



**PECO Energy**  
**2014 LIURP Evaluation**  
**Final Report**

**April 2016**

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## Executive Summary

This report presents the findings from the Evaluation of PECO's 2014 Low Income Usage Reduction Program (LIURP). LIURP provides energy efficiency services and energy education to PECO's low-income customers to help them reduce their energy usage and increase the affordability of their energy bills. The Program addresses both electric and gas energy usage. This report describes the LIURP services and analyzes the impact of the Program on customers' energy usage, energy bills, and payments.

### *Evaluation*

The goals of the evaluation were to analyze the LIURP services provided and the impacts of the services on participating customers. The following activities were undertaken.

- *Process Review:* Review and update of LIURP program description.
- *Program Database Analysis:* Analysis of 2014 LIURP services, homes, and customer characteristics.
- *Program Impacts Analysis:* Analysis of LIURP impact on energy usage, energy costs, and bill payment.

### *PECO's LIURP*

The Low Income Usage Reduction Program (LIURP) provides education, conservation, and weatherization measures to reduce electric and gas usage. Customers must meet the following usage and income eligibility criteria for program participation.

- Household usage levels at or above 600 kWh per month for electric baseload, 1,400 kWh per month for electric heat, or 50 ccf per month for gas heat. The definition of high usage for CAP Rate customers is usage that is at or above 500 kWh.
- Residential customers with household income at or below 150 percent of the federal poverty level (FPL), or special needs residential customers with an arrearage and household income between 151 percent and 200 percent of the FPL.

CAP customers are targeted for Program services, but participation in CAP is not required for LIURP services. The CAP rate definition of high usage is 500 kWh. CAP customers are required to participate in LIURP if they are identified as high users.

The number of customers who receive LIURP services each year is largely determined by the annual program budget established in the settlement agreement of PECO's electric restructuring case (PUC Docket Numbers R-00973953 and P-00971265). The annual budget

for 2014 was \$5.6 million for electric and \$2.250 million for gas. In 2014, 10,803 customers received LIURP services.<sup>1</sup>

PECO contracts with CMC Energy Services to administer LIURP. PECO provides CMC with a list of eligible customers and their energy usage data. CMC recruits these households in descending order based on highest usage and largest arrearages. CMC also contacts households who are directly referred from external organizations, including social and governmental agencies. CMC conducts an energy audit to determine the behavioral changes and program measures required for usage reduction. Following the audit, the auditor schedules appointments for follow up work, by one or more subcontractors, to install measures. For one year after LIURP services have been provided, PECO and CMC monitor the customer's monthly energy usage. CMC mails monthly progress letters to customers to highlight any changes in monthly usage, as compared to the customer's individual goal.

### *Program Statistics*

In 2014, 24,681 customers were evaluated for LIURP services. There were 13,576 customers who were cancelled and 302 customers who were ineligible for the program. The cancellations were primarily due to customers' lack of response to contact attempts, inactive accounts, refusals and moves.<sup>2</sup> In total, 10,803 customers received LIURP services in 2014, though 2,193 customers received only education services and no measures, as there were no LIURP opportunities in these homes.

Table ES-1 displays how program funds were expended in 2014. In total \$7.85 million were spent. Approximately 54 percent was for weatherization measures, 36 percent was for audit and education, and ten percent was for program administration.

**Table ES-1**  
**2014 LIURP Expenditures**  
**Gas and Electric Treatments**  
**By Category**

<b>Category</b>	<b>Amount Spent</b>	<b>Percent of Funds</b>
Weatherization Measures	\$4,259,634	54%
Audit/Education	\$2,820,706	36%
PECO Administration	\$769,070	10%
Solar Water Maintenance	\$593	<1%
<b>TOTAL</b>	<b>\$7,850,004</b>	<b>100%</b>

Table ES-2 displays the distribution of 2014 LIURP jobs by job type, for both electric and gas accounts. The table shows that 57 percent of jobs were classified as baseload, meaning that measures primarily address electric baseload usage. However, the baseload jobs have

<sup>1</sup>2,193 customers did not receive measures. These customers only received education.

<sup>2</sup> See Table III-3.

lower job costs and represent only 24 percent of total costs. The average cost for measures on these jobs was \$159. Gas heating jobs represented 11 percent of jobs and 41 percent of costs, averaging \$1,355 in measure costs per home. Electric heating jobs averaged \$1,325 per home.

**Table ES-2**  
**2014 LIURP Service Delivery and Expenditures**  
**By Job Type**

Job Type	# of Jobs	% of Jobs	Total Cost	% of Costs	Average Job Cost
Baseload <sup>†</sup>	6,159	57%	\$978,561	24%	\$159
Electric Heating	981	9%	\$1,299,687	32%	\$1,325
Gas Heating	1,222	11%	\$1,656,299	41%	\$1,355
Low Usage	126	1%	\$54,671	1%	\$434
Electric Heat Low Use	116	1%	\$24,908	1%	\$215
Baseload Addressing Heater	6	<1%	\$19,451	<1%	\$3,242
No LIURP Measure Costs <sup>‡</sup>	2,193	20%	\$0	0%	\$0
<b>TOTAL</b>	<b>10,803</b>	<b>100%</b>	<b>\$4,033,576</b>	<b>100%</b>	<b>\$373</b>

<sup>†</sup>There were 3 accounts all the measures installed were cancelled.

<sup>‡</sup>There were 2,193 accounts that received education only.

### *Participant Characteristics*

PECO's LIURP database allows for extensive analysis of home and participant characteristics. Some of the important findings from this analysis include the following.

- *Supplemental heating:* Overall, 42 percent of customers who were treated by LIURP used supplemental heat. Forty-six percent of the customers who had baseload LIURP services used electric supplemental heat.
- *Health and safety:* Over 6,500 smoke detectors were provided in approximately 2,600 homes.
- *Compact fluorescent light bulbs:* CFLs were provided to approximately 60% of the homes serviced. On average, 3.8 bulbs were provided to each home serviced.
- *Refrigerator replacement and removal:* Refrigerators were replaced in 2,163 homes and second refrigerators were removed in 16 homes.
- *Air conditioner replacement:* Window air conditioners were replaced in 201 homes.
- *Aerators and showerheads:* A total of 1,832 aerators were provided in 1,121 homes and 1,041 showerheads were provided in 950 homes.

- *Water heaters:* Electric water heater timers were provided in 582 homes and water heater replacements were provided in 128 homes.
- *Air sealing:* Air sealing was provided in 1,507 homes. However, only 765 received a blower door test.
- *Insulation:* Insulation was provided in 599 homes.
- *Heat system repair:* Heating system repair work was provided to 416 homes.
- *Heating system replacement:* Heat pumps were replaced in 31 homes, furnaces in 60 homes, and boilers in 63 homes.

### Usage Impacts

Energy usage was analyzed for the year prior to the LIURP visit and for the year after service delivery was completed. The analysis included as close to a full year of data pre and post-treatment as possible. Data were available for approximately 75 percent of the treated households.

Energy usage data were weather-normalized in the pre and the post usage periods to ensure that changes in energy usage were due to changes in usage patterns, rather than due to changes in weather. We used a degree-day normalization process to conduct this analysis. Results were similar to PRISM, but allowed for inclusion of a larger number of homes.

Table ES-3 summarizes the overall usage impact results.

- *Baseload jobs* had average annual savings of approximately 849 kWh, or 8.5 percent of pre-treatment usage.
- *Electric heat jobs* had average annual savings of approximately 1,113 kWh, or 6.8 percent of pre-treatment usage.
- *Gas heat jobs* had average annual savings of approximately 27 ccf, or 2.9 percent of pre-treatment usage.

**Table ES-3**  
**Average Annual Usage and Savings**

	#	Pre-Use	Post-Use	Annual Savings	% Savings
<b>Electric Baseload (kWh)</b>					
Non Normalized	4,798	9,653	9,089	564	5.8%
Degree Day Normalized	4,798	9,969	9,120	849	8.5%
PRISM Normalized	4,062	9,707	8,954	753	7.8%

	#	Pre-Use	Post-Use	Annual Savings	% Savings
<b>Electric Heat (kWh)</b>					
Non Normalized	593	17,035	15,932	1,103	6.5%
Degree Day Normalized	593	16,263	15,150	1,113	6.8%
PRISM Normalized	483	16,073	15,026	1,047	6.5%
<b>Gas Heat (ccf)</b>					
Non Normalized	845	1,007	941	66	6.6%
Degree Day Normalized	845	906	879	27	2.9%
PRISM Normalized	825	910	886	24	2.7%

We compared the usage impact results to historical savings results.<sup>3</sup>

- **Electric Baseload Jobs:** The 2014 electric baseload jobs had close to the same level of savings as the 1999-2013 average. Savings were 8.5 percent in 2014 compared to the historical average of 8.6 percent. However, the 2014 electric baseload savings were significantly higher than they were in 2011 through 2012.
- **Electric Heating Jobs:** The 2014 electric heating jobs had lower savings than the 1999-2013 average. Savings were 6.8 percent in 2014 compared to the historical average of 7.8 percent. The electric heating pre-treatment usage was significantly lower than in the past, averaging 16,263 kWh, compared to the historical average of 21,654 kWh. Additionally, the cost of measures was almost 30 percent lower than the historical average.
- **Gas Heating Jobs:** The 2014 gas heating jobs had significantly lower savings than the 1999-2013 average, as well as than in other recent years. Savings were 2.9 percent in 2014 compared to the historical average of 9.7 percent. Pre-treatment usage in 2014 was about 21 percent lower than the historical average and spending in 2014 was 38 percent lower than the historical average.

### *Measure Savings*

The analysis also estimated the impact of specific LIURP measures on kWh and ccf savings. Table ES-4 displays results from this analysis. Savings were computed by running a regression model that predicted savings based on the measures provided and home and customer characteristics.

<sup>3</sup>Table IV-3A provides the historical comparison of energy savings by job type.



**Table ES-4  
Measure Savings Estimates**

	<b>Savings</b>	<b>Cost/Home</b>	<b>\$/Unit Saved</b>	<b>Measure Life</b>	<b>\$/Unit Saved Over Lifetime</b>
<b>Electric Baseload (kWh)</b>					
CFL Only <sup>1</sup>	801 (±85)	\$12/\$273	\$0.02/\$0.34	5	<\$0.01/\$0.08
CFL	24 (±13)	\$2	\$0.08	5	\$0.02
Refrigerator	640 (±153)	\$378	\$0.59	12	\$0.07
<b>Gas Heat (ccf)</b>					
Gas Furnace	68 (±61)	\$2,734	\$40.14	15	\$3.87
Boiler	100 (±64)	\$3,442	\$34.30	15	\$3.30
Insulation	34 (±25)	\$839	\$24.43	15	\$2.35

<sup>1</sup>The average number of CFLs provided to these customers was 6.3, for an average savings of 127 kWh per CFL.

### *LIURP Cost Effectiveness*

We also analyzed the cost-effectiveness of LIURP by job type. Table ES-5 estimates the cost per unit saved based on different assumptions about measure life. These costs should be compared to retail rates to evaluate the cost-effectiveness of the program at different measure lives. The most reasonable assumption for electric baseload reduction is a five to seven-year measure life. Baseload electric services, at a cost of seven cents per kWh saved with a 10-year measure life, are cost-effective. Gas heat savings have a 15-year measure life. Under the 15-year measure life assumption, the cost per ccf saved is \$4.58, which is not cost-effective with current gas prices.<sup>4</sup> To increase cost-effectiveness, the program would need to reduce spending on gas heating measures and increase the savings that were obtained from the measures that were installed.

**Table ES-5  
Cost Per Unit Saved  
By Measure Life Assumption**

	<b>#</b>	<b>Average Savings</b>	<b>Average Total Cost</b>	<b>Cost Per Unit Saved</b>	<b>5-Year Measure Life</b>	<b>10-Year Measure Life</b>	<b>15-Year Measure Life</b>
<b>Electric Baseload</b>							
Electric (kWh)	4,798	849	\$491	\$0.58	\$0.13	\$0.07	\$0.06
Gas (ccf)	41	5	\$6	\$1.26	\$0.29	\$0.16	\$0.12
<b>Electric Heat</b>							
Electric (kWh)	593	1,113	\$1,634	\$1.47	\$0.34	\$0.19	\$0.14

<sup>4</sup>The cost to save a ccf of gas would need to be lower than the price for a ccf for the program to be cost-effective. Since the current cost per ccf of gas is approximately \$.70 per ccf, the cost of services would need to be significantly lower or savings would need to be significantly greater for the program to be cost-effective.

	#	Average Savings	Average Total Cost	Cost Per Unit Saved	5-Year Measure Life	10-Year Measure Life	15-Year Measure Life
Gas Heat							
Electric (kWh)	800	911	\$190	\$0.21	\$0.05	\$0.03	\$0.02
Gas (ccf)	845	27	\$1,262	\$47.55	\$10.98	\$6.16	\$4.58

### *Bill and Payment Impacts*

The evaluation also included an analysis of the charges and payments made by customers in the pre and post-treatment periods. Table ES-6 summarizes the results of this analysis. While total bills and charges declined by \$155, total payments and credits declined by \$3 from the pre to post period. The total bill coverage rate increased by 15.4 percentage points. Customers were paying an average of 92.7 percent of their bills prior to LIURP treatment and an average of 108.0 percent of their bills following LIURP treatment.

**Table ES-6  
Bills, Payments, and Coverage Rates  
Pre and Post-LIURP Treatment**

	#	Pre	Post	Change	Percent Change
<b>Electric Baseload</b>					
Total Bills and Charges	4,370	\$988	\$818	-\$170 <sup>***</sup>	-17.2%
Total Payments and Credits		\$862	\$837	-\$26 <sup>***</sup>	-3.0%
Total Coverage Rate		92.9%	109.6%	16.8% <sup>***</sup>	18.1%
<b>Electric Heat</b>					
Total Bills and Charges	408	\$1,928	\$1,762	-\$166 <sup>***</sup>	-8.6%
Total Payments and Credits		\$1,568	\$1,751	\$183 <sup>***</sup>	11.6%
Total Coverage Rate		85.6%	102.5%	16.9% <sup>***</sup>	19.8%
<b>Gas Heat</b>					
Total Bills and Charges	688	\$1,723	\$1,586	-\$138 <sup>***</sup>	-8.0%
Total Payments and Credits		\$1,561	\$1,593	\$33	2.1%
Total Coverage Rate		93.9%	101.9%	8.0% <sup>***</sup>	8.5%
<b>Education Only</b>					
Total Bills and Charges	1,617	\$949	\$821	-\$129 <sup>***</sup>	-13.5%
Total Payments and Credits		\$832	\$823	-\$9	-1.1%
Total Coverage Rate		93.3%	107.8%	14.4% <sup>***</sup>	15.5%
<b>All Job Types</b>					
Total Bills and Charges	7,233	\$1,099	\$944	-\$155 <sup>***</sup>	-14.1%
Total Payments and Credits		\$959	\$955	-\$3	-0.3%
Total Coverage Rate		92.7%	108.0%	15.4% <sup>***</sup>	16.6%

## *Key Findings and Recommendations*

PECO's LIURP delivered usage reduction services and energy education to over ten thousand customers in 2014, many of whom had vulnerable household members. Reductions in electric usage were higher for baseload jobs than they had been in recent years, and were higher than the historical average savings but electric and gas heating savings declined.

LIURP has had a positive impact on energy affordability and bill payment for program participants. Following participation, the percent of the total bill that customers paid increased by 15.4 percentage points. Customers were paying an average of 92.7 percent of their bills prior to LIURP treatment and an average of 108.0 percent of their bills following LIURP treatment.

We have the following recommendations to continue to achieve these higher electric baseload savings and to potentially improve savings for the electric and gas heating jobs.

- *Service Delivery* – APPRISE completed a technical evaluation of PECO's LIURP program in 2014 that included on-site observation of service delivery and inspections of completed jobs. The research found that refining current procedures and improved implementation with additional contractor training could have significant positive impacts on the energy savings achieved by LIURP. Key aspects of service delivery that could be improved to increase energy savings include use of the blower door with pressure pan testing and zonal pressure testing, air sealing, duct sealing, and refrigerator replacement. PECO should continue to observe and inspect LIURP jobs to ensure that higher standards for service delivery are met.
- *Education*: Households that only received CFLs had higher savings than in 2011 and 2012, suggesting the education delivery was more effective. PECO should also review whether changes in education were made in 2013 and 2014 that can continue to be implemented in future program years. The forthcoming customer survey will provide more information on this issue.
- *Opportunities*: Installation of major measures was lower for electric heating and gas heating jobs than it has been in 2011 and 2012. Only 31 percent of electric heating jobs received insulation, compared to 37 percent in 2012 and 39 percent in 2011. Only 35 percent of gas heating jobs received insulation, compared to 46 percent in 2012 and 54 percent in 2011, and only 61 percent received air sealing, compared to 74 percent in 2012 and 76 percent in 2011. PECO should ensure that CMC is pursuing all cost-effective energy-saving opportunities.
- *Additional Measures*: PECO has found that the number of customers with defacto electric heat has increased over the past several years. They have also had a large number of customers referred to the Pennsylvania State Weatherization Program (WAP) for services that are not provided through PECO's LIURP. WAP currently has a long waiting list, and it is unlikely that many of the referred customers will be served soon. Therefore, PECO implemented a pilot to test the addition of weatherization measures with the goal of providing more comprehensive services to participants and increasing program

savings. Additionally, the 2014 technical evaluation<sup>5</sup> found the following measures should be considered for the future – heat pump water heaters, additional refrigerator replacement, boiler flue dampers, discharge tubes on boilers and water heaters, replacement of old dehumidifiers, and potentially use of LED bulb replacement as their cost continues to decline and the cost-effectiveness is positively evaluated. PECO will be piloting mini-split systems in 2016 and 2017.

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<sup>5</sup>LIURP On-Site Research Final Report, February 2015.

## **I. Introduction**

This report presents the findings from the 2014 PECO LIURP evaluation. PECO's LIURP provides energy efficiency services and energy education to low-income households to help them reduce their energy usage and increase the affordability of their energy bills. This report describes the Program services and analyzes the impact of the Program on customers' energy usage, energy bills, and payments.

### **A. *Background***

PECO Energy has implemented a set of Universal Services Programs to meet requirements set by Pennsylvania's electric and gas restructuring legislation and various Public Utility Commission orders and agreements. The Universal Service goals are as follows.

- To protect consumers' health and safety by helping low-income customers maintain affordable utility service.
- To provide affordable utility service by making available payment assistance to low-income customers.
- To help low-income customers conserve energy and reduce residential utility bills.
- To ensure utilities operate universal service and energy conservation Programs in a cost-effective and efficient manner.

The Universal Services Programs include the following four initiatives.

- A CAP payment assistance Program that is designed to make energy bills more affordable by furnishing payment subsidies.
- A LIURP Program that is designed to make energy bills more affordable by helping to reduce usage.
- A CARES Program that is designed to assist households in developing appropriate strategies for maintaining energy service.
- A MEAF hardship fund Program that is designed to furnish emergency payments to households that cannot pay their energy bills.

### **B. *Evaluation Objectives and Activities***

The goals of the evaluation were to analyze the LIURP services provided and the impacts of the services on participating customers. Three key activities were undertaken as part of this evaluation.

- *Process Review:* We reviewed and updated the LIURP program description.
- *Program Database Analysis:* We conducted analysis of the 2014 LIURP Program database, which included data on services delivered, homes serviced, and customers served.
- *Program Impacts Analysis:* We analyzed billing and transactions data to estimate the impact of the Program on energy usage, energy costs, and bill payment.

### ***C. Organization of the Report***

Five sections follow this introduction.

- **Section II – Low Income Usage Reduction Program:** This section describes PECO’s LIURP design and implementation.
- **Section III – Program and Participant Statistics:** This section provides descriptive statistics on LIURP services delivered in 2014 and the customers who received these services.
- **Section IV – Usage Impacts:** This section analyzes the impacts of LIURP on customers’ electric and gas usage.
- **Section V – Payment Impacts:** This section analyzes changes in customers’ bills, payments, and arrearages after receiving Program services.
- **Section VI – Summary of Findings and Recommendations:** This section provides a summary of the key findings and furnishes recommendations for PECO’s LIURP based on the analyses in this report.

APPRISE prepared this report under contract to PECO. PECO facilitated this research by furnishing Program data to APPRISE. Any errors or omissions in this report are the responsibility of APPRISE. Further, the statements, findings, conclusions, and recommendations are solely those of analysts from APPRISE and do not necessarily reflect the views of PECO.

## II. Low Income Usage Reduction Program

PECO has implemented a set of Universal Service Programs to comply with Public Utility Commission Regulations. The programs are designed for low-income, residential customers. One of these programs is the Low Income Usage Reduction Program (LIURP).

The Pennsylvania Public Utility Commission (PUC) requires that all electric and gas utilities in the state offer a Low-Income Usage Reduction Program (LIURP) to their customers. PECO has contracted with CMC Energy Services (CMC) to administer LIURP since the implementation of the Program in 1991. PECO and CMC worked together to create Program procedures that complied with Chapter 58 guidelines, and continue to work together to design and implement Program changes when necessary. CMC sub-contracts with five subcontractors to install major Program measures and an additional subcontractor to deliver energy efficient refrigerators.

The total 2014 LIURP budget was \$7.85 million with \$5.6 million for electric usage reduction and \$2.250 million for gas usage reduction.

### ***A. Program Management and Administration***

LIURP managers and staff have many years of experience with LIURP. PECO's analyst is responsible for overseeing overall LIURP production, quality assurance, and the annual Program evaluation. She is also responsible for managing the LIURP budget, refining the Program, and analyzing CMC reports.

CMC has a total of 51 staff members who work on PECO's LIURP. The following are the key CMC staff.

- The Director of Operations is responsible for monitoring overall Program performance. Responsibilities include budget management, monthly reporting, contract/regulatory compliance, sub-contractor performance, customer satisfaction and staff training.
- The Director of Operations is also responsible for managing program activities, setting performance goals, providing technical support, recommendations for program enhancements and implementation, financial data and management of special projects.
- The Administrative Assistant provides support to the Director of Operations. The Administrative Assistant is responsible for ensuring that subcontractors are in compliance with fitness for duty and insurance requirements.
- The Quality Control Manager is responsible for managing subcontractors, field inspectors, and providing technical assistance to inspectors and customer service representatives, resolution of customer inquiries, and monitoring of the quality control procedures. The Quality Control Manager is responsible for all technical compliance and ensuring that subcontractors complete work within the allotted timeline;

- The Field Services Supervisor is responsible for oversight of the energy auditors who perform energy audits, training, and provide technical support. The Field Services Supervisor is responsible for ensuring that production goals are achieved and opportunities to reduce usage are captured. The Field Services Supervisor is also responsible for ensuring that program measures are installed as recommended by the energy auditor and the energy auditor's analysis is in compliance with the LIURP program guidelines.
- CMC's Field Inspectors are responsible for monitoring the work performed by subcontractors, and conduct on-site observations and post treatment inspections.
- The Customer Care Center Supervisor is responsible for the completeness and accuracy of the customer demographic data collected during the appointment scheduling process.

CMC meets with PECO monthly for performance reviews and bi-monthly for Program review meetings. PECO conducts monthly site visits and inspections and has regular telephone and/or e-mail contact with CMC.

CMC staff conduct the LIURP audit and develop a work order for additional measures to be installed on subsequent visit(s) by the program subcontractors who assist in the implementation of LIURP.

CMC has a total of six subcontractors responsible for the installation of residential air sealing, insulation, house heating, and water heating system repair and replacement, water heater timers, line voltage thermostats, energy efficient refrigerators and room air conditioners. CMC's subcontractors are required to submit invoices weekly and obtain all required permits for municipal county inspections.

- Premier Contractors completes weatherization work, air sealing, insulation, and air conditioner replacements.
- Davis Modern Heating completes house heating and water heating repair and replacement work.
- McCann Company completes house heating and water heating repair and replacement work.
- Kinkaid completes house heating and water heating repair and replacement work.
- Colonial Electrical installs water heater timers and line voltage thermostats.
- General Electric delivers energy efficient refrigerators.

## ***B. LIURP Eligibility and Benefits***

PECO customers must meet the following criteria to participate in the Program.

- Residential customer who is not planning to move in the next 12 months



- Income at or below 200 percent of the Federal Poverty Level (FPL)<sup>6</sup>
- Usage requirements
  - At least 500 kWh average monthly usage for CAP customers
  - At least 600 kWh average monthly usage for baseload customers
  - At least 1,400 kWh average monthly usage for electric heating customers
  - At least 50 ccf average monthly usage for gas heating customers

LIURP provides weatherization and conservation measures to promote usage reduction. Energy education tailored to the individual household's energy use is also provided to facilitate usage reduction.

The following measures may be provided.

- Insulation
- Air sealing
- Heating system repair or replacement
- Air conditioner replacement
- Refrigerator replacement
- Water heater timer installation
- Water heater and pipe wraps
- Line voltage thermostats
- Faucet aerators
- Showerheads
- Smoke detectors
- Carbon monoxide detectors
- CFL bulbs

### ***C. Qualification of Leads***

PECO sends a quarterly download of high usage, low-income customers to CMC.<sup>7</sup> Customers are also referred to LIURP through the following mechanisms.

- PECO Universal Services staff
- CAP call center
- Community Based Organizations (CBOs)
- Government agencies
- Prior Program recipients
- Universal Services Cares Unit

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<sup>6</sup> Since 1998, LIURP regulations have permitted companies to spend up to 20 percent of their annual Program budgets on customers with income between 150 and 200 percent of the FPL.

<sup>7</sup> This is done through a three step process.

The electronic file downloaded from PECO contains high energy users who are also LIHEAP recipients, Customer Assistance Program (CAP) participants, payment-troubled customers, or customers with multiple payment agreements. CMC reviews the lists and eliminates customers who have received LIURP within the past two years, refused Program services, or moved within the past six months. Typically, after these removals, the remaining customers on the downloaded file are eligible for and receive services from LIURP.

CMC screens all referrals from other sources to determine Program eligibility. If income and usage history are available and the customer is determined to be eligible, CMC enrolls the customer immediately. If income eligibility cannot be determined from PECO's system, CMC mails income documentation forms to the customer. Typically, 25 to 30 percent of customers referred through other sources are determined to be eligible for and receive services from LIURP.

Referred customers may not receive LIURP services because of one of the following reasons.

- Refusal of LIURP services
- Insufficient usage history<sup>8</sup>
- Inactive account
- Income over the eligibility limit
- Non-responsive to CMC contacts
- Recently moved or is planning to move within one year
- Deceased
- Usage below the required level<sup>9</sup>
- Tenant with a landlord who will not provide consent

CMC is required to obtain consent from the landlord to provide services to a tenant. A landlord may not provide approval because he or she wants to choose Program measures or is evicting the tenant.<sup>10</sup> Some landlords never respond to CMC inquiries. CMC is able to obtain landlord consent for more than 50 percent of renters.

Approximately 90 percent of customers who receive LIURP services are identified through the downloaded list, and about 10 percent through other referrals.

#### ***D. Customer Outreach***

CMC's customer service representatives contact potential Program participants by telephone to explain Program services, obtain customer information, and confirm or determine eligibility.

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<sup>8</sup>This may be the case if the customer recently moved into the home.

<sup>9</sup> There are some hardship cases where PECO makes exceptions to the usage requirement.

<sup>10</sup> Landlords are not required to contribute to the cost of LIURP services.

If the customer is eligible, an appointment is scheduled for the energy audit. CMC will attempt to make this contact 25 to 30 times by telephone and a minimum of one time by mail over a 90-day period. Information collected during this contact includes the following.

- Name of person responsible for bill payment
- Age of each household member
- Income sources for each household member
- Income amounts for each household member
- Property status and, if applicable, landlord contact information
- Monthly amount of mortgage or rent
- Housing type
- Occupation
- Employment status, marital status and level of education

### ***E. Job Types***

There are two different LIURP job types: Baseload and Heating. Baseload jobs focus on a household's lighting and appliances. Heating jobs include weatherization, insulation, and heating system repair or replacement. Both heating and baseload issues in a household are addressed when necessary.<sup>11</sup>

### ***F. Service Delivery***

CMC prioritizes CAP participants for LIURP service delivery. All CAP participants with monthly usage at or above 500 kWh are considered for LIURP. Those with the lowest income and the greatest CAP benefits receive the highest priority. CMC prioritizes remaining LIURP participants by energy use and income.

The first step in direct service delivery is the Program audit, performed by CMC staff. The auditor verifies the previously reported household characteristics, including income, number of household occupants, age of home, and years of occupancy. He or she also calculates the average household energy use per day, the energy use for each household appliance, temperature settings, and water temperature. Based on this information, the auditor may wrap the water heater and pipes, and install aerators, smoke detectors, showerheads, and CFLs during this initial audit visit.

CMC schedules the appropriate sub-contractors to complete any necessary major measures, such as insulation, heating system repair or replacement, or new appliances. A work order is sent to the subcontractor to communicate the work that is needed. CMC requires that measures be installed within 30 days of the initial audit.

PECO and the PUC have pre-approved all of the LIURP measures. They have placed no cap on the amount of money spent per home. Smoke detectors and CFLs are much more

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<sup>11</sup> Renters do not receive appliance replacement.

commonly provided than some of the more costly measures. CFLs are now provided where bulbs are used for three hours instead of four hours due to the increasing saturation of CFL bulbs.

### ***G. Energy Education***

PECO and CMC designed the energy education portion of LIURP to facilitate customers' clear understanding of the reasons for high energy use, and to communicate how their behaviors contribute to energy use and energy bills. The auditor provides the primary LIURP energy education session during the initial audit visit. This session lasts at least 30 minutes. Further education is often provided by subcontractors when measures are installed, and by other CMC quality control inspectors during quality control inspections and follow-up telephone calls.

During the initial education session, the auditor reviews the customer's audit results and identifies ways that the customer can modify the behaviors of household members to save energy and money. The auditor and the customer set a monthly usage and bill reduction goal for the household. The auditor also provides the customer with an education package, which includes the following materials.

- Tips for saving energy
- An energy calculator
- 'Hazards of Space Heating' pamphlet
- A brochure on CFLs that includes information on how to safely dispose of them
- Energy Savers calendar
- Energy cost estimate form
- Energy saving recommendations list based on the household's energy use
- 'Does Your Money Run Out' booklet
- Referrals to CAP rate and other programs that the customer may be eligible for

The auditor reviews these educational materials with the customer, and compares the household's energy cost estimate form to the household's actual energy bill. Additionally, the auditor refers the customer to programs and agencies that might help him or her meet household needs, and answers any questions the customer may have about the Program or the education session. The auditor reviews the measures that have been installed and those that will be installed by subcontractors. In addition, the auditor reviews the LIURP follow-up procedures that the customer can expect.

For one year after LIURP services have been provided, PECO and CMC monitor the customer's monthly energy usage. CMC mails monthly progress letters to customers to highlight any changes in monthly usage, as compared to the customer's individual goal. Each quarter CMC revises the letters to emphasize energy saving tips that are specific to the current season. CMC provides an additional telephone energy education session to customers who do not meet their monthly average usage goal (MAU) after they receive LIURP services. In rare occasions, an auditor is sent back to the home for reinforcement.

## ***H. Quality Control***

Three methods are primarily used for LIURP quality control.

- An annual evaluation, conducted by an independent program evaluator.
- Customer satisfaction surveys administered by CMC.
- Inspections by the CMC Quality Control Manager and PECO's LIURP Manager.

Additionally, in 2010, PECO hired Pure Energy to conduct quality control inspections on a sample of approximately 300 completed jobs. The findings from the inspections were generally good, within industry standards.<sup>12</sup>

CMC conducts customer satisfaction surveys during post-delivery site inspections, by telephone, and by mail. CMC reported that the surveys show customers increased their knowledge of energy conservation through Program participation. Customers reported that they were satisfied with LIURP and with the new appliances that the Program provided.

CMC has a Quality Control Manager who supervises the Quality Control Supervisor, two field inspectors, and the auditor. A minimum of five percent of the baseload audits are inspected. All of the heating audits are inspected.

The inspector works from an inspection checklist, and has the customer satisfaction survey, the home's audit results, and the completed work order to assist in the inspection. The inspector also conducts blower door, heating, and carbon monoxide testing, and confirms the presence of all invoiced measures. In addition to post-completion inspections, the inspector sometimes accompanies CMC staff on audits, and sub-contractor staff on installations.

When the inspector finds missed opportunities or small mistakes, he fixes the problem and provides feedback to the individual who performed the work. For larger mistakes, or discrepancies in quantities invoiced and quantities received, the inspector fails the job and allows CMC or subcontractor staff 10 business days to fix the problems and send written confirmation of resolution to the inspector. Depending on the nature of the problem, the inspector may return to the site to re-inspect.

The PECO LIURP manager also randomly selects home for visits. She visits these homes and confirms that the work listed on the invoice was performed in the home. She also randomly selects and validates LIURP invoices.

The LIURP inspection process helps to ensure high quality work, and highlights areas for potential improvement. Inspection findings led to the addition of LIURP measures including central AC maintenance and an anti-spill switch for heating systems.

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<sup>12</sup> PECO has hired Pure Energy to conduct quality control inspections again in 2016.

## ***I. Data and Reporting***

LIURP databases contain the following information.

- Personal and household demographics
- Landlord contact information
- Audit results
- Quantity and costs of installed measures
- Referrals made to other programs
- Post treatment follow-up outreach results
- Completion dates and usage history
- Performance scorecard

CMC conducts data entry daily. CMC and PECO check the database for completeness and accuracy. These data are used to generate regular reports, including the following.

- Completed jobs compared to projected jobs
- Program costs by category
- Average cost per job
- Completed jobs by type
- Outreach call volume
- Customer demographics

CMC and PECO monitor Program data monthly and the independent evaluator monitors Program data annually. In addition to this report, CMC and PECO produce an annual report to the PUC.

## ***J. LIURP Training***

PECO states in their contract with CMC that they require LIURP staff members to be adequately trained. CMC's Quality Control Manager assesses the training needs of the CMC field and sub-contractor staff. The CMC Office Manager assesses the training needs of the CMC administrative staff. CMC provides full training to each LIURP staff member at the time of hire, and additional training as needed.

CMC provides LIURP staff with diagnostic training through the Pennsylvania College of Technology, state certification, and auditor certification. CMC also sends staff members to Affordable Comfort conferences and provides field technicians with BPI training. PECO provides LIURP staff with training on mainframe connection and procedures, the Universal Services Programs, customer service procedures, and safety hazards. PECO also provides LIURP staff with the opportunity to attend conferences.

Subcontractors only attend trainings that are relevant to the Program measures that they install. CMC provides subcontractors with in-field training as needed.

***K. Program Coordination***

CMC maintains a LIURP referral list consisting of other Universal Services Programs and state and county agencies that provide assistance to low-income customers. CMC staff make referrals during the initial energy audit, as well as during inspection and post treatment follow-up calls. During the follow-up call, CMC staff members ask customers whether they were able to obtain any benefits from the referrals they were given. Additionally, the CMC auditor provides CAP and LIHEAP applications to customers at the time of the LIURP audit.

Participation in LIURP is a requirement of PECO's CAP. CAP participants who refuse LIURP receive two letters to remind them of the CAP requirements. Most customers respond to the second letter. PECO's LIURP manager sends the list of customers who do not respond to the second letter (not including tenants) to the call center for a telephone follow-up.

### III. Program and Participant Statistics

This section provides statistics on the LIURP services that were provided in 2014, as well as the characteristics of the homes and the customers who were served by the Program.

#### A. Participation

PECO screened 24,681 customers for LIURP services in 2014. Table III-1 shows that 13,576 were cancelled, 302 customers were not eligible, and 10,803 received Program services.

**Table III-1  
Customers Evaluated for Program Services**

Category	Number	Percent of Total
Cancelled	13,576	55%
Ineligible	302	1%
Treated	10,803	44%
TOTAL	24,681	100%

Table III-2 displays the reasons why customers were deemed ineligible for LIURP. While 49 percent were ineligible because they were over the income eligibility limit, 23 percent were ineligible because the scope of work was beyond the program's guidelines, and 17 percent were ineligible because they were commercial accounts.

**Table III-2  
Ineligible Customers**

Category	Number	Percent of Total
Over Income	149	49%
Scope Of Work Beyond Guidelines	70	23%
Commercial Account	52	17%
Insufficient Usage History	18	6%
Usage Below Guidelines	11	4%
Previously Treated In LIURP	2	1%
TOTAL	302	100%

Table III-3 displays reasons why customers were cancelled. The largest group of customers, 67 percent, made no response to contact attempts. CMC attempts to contact customers 25 to 30 times prior to removing customers from the targeted list. Twenty percent had a planned move, and ten percent refused services.



**Table III-3  
Cancelled Customers**

Category	Number	Percent of Total
No Response To Contact Attempts	9,074	67%
Customer Moving	2,717	20%
Customer Refused	1,417	10%
No Landlord Consent	231	2%
Renovations In Progress	63	<1%
Inactive Account	27	<1%
Cancelled At The Door Due To Inactive Account	20	<1%
Cancelled Due To Unsafe Environment	14	<1%
Do Not Contact	13	<1%
<b>TOTAL</b>	<b>13,576</b>	<b>100%</b>

### **B. LIURP Services**

This section describes LIURP services that were delivered in 2014. The total budget was \$7.85 million with \$5.6 million for electric usage reduction and \$2.250 million for gas usage reduction. Table III-4 shows the distribution of this spending. Fifty-four percent was spent on weatherization measures and labor, 36 percent was spent on audits and education, ten percent was spent on PECO administration, and less than one percent was spent on solar water heating pilot maintenance.

**Table III-4  
2014 LIURP Expenditures  
By Category**

Category	Amount Spent	Percent of Funds
Weatherization Measures	\$4,259,634	54%
Audit/Education	\$2,820,706	36%
PECO Administration	\$769,070	10%
Solar Water Maintenance	\$593	<1%
<b>TOTAL</b>	<b>\$7,850,004</b>	<b>100%</b>

Table III-5A displays the distribution of LIURP jobs and expenditures by job type. Jobs are classified as baseload, electric heating, or gas heating. While 58 percent of the jobs were classified as baseload, they represented 25 percent of the total costs. The average cost for measures on these jobs was \$162. Gas heating jobs represented 11 percent of jobs and 42 percent of costs, averaging \$1,361 in measure costs per home. Electric heating jobs averaged \$1,206 per home.

**Table III-5A**  
**2014 LIURP Service Delivery and Expenditures**  
**By Job Type**

<b>Job Type</b>	<b># of Jobs</b>	<b>% of Jobs</b>	<b>Total Cost</b>	<b>% of Costs</b>	<b>Average Job Cost</b>
Baseload <sup>†</sup>	6,264	58%	\$1,012,353	25%	\$162
Electric Heating	1,106	10%	\$1,333,848	33%	\$1,206
Gas Heating	1,240	11%	\$1,687,375	42%	\$1,361
No LIURP Measure Costs <sup>‡</sup>	2,193	20%	\$0	0%	\$0
<b>TOTAL</b>	<b>10,803</b>	<b>100%</b>	<b>\$4,033,576</b>	<b>100%</b>	<b>\$373</b>

<sup>†</sup>There were 3 accounts all the measures installed were cancelled.

<sup>‡</sup>There were 2,193 accounts that received education only.

Table III-5B displays jobs by type, but lists the low usage and prior year jobs separately, as these jobs are not included in the impact analysis.

**Table III-5B**  
**2014 LIURP Service Delivery and Expenditures by Job Type**  
**Low Usage and Prior Year Jobs Separated**

<b>Job Type</b>	<b># of Jobs</b>	<b>% of Jobs</b>	<b>Total Cost</b>	<b>% of Costs</b>	<b>Average Job Cost</b>
Baseload <sup>†</sup>	6,159	57%	\$978,561	24%	\$159
Electric Heating	981	9%	\$1,299,687	32%	\$1,325
Gas Heating	1,222	11%	\$1,656,299	41%	\$1,355
Low Usage	126	1%	\$54,671	1%	\$434
Electric Heat Low Use	116	1%	\$24,908	1%	\$215
Baseload Addressing Heater	6	<1%	\$19,451	<1%	\$3,242
No LIURP Measure Costs <sup>‡</sup>	2,193	20%	\$0	0%	\$0
<b>TOTAL</b>	<b>10,803</b>	<b>100%</b>	<b>\$4,033,576</b>	<b>100%</b>	<b>\$373</b>

<sup>†</sup>There were 3 accounts all the measures installed were cancelled.

<sup>‡</sup>There were 2,193 accounts that received education only.

Table III-6 provides a more detailed breakdown of the type of work done in LIURP jobs, based on CMC's classification of measure types. Many jobs received more than one type of service. Seventy-three percent of the customers received baseload services, but only 20 percent received a refrigerator replacement. Approximately 10 percent received air sealing and 10 percent received weatherization. Six percent received a heating system tune-up, and six percent received insulation.

**Table III-6**  
**2014 LIURP Service Delivery and Expenditures**

<b>Work Type</b>	<b># of Jobs</b>	<b>% of Jobs</b>	<b>Total Cost</b>	<b>% of Costs</b>	<b>Average Cost</b>
Baseload	7,908	73%	\$261,853	6%	\$35 <sup>†</sup>
Refrigerator Replacement	2,166	20%	\$818,136	20%	\$808 <sup>‡</sup>
Air Sealing	1,100	10%	\$404,450	10%	\$368
Weatherization	1,055	10%	\$270,513	7%	\$256
Insulation	631	6%	\$612,374	15%	\$970
Electrical	861	8%	\$497,518	12%	\$578
Heating System Tune Up	614	6%	\$234,787	6%	\$382
Heating System Replacement	161	1%	\$665,163	16%	\$4,131
Air Conditioner Replacement	201	2%	\$130,929	3%	\$651
Water Heater Replacement	135	1%	\$112,762	3%	\$835
Water Haeter Service	150	1%	\$25,091	1%	\$167
<b>TOTAL</b>	<b>10,803</b>	<b>100%</b>	<b>\$4,033,576</b>	<b>100%</b>	<b>\$373</b>

<sup>†</sup>7,498 of the 7,908 jobs with baseload measures had one or more baseload measures funded through LIURP. The other jobs had all baseload measures funded through Act 129. Average costs for the 32,203 baseload measures funded through LIURP are shown in this table.

<sup>‡</sup>1,012 of the 2,166 jobs with a refrigerator replaced had that refrigerator replacement funded through LIURP. The other jobs had the refrigerator replacement funded through Act 129. Average costs for the 1,023 refrigerator replacements (a few jobs had more than one refrigerator replaced) funded through LIURP are shown in this table.

Table III-7 provides information on the frequency of individual measures installed through LIURP. Some of the key pieces of information from this table are described below.

- *Health and safety:* Over 6,500 smoke detectors were provided in approximately 2,600 homes.
- *Compact fluorescent light bulbs:* CFLs were provided to approximately 60% of the homes serviced. On average, 3.8 bulbs were provided to each home serviced.
- *Refrigerator replacement and removal:* Refrigerators were replaced in 2,163 homes and second refrigerators were removed in 16 homes.
- *Air conditioner replacement:* Window air conditioners were replaced in 201 homes.
- *Aerators and showerheads:* A total of 1,832 aerators were provided in 1,121 homes and 1,041 showerheads were provided in 950 homes.
- *Water heaters:* Electric water heater timers were provided in 582 homes and water heater replacements were provided in 128 homes.
- *Air sealing:* Air sealing was provided in 1,507 homes. However, only 765 received a blower door test.

- *Insulation:* Insulation was provided in 599 homes.
- *Heat system repair:* Heating system repair work was provided to 416 homes.
- *Heating system replacement:* Heat pumps were replaced in 31 homes, furnaces in 60 homes, and boilers in 63 homes.

**Table III-7A**  
**2014 LIURP Service Delivery and Expenditures**  
**By Measure Type**

Measure	Number of Jobs	% of Jobs	Total Number
Smoke Detector	2,624	24%	6,567
Smoke Detector Battery	522	5%	968
Other Health and Safety	974	9%	978
CFLs	6,528	60%	41,298
Refrigerator Replacement	2,163	20%	2,163
Refrigerator Removal	16	<1%	16
Air Conditioner Replacement	201	2%	345
AC Maintenance	9	<1%	215
Aerator	1,121	10%	1,832
Showerhead	950	9%	1,041
Water Heater Pipe Insulation	529	5%	529
Electric Water Heater Timer	582	5%	582
Water Heater Replacement	128	1%	3,395
Water Heater Labor	151	1%	151
Water Heater Part	48	<1%	10,430
Water Heater Tank Insulation	4	<1%	6
Air Sealing	1,507	14%	1,507
Blower Door Test	765	7%	765
Insulation	735	7%	735
Weatherization	599	6%	599
Duct/Pipe Insulation	237	2%	237
Electric Labor	314	3%	314
Electric Part	186	2%	7,116
Line Voltage Thermostat	353	3%	1,176
Manual Thermostat	189	2%	199
Programmable Thermostat	47	<1%	48
Other Thermostat	2	<1%	2
Clean and Tune	432	4%	432
Heating System Labor	416	4%	416

Measure	Number of Jobs	% of Jobs	Total Number
Heating System Part	165	2%	549
Electric Baseboard	54	<1%	119
Gas Boiler	63	1%	63
Furnace	60	1%	60
Furnace Filter	19	<1%	20
Heat Pump	31	<1%	31

Table III-7B displays the measure installation rates by job type. The table shows that 61 percent of gas heat jobs and 45 percent of electric heat jobs received air sealing and that 35 percent of gas heat jobs and 31 percent of electric heat jobs received insulation.

**Table III-7B**  
**2014 LIURP Service Delivery**  
**Measure Frequency by Job Type**

Measure	All Participants			Analysis Group		
	Baseload	Electric Heat	Gas Heat	Baseload	Electric Heat	Gas Heat
Number of Customers	6,159	981	1,222	4,798	593	845
Smoke Detector	28%	22%	50%	31%	23%	49%
Smoke Detector Battery	6%	7%	5%	6%	7%	5%
Other Health and Safety	<1%	9%	70%	<1%	10%	69%
CFLs	79%	67%	65%	79%	64%	65%
Refrigerator Replacement	27%	21%	22%	25%	19%	22%
Refrigerator Removal	<1%	0%	<1%	<1%	0%	<1%
Air Conditioner Replacement	3%	1%	1%	2%	<1%	<1%
AC Maintenance	0%	<1%	<1%	0%	<1%	<1%
Aerator	5%	38%	34%	4%	36%	35%
Showerhead	5%	33%	25%	4%	31%	24%
Water Heater Pipe Insulation	3%	14%	16%	3%	14%	17%
Electric Water Heater Timer	4%	27%	5%	4%	28%	4%
Water Heater Replacement	<1%	2%	7%	<1%	1%	4%
Water Heater Labor	<1%	2%	11%	<1%	2%	10%
Water Heater Part	<1%	1%	3%	<1%	1%	2%
Water Heater Tank Insulation	<1%	<1%	<1%	<1%	<1%	<1%
Air Sealing	5%	45%	61%	5%	44%	58%
Blower Door Test	0%	27%	40%	0%	28%	39%
Insulation	0%	31%	35%	0%	32%	33%

Measure	All Participants			Analysis Group		
	Baseload	Electric Heat	Gas Heat	Baseload	Electric Heat	Gas Heat
Weatherization	0%	21%	32%	0%	21%	30%
Duct/Pipe Insulation	0%	5%	15%	0%	6%	12%
Electric Labor	2%	18%	1%	2%	16%	1%
Electric Part	1%	9%	1%	1%	8%	1%
Line Voltage Thermostat	<1%	29%	2%	<1%	25%	2%
Manual Thermostat	0%	2%	13%	0%	2%	10%
Programmable Thermostat	0%	3%	2%	0%	3%	1%
Other Thermostat	0%	0%	<1%	0%	0%	0%
Clean and Tune	0%	3%	33%	0%	2%	29%
Heating System Labor	0%	12%	23%	0%	11%	17%
Heating System Part	0%	2%	12%	0%	2%	7%
Electric Baseboard	<1%	5%	<1%	0%	4%	<1%
Gas Boiler	0%	1%	4%	0%	1%	3%
Furnace	0%	1%	4%	0%	1%	3%
Furnace Filter	0%	1%	1%	0%	1%	1%
Heat Pump	0%	3%	0%	0%	3%	0%

Table III-7C displays the key measure installation rates for electric baseload jobs from 2011 through 2014. The table shows that the refrigerator replacement rate increased in 2013 and again in 2014. As refrigerator replacement has a large contribution to energy savings, this is a positive development for the program.

**Table III-7C**  
**2011-2014 LIURP Measure Frequency**  
**Electric Baseload Jobs**

Measure	Electric Baseload - All Participants				Electric Baseload - Analysis Group			
	2011	2012	2013	2014	2011	2012	2013	2014
Number of Customers	4,175	5,475	6,163	6,159	2,440	3,982	4,781	4,798
Refrigerator Removal	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Refrigerator Replacement	11%	9%	15%	27%	12%	10%	16%	25%
CFLs	88%	86%	85%	79%	87%	86%	84%	79%
Average Number CFLs	8.0	7.0	4.7	6.6	7.9	7.1	4.6	6.6

Table III-7D shows that while refrigerator replacement increased for electric heating jobs in 2014, rates for other major measures were approximately the same as in 2013.

**Table III-7D**  
**2011-2014 LIURP Measure Frequency**  
**Electric Heating Jobs**

Measure	Electric Heating - All Participants				Electric Heating - Analysis Group			
	2011	2012	2013	2014	2011	2012	2013	2014
Number of Customers	265	494	743	981	134	309	485	593
CFLs	68%	82%	71%	67%	65%	84%	71%	64%
Refrigerator Removal	0%	0%	0%	0%	0%	0%	0%	0%
Refrigerator Replacement	12%	6%	11%	21%	14%	7%	11%	19%
Blower Door Test	40%	32%	30%	27%	48%	34%	30%	28%
Air Sealing	49%	48%	42%	45%	54%	49%	41%	44%
Duct/Pipe Insulation	3%	3%	4%	5%	3%	4%	4%	6%
Weatherization	28%	24%	21%	21%	26%	22%	19%	21%
Insulation	39%	37%	29%	31%	44%	37%	27%	32%
Line Voltage Thermostat	36%	30%	29%	29%	33%	28%	27%	25%
Heating System Labor	19%	10%	9%	12%	23%	12%	8%	11%
Heating System Part	2%	2%	1%	2%	1%	2%	1%	2%
Electric Baseboard	7%	9%	10%	5%	5%	8%	9%	4%
Heat Pump	7%	3%	4%	3%	7%	4%	4%	3%

Table III-7E shows that installation rates for major measures were approximately the same in 2014 as in 2013, but were lower than the previous two years. For example, only 40 percent received the blower door test in 2014, compared to 60 percent in 2011 and 2012, and only 35 percent received insulation in 2014, compared to 54 percent in 2011. More research should be done to determine why these installation rates are decreasing, as they can lead to lower program savings.

**Table III-7E**  
**2011-2014 LIURP Measure Frequency**  
**Gas Heating Jobs**

Measure	Gas Heating - All Participants				Gas Heating - Analysis Group			
	2011	2012	2013	2014	2011	2012	2013	2014
Number of Customers	1,668	1,282	1,623	1,222	1,211	833	1,170	845
Blower Door Test	60%	60%	41%	40%	60%	59%	38%	39%
Air Sealing	76%	74%	57%	61%	76%	74%	55%	58%
Duct/Pipe Insulation	12%	15%	13%	15%	12%	15%	13%	12%
Weatherization	45%	41%	31%	32%	45%	42%	30%	30%

Measure	Gas Heating - All Participants				Gas Heating - Analysis Group			
	2011	2012	2013	2014	2011	2012	2013	2014
Insulation	54%	46%	30%	35%	54%	45%	30%	33%
Heating System Labor	30%	23%	17%	23%	31%	22%	15%	17%
Heating System Part	25%	20%	13%	12%	25%	21%	11%	7%
Furnace	14%	10%	4%	4%	14%	10%	3%	3%
Gas Boiler	13%	7%	5%	4%	13%	6%	4%	3%

Table III-7F displays the number of major measures installed in electric and gas heating jobs from 2011 through 2014. Electric major measures include refrigerator replacement, air conditioner replacement, water heater replacement, heat pumps, electric baseboards, insulation, and blower door guided air sealing. Gas major measures include furnace replacement, water heater replacement, insulation, and blower door guided air sealing. The table shows that the percentage of jobs with no major measures has increased and the percent with two or more has declined since 2011 and 2012.

**Table III-7F  
2011-2014 Number of Major Measures Installed**

	Electric Heating – Analysis Group					Gas Heating - Analysis Group			
	2011	2012	2013	2014		2011	2012	2013	2014
Number of Customers	134	309	485	593	Number of Customers	1,211	833	1,170	845
0 Major Measures	37%	49%	51%	50%	0 Major Measures	17%	27%	49%	49%
1 Major Measure	17%	17%	23%	21%	1 Major Measure	28%	29%	25%	23%
2 Major Measures	35%	27%	18%	23%	2+ Major Measures	54%	44%	26%	28%
3+ Major Measures	11%	8%	8%	6%					
<b>Total</b>	100%	100%	100%	100%		100%	100%	100%	100%

### ***C. Home Characteristics***

CMC collects detailed information on customers who receive LIURP services, which allows for an in-depth analysis of the homes treated by the Program. We first examine the weather-normalized pre-treatment usage of customers who received LIURP treatments. Table III-8A shows that customers who received baseload services had average usage of 9,914 kWh, electric heating customers had average usage of 15,421 kWh, and gas heating customers had average gas usage of 907 ccf.



**Table III-8A**  
**Pre-Treatment Weather Normalized Usage**

Job Type	Number of Jobs	Jobs with Usage Data	Electric Use (kWh)	Gas Use (ccf)
Baseload	6,264	4,872	9,914	552 <sup>2</sup>
Electric Heating	1,106	677	15,421	923 <sup>3</sup>
Gas Heating	1,240	856	8,797 <sup>1</sup>	907 <sup>4</sup>
Total Excluding Those Without LIURP Measures	8,610	6,405	10,358	891
No LIURP Measures	2,193	1,715	9,594	701
Total Including Those Without LIURP Measures	10,803	8,120	10,196	887

<sup>1</sup>There are only 810 gas heating jobs with electric usage.

<sup>2</sup>There are only 42 baseload jobs with gas usage.

<sup>3</sup>There are only 37 electric heating jobs with gas usage.

<sup>4</sup>There are only 853 gas heating jobs with gas usage. (These jobs are originally classified as “low usage.”)

Table III-8B lists those with low usage and prior year jobs separately.

**Table III-8B**  
**Pre-Treatment Weather Normalized Usage**  
**Low Usage and Prior Year Jobs Separated**

Job Type	Number of Jobs	Jobs with Usage Data	Electric Use (kWh)	Gas Use (ccf)
Baseload	6,159	4,798	9,969	549 <sup>3</sup>
Electric Heating	981	593	16,263	923 <sup>4</sup>
Gas Heating	1,222	845	8,848 <sup>1</sup>	906
Low Usage	126	85	6,182 <sup>2</sup>	949 <sup>5</sup>
Electric Heat Low Use	116	84	9,472	-
Baseload Addressing Heater	6	0	-	-
Total Excluding Those Without LIURP Measures	8,610	6,405	10,358	891
No LIURP Measures	2,193	1,715	9,594	701
TOTAL Including Those Without LIURP Measures	10,803	8,120	10,196	887

<sup>1</sup>There are only 800 gas heating jobs with electric usage.

<sup>2</sup>There are only 84 low usage jobs with electric usage.

<sup>3</sup>There are only 41 baseload jobs with gas usage.

<sup>4</sup>There are only 37 electric heating jobs with gas usage.

<sup>5</sup>There are only 9 low usage jobs with gas usage.

Table III-9 displays the primary heating source for LIURP jobs by job type and overall. Approximately 80 percent of the homes served had utility gas as their primary heating

source. Nine percent used fuel oil and 11 percent had electric heat. Baseload jobs were distributed similarly, though only two percent had electric heat.

**Table III-9  
Primary Heating Source**

Primary Heating Source	Baseload		Electric Heat		Gas Heat		All Jobs	
	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs
Utility Gas	7,084	87%	111	10%	1,210	98%	8,601	80%
Fuel Oil	891	11%	3	<1%	16	1%	930	9%
Electric	140	2%	955	89%	9	1%	1,220	11%
Other	48	1%	2	<1%	1	<1%	52	<1%
TOTAL	8,163	100%	1,071	100%	1,236	100%	10,803	100%

Table III-10 describes the use of supplemental heating by jobs treated through LIURP. Overall, 42 percent of the customers who were treated by LIURP used supplemental heat, virtually all of whom used electric supplemental heat. Forty-six percent of the customers who had baseload services used electric supplemental heat.

**Table III-10  
Supplemental Heating**

Supplemental Heating Source	Baseload		Electric Heat		Gas Heat		All Jobs	
	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs
None Used	4,292	53%	833	78%	897	73%	6,246	58%
Electric	3,763	46%	219	20%	321	26%	4,408	41%
Other	108	1%	19	2%	18	1%	149	1%
TOTAL	8,163	100%	1,071	100%	1,236	100%	10,803	100%

Table III-11 displays the type of air conditioning that LIURP recipients used. Most of the LIURP recipients, 97 percent, used some form of air conditioning. The most common type, with 65 percent, was a window unit. Twenty percent had central air conditioning.

**Table III-11  
Air Conditioning**

Air Conditioning	Number of Jobs	% of Jobs
Window Unit	7,041	65%
Central	2,206	20%
Wall Unit	696	6%
Central Heat Pump	384	4%

<b>Air Conditioning</b>	<b>Number of Jobs</b>	<b>% of Jobs</b>
Portable Unit	111	1%
None Used	365	3%
<b>TOTAL</b>	<b>10,803</b>	<b>100%</b>

Table III-12 shows the home ownership characteristics of LIURP recipients. This table shows that the Program was successful at serving renters, as 56 percent of the LIURP recipients were renters. Renters are not eligible for refrigerator replacement, air conditioner replacement, or furnace replacement.

**Table III-12**  
**Home Ownership**

	<b>Number of Jobs</b>	<b>% of Jobs</b>
Own	4,741	44%
Rent	6,062	56%

Homes treated by LIURP were fairly old. The average age of homes treated was 76 years, and 60 percent were more than 75 years old.

**Table III-13**  
**Home Age**

	<b>Number of Jobs</b>	<b>% of Jobs</b>
≤ 25 Years	490	5%
26 – 50 Years	1,266	12%
51 – 75 Years	2,538	23%
76 Years or Older	6,509	60%
Mean	76 Years	

Table III-14 displays the dwelling type for the homes served under LIURP. The most common type was a row home, with 68 percent of homes served. Ten percent lived in other types of single family homes, another 17 percent lived in multi-family homes, and four percent lived in duplexes.

**Table III-14**  
**Dwelling Type**

	<b>Number of Jobs</b>	<b>% of Jobs</b>
Row	7,349	68%
Multi	1,803	17%

	Number of Jobs	% of Jobs
Other Single Family	1,091	10%
Duplex	439	4%
Mobile	100	1%
Other	6	<1%
Missing	15	<1%
TOTAL	10,803	100%

Table III-15 describes the heated square footage of the homes treated by LIURP. Homes averaged 1,140 square feet. Twenty-eight percent of the homes were greater than 1,200 square feet.

**Table III-15**  
**Heated Square Footage**

	Number of Jobs	% of Jobs
≤ 800 <sup>†</sup>	1,919	18%
801 - 1,000	1,946	18%
1,001 - 1,200	3,950	37%
1,201 or More	2,988	28%
Mean	1,140	

<sup>†</sup>Two records have 0.

#### ***D. Participant Characteristics***

The Program also captures detailed information on the characteristics of households who participate in the Program. Table III-16 shows that 74 percent of the households were female-headed, 52 percent contained at least one child, and 21 percent contained at least one elderly member.

**Table III-16**  
**Household Composition**

	Number of Jobs	% of Jobs
Female Household Head	8,030	74%
Male Household Head	2,773	26%
Child in Household (<18)	5,663	52%
Elderly in Household (>62)	2,294	21%

Table III-17 shows that the mean annual household income level was \$10,159. Approximately 58 percent of the households served had annual income below \$10,000. Only nine percent had gross annual income above \$20,000.

**Table III-17  
Annual Income**

	<b>Number of Jobs</b>	<b>% of Jobs</b>
≤ \$5,000	2,572	24%
\$5,001 - \$10,000	3,636	34%
\$10,001 - \$15,000	2,439	23%
\$15,001 - \$20,000	1,155	11%
\$20,001 or More	1,001	9%
Mean	\$10,159	

Table III-18 displays the household poverty level. Approximately 43 percent of the households had income below 50 percent of the Federal Poverty Level (FPL) and approximately three percent had income above 150 percent of the FPL.

**Table III-18  
Poverty Level**

	<b>Number of Jobs</b>	<b>% of Jobs</b>
≤ 25%	2,642	24%
26% - 50%	2,018	19%
51% - 100%	4,320	40%
101% - 150%	1,478	14%
151% - 175%	260	2%
>175%	85	1%
Mean	59%	

Table III-19 describes the account type of households who participated in the Program. Approximately 93 percent were CAP participants and six percent were Customer Choice participants.

**Table III-19  
Account Type**

	<b>Number of Jobs</b>	<b>% of Jobs</b>
CAP	10,022	93%
Customer Choice	605	6%

Table III-20 displays the education level of the head of household. The majority of participants, 65 percent, had a high school education. Thirteen percent had some college, ten percent had some high school, and nine percent had a college degree.

**Table III-20  
Education Level**

	<b>Number of Jobs</b>	<b>% of Jobs</b>
No Formal Education	98	1%
Some Grade School	118	1%
Grade School	134	1%
Some High School	1,030	10%
High School	7,033	65%
Some College	1,362	13%
College Degree	946	9%
Some Graduate Work	19	<1%
Graduate Degree	63	1%

Table III-21 displays the primary income source for the LIURP participants. The table shows that the largest sources of income were public assistance, part-time work, dependent on another, full-time work, and retirement. Thirty-six percent had public assistance as their primary source of income, 14 percent had part-time work, 13 percent had full-time work, and 12 percent had a pension and/or retirement.

**Table III-21  
Income Source**

	<b>Number of Jobs</b>	<b>% of Jobs</b>
Public Assistance	3,555	33%
Part-Time Work	1,692	16%
Dependent on Another	1,606	15%
Full Time	1,534	14%
Pension/Retirement	1,164	11%
Self-Employment	80	1%
Seasonal Employment	24	<1%
Other	1,103	10%
Missing	45	<1%

## IV. Usage Impacts

This section of the report provides analysis of the impacts of LIURP on participants' annual electric and gas usage. The section describes the methodology for the analysis, the results for all participants by job type, and the results by type of service. We then provide estimates of the impacts of individual measures and the cost effectiveness of LIURP.

### A. Methodology

Customers who received LIURP services in 2014 were treated as the analysis group for this evaluation. We focus on the electric impacts for customers who were treated as electric baseload and electric heating jobs, and the gas impacts for customers who were treated as gas heating jobs.

Energy usage was analyzed for the year prior to the LIURP audit visit and the year after service delivery was completed. The analysis included as close to a full year of data pre and post-treatment as possible. Table IV-1 displays the attrition statistics for the usage analysis. Customers were included in the analysis if their pre and post usage data each spanned between 270 and 390 days. Some additional customers were removed from the analysis if their usage was below 1,200 kWh or 300 ccf, or if their change in usage was greater than 65 percent. After these eliminations, we included 75 percent of the treated population in the usage analysis.

**Table IV-1  
Usage Impact Data Attrition**

	<b>Electric Baseload</b>	<b>Electric Heating</b>	<b>Gas Heating</b>	<b>Education Only (kWh)</b>	<b>Education Only (ccf)</b>	<b>All Jobs</b>
Original Population*	6,159	981	1,222	2,193	76	10,803
Not Enough Pre-Treatment Days	597	222	253	188	6	1,309
Not Enough Post-Treatment Days	535	135	60	205	4	955
All Estimated Reads in Pre or Post	3	0	0	0	0	3
Pre Usage Below 1200 kWh or 300 ccf	0	0	5	0	38	5
Post Usage Below 1200 kWh or 300 ccf	4	0	16	2	2	24
Change in Total Usage>65%	219	29	40	78	2	373
Additional Outliers	3	2	3	7	0	14
Final Sample	4,798	593	845	1,713	24	8,120
% Included in Analysis	78%	60%	69%	78%	32%	75%

\*As program data did not furnish rate types (electric or gas), only the customers with usage data were included in the number of original population for Education Only groups.

Energy usage data were weather normalized in the pre and the post usage period to ensure that changes in energy usage were due to changes in usage patterns, rather than due to

changes in weather. We used a degree-day normalization process to conduct this analysis. This process involved the following steps.

1. Calculate the heating and cooling degree-days that are included in each usage period.
2. Determine whether periods should be classified as baseload periods, heating periods, or cooling periods, based on the number of heating and cooling degree-days in the period.
3. Calculate the total baseload period usage, heating period usage, and cooling period usage.
4. Calculate the relationship between heating usage minus baseload usage and degree-days. Use that slope and the average long-term heating degree-days to calculate normalized heating period usage.
5. Follow the same method to calculate normalized cooling period usage.
6. Add up the baseload usage, heating period usage, and cooling period usage to obtain the normalized annual usage.

This process yielded results that were similar to the PRISM analysis results, but allowed for a higher percentage of cases to be included in the analysis, due to fewer restrictions on data availability, and the fact that cases did not need to be removed because the model did not run or the model had a poor fit.

While the PUC does not require that baseload usage is normalized, we conducted the normalization process on the baseload usage as well as the heating and cooling usage. Baseload usage may vary with weather because of the use of air conditioning, the gas furnace's electric fan, the refrigerator, and use of electric space heaters.

## ***B. Energy Savings Impacts***

This section of the report provides the average weather-normalized usage for the pre and post-treatment periods and the average energy savings. Table IV-2 displays these results by job type. The table shows the following degree-day normalized savings.

- Baseload jobs had average annual savings of approximately 849 kWh, or 8.5 percent of pre-treatment usage.
- Electric heat jobs had average annual savings of approximately 1,113 kWh, or 6.8 percent of pre-treatment usage.
- Gas heat jobs had average annual savings of approximately 27 ccf, or 2.9 percent of pre-treatment usage.



- Education only jobs had average savings of 515 kWh, or 5.4 percent of pre-treatment usage. There were only 24 education only jobs with gas usage, and these jobs did not have a statistically significant change in gas usage.

**Table IV-2  
Average Annual Usage and Savings**

	#	Pre-Use	Post-Use	Annual Savings	% Savings
<b>Electric Baseload (kWh)</b>					
Non Normalized	4,798	9,653	9,089	564	5.8%
Degree Day Normalized	4,798	9,969	9,120	849	8.5%
PRISM Normalized	4,062	9,707	8,954	753	7.8%
<b>Electric Heat (kWh)</b>					
Non Normalized	593	17,035	15,932	1,103	6.5%
Degree Day Normalized	593	16,263	15,150	1,113	6.8%
PRISM Normalized	483	16,073	15,026	1,047	6.5%
<b>Gas Heat (ccf)</b>					
Non Normalized	845	1,007	941	66	6.6%
Degree Day Normalized	845	906	879	27	2.9%
PRISM Normalized	825	910	886	24	2.7%
<b>Education Only (kWh)</b>					
Non Normalized	1,713	9,280	9,143	137	1.5%
Degree Day Normalized	1,713	9,594	9,078	515	5.4%
PRISM Normalized	1,459	9,355	8,914	441	4.7%
<b>Education Only (ccf)</b>					
Non Normalized	24	789	756	34	4.2%
Degree Day Normalized	24	701	713	-12	-1.7%
PRISM Normalized	24	710	714	-4	-0.5%

The rest of the report focuses on the degree day normalized savings. Tables IV-3A, 3B, and 3C provide the historical comparison of energy savings by job type. Table IV-3A displays historical savings of electric baseload jobs. The table shows that the 2014 jobs had close to the same level of savings as the 1999-2013 average. Savings were 8.5 percent in 2014 compared to the historical average of 8.6 percent. However, the 2014 electric baseload savings were significantly higher than they were in 2011 through 2012.

One factor that may have resulted in the higher savings in 2013 and in 2014 than in the previous two years is that participants were more likely to receive refrigerator replacements than in 2011 and 2012. The previous section showed that 15 percent of 2013 and 27 percent of 2014 electric baseload participants received refrigerator replacements, compared to nine

percent in 2012 and 11 percent in 2011. Additionally, the next section shows that the estimated savings from refrigerator replacement were 640 kWh per refrigerator in 2014 compared to 462 in 2012 and 584 in 2011.

The only other measure installed in a significant number of electric baseload jobs was CFLs, and the earlier analysis showed that customers received fewer CFLs on average in 2014 than in 2011 and 2012. However, the analysis in the next section shows that CFL only homes saved 801 kWh in 2014, compared to 492 in 2012 and 635 in 2011. This suggests that the education provided in 2014 was more effective than in 2012. Additionally, the next section shows high savings for the highest electric baseload users. Savings for electric baseload jobs with usage above 12,000 kWh averaged 2,022 kWh in 2014, compared to 1,079 kWh in 2012 and 1,379 kWh in 2011. This also supports the hypothesis that the providers were doing a better job with education of the highest users, and perhaps in reducing usage of electric space heaters, as the results show that electric baseload jobs with supplemental heating had average savings of 977 kWh in 2014, compared to 882 in 2012 and 737 in 2011.

**Table IV-3A**  
**Time-Series Comparison of Annual Usage and Savings**  
**Electric Baseload Jobs**

	Pre-Use	Post-Use	Savings	Percent Savings	Wx Cost
<b>2014</b>	<b>9,969</b>	<b>9,120</b>	<b>849</b>	<b>8.5%</b>	<b>\$161</b>
<b>1999-2013 Average</b>	<b>10,671</b>	<b>9,752</b>	<b>918</b>	<b>8.6%</b>	<b>\$215</b>
2013	10,707	9,877	830	7.7%	\$182
2012	11,461	10,911	550	4.8%	\$161
2011	10,758	10,148	610	5.7%	\$258
2010	11,370	10,147	1,223	10.8%	\$201
2009	12,144	11,090	1,054	8.7%	\$186
2008	10,990	10,276	714	6.5%	\$191
2007	10,919	10,032	887	8.1%	\$240
2006	10,695	9,953	742	6.9%	\$214
2005	11,188	10,073	1,115	10.0%	\$208
2004	9,309	8,384	925	9.9%	\$215
2003	10,040	8,679	1,361	13.6%	\$214
2002	10,591	9,687	904	8.5%	\$192
2001	10,821	9,722	1,099	10.2%	\$296
2000	9,741	8,843	898	9.2%	\$268
1999	9,324	8,460	864	9.3%	\$206

Table IV-3B displays historical savings of electric heating jobs. The table shows that the 2014 jobs had lower savings than the 1999-2013 average. Savings were 6.8 percent in 2014

compared to the historical average of 7.8 percent. The electric heating pre-treatment usage was significantly lower than in the past, averaging 16,263 kWh, compared to the historical average of 21,654 kWh. Additionally, the cost of measures was almost 30 percent lower than the historical average.

**Table IV-3B**  
**Time-Series Comparison of Annual Usage and Savings**  
**Electric Heating Jobs**

	Pre-Use	Post-Use	Savings	Percent Savings	Wx Cost
<b>2014</b>	<b>16,263</b>	<b>15,150</b>	<b>1,113</b>	<b>6.8%</b>	<b>\$1,301</b>
<b>1999-2013 Average</b>	<b>21,654</b>	<b>19,956</b>	<b>1,698</b>	<b>7.8%</b>	<b>\$1,800</b>
2013	21,350	19,416	1,934	9.1%	\$1,310
2012	20,700	19,465	1,235	6.0%	\$1,430
2011	19,402	17,899	1,503	7.7%	\$1,798
2010	19,662	18,534	1,128	5.7%	\$2,094
2009	23,179	21,493	1,686	7.3%	\$2,514
2008	20,786	18,614	2,172	10.4%	\$2,332
2007	21,017	19,888	1,129	5.4%	\$1,735
2006	21,890	20,458	1,433	6.5%	\$1,643
2005	21,956	20,326	1,629	7.4%	\$1,824
2004	23,449	21,148	2,301	9.8%	\$1,782
2003	22,510	20,220	2,290	10.2%	\$1,646
2002	22,745	21,441	1,304	5.7%	\$1,753
2001	22,825	20,469	2,356	10.3%	\$2,234
2000	21,368	19,724	1,644	7.7%	\$1,521
1999	21,970	20,251	1,719	7.8%	\$1,377

Table IV-3C displays historical savings of gas heating jobs. The table shows that the 2014 gas heating jobs had significantly lower savings than the 1999-2013 average, as well as than in other recent years. Savings were 2.9 percent in 2014 compared to the historical average of 9.7 percent. Pre-treatment usage in 2014 was about 21 percent lower than the historical average and spending in 2014 was 38 percent lower than the historical average.

**Table IV-3C**  
**Time-Series Comparison of Annual Usage and Savings**  
**Gas Heating Jobs**

	Pre-Use	Post-Use	Savings	Percent Savings	Wx Cost
<b>Gas Heat (ccf)</b>					
<b>2014</b>	<b>906</b>	<b>879</b>	<b>27</b>	<b>2.9%</b>	<b>\$1,117</b>
<b>1999-2013 Average</b>	<b>1,143</b>	<b>1,032</b>	<b>111</b>	<b>9.7%</b>	<b>\$1,806</b>
2013	1,022	945	77	7.5%	\$1,086
2012	989	924	65	6.6%	\$1,820
2011	1,025	959	67	6.5%	\$2,410
2010	1,052	991	61	5.8%	\$2,253
2009	1,090	998	92	8.4%	\$2,100
2008	1,087	984	103	9.5%	\$2,016
2007	1,054	965	89	8.4%	\$1,914
2006	1,128	1,037	91	8.0%	\$1,640
2005	1,206	1,039	168	13.9%	\$1,643
2004	1,205	1,037	168	13.9%	\$1,789
2003	1,227	1,086	141	11.5%	\$1,422
2002	1,253	1,159	94	7.5%	\$1,488
2001	1,262	1,097	165	13.1%	\$2,003
2000	1,265	1,106	159	12.6%	\$1,763
1999	1,273	1,148	125	9.8%	\$1,741

Table IV-4 displays the seasonal analysis of energy savings by job type. The table shows that electric baseload and electric heating jobs achieved savings from baseload, heating, and cooling usage. Gas heat households had 99 percent of their savings from heating usage.

**Table IV-4**  
**Seasonal Usage Analysis**

	#	Pre-Use	Post-Use	Savings	% Savings	Share of Savings
<b>Electric Baseload (kWh)</b>						
Baseload	4,798	6,511	6,154	358	5.5%	42.1%
Heating		1,708	1,447	261	15.3%	30.7%
Cooling		1,749	1,519	230	13.2%	27.1%
<b>Electric Heat (kWh)</b>						
Baseload	593	7,927	7,554	373	4.7%	33.5%
Heating		7,267	6,621	646	8.9%	58.1%

	#	Pre-Use	Post-Use	Savings	% Savings	Share of Savings
Cooling		1,069	975	94	8.8%	8.5%
<b>Gas Heat (ccf)</b>						
Baseload	845	237	237	<1	0.1%	1.0%
Heating		669	643	26	3.9%	99.0%
<b>Education Only (kWh)</b>						
Baseload	1,713	6,083	6,047	36	0.6%	7.0%
Heating		1,708	1,450	257	15.1%	49.9%
Cooling		1,803	1,581	222	12.3%	43.0%

Energy efficiency program savings are often found to correlate with the level of pre-treatment usage. This is because households with higher pre-treatment usage have greater opportunities for energy savings and often receive greater energy efficiency investments. Table IV-5 shows that the 2014 savings were consistent with this expectation.

- Baseload jobs with pre-treatment usage over 12,000 kWh had savings of 12.7 percent, compared to savings of 7.5 percent for baseload jobs with pre-treatment usage between 8,000 and 12,000 kWh, and savings of 4.6 percent for baseload jobs with pre-treatment usage below 8,000 kWh. The jobs with pre-treatment usage over 12,000 kWh cost nine cents per kWh saved, as compared to a cost of 47 cents per kWh saved for the lowest pre-usage jobs.
- Electric heat jobs with pre-treatment usage over 26,000 kWh had average savings of 12.3 percent, while those jobs with pre-treatment usage between 16,000 and 26,000 kWh had savings of 6.8 percent.
- Gas heat jobs with pre-treatment usage over 1,400 ccf had average savings of 6.7 percent, compared to average savings of 3.3 percent for jobs with usage between 800 and 1,400 ccf. Costs were higher for the higher usage jobs, but the cost-effectiveness was greater for these jobs.

**Table IV-5  
Change in Annual Usage  
By Pre Program Usage**

	#	Pre-Use	Post-Use	Annual Savings	% Savings	Measure Cost	Cost/Unit Saved
<b>Electric Baseload (kWh)</b>							
< 8,000 kWh	1,759	6,884	6,568	315	4.6%	\$147	\$0.47
8,000 – 12,000 kWh	2,035	9,713	8,982	731	7.5%	\$162	\$0.22
> 12,000 kWh	1,004	15,893	13,871	2,022	12.7%	\$183	\$0.09

Electric Heat (kWh)							
< 16,000 kWh	335	10,698	10,331	367	3.4%	\$849	\$2.31
16,000 – 26,000 kWh	186	20,343	18,962	1,380	6.8%	\$1,735	\$1.26
> 26,000 kWh	72	31,619	27,722	3,897	12.3%	\$2,286	\$0.59
Gas Heat <sup>1</sup> (ccf)							
< 800 ccf	387	600	602	-2	-0.3%	\$708	-
800 – 1,400 ccf	366	1,034	999	34	3.3%	\$1,182	\$34.33
> 1,400 ccf	92	1,683	1,570	113	6.7%	\$1,259	\$11.10

<sup>1</sup>Measure costs for gas heat jobs exclude the costs for the measures targeted at reducing electric usage.

Table IV-6 displays usage impacts by job type and by whether the household participated in CAP in the pre or post-treatment period. Electric heating savings were higher for the non-CAP participants.

**Table IV-6**  
**Change in Annual Usage**  
**By CAP Participation**

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost/Unit Saved
Electric Baseload (kWh)							
CAP	4,511	9,816	8,971	844	8.6%	\$157	\$0.19
Non-CAP	287	12,375	11,453	922	7.5%	\$226	\$0.24
Electric Heat (kWh)							
CAP	502	15,827	14,807	1,020	6.4%	\$1,191	\$1.17
Non-CAP	91	18,671	17,041	1,630	8.7%	\$1,911	\$1.17
Gas Heat <sup>1</sup> (ccf)							
CAP	746	895	870	26	2.8%	\$961	\$37.67
Non-CAP	99	986	952	34	3.5%	\$1,064	\$31.07
Education Only (kWh)							
CAP	1,642	9,515	8,999	516	5.4%	-	-
Non-CAP	71	11,413	10,913	500	4.4%	-	-

<sup>1</sup>Measure costs for gas heat jobs exclude the costs for the measures targeted at reducing electric usage.

\*None of the difference in savings between the groups are statistically significant at the 90% level.

Table IV-7 displays the change in usage by whether the customer had selected an alternate supplier in the pre or post period. Only a small percentage of customers served by LIURP were Customer Choice. The Customer Choice jobs had greater savings than the non-choice customers.

**Table IV-7  
Change in Annual Usage  
By Customer Choice**

	#	Pre-Use	Post-Use	Savings	% Savings
<b>Electric Baseload (kWh)</b>					
Choice	183	10,264	9,175	1,089	10.6%
Non-Choice	4,615	9,957	9,118	840	8.4%
<b>Electric Heat (kWh)</b>					
Choice	47	17,749	16,222	1,527	8.6%
Non-Choice	546	16,136	15,058	1,078	6.7%
<b>Gas Heat (ccf)</b>					
Choice	46	1,036	971	65	6.3%
Non-Choice	799	898	874	24	2.7%
<b>Education Only (kWh)</b>					
Choice	59	9,413	8,756	658	7.0%
Non-Choice	1,654	9,600	9,090	510	5.3%

\*Difference in savings between the groups for gas heat is statistically significant at the 90% level.

Table IV-8 displays the change in usage by home ownership status. Approximately half of baseload and electric heating service participants were renters, and 30 percent of gas heat service participants were renters.

Baseload job renters had savings that averaged 7.9 percent, compared to average savings of 9.1 percent for owners, and the renters' measure costs averaged only \$20, as compared to measure costs that averaged \$299 for owners.

**Table IV-8  
Change in Annual Usage  
By Home Ownership**

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost Per Unit Saved
<b>Electric Baseload (kWh)</b>							
Owner	2,429	10,271	9,338	933	9.1%	\$299	\$0.32
Renter	2,369	9,659	8,896	763	7.9%	\$20	\$0.03
<b>Electric Heat (kWh)</b>							
Owner	259	19,608	18,274	1,334	6.8%	\$2,149	\$1.61
Renter	334	13,670	12,727	942	6.9%	\$644	\$0.68

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost Per Unit Saved
<b>Gas Heat<sup>1</sup> (ccf)</b>							
Owner	590	904	880	24	2.7%	\$1,094	\$45.08
Renter	255	909	878	32	3.5%	\$694	\$21.82
<b>Education Only (kWh)</b>							
Owner	562	10,114	9,527	587	5.8%	-	-
Renter	1,151	9,339	8,860	480	5.1%	-	-

<sup>1</sup>Measure costs for gas heat jobs exclude the costs for the measures targeted at reducing electric usage.

\*Difference in savings between the groups for electric baseload is statistically significant at the 95% level.

Table IV-9 displays energy savings by whether the customer used supplemental heat. Customers with supplemental heat had a greater reduction in usage. Baseload jobs with supplemental heat had average savings of 9.1 percent, compared to average savings of 7.9 percent for baseload jobs without supplemental heat.

**Table IV-9  
Change in Annual Usage  
By Supplemental Heat**

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost Per Unit Saved
<b>Electric Baseload (kWh)</b>							
Supplemental Heat	2,317	10,722	9,745	977	9.1%	\$187	\$0.19
No Supp Heat	2,481	9,266	8,536	730	7.9%	\$136	\$0.19
<b>Electric Heat (kWh)</b>							
Supplemental Heat	122	15,415	14,122	1,293	8.4%	\$1,527	\$1.18
No Supp Heat	471	16,483	15,416	1,067	6.5%	\$1,243	\$1.16
<b>Gas Heat<sup>1</sup> (ccf)</b>							
Supplemental Heat	213	969	931	39	4.0%	\$1,204	\$31.19
No Supp Heat	632	885	862	22	2.5%	\$895	\$39.84
<b>Education Only (kWh)</b>							
Supplemental Heat	735	10,240	9,606	635	6.2%	-	-
No Supp Heat	978	9,107	8,682	425	4.7%	-	-
<b>Education Only (ccf)</b>							
Supplemental Heat	6	834	866	-32	-3.8%	-	-
No Supp Heat	18	657	662	-5	-0.7%	-	-

<sup>1</sup>Measure costs for gas heat jobs exclude the costs for the measures targeted at reducing electric usage.

\*Difference in savings between the groups for electric baseload is statistically significant at the 99% level. Difference in savings between the groups for education only (kWh) are statistically significant at the 95% level.



### *C. Measure Specific Savings*

This section of the report attributes savings to specific measures that were provided through LIURP. We begin by analyzing savings by whether major measures are provided. Major measures are defined as the following.

- **Baseload jobs:** Major measures include refrigerator replacement, air conditioner replacement, and water heater replacement.
- **Electric heat jobs:** Major measures include refrigerator replacement, air conditioner replacement, water heater replacement, heat pumps, electric baseboards, insulation, and blower door guided air sealing.
- **Gas heat jobs – gas measures:** Major measures include furnace replacement, water heater replacement, insulation, and blower door guided air sealing.
- **Gas heat jobs – electric measures:** Major measures include refrigerator replacement and air conditioner replacement.

Homes that did not receive one of the major measures listed above were considered to have basic measures.

Table IV-10 displays energy savings by whether the job received one or more major measures.

- **Baseload Jobs:** Only about 27 percent of baseload jobs received major measures. Costs for these jobs were significantly higher than costs for baseload jobs that did not receive major measures. Savings for baseload jobs with major measures averaged 13.1 percent, as compared to savings that averaged 6.9 percent for baseload jobs that did not receive major measures.
- **Electric Heat Jobs:** Half of the electric heat jobs received major measures. Savings for jobs that received major measures averaged 8.5 percent, compared to average savings of 4.5 percent for jobs that did not receive major measures. Spending on jobs that received major measures averaged \$2,316, compared to average spending of \$269 for jobs that did not receive major measures.
- **Gas Heat Jobs – Gas Measures:** Fifty-two percent of gas heat jobs received major measures aimed at reducing gas usage. Gas savings for jobs with major measures averaged 6.0 percent, compared to no significant change in usage for jobs that did not receive major measures. Costs for gas jobs with major measures averaged \$1,715 compared to average costs of \$201 for jobs that did not receive major measures.
- **Gas Heat Jobs – Electric Measures:** Most of the gas jobs did not receive major measures targeted at reducing electric usage. Electric savings for gas heat jobs that received major

electric measures were 14.8 percent compared to 9.1 percent for those who received only basic electric measures.

**Table IV-10**  
**Change in Annual Usage**  
**By Level of Service**

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost per Unit Saved
<b>Electric Baseload (kWh)</b>							
Basic	3,521	10,045	9,352	693	6.9%	\$42	\$0.06
Major	1,277	9,759	8,479	1,280	13.1%	\$488	\$0.38
<b>Electric Heat (ccf)</b>							
Basic	294	13,904	13,273	630	4.5%	\$269	\$0.43
Major	299	18,584	16,996	1,588	8.5%	\$2,316	\$1.46
<b>Gas Heat<sup>1</sup> (ccf)</b>							
Basic	414	869	873	-5	-0.5%	\$201	-
Major	431	942	885	56	6.0%	\$1,715	\$30.38
<b>Gas Heat<sup>2</sup> (kWh)</b>							
Basic	618	9,134	8,299	836	9.1%	\$25	\$0.03
Major	182	7,875	6,707	1,169	14.8%	\$558	\$0.48

<sup>1</sup>Measure costs for gas heat (ccf) jobs exclude the costs for the measures targeted at reducing electric usage.

<sup>2</sup>Measure costs for gas heat (kWh) jobs exclude the costs for the measures targeted at reducing gas usage.

\*Differences in savings between the groups for electric baseload, electric heat, gas heat (ccf) are statistically significant at the 99% level. Difference in savings between the groups for gas heat (kWh) is statistically significant at the 90% level.

Table IV-11A displays savings for electric heat jobs by the number of major measures installed. The table shows that customers who received more major measures generally had higher pre-treatment usage and higher savings.

**Table IV-11A**  
**Change in Annual Electric Heat Usage (kWh)**  
**By Number of Major Measures**

Major Measures	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost per Unit Saved
0	294	13,904	13,273	630	4.5%	\$269	\$0.43
1	125	16,181	14,553	1,627	10.1%	\$1,628	\$1.00
2	138	20,457	18,934	1,523	7.4%	\$2,481	\$1.63
3 or More	36	19,749	18,046	1,703	8.6%	\$4,075	\$2.39

Table IV-11B displays savings for gas heat jobs by the number of major measures installed. The table shows that customers who received more major measures had higher savings.

Homes with two or more major measures saved about seven percent of pre-treatment usage, or about 64 ccf.

**Table IV-11B**  
**Change in Annual Gas Heat Usage (ccf)**  
**By Number of Major Measures**

Major Measures	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost <sup>1</sup>	Cost per Unit Saved
0	414	869	873	-5	-0.5%	\$201	-
1	191	930	884	46	5.0%	\$1,382	\$29.77
2 or More	240	951	886	64	6.8%	\$1,979	\$30.73

<sup>1</sup>Measure costs for gas heat (ccf) jobs exclude the costs for the measures targeted at reducing electric usage.

Table IV-12 displays energy savings by whether or not participants received particular measures. Some of the key findings were as follows.

- *Refrigerator*: Baseload participants who received a refrigerator had higher savings (13.3%) than those who did not (6.9%). Electric heat customers who received a refrigerator had higher electric savings (10.5%) than those who did not (6.0%). Gas heat customers who received a refrigerator had higher electric savings (15.0%) than those who did not (9.1%).
- *Electric Water Heater Timer*: Of those who received electric heating measures, participants who received an electric water heater timer also had higher savings (8.4%) than those who did not (5.9%).
- *Blower Door Guided Air Sealing*: Gas heating customers who received blower door guided air sealing had higher savings (5.9%) than those who did not (0.9%). Electric heating customers who received blower door guided air sealing had higher savings (8.1%) than those who did not (6.2%).
- *Insulation*: Gas heating customers who received insulation had higher savings (7.1%) than those who did not (0.7%). Electric heating customers who received insulation had higher savings (8.7%) than those who did not (5.7%).
- *Furnace*: Gas heating customers who received a new furnace had higher savings (11.2%) than those who did not (2.7%).

**Table IV-12  
Change in Annual Usage  
By Major Measures**

	#	Pre-Use	Post-Use	Savings	% Savings	Total Measure Cost
<b>Electric Baseload (kWh)</b>						
Air Conditioner	100	9,896	8,697	1,200	12.1%	\$1,034
No Air Conditioner	4,698	9,970	9,129	842	8.4%	\$142
Refrigerator	1,211	9,719	8,421	1,297	13.3%	\$472
No Refrigerator	3,587	10,053	9,356	698	6.9%	\$55
Air Conditioner/Refrigerator	38	9,503	7,910	1,593	16.8%	\$1,491
Air Conditioner/ No Refrigerator	62	10,137	9,179	959	9.5%	\$754
No Air Conditioner/ Refrigerator	1,173	9,726	8,438	1,288	13.2%	\$439
No Air Conditioner/ No Refrigerator	3,525	10,052	9,359	693	6.9%	\$43
Electric Water Heater Timer	171	14,182	13,119	1,063	7.5%	\$553
No Electric Water Heater Timer	4,627	9,813	8,972	841	8.6%	\$146
<b>Electric Heat (kWh)</b>						
Refrigerator	111	15,990	14,316	1,674	10.5%	\$1,934
No Refrigerator	482	16,326	15,342	984	6.0%	\$1,156
Blower Door Test	169	19,889	18,280	1,609	8.1%	\$2,338
No Blower Door Test	424	14,818	13,902	916	6.2%	\$888
Electric Water Heater Timer	168	21,334	19,536	1,798	8.4%	\$2,202
No Electric Water Heater Timer	425	14,259	13,416	843	5.9%	\$945
Insulation	190	19,909	18,187	1,723	8.7%	\$2,734
No Insulation	403	14,545	13,718	826	5.7%	\$626
<b>Gas Heat<sup>1</sup> (ccf)</b>						
Blower Door Test	330	944	888	55	5.9%	\$1,465
No Blower Door Test	515	882	874	8	0.9%	\$658
Insulation	281	940	873	67	7.1%	\$1,821
No Insulation	564	889	883	7	0.7%	\$551
Furnace	24	866	769	97	11.2%	\$4,298
No Furnace	821	907	883	24	2.7%	\$876

	#	Pre-Use	Post-Use	Savings	% Savings	Total Measure Cost
<b>Gas Heat<sup>2</sup> (kWh)</b>						
Refrigerator	181	7,892	6,710	1,182	15.0%	\$556
No Refrigerator	619	9,127	8,295	832	9.1%	\$27

<sup>1</sup>Measure costs for gas heat (ccf) jobs exclude the costs for the measures targeted at reducing electric usage.

<sup>2</sup>Measure costs for gas heat (kWh) jobs exclude the costs for the measures targeted at reducing gas usage.

\*For electric baseload, differences in savings between the refrigerator groups and the refrigerator only/neither refrigerator nor air conditioner groups are significant at the 99% level, difference in savings between both refrigerator and air conditioner/neither refrigerator nor air conditioner is significant at the 95% level.

For electric heat, difference in savings between refrigerator groups is statistically significant at the 90% level, difference in savings between blower door guided air sealing groups is statistically significant at the 95% level, and differences in savings between electric water heater timer groups and insulation groups are statistically significant at the 99% level.

For gas heat, differences in savings between blower door guided air sealing groups and insulation groups are statistically significant at the 99% level, and differences in savings between furnace groups and refrigerator groups are statistically significant at the 95% level.

Table IV-13 displays measure-specific savings estimates. These savings were calculated by running a regression model that predicted savings based on the measures that were provided and other household characteristics.

In 2014, savings averaged 801 kWh for customers who only received CFLs and they received 6.3 bulbs on average and no other measures. The resulting estimate of average CFL savings was 127 kWh per CFL. We estimated cost and cost-effectiveness using only the CFL costs and using both the CFL and the audit/education costs. Even when including the entire education and audit cost, the cost per kWh saved over the lifetime of the bulbs was only \$0.08.

A regression-based estimate of CFL savings was also developed, as there was variation in the number of CFLs provided to program participants. The regression-based estimate was 24 kWh per bulb. This estimate is lower than the other estimate because it does not include the savings that accrue from education. However, this estimate still shows the CFLs to be cost-effective, at a cost of \$0.02 per kWh with a 5-year measure life.

**Table IV-13  
Measure Savings Estimates**

	Savings	Cost/Home	\$/Unit Saved	Measure Life	\$/Unit Saved Over Lifetime
<b>Electric Baseload (kWh)</b>					
CFL Only <sup>1</sup>	801 (±85)	\$12/\$273	\$0.02/\$0.34	5	<\$0.01/\$0.08
CFL	24 (±13)	\$2	\$0.08	5	\$0.02
Refrigerator	640 (±153)	\$378	\$0.59	12	\$0.07
<b>Gas Heat (ccf)</b>					
Gas Furnace	68 (±61)	\$2,734	\$40.14	15	\$3.87
Boiler	100 (±64)	\$3,442	\$34.30	15	\$3.30

	Savings	Cost/Home	\$/Unit Saved	Measure Life	\$/Unit Saved Over Lifetime
Insulation	34 ( $\pm$ 25)	\$839	\$24.43	15	\$2.35

The average number of CFLs provided to these customers was 6.3, for an average savings of 127 kWh per CFL.

#### D. Cost Effectiveness

This section examines the cost-effectiveness of the Program services delivered by job type. Audit and administrative costs were assigned to electric and gas costs in the same proportion as the measure costs. Table IV-14 shows the measure costs, audit/education costs, and administrative costs by job type and electric and gas reduction. Cost per unit saved was calculated as the average total cost divided by the unit savings. The cost per kWh saved was \$0.58 for baseload jobs, \$1.47 for electric heat jobs, and \$0.21 for gas heat jobs. The cost per ccf saved was \$47.55 for gas heat jobs.

**Table IV-14**  
**Cost per Unit Saved**

	#	Average Savings	Average Measure Cost	Average Audit/Education Cost	Average Admin Cost	Average Total Cost	Cost Per Unit Saved
<b>Electric Baseload</b>							
Electric (kWh)	4,789	849	\$159	\$258	\$71	\$491	\$0.58
Gas (ccf)	41	5	\$2	\$3	\$1	\$6	\$1.26
<b>Electric Heat</b>							
Electric (kWh)	593	1,113	\$1,301	\$261	\$71	\$1,634	\$1.47
<b>Gas Heat</b>							
Electric (kWh)	800	911	\$146	\$34	\$9	\$190	\$0.21
Gas (ccf)	845	27	\$973	\$227	\$62	\$1,262	\$47.55

The previous analysis displayed the total job cost divided by the total savings as an indicator of how cost-effective the services were. Table IV-15 displays the discounted present value of the job savings under 5-year, 10-year and 15-year measure life assumptions. The costs per unit saved should be compared to retail rates to evaluate the cost-effectiveness of the program at different measure lives. This table shows that the electric investments were cost-effective at current retail rates if the measures have a life of at ten years. For example, assuming a 10-year measure life, electric baseload services cost six cents for each kWh saved.

**Table IV-15**  
**Cost Per Unit Saved**  
**By Measure Life Assumption**

	#	Average Savings	Average Total Cost	Cost Per Unit Saved	5-Year Measure Life	10-Year Measure Life	15-Year Measure Life
<b>Electric Baseload</b>							
Electric (kWh)	4,798	849	\$491	\$0.58	\$0.13	\$0.07	\$0.06
Gas (ccf)	41	5	\$6	\$1.26	\$0.29	\$0.16	\$0.12
<b>Electric Heat</b>							
Electric (kWh)	593	1,113	\$1,634	\$1.47	\$0.34	\$0.19	\$0.14
<b>Gas Heat</b>							
Electric (kWh)	800	911	\$190	\$0.21	\$0.05	\$0.03	\$0.02
Gas (ccf)	845	27	\$1,262	\$47.55	\$10.98	\$6.16	\$4.58

## V. Bill and Payment Impacts

This section of the report examines the bill and payment impacts for 2014 LIURP participants. We review the methodology used in the analysis, and then analyze the billing and payment impacts.

### A. Methodology

Billing and payment transactions data were used to analyze the pre and post-treatment billing and payment statistics. Accounts were required to have between 300 and 390 days of transactions data in both the pre and post periods to be included in the analysis.

Table V-1 displays the data attrition statistics. Overall, sufficient data were available for 67 percent of program participants.

**Table V-1  
Payment Impact Data Attrition**

	<b>Electric Baseload</b>	<b>Electric Heating</b>	<b>Gas Heating</b>	<b>Education Only</b>	<b>All Jobs</b>
Original Population	6,159	981	1,222	2,193	10,803
Not Enough Pre-Treatment Days	1,106	446	460	308	2,397
Not Enough Post-Treatment Days	567	105	52	217	960
Data Outliers	116	22	22	51	213
Final Sample	4,370	408	688	1,617	7,233
% Included in Analysis	71%	42%	56%	74%	67%

### B. Billing and Payment Impacts

Table V-2 displays the billing revenue data obtained from the usage file. These data show the changes in charges that were associated with electric and gas usage only. For example, charges related to service agreements or late payment charges would not be included in this table.

Table V-2 shows that electric revenue declined by an average of \$17 for baseload jobs and increased by \$86 for electric heat jobs. Gas revenue increased by \$43 for gas heat jobs.



**Table V-2  
Billing Revenue**

	#	Pre	Post	Change	Percent Change
<b>Electric Baseload</b>					
Electric Revenue	4,370	\$778	\$761	-\$17**	-2.2%
Gas Revenue		\$8	\$10	\$2**	23.9%
Total Revenue		\$785	\$770	-\$15**	-2.0%
<b>Electric Heat</b>					
Electric Revenue	408	\$1,498	\$1,584	\$86**	5.8%
Gas Revenue		\$53	\$65	\$12*	22.6%
Total Revenue		\$1,551	\$1,649	\$98**	6.3%
<b>Gas Heat</b>					
Electric Revenue	688	\$782	\$814	\$31*	4.0%
Gas Revenue		\$631	\$674	\$43***	6.8%
Total Revenue		\$1,414	\$1,488	\$74***	5.3%
<b>Education Only</b>					
Electric Revenue	1,617	\$769	\$751	-\$18*	-2.4%
Gas Revenue		\$13	\$15	\$2	13.3%
Total Revenue		\$782	\$766	-\$16	-2.1%
<b>All Job Types</b>					
Electric Revenue	7,233	\$815	\$808	-\$7	-0.8%
Gas Revenue		\$71	\$78	\$6***	9.0%
Total Revenue		\$886	\$886	-\$1	-0.1%

\*\*\*Denotes significance at the 99 percent level. \*\*Denotes significance at the 95 percent level.

\*Denotes significance at the 90 percent level.

Table V-3A displays the change in customer electric and gas bills and total charges, between the pre and the post-treatment periods, based on analysis of the transactions file. Total charges declined by 17.2 percent for electric baseload jobs, by 8.6 percent for electric heat jobs, and by 8.0 percent for gas heat jobs.

**Table V-3A  
Bills and Total Charges**

	#	Pre	Post	Change	Percent Change
<b>Electric Baseload</b>					
Electric and Gas Charges	4,370	\$949	\$795	-\$155***	-16.3%
Other Charges		\$39	\$24	-\$15***	-38.8%
Total Charges		\$988	\$818	-\$170***	-17.2%

	#	Pre	Post	Change	Percent Change
<b>Electric Heat</b>					
Electric and Gas Charges	408	\$1,884	\$1,730	-\$154 <sup>***</sup>	-8.2%
Other Charges		\$44	\$32	-\$12 <sup>*</sup>	-26.9%
Total Charges		\$1,928	\$1,762	-\$166 <sup>***</sup>	-8.6%
<b>Gas Heat</b>					
Electric and Gas Charges	688	\$1,688	\$1,561	-\$127 <sup>***</sup>	-7.5%
Other Charges		\$35	\$25	-\$11 <sup>***</sup>	-30.0%
Total Charges		\$1,723	\$1,586	-\$138 <sup>***</sup>	-8.0%
<b>Education Only</b>					
Electric and Gas Charges	1,617	\$913	\$798	-\$115 <sup>***</sup>	-12.6%
Other Charges		\$36	\$22	-\$14 <sup>***</sup>	-37.9%
Total Charges		\$949	\$821	-\$129 <sup>***</sup>	-13.5%
<b>All Job Types</b>					
Electric and Gas Charges	7,233	\$1,061	\$919	-\$141 <sup>***</sup>	-13.3%
Other Charges		\$38	\$24	-\$14 <sup>***</sup>	-36.5%
Total Charges		\$1,099	\$944	-\$155 <sup>***</sup>	-14.1%

\*\*\* Denotes significance at the 99 percent level. \*\* Denotes significance at the 95 percent level. \* Denotes significance at the 90 percent level.

Table V-3B displays bills and total charges for customers who had CAP rates for the full pre-period and for the full post-treatment period. The table shows that across all job types, total charges declined by 17.0 percent for this population, compared to the 14.1 percent decline overall, as shown in the previous table.

**Table V-3B  
Bills and Total Charges  
Customers with CAP Rates In All Pre and Post Periods**

	#	Pre	Post	Change	Percent Change
<b>Electric Baseload</b>					
Electric and Gas Charges	3,300	\$938	\$754	-\$184 <sup>***</sup>	-19.6%
Other Charges		\$38	\$22	-\$16 <sup>***</sup>	-42.5%
Total Charges		\$976	\$776	-\$200 <sup>***</sup>	-20.5%
<b>Electric Heat</b>					
Electric and Gas Charges	296	\$1,827	\$1,648	-\$179 <sup>***</sup>	-9.8%
Other Charges		\$45	\$33	-\$13 <sup>*</sup>	-28.3%
Total Charges		\$1,872	\$1,680	-\$192 <sup>***</sup>	-10.3%

	#	Pre	Post	Change	Percent Change
<b>Gas Heat</b>					
Electric and Gas Charges	528	\$1,624	\$1,482	-\$142 <sup>***</sup>	-8.8%
Other Charges		\$35	\$21	-\$14 <sup>***</sup>	-40.8%
Total Charges		\$1,659	\$1,502	-\$157 <sup>***</sup>	-9.4%
<b>Education Only</b>					
Electric and Gas Charges	1,259	\$917	\$772	-\$145 <sup>***</sup>	-15.8%
Other Charges		\$35	\$21	-\$14 <sup>***</sup>	-40.7%
Total Charges		\$952	\$792	-\$159 <sup>***</sup>	-16.7%
<b>All Job Types</b>					
Electric and Gas Charges	5,490	\$1,044	\$875	-\$169 <sup>***</sup>	-16.2%
Other Charges		\$37	\$22	-\$15 <sup>***</sup>	-40.4%
Total Charges		\$1,081	\$897	-\$184 <sup>***</sup>	-17.0%

<sup>\*\*\*</sup>Denotes significance at the 99 percent level. <sup>\*\*</sup>Denotes significance at the 95 percent level. <sup>\*</sup>Denotes significance at the 90 percent level.

Differences in results between the revenue analysis from the billing data (shown in Table V-2) and the billing analysis from the transactions data (shown in Table V-3A) is due to the fact that the transactions data include all charges, while the revenue data only include charges for electric and gas usage.

Table V-4 displays payment statistics for the 2014 LIURP participants. The average number of payments increased for all job types between the pre and post-treatment years. Electric and gas heat participants increased the amount of cash payments made from the pre to the post year.

**Table V-4  
Annual Payments  
Pre and Post-LIURP Treatment**

	#	Pre	Post	Change	Percent Change
<b>Electric Baseload</b>					
# Payments	4,370	8.0	8.4	0.5 <sup>***</sup>	6.0%
Cash Payments		\$794	\$782	-\$13 <sup>*</sup>	-1.6%
Assistance Payments		\$56	\$48	-\$8 <sup>***</sup>	-13.4%
Other Credits		\$12	\$6	-\$6 <sup>***</sup>	-47.0%
Total Credits		\$862	\$837	-\$26 <sup>***</sup>	-3.0%
<b>Electric Heat</b>					
# Payments	408	8.5	9.3	0.8 <sup>***</sup>	9.7%
Cash Payments		\$1,419	\$1,614	\$195 <sup>***</sup>	13.7%
Assistance Payments		\$127	\$116	-\$12	-9.1%

	#	Pre	Post	Change	Percent Change
Other Credits		\$22	\$21	-\$1	-3.0%
Total Credits		\$1,568	\$1,751	\$183 <sup>***</sup>	11.6%
<b>Gas Heat</b>					
# Payments	688	8.7	9.5	0.8 <sup>***</sup>	9.4%
Cash Payments		\$1,432	\$1,481	\$49 <sup>**</sup>	3.4%
Assistance Payments		\$109	\$102	-\$6	-5.8%
Other Credits		\$20	\$10	-\$10 <sup>***</sup>	-50.8%
Total Credits		\$1,561	\$1,593	\$33	2.1%
<b>Education Only</b>					
# Payments	1,617	8.2	8.5	0.3 <sup>***</sup>	4.3%
Cash Payments		\$762	\$765	\$4	0.5%
Assistance Payments		\$58	\$52	-\$6	-10.2%
Other Credits		\$12	\$5	-\$7 <sup>***</sup>	-57.4%
Total Credits		\$832	\$823	-\$9	-1.1%
<b>All Job Types</b>					
# Payments	7,233	8.1	8.6	0.5 <sup>***</sup>	6.2%
Cash Payments		\$879	\$889	\$10 <sup>*</sup>	1.2%
Assistance Payments		\$66	\$59	-\$7 <sup>***</sup>	-11.0%
Other Credits		\$14	\$7	-\$6 <sup>***</sup>	-45.8%
Total Credits		\$959	\$955	-\$3	-0.3%

<sup>\*\*\*</sup>Denotes significance at the 99 percent level. <sup>\*\*</sup>Denotes significance at the 95 percent level. <sup>\*</sup>Denotes significance at the 90 percent level.

Table V-5 displays payments for CAP and Non-CAP customers in the year prior to and after receipt of LIURP. Both groups increased the average number of payments made by 0.5.

**Table V-5  
Payments for CAP Customers  
Pre and Post-LIURP Treatment**

	#	Pre	Post	Change	Percent Change
<b>CAP Customers – All Job Types</b>					
# Payments	6,725	8.0	8.5	0.5 <sup>***</sup>	6.2%
Cash Payments		\$832	\$845	\$13 <sup>**</sup>	1.6%
Assistance Payments		\$67	\$60	-\$7 <sup>***</sup>	-11.0%
Other Credits		\$14	\$7	-\$7 <sup>***</sup>	-49.8%
Total Credits		\$913	\$912	-\$1	-0.1%

	#	Pre	Post	Change	Percent Change
<b>Non-CAP Customers – All Job Types</b>					
# Payments	508	8.7	9.2	0.5***	5.8%
Cash Payments		\$1,507	\$1,477	-\$30	-2.0%
Assistance Payments		\$50	\$44	-\$6	-11.4%
Other Credits		\$15	\$15	<\$1	2.7%
Total Credits		\$1,571	\$1,536	-\$35	-2.2%

\*\*\* Denotes significance at the 99 percent level. \*\* Denotes significance at the 95 percent level.

\* Denotes significance at the 90 percent level.

Table V-6 displays a more detailed analysis of the types of assistance payments received in the pre and the post-treatment periods by 2014 LIURP participants. The table shows that these statistics remained approximately the same.

**Table V-6**  
**Assistance Payments**  
**Pre and Post-LIURP Treatment**

	#	Pre	Post	Change	% Change
<b>Electric Baseload</b>					
LIHEAP Cash	4,370	\$39	\$32	-\$7***	-17.3%
LIHEAP Crisis		\$16	\$16	<\$1	1.1%
MEAF		\$1	\$0	-\$1***	-100.0%
Total Assistance		\$56	\$48	-\$8***	-13.4%
<b>Electric Heat</b>					
LIHEAP Cash	408	\$99	\$97	-\$2	-2.2%
LIHEAP Crisis		\$28	\$18	-\$10	-35.7%
MEAF		\$0	\$1	\$1	-
Total Assistance		\$127	\$116	-\$12	-9.1%
<b>Gas Heat</b>					
LIHEAP Cash	688	\$87	\$86	-\$2	-1.9%
LIHEAP Crisis		\$19	\$16	-\$3	-17.9%
MEAF		\$2	\$1	-\$1	-55.3%
Total Assistance		\$109	\$102	-\$6	-5.8%
<b>Education Only</b>					
LIHEAP Cash	1,617	\$42	\$33	-\$8**	-19.9%
LIHEAP Crisis		\$16	\$18	\$2	12.0%
MEAF		\$1	\$1	<\$1	84.5%
Total Assistance		\$58	\$52	-\$6	-10.2%

	#	Pre	Post	Change	% Change
<b>All Job Types</b>					
LIHEAP Cash	7,233	\$48	\$42	-\$7 <sup>***</sup>	-14.0%
LIHEAP Crisis		\$17	\$17	<\$1	0.6%
MEAF		\$1	<\$1	-\$1 <sup>**</sup>	-63.3%
Total Assistance		\$66	\$59	-\$7 <sup>***</sup>	-11.0%

<sup>\*\*\*</sup>Denotes significance at the 99 percent level. <sup>\*\*</sup>Denotes significance at the 95 percent level. <sup>\*</sup>Denotes significance at the 90 percent level.

Table V-7 displays changes in cash and total bill coverage rates between the pre and the post-treatment periods. Total bill coverage rates increased for all types of participants and increased by 16.6 percent overall.

**Table V-7  
Coverage Rates  
Pre and Post-LIURP Treatment**

	#	Pre	Post	Change	Percent Change
<b>Electric Baseload</b>					
Cash Coverage Rate	4,370	83.9%	100.4%	16.5% <sup>***</sup>	19.7%
Total Coverage Rate		92.9%	109.6%	16.8% <sup>***</sup>	18.1%
<b>Electric Heat</b>					
Cash Coverage Rate	408	74.2%	90.7%	16.5% <sup>***</sup>	22.3%
Total Coverage Rate		85.6%	102.5%	16.9% <sup>***</sup>	19.8%
<b>Gas Heat</b>					
Cash Coverage Rate	688	83.1%	91.7%	8.6% <sup>***</sup>	10.4%
Total Coverage Rate		93.9%	101.9%	8.0% <sup>***</sup>	8.5%
<b>Education Only</b>					
Cash Coverage Rate	1,617	84.2%	98.7%	14.5% <sup>***</sup>	17.2%
Total Coverage Rate		93.3%	107.8%	14.4% <sup>***</sup>	15.5%
<b>All Job Types</b>					
Cash Coverage Rate	7,233	83.2%	98.5%	15.3% <sup>***</sup>	18.4%
Total Coverage Rate		92.7%	108.0%	15.4% <sup>***</sup>	16.6%

<sup>\*\*\*</sup>Denotes significance at the 99 percent level. <sup>\*\*</sup>Denotes significance at the 95 percent level. <sup>\*</sup>Denotes significance at the 90 percent level.

Table V-8 displays changes in customer balances. The table shows that balances increased in the pre-treatment period and remained approximately the same in the post period.

**Table V-8  
Change in Customer Balance**

	#	Start	End	Change	Percent Change
<b>Electric Baseload</b>					
Pre Balance	4,370	\$93	\$221	\$128 <sup>***</sup>	137.3%
Post Balance		\$209	\$183	-\$26 <sup>***</sup>	-12.2%
<b>Electric Heat</b>					
Pre Balance	408	\$14	\$402	\$388 <sup>***</sup>	2,815.3%
Post Balance		\$372	\$360	-\$12	-3.2%
<b>Gas Heat</b>					
Pre Balance	688	\$103	\$276	\$173 <sup>***</sup>	167.0%
Post Balance		\$272	\$247	-\$26	-9.5%
<b>Education Only</b>					
Pre Balance	1,617	\$76	\$197	\$121 <sup>***</sup>	158.1%
Post Balance		\$190	\$192	\$2	1.0%
<b>All Job Types</b>					
Pre Balance	7,233	\$86	\$231	\$145 <sup>***</sup>	169.6%
Post Balance		\$220	\$201	-\$18 <sup>***</sup>	-8.4%

<sup>\*\*\*</sup> Denotes significance at the 99 percent level. <sup>\*\*</sup> Denotes significance at the 95 percent level.

<sup>\*</sup> Denotes significance at the 90 percent level.

## VI. Summary of Findings and Recommendations

PECO's LIURP delivered usage reduction services and energy education to over ten thousand customers in 2014, many of whom had vulnerable household members. Reductions in electric usage were higher for baseload jobs than they had been in recent years, and were higher than the historical average savings but electric and gas heating savings declined.

LIURP has had a positive impact on energy affordability and bill payment for program participants. Following participation, the percent of the total bill that customers paid increased by 15.4 percentage points. Customers were paying an average of 92.7 percent of their bills prior to LIURP treatment and an average of 108.0 percent of their bills following LIURP treatment.

We have the following recommendations to continue to achieve these higher electric baseload savings and to potentially improve savings for the electric and gas heating jobs.

- *Service Delivery* – APPRISE completed a technical evaluation of PECO's LIURP program in 2014 that included on-site observation of service delivery and inspections of completed jobs. The research found that refining current procedures and improved implementation with additional contractor training could have significant positive impacts on the energy savings achieved by LIURP. Key aspects of service delivery that could be improved to increase energy savings include use of the blower door with pressure pan testing and zonal pressure testing, air sealing, duct sealing, and refrigerator replacement. PECO should continue to observe and inspect LIURP jobs to ensure that higher standards for service delivery are met.
- *Education*: Households that only received CFLs had higher savings than in 2011 and 2012, suggesting the education delivery was more effective. PECO should also review whether changes in education were made in 2013 and 2014 that can continue to be implemented in future program years. The forthcoming customer survey will provide more information on this issue.
- *Opportunities*: Installation of major measures was lower for electric heating and gas heating jobs than it has been in 2011 and 2012. Only 31 percent of electric heating jobs received insulation, compared to 37 percent in 2012 and 39 percent in 2011. Only 35 percent of gas heating jobs received insulation, compared to 46 percent in 2012 and 54 percent in 2011, and only 61 percent received air sealing, compared to 74 percent in 2012 and 76 percent in 2011. PECO should ensure that CMC is pursuing all cost-effective energy-saving opportunities.
- *Additional Measures*: PECO has found that the number of customers with defacto electric heat has increased over the past several years. They have also had a large number of customers referred to the Pennsylvania State Weatherization Program (WAP) for services that are not provided through PECO's LIURP. WAP currently has a long waiting list, and it is unlikely that many of the referred customers will be served soon. Therefore,



PECO implemented a pilot to test the addition of weatherization measures with the goal of providing more comprehensive services to participants and increasing program savings. Additionally, the 2014 technical evaluation<sup>13</sup> found the following measures should be considered for the future – heat pump water heaters, additional refrigerator replacement, boiler flue dampers, discharge tubes on boilers and water heaters, replacement of old dehumidifiers, and potentially use of LED bulb replacement as their cost continues to decline and the cost-effectiveness is positively evaluated. PECO will be piloting mini-split systems in 2016 and 2017.

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<sup>13</sup>LIURP On-Site Research Final Report, February 2015.