215	Note 1		Note 1	
Education Center	Upward	Increase	3,707	Increase	3.7	Decrease	-1.4

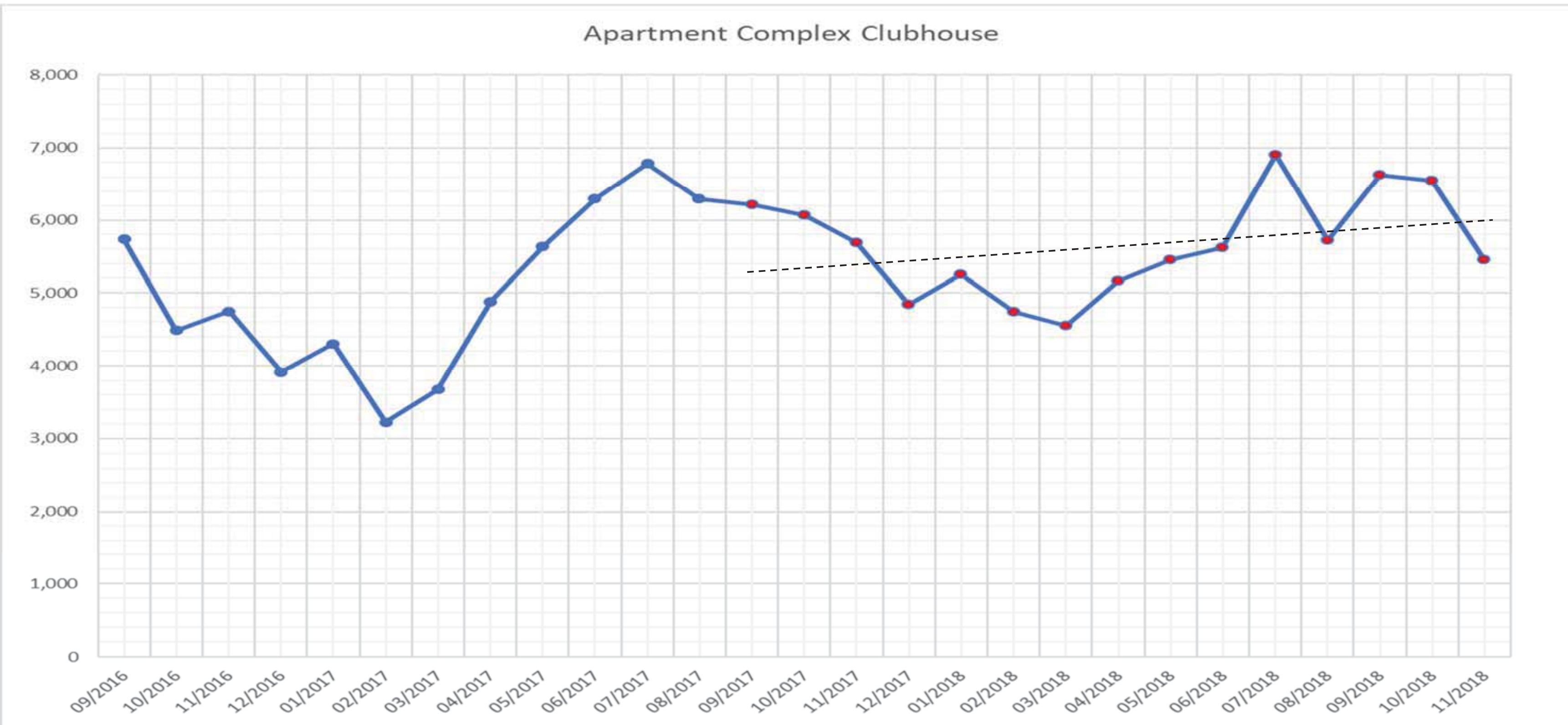
Note 1: Customer is General Service (non-demand)

Graphs:

Participant #1: 1,679 Sq. Ft. Apartment Clubhouse/Office

Measures Installed: Added R19 insulation
Installed (2) "Nest" Programmable Thermostat
Sealed Air Duct Systems
Installed 4 LED screwing lamps

Note: The thermostats installed at this location were not compatible with the customer's air conditioning equipment. The customer eventually replaced the Nest thermostats with standard digital thermostats.



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Participant #2: 1,110 Sq. Ft. Apartment Clubhouse/Office

Measures Installed: Added R19 insulation
Installed (1) "Nest" Programmable Thermostat
Sealed Air Duct System
Installed 6 LED screwing lamps

Note: Initially the customer was still operating the thermostat manually and overriding the Nest thermostat. The customer received additional education during follow-up site visit from Tampa Electric's commercial energy management staff.

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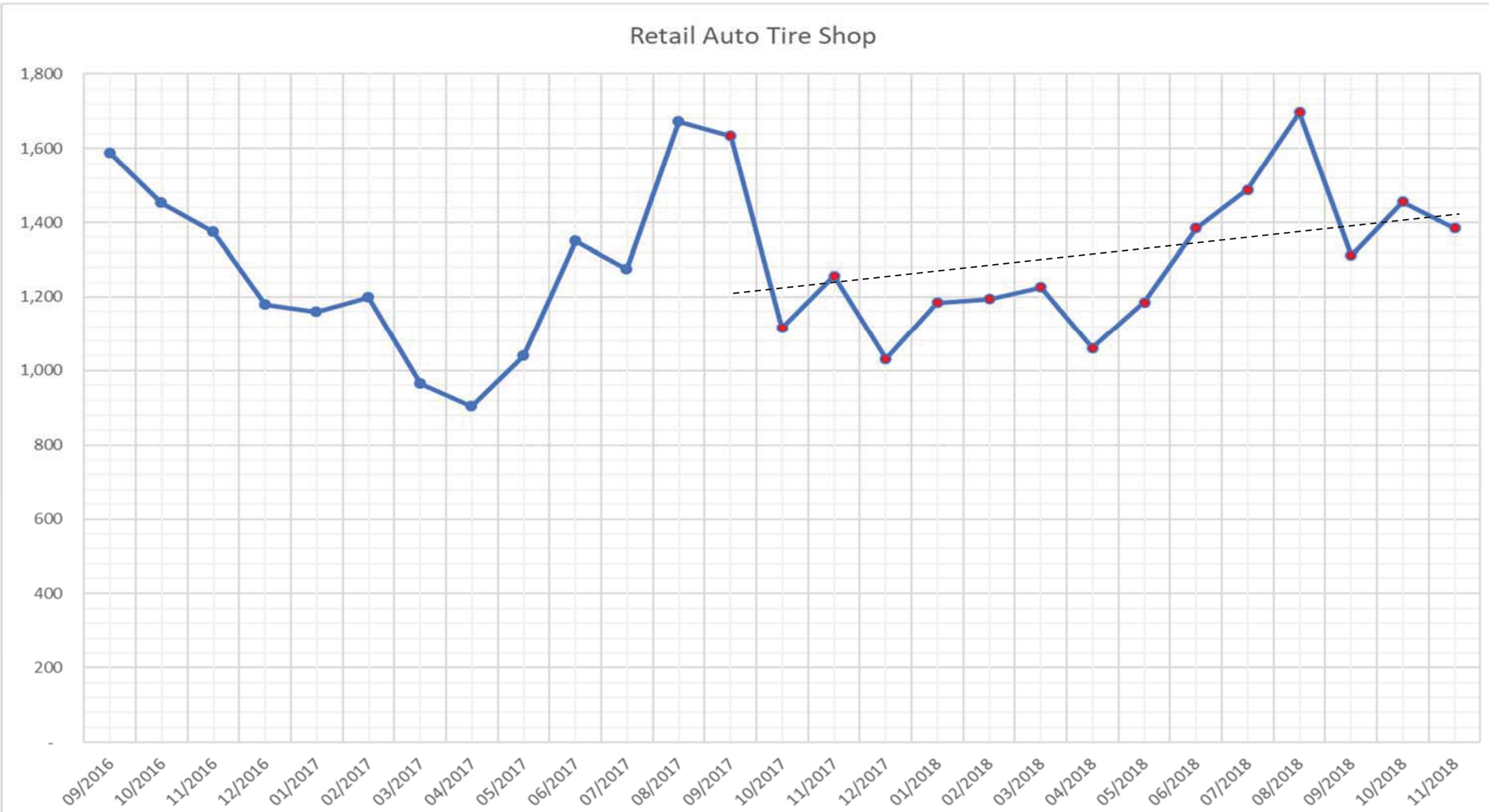
Participant #3: 1,000 Sq. Ft. Auto Tire Store
Measures Installed: Added 600 Sq. Ft. of R19 batted wall insulation to one wall

Note: This was a small facility with a window air conditioning system. The majority of energy usage was attributed to automotive repair equipment. Thus, the wall insulation did not significantly affect the energy consumption.



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Participant #4: 1,400 Sq. Ft. Retail Consignment Store

Measures Installed: Installed (1) " Honeywell" Programmable Thermostat
Installed Weather-stripping to front door

Note: During the follow-up site visit, it was discovered the Honeywell thermostat was not operating correctly, so it was not controlling the air conditioning systems efficiently. In addition, the damage to the front door was so severe that the weather-stripping had minimal impact on decreasing the electric usage.

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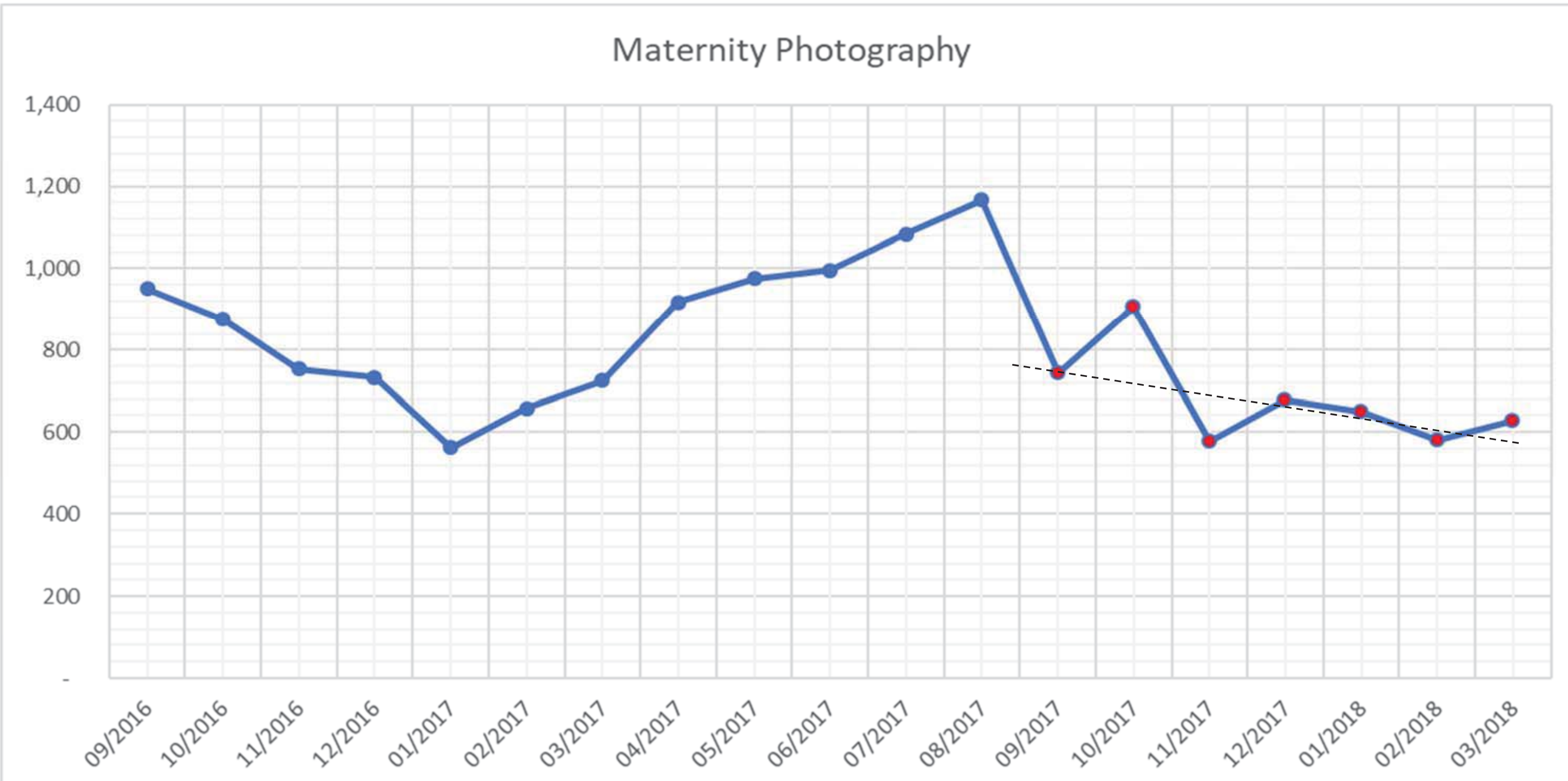
Participant #5: 537 Sq. Ft. Maternity Photography

Measures Installed: Installed (1) " Honeywell" Programmable Thermostat
Installed R19 Ceiling Insulation
Seal Air Duct System
Installed 6 LED Screw-in lamps

Note: This facility showed a decrease in the energy consumption compared to the same time the previous year. Unfortunately, the business relocated seven months after the measures were installed so data is limited.



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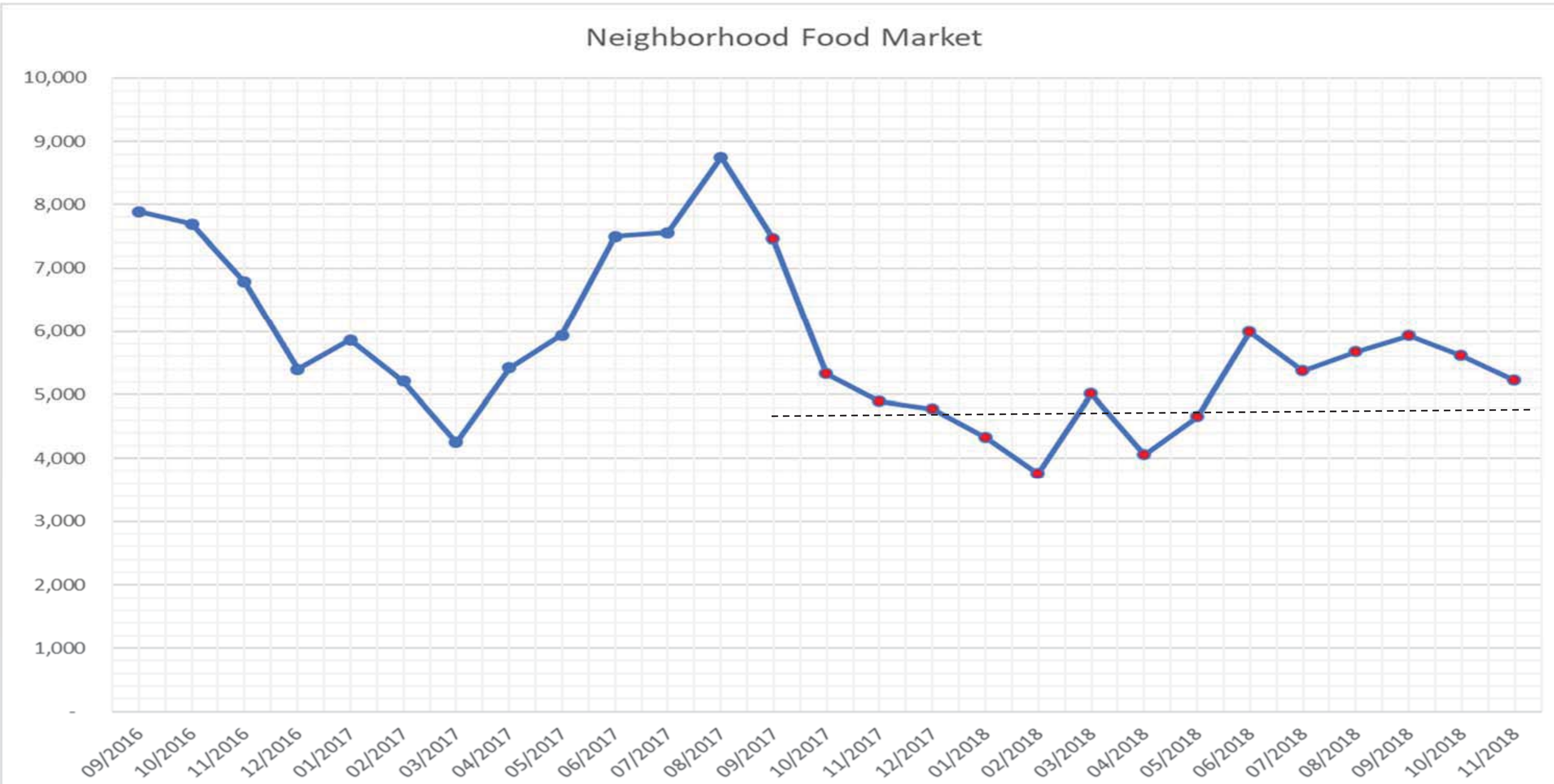
Participant #6: 1,300 Sq. Ft. Neighborhood Food Market

Measures Installed: Installed (1) " Honeywell" Programmable Thermostat
Installed R19 Ceiling Insulation
Seal Air Duct System
Installed 6 LED Screw-in lamps

Note: This facility showed a decrease in both energy consumption and demand reduction compared to the same time the previous year.



Participant #7**:** 2,500 Sq. Ft. Historic Office Building

Measures Installed: Installed (3) " Honeywell" Programmable Thermostat
Installed R19 Ceiling Insulation
Installed 6 LED Screw-in lamps

Note: This facility showed an increase in energy consumption due to the customer manually overriding the programmable thermostat settings.

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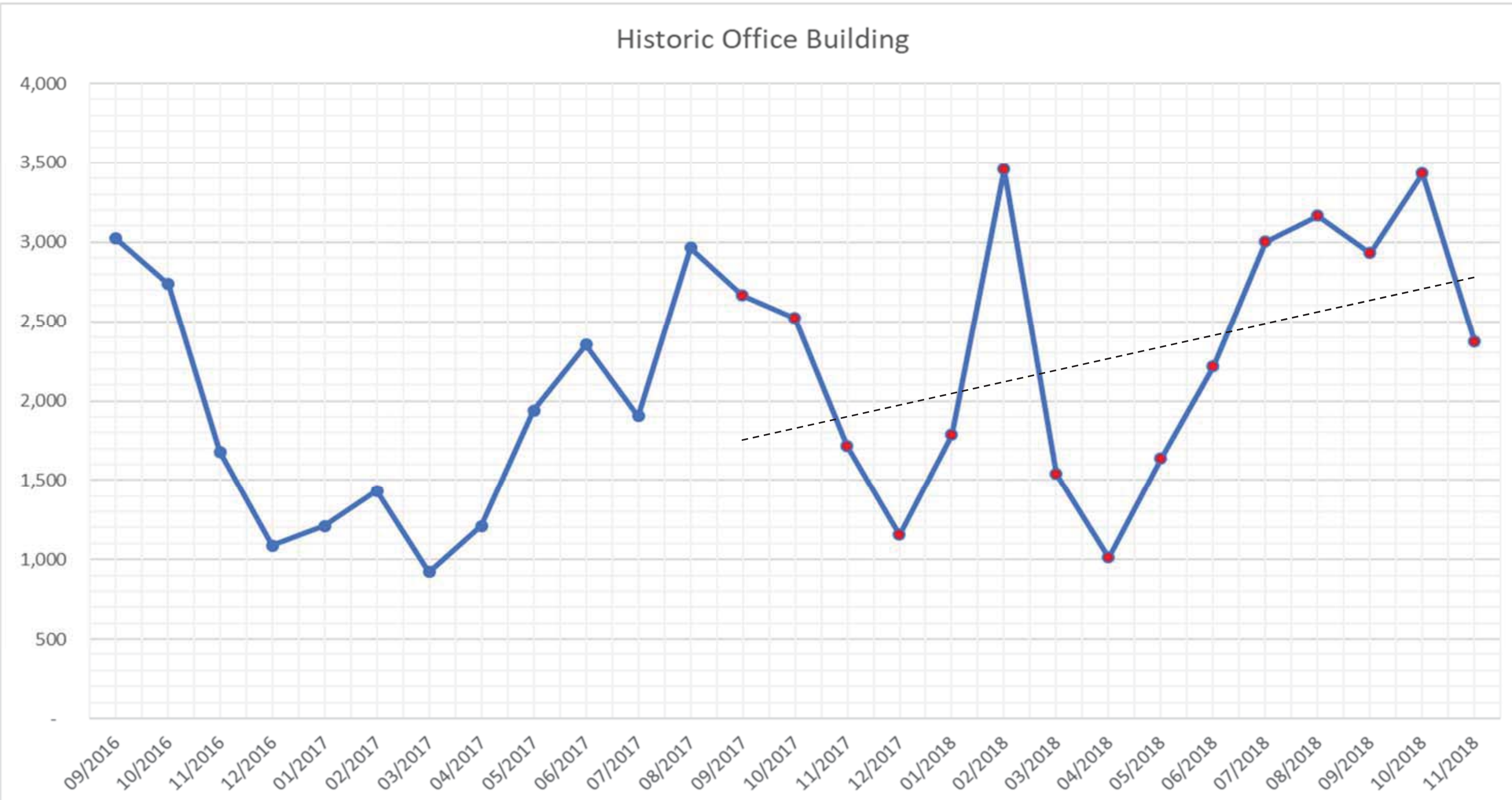

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Participant #8: 512 Sq. Ft. Seafood Store

Measures Installed: Installed (1) " Honeywell" Programmable Thermostat
Installed R19 Ceiling Insulation
Installed 6 LED Screw-in lamps

Note: This facility showed a decrease in the energy consumption compared to the same time the previous year. Unfortunately, the business relocated seven months after the measures were installed so data is limited.

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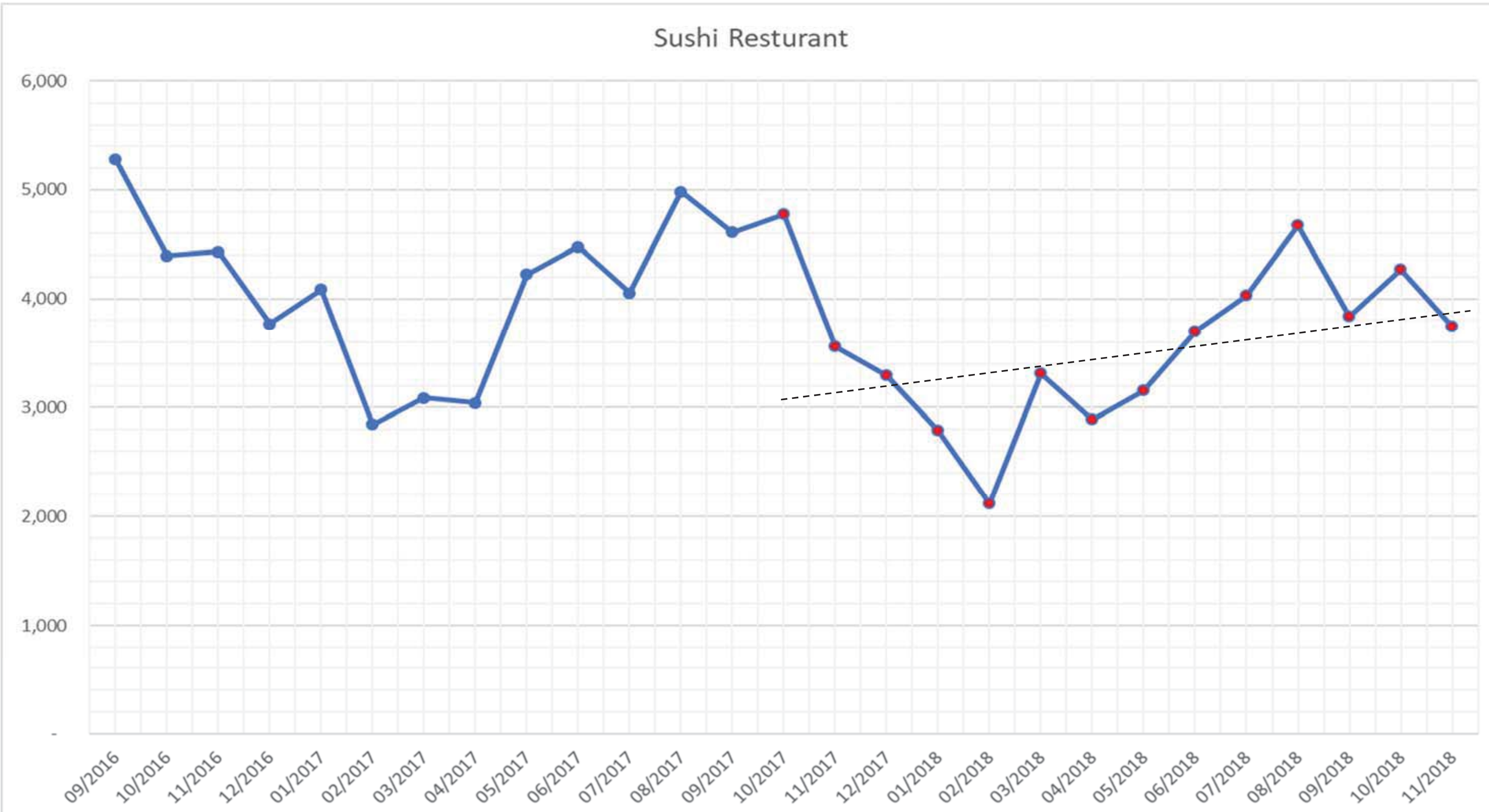
Participant #9: 1,300 Sq. Ft. Sushi Restaurant
Measures Installed: Installed (1) " Honeywell" Programmable Thermostat
Sealed Air Duct System

Note: This facility showed a decrease in the energy consumption compared to the same time the previous year.



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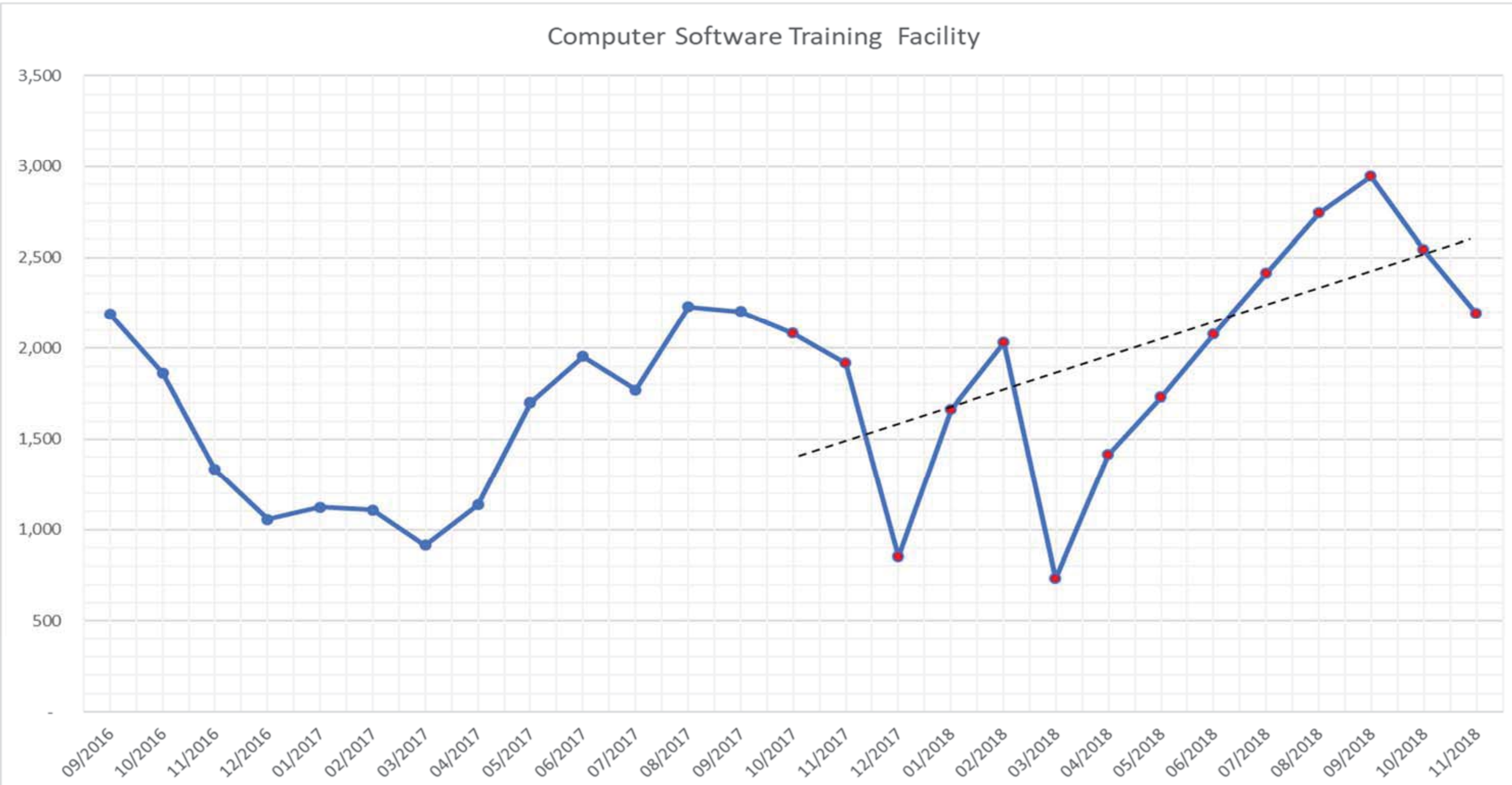
Participant #10: 1,300 Sq. Ft. Computer Software Training Facility
Measures Installed: Added R19 Ceiling Insulation
Sealed Air Duct System

Note: This facility showed no decrease in the energy consumption compared to the same time the previous year. Customer manually overrides the existing programmable thermostat. In addition, the building was older frame construction and the building envelope was not sealed tight which allows for nonconditioned air infiltration.



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Participant #11: 3,000 Sq. Ft. Education Center with Residential Quarters

Measures Installed: Added R19 Ceiling Insulation
Sealed Air Duct System
Installed (1) "Honeywell" Programmable Thermostat
Installed (6) Screw-in LED lamps

Note: This facility showed no decrease in the energy consumption compared to the same time the previous year. Customer manually overrides the existing programmable thermostat. In addition, this is an older frame two story building and the building envelope was not sealed tight which allows for outside nonconditioned air infiltration.

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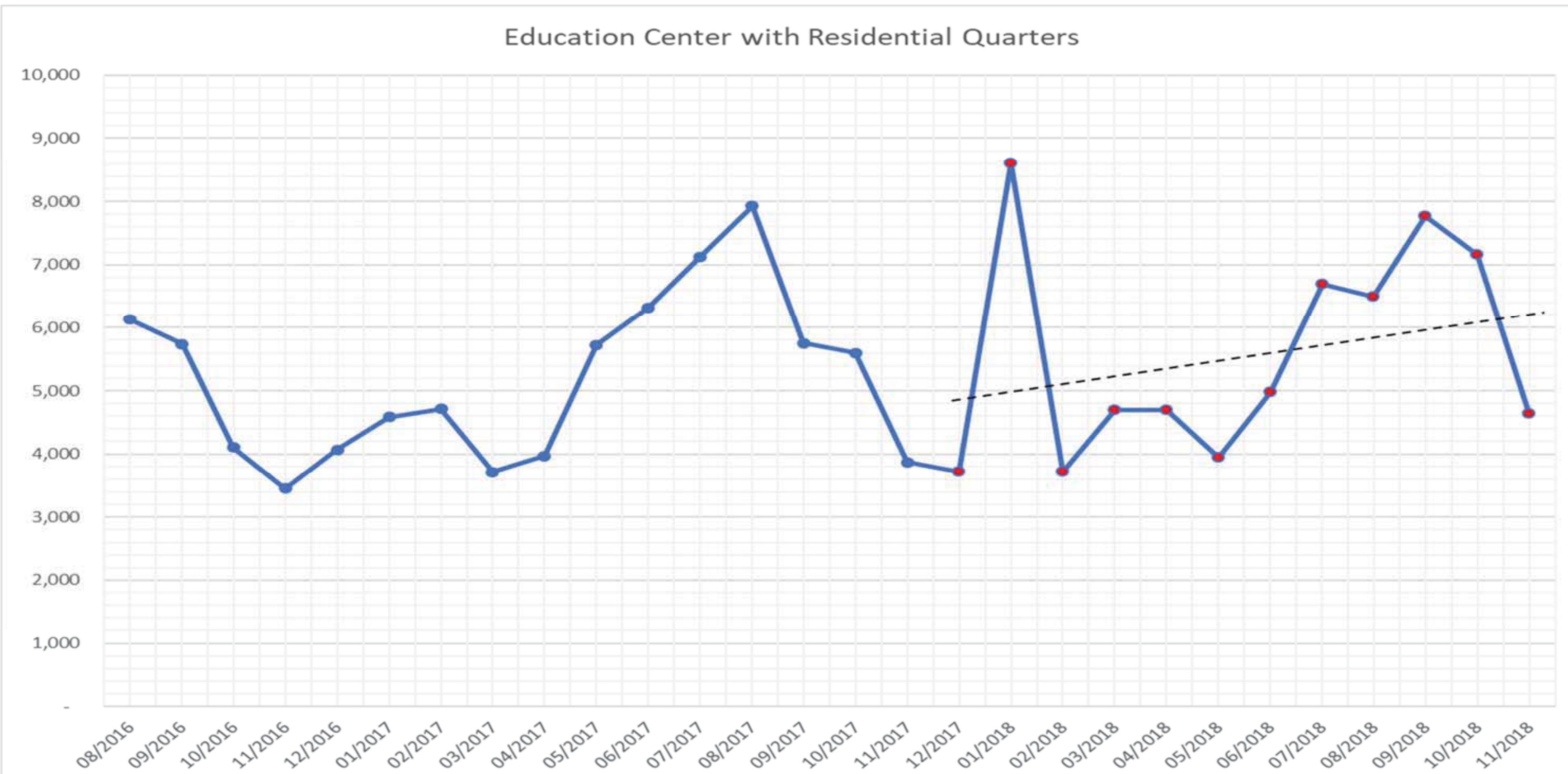

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