



PECO Energy
2006 LIURP Evaluation
Final Report

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Executive Summary

This report presents the findings from the Evaluation of PECO's 2006 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 activities that were undertaken included:

- *Process Review:* Review and update of LIURP program description.
- *Program Database Analysis:* Analysis of 2006 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 that exceed 600 kWh per month for electric baseload, 1,400 kWh per month for electric heat, or 100 ccf per month for gas heat.¹
- 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.

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 2006 was \$6,475,000. In 2006, 8,305 customers received LIURP services.

¹ CAP customers with usage above 500 kWh monthly are evaluated for LIURP services.

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 conducts an energy audit to determine the behavioral changes and program measures required for usage reduction. Following the audit, the auditor makes arrangements for a future visit, by one or more of five subcontractors, to install measures.

Program Statistics

In 2006, 24,516 customers were evaluated for LIURP services. There were 3,782 customers who were ineligible for the program and 12,429 customers who were cancelled. The cancellations were due to customers' lack of response to contact attempts, refusal of services, moves, and lack of landlord consent.² In total, 8,305 customers received LIURP services in 2006.

Table ES-1 displays how program funds were expended in 2006. In total \$6.475 million were spent. Approximately 68 percent was for weatherization measures, 23 percent was for audit and education, and nine percent was for program administration.

Table ES-1
2006 LIURP Expenditures
By Category

Category	Amount Spent	Percent of Funds
Weatherization Measures	\$4,374,454	68%
Audit/Education	\$1,475,715	23%
PECO Administration	\$609,010	9%
Solar Water Maintenance	\$15,819	<1%
TOTAL	\$6,474,998	100%

Table ES-2 displays the distribution of 2006 LIURP jobs by job type. Nearly 75 percent of jobs are classified as baseload, meaning that measures primarily address electric baseload usage. However, the baseload jobs have lower job costs and represent only 30 percent of total costs. The average costs for measures on these jobs was \$204. Gas heating jobs represent 18 percent of jobs and 58 percent of costs, averaging \$1,624 in measure costs per home. Electric heating jobs averaged \$1,635 per home.

² See Table III-3.

Table ES-2
2006 LIURP Service Delivery and Expenditures
By Job Type

Job Type	# of Jobs	% of Jobs	Total Cost	% of Costs	Average Job Cost
Baseload	6,073	73%	\$1,241,763	29%	\$204
Electric Heating	277	3%	\$452,985	11%	\$1,635
Gas Heating	1,531	18%	\$2,486,030	58%	\$1,624
Low Usage	122	1%	\$12,997	0%	\$107
Electric Heat Low Use	239	3%	\$49,722	1%	\$208
Solar Water Heat Maintenance	48	1%	\$15,915	0%	\$332
Prior Year	15	<1%	\$5,317	0%	\$354
Total	8305	100%	\$4,264,729	100%	\$514

Participant Characteristics

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

- *Supplemental heat usage:* Nearly 40 percent of the customers served through LIURP use electric supplemental heat.
- *Air conditioning:* Air conditioning is used by 95 percent of the LIURP participants.
- *Renters:* PECO's LIURP is successful in serving renters. Nearly half of the customers served are renters.
- *Vulnerable households:* Nearly two-thirds of the customers had a child and 22 percent had an elderly member.
- *Poverty level:* Approximately 25 percent had income below 50 percent of the FPL, 41 percent had income between 51 and 100 percent of the FPL, 26 percent had income between 101 and 150 percent of the FPL, and eight percent had income above 150 percent of the FPL.
- *CAP:* More than three quarters of LIURP recipients were CAP participants.

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 period to ensure that changes in energy usage are 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 much larger number of homes.

Table ES-3 summarizes the overall usage impact results.

- *Baseload jobs* had average savings of approximately 742 kWh, or 6.9 percent of pre-treatment usage.
- *Electric heat jobs* had average savings of approximately 1,433 kWh, or 6.5 percent of pre-treatment usage.
- *Gas heat jobs* had average savings of approximately 91 ccf, or eight percent of pre-treatment usage.

Table ES-3
Average Usage and Savings

	#	Pre-Use	Post-Use	Savings	% Savings
Electric Baseload (kWh)					
Non Normalized	4,417	10,557	9,600	957	9.1%
Degree Day Normalized	4,417	10,695	9,953	742	6.9%
Electric Heat (kWh)					
Non Normalized	219	21,074	19,438	1,636	7.8%
Degree Day Normalized	219	21,890	20,458	1,433	6.5%
Prism Normalized	181	21,760	20,279	1,481	6.8%
Gas Heat (ccf)					
Non Normalized	1,236	1,052	964	88	8.4%
Degree Day Normalized	1,236	1,128	1,037	91	8.0%
Prism Normalized	621	1,086	997	89	8.2%

We compared the usage impact results to historical savings results.³

- Electric baseload jobs had lower average pre-usage and lower savings than in 2005. Pre-treatment usage averaged 10,695 in 2006 compared to 11,188 kWh in 2005. (However, 2006 pre-treatment usage was somewhat higher than the historical average.) Savings were seven percent in 2006 compared to ten percent in 2005 and the historical average of ten percent. Weatherization spending, at \$214 in 2006, was also approximately the same as in the recent history of the Program.

³ Table IV-3 provides the historical comparison of energy savings by job type.

- Electric heat jobs had pre-treatment usage and average savings that were lower than the 1999-2005 average. Savings were 6.5 percent in 2006 compared to 8.6 percent for the seven-year average. Costs for 2006 are also lower than the seven-year average.
- Gas heat jobs had pre-treatment usage and savings that were significantly lower than the 1999-2005 average. Pre-treatment usage was 1,128 compared to the seven year average of 1,242, nearly nine percent lower. Gas savings were 8.0 percent in 2006, as compared to 11.8 percent for the seven-year average. Gas heat measure costs were approximately the same as the seven-year average.

The lower pre-treatment usage for the electric baseload and gas heating jobs may be due to the longevity of PECO's LIURP and their historical treatment of high usage customers. After so many years of providing LIURP to the highest use customers, the customers who have not yet received service have lower usage. Additionally, recent increases in energy prices may have caused customers to conserve energy prior to receiving services.

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 for most measures were computed by running a regression model that predicted savings based on the measures provided and home and customer characteristics. Estimates were developed for refrigerators, furnaces, boilers, and insulation.

Because almost all LIURP participants received four CFLs, there was no variation in this measure to statistically estimate savings. Therefore, we estimated savings for CFLs by examining total kWh savings for electric baseload jobs that only received CFLs. These customers saved an average of 500 kWh, much higher than the 274 kWh that might be expected to be saved if each of the four CFLs replaced 60 watt incandescent bulbs that were used an average of four hours per day.⁴ Therefore, we expect that a significant part of these savings is due to education and resulting changes in behavior.

In the cost and cost-effectiveness columns of the table, we provide estimates using only the CFL costs and estimates that include the CFL costs and the audit/education costs. Even when the audit/education costs are included, the cost per kWh saved over a 5-year lifetime is only 12 cents per kWh. This indicates that there may be potential to cost-effectively increase savings by providing more CFLs to LIURP participants. It also indicates that the LIURP education process is very effective.

Table ES-4
Measure Savings Estimates

⁴ (60 watts – 13 watts)*.001 * 365 days * 4 hours/day * 4 bulbs = 274 kWh

	Savings	Cost/Home	\$/Unit Saved	Measure Life	\$/Unit Saved Over Lifetime
Electric Baseload					
CFL Only	500 (±114)	\$74/\$252	\$0.15/\$0.50	5	\$0.03/\$0.12
Refrigerator	876 (±255)	\$726	\$0.83	12	\$0.09
Gas Heat - ccf					
Gas Furnace	152 (±42)	\$2,322	\$15.28	15	\$1.47
Boiler	134 (±44)	\$2,986	\$22.28	15	\$2.15
Insulation	67 (±27)	\$288	\$4.30	15	\$0.41

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. The most reasonable assumption for electric baseload reduction is probably a five to seven-year measure life. Baseload electric services, at a cost of 13 cents per kWh saved with a 5-year measure life and eight cents per kWh saved with a 10-year measure life, are cost-effective under a seven-year measure life assumption. Gas heat savings probably have a 10-year to 15-year measure life. Under the 15-year measure life assumption, the cost per ccf saved is \$1.80, which close to cost-effective with current gas prices.

Table ES-5
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
Electric Baseload							
Electric (kWh)	4,417	742	\$431	\$0.58	\$0.13	\$0.08	\$0.06
Gas (ccf)	66	49	\$68	\$1.40	\$0.32	\$0.18	\$0.13
Electric Heat							
Electric (kWh)	219	1433	\$1,894	\$1.32	\$0.31	\$0.17	\$0.13
Gas Heat							
Electric (kWh)	1,223	163	\$187	\$1.15	\$0.26	\$0.15	\$0.11
Gas (ccf)	1,236	91	\$1,704	\$18.73	\$4.33	\$2.43	\$1.80

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. Total bills and charges declined by \$125 and total payments and credits declined by \$114

from the pre to post period. There was a small increase in the total bill coverage rate of four percentage points.

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

	#	Pre	Post	Change	Percent Change
All Job Types					
Total Bills and Charges	3,381	\$1,447	\$1,322	-\$125	-8.6%
Total Payments and Credits		\$1,225	\$1,112	-\$114	-9.3%
Total Coverage Rate		85.9%	89.3%	3.4%	4.0%

Key Findings and Recommendations

PECO's LIURP cost-effectively delivered energy efficiency services and energy education to over eight thousand customers in 2006, many of whom had vulnerable household members. They have kept program administration costs low, at just nine percent of program expenditures.

Reductions in energy usage were somewhat lower than in previous years. This reduction is probably due to lower pre-treatment energy usage. PECO has been providing LIURP services for many years, and has furnished LIURP to many of its highest usage customers. Additionally, lower pre-treatment usage may be due to higher energy bills and customers' energy conservation efforts.

We have the following recommendations to continue to deliver effective services and potentially improve savings.

1. *Targeting:* It is a challenge to continue to find high usage customers to treat in the program. Lower energy savings for 2006 participants may be related to lower pre-treatment usage and fewer energy saving opportunities for these households. For example, while almost 90 percent of 2005 gas heat jobs had major measures installed, only about 75 percent of 2006 gas heat jobs had major measures installed. PECO should continue to make targeting the highest usage households a priority for the program.
2. *CFL's:* The program provides four CFLs to nearly every household served in LIURP. The measure saving analysis found that customers who only received CFLs had high average savings. PECO should modify LIURP procedures to evaluate each customer's lighting usage, and provide CFLs for any bulb used more than 2 hours per day. This may require the use of a broader range of CFLs than are currently used, but would probably be a very cost-effective investment.

3. *Education:* The high savings for households that only received CFLs, as well as previous customer survey research conducted as part of PECO's 2006 USF evaluation, indicate that the energy education conducted as part of LIURP is successful. We believe this is due to the extensive education process that occurs during the audit and the reinforcement that occurs through letters and phone calls. PECO should continue the emphasis on education.
4. *Evaluation:* The evaluation methodology that has been used examines gross savings, the difference between weather-normalized pre and post usage. PECO should consider using a comparison group to calculate the net savings due to the program. The net savings would be measured as the difference between the change for the treatment group and the change for the comparison group. Because electric baseload usage has been increasing over time, this may show a more accurate estimate of a greater reduction in electric usage that is due to LIURP. Such an analysis would also control for other factors, such as increases in energy prices, which may lead customers to conserve even in the absence of LIURP. Failure to account for this change may lead to an overestimate of LIURP savings, particularly on the gas side. However, the Pennsylvania Public Utility Commission does not require the use of a comparison group.

I. Introduction

This report presents the findings from the 2006 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:

- 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:

- 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. The activities that were undertaken as part of the evaluation included:

- *Process Review:* We reviewed the process information that was collected as part of the 2006 Universal Program Evaluation and updated information where required.
- *Program Database Analysis:* We conducted analysis of the 2006 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

Four 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 2006 and the customers who received these services.
- **Section IV – Usage Impacts:** This section analyzes the impacts of the 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.

The annual LIURP budget for 2006, determined by the settlement agreement of PECO's electric restructuring case, was \$6,475,000, with \$875,000 earmarked for the LIURP Gas Program.

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 the following staff responsible for PECO's LIURP:

- **LIURP Manager:** The LIURP Manager has 15 years of PECO LIURP experience. She is responsible for monitoring Program performance, including training, sub-contractor performance and customer satisfaction. She is also responsible for coordinating Program activities, making recommendations for and implementing Program improvements, analyzing Program data, and reporting to PECO.
- **LIURP Office Manager:** The LIURP Office Manager has 14 years of PECO LIURP experience. She is responsible for supervising daily LIURP work activities. She is also responsible for ensuring accurate and timely data input, evaluating training and performance, managing customer service calls, and following up on referrals.
- **LIURP Quality Control Manager:** The LIURP Quality Control Manager has nine years of PECO LIURP experience. He is responsible for providing training and technical support to field staff and sub-contractors. He is also responsible for completing pre and post work inspections and resolving job issues.

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. Five subcontractors assist in the implementation of LIURP.

- 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.
- Colonial Electrical installs water heater timers and line voltage thermostats.
- Whirlpool delivers new refrigerators.

B. LIURP Eligibility and Benefits

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

- Residential customer
- Income requirement
 - Income at or below 150 percent of the Federal Poverty Level (FPL), or
 - Special needs customer with income between 150 and 200 percent of the FPL⁵
- Usage requirements
 - At least 600 kWh monthly for baseload customers⁶
 - At least 1,400 kWh monthly for electric heating customers
 - At least 100 ccf monthly 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 major measures may be provided:

- Insulation
- Air sealing
- Heating system repair or replacement
- Air conditioner replacement
- Refrigerator replacement
- Water heater timer installation

⁵ 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.

⁶ CAP customers with usage over 500 kWh monthly are evaluated for LIURP.

The following minor measures may be provided:

- Water heater and pipe wraps
- Faucet aerators
- Showerheads
- Smoke detectors
- CFL bulbs

C. Qualification of Leads

PECO sends a quarterly download of high usage, low-income customers to CMC.⁷ The majority of LIURP recipients are recruited from this list. Customers are also referred to LIURP through the following mechanisms:

- PECO Universal Services staff
- CAP call center
- Community Based Organizations (CBOs)
- Prior Program recipients
- CARES customers

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. This compares to about 87 percent who are eligible and 36 percent who receive treatment over all who are evaluated.

Referred customers may not receive LIURP services because the customer:

- Refused LIURP services.
- Has insufficient usage history.
- Has an inactive account.
- Has income over the eligibility limit.
- Is non-responsive to contacts by CMC.
- Has recently, or is planning, to move.

⁷ This is done through a three step process.

- Has usage below the required level.⁸
- Is a tenant and has 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 give approval because he or she wants to choose Program measures, wants ownership of the new appliances, or is evicting the tenant.⁹ Some landlords never respond to CMC inquiries. CMC estimates that they are unable to obtain landlord consent for about seven percent of renters.¹⁰

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. If the customer is eligible, an appointment is scheduled for the energy audit. CMC will attempt to make this contact three times by telephone and one time by mail over a 30-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 services such as weatherization, insulation, and heating system repair or replacement. Both heating and baseload issues in a household are addressed when necessary.

F. Service Delivery

CMC prioritizes CAP participants for LIURP service delivery. All CAP participants with monthly usage above 500 kWh are considered for LIURP. Those with the lowest income

⁸ There are some hardship cases where PECO makes exceptions to the usage requirement.

⁹ Landlords are not required to contribute to the cost of LIURP services.

¹⁰ PECO Energy Universal Services Program, Final Evaluation Report, April 2006, APPRISE.

and the greatest CAP benefits receive the highest priority. CMC prioritizes remaining LIURP participants by energy use and income.

The first step in service delivery is the Program audit, performed by CMC staff. The auditor verifies the previously reported household characteristics, including 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.

The auditor 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 major measures be installed within 30 days of the initial audit.

PECO and the PUC have pre-approved all of the minor and major LIURP measures. They have placed no cap on the amount of money spent per home. The minor measures, particularly smoke detectors and CFLs, are much more commonly provided than the major measures.

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 major measures are installed, and by other CMC staff during quality control inspections and follow-up telephone calls.

During the initial education session, the educator 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 educator 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
- Energy Savers calendar
- Energy cost estimate form
- Energy saving recommendations list based on the household's energy use
- 'Does Your Money Run Out' booklet

The educator 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 educator 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 educator reviews the measures that have been installed and those that will be installed by subcontractors. In addition, the educator 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 energy usage monthly. 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 reduce energy usage after they receive LIURP services. In some cases an auditor is sent back to the home for reinforcement.

H. Quality Control

Three methods primarily used for LIURP quality control are:

- 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.

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's Quality Control Manager inspects approximately 30 percent of LIURP jobs. 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.

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.

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

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

- 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. 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 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. Historically, PECO and CMC have not enforced this requirement. However, beginning in Fall 2005, a procedure was initiated in which CMC sends a list of CAP customers who refused LIURP services to PECO, and PECO sends a reminder letter that restates CAP requirements. Most customers who received the letter have agreed to receive LIURP services.

One potential method by which PECO could improve program cost effectiveness may be to integrate delivery of baseload services with the publicly funded Weatherization Assistance Program (WAP) or other utility programs.

III. Program and Participant Statistics

This section provides statistics on the LIURP services that were provided in 2006, as well as the characteristics of the homes and the customers who were served by the Program.

A. 2006 Customer Participation

PECO screened 24,516 customers for LIURP services in 2006. Table III-1 shows that 3,782 customers were not eligible, 12,429 were cancelled, and 8,305 received Program services.

Table III-1
Customers Evaluated for Program Services

Category	Number	Percent of Total
Ineligible	3,782	15%
Cancelled	12,429	51%
Treated	8,305	34%
TOTAL Evaluated	24,516	100%

Table III-2 displays the reasons why customers were deemed ineligible for LIURP. The largest group, 42%, was not eligible due to usage that was below the guidelines for LIURP services. Twenty-two percent had income that was above the eligibility guidelines and 15 percent previously received LIURP services. Thirteen percent did not submit income verification, and six percent did not have a sufficient usage history.

Table III-2
Ineligible Customers

Category	Number	Percent of Total
Usage below guidelines	1,595	42%
Over income	850	22%
Previously Treated in LIURP	586	15%
Income verification not submitted	493	13%
Insufficient Usage History	219	6%
Scope of Work Beyond Guidelines	22	1%
Commercial Account	17	0%
TOTAL Ineligible	3,782	100%

Table III-3 displays reasons why customers were cancelled. The largest group of customers, 48 percent, made no response to contact attempts. Another large group, 27 percent, refused services. Eighteen percent were cancelled because of a planned move and six percent were cancelled because landlord consent was not obtained.

Table III-3
Cancelled Customers

Category	Number	Percent of Total
No response to contact attempts	6,007	48%
Customer refused	3,400	27%
Customer moving	2,194	18%
No landlord consent	794	6%
Other	34	<1%
TOTAL Cancelled	12,429	100%

B. 2006 LIURP Services

This section describes LIURP services that were delivered in 2006. The annual LIURP budget for 2006, determined by the settlement agreement of PECO's electric restructuring case, was \$6,475,000, with \$875,000 earmarked for the LIURP Gas Program. Table III-4 shows the distribution of this spending. Sixty-eight percent of the funds were spent on weatherization measures and labor, 23 percent was spent on audits and education, nine percent was spent on PECO administration, and less than one percent was spent on the photo-voltaic grant.

Table III-4
2006 LIURP Expenditures
By Category

Category	Amount Spent	Percent of Funds
Weatherization Measures	\$4,374,454	68%
Audit/Education	\$1,475,715	23%
PECO Administration	\$609,010	9%
Solar Water Heater Maintenance	\$15,819	<1%
TOTAL	\$6,474,998	100%

Table III-5 displays the distribution of LIURP jobs and expenditures by job type. While nearly 75 percent of jobs are classified as baseload, meaning that measures primarily address electric baseload usage, these are lower cost jobs and represent approximately 30 percent of

total weatherization costs. The average cost for measures on these jobs is \$204. Gas heating jobs represent 18 percent of jobs and 58 percent of costs, averaging \$1,624 in measure costs per home. Electric heating jobs average \$1,635 per home.

Table III-5
2006 LIURP Service Delivery and Expenditures
By Job Type

Job Type	# of Jobs	% of Jobs	Total Cost	% of Costs	Average Job Cost
Baseload	6,073	73%	\$1,241,763	29%	\$204
Electric Heating	277	3%	\$452,985	11%	\$1,635
Gas Heating	1,531	18%	\$2,486,030	58%	\$1,624
Low Usage	122	1%	\$12,997	0%	\$107
Electric Heat Low Use	239	3%	\$49,722	1%	\$208
Solar Water Heat Maintenance	48	1%	\$15,915	0%	\$332
Prior Year	15	<1%	\$5,317	0%	\$354
Total	8305	100%	\$4,264,729	100%	\$514

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. Almost all of the customers received baseload services, but only nine percent received a refrigerator replacement. Approximately 15 percent received weatherization and approximately 15 percent received air sealing. Approximately 9 percent received insulation, and approximately 8 percent received a heating system tune-up.

Table III-6
2006 LIURP Service Delivery and Expenditures

Work Type	# of Jobs	% of Jobs	Total Cost	% of Costs	Average Cost
Baseload	8,238	99%	\$775,619	18%	\$94
Refrigerator Replacement	751	9%	\$545,934	13%	\$727
Appliance	6	0%	\$167	0%	\$28
Weatherization	1,237	15%	\$384,168	9%	\$311
Air Sealing	1,264	15%	\$356,857	8%	\$282
Insulation	735	9%	\$573,809	13%	\$781
Electrical	289	3%	\$196,696	5%	\$681
Heating System Replacement	292	4%	\$952,963	22%	\$3,264
Heating System Tune Up	651	8%	\$236,524	6%	\$363
Air Conditioner Replacement	278	3%	\$116,086	3%	\$418
Water Heater Replacement	165	2%	\$111,628	3%	\$677

Work Type	# of Jobs	% of Jobs	Total Cost	% of Costs	Average Cost
Solar Water Heater Tune Up	47	1%	\$14,279	0%	\$304
TOTAL	8305	\$1	\$4,264,729	100%	\$514

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 12,000 smoke detectors were provided in over 5,000 homes.
- *Compact fluorescent light bulbs:* CFL's were provided to nearly all the homes serviced. On average, four bulbs were provided to each home serviced. As there was very little variation in the number of bulbs provided per home, almost all homes received four CFLs.
- *Refrigerator replacement and removal:* Refrigerators were replaced in 750 homes and second refrigerators were removed in 77 homes.
- *Air conditioner replacement:* Window air conditioners were replaced in 309 homes.
- *Aerators and showerheads:* A total of 3,574 aerators were provided in 2,899 homes and 1,902 showerheads were provided in 1,595 homes.
- *Water heaters:* Electric water heater timers were provided in 182 homes and water heater replacements were provided in 216 homes.
- *Air sealing:* Air sealing was provided in approximately 1,200 homes. As expected, almost all of the customers who received air sealing also received a blower door test.
- *Insulation:* Insulation was provided in approximately 2,000 homes. For the most part, the insulation was provided in the attic.
- *Heat system repair:* Approximately 850 homes received heating system repair work.
- *Heating system replacement:* Heat pumps were replaced in 30 homes, gas furnaces in 127 homes, boilers in 126 homes, and oil furnaces in four homes.
- *Solar water heaters:* Forty-six homes received solar water heater inspections and 16 received repairs.

Table III-7
2006 LIURP Service Delivery and Expenditures
By Measure Type

Measure	Number of Jobs	% of Jobs	Total Number
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Measure	Number of Jobs	% of Jobs	Total Number
Smoke Detector	5,169	62%	12,595
Smoke Detector Battery	784	9%	1,386
CFLs	8,234	99%	32,918
Refrigerator Removal	77	1%	77
Refrigerator Replacement	750	9%	750
AC Maintenance	24	<1%	24
Air Conditioner Replacement	309	4%	342
Aerator	2,899	35%	3,574
Showerhead	1,595	19%	1,902
Water Heater Pipe Insulation	660	8%	660
Water Heater Tank Insulation	280	3%	280
Water Heater Labor	51	1%	51
Water Heater Part	26	<1%	26
Electric Water Heater Timer	182	2%	183
Water Heater Replacement	216	3%	216
Blower Door Test	1,229	15%	1,229
Air Sealing	1,206	15%	1,206
Duct/Pipe Insulation	529	6%	529
Insulation	2,024	24%	2,024
Electric Labor	91	1%	91
Electrical Part	100	1%	1,991
Line Voltage Thermostat	133	2%	484
Manual Thermostat	313	4%	328
Programmable Thermostat	238	3%	250
Thermostat Visually Impaired	56	1%	60
Unspecified Thermostat	12	<1%	13
Heating System Labor	329	4%	329
Heating System Part	864	10%	1,546
Clean and Tune	440	5%	440
Furnace Filter	235	3%	235
Electric Baseboard	42	1%	98
Heat Pump	30	<1%	30
Gas Furnace	127	2%	127
Gas Boiler	126	2%	126
Oil Furnace	4	<1%	4
Solar Water Heater Inspection	46	1%	46

Measure	Number of Jobs	% of Jobs	Total Number
Solar Water Heater Repair	16	<1%	16

C. 2006 LIURP 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-8 shows that customers who received baseload services had average usage of 10,713 kWh, electric heating customers had average usage of 21,977 kWh, and gas heating customers had average gas usage of 1,136 ccf.

Table III-8
Pre-Treatment Usage
Weather Normalized

Job Type	Number of Jobs	Jobs with Data	Electric Use (kWh)	Gas Use (ccf)
Baseload	6,073	4,417	10,713	571
Electric Heating	277	219	21,977	798
Gas Heating	1,531	1,236	8,605	1,136
Low Usage	122	90	7,030	658
Electric Heat Low Use	239	173	11,077	-
Solar Water Heat Maintenance	48	35	16,148	1,145
Prior Year	15	10	10,026	1,195
Total	8305	6,180	10,681	1,046

¹There are only two electric heating jobs with gas usage, six low usage jobs with gas usage, and one solar job with gas usage.

Table III-9 displays the primary heating source for LIURP jobs by job type and overall. Approximately three quarters of the homes served have utility gas as their primary heating source. Fourteen percent use fuel oil and seven percent have electric heat. Baseload jobs are distributed similarly, except that only one percent of these homes use electric heat. Most of the homes with electric heat are treated as electric heating jobs.

Table III-9
Primary Heating Source

	Baseload		Electric Heat		Gas Heat		All Jobs	
Primary Heating Source	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs
Utility Gas	4,802	79%	2	1%	1,523	99%	6,451	78%
Fuel Oil	1,142	19%	0	0%	0	0%	1,159	14%

	Baseload		Electric Heat		Gas Heat		All Jobs	
Primary Heating Source	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs
Electric	74	1%	273	99%	3	<1%	564	7%
Other	50	<1%	2	<1%	1	<1%	58	<1%
Missing	5	<1%	0	0%	4	<1%	73	<1%
Total	6,073	100%	277	100%	1,531	100%	8,305	100%

Table III-10 describes the use of supplemental heating by jobs treated through LIURP. Overall, 40 percent of the customers who were treated by LIURP used supplemental heat, virtually all of whom used electric supplemental heat. Forty-eight percent of the customers who had baseload services used electric supplemental heat.

Table III-10
Supplemental Heating

	Baseload		Electric Heat		Gas Heat		All Jobs	
Primary Heating Source	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs	# of Jobs	% of Jobs
None Used	3,078	51%	242	87%	1,269	83%	4,928	59%
Electric	2,909	48%	23	8%	253	17%	3,268	39%
Other	86	1%	12	4%	9	1%	109	1%
Total	6,073	100%	277	100%	1,531	100%	8,305	100%

Table III-11 shows the type of air conditioning that LIURP recipients used. Most of the LIURP recipients, 95 percent, used some form of air conditioning. The most common type, with 63 percent, was a window unit. Twenty-two percent had central air conditioning.

Table III-11
Air Conditioning

Air Conditioning	Number of Jobs	% of Jobs
None Used	385	5%
Window Unit	5,256	63%
Central Electric	1,810	22%
Wall Unit	600	7%
Window/Wall Unit	10	<1%
Central Heat Pump	233	3%
Portable Unit	11	<1%
Total	8,305	100%

Table III-12 shows the home ownership characteristics of LIURP recipients. This table shows that the Program was successful at serving renters, as nearly half of the LIURP recipients are renters.

Table III-12
Home Ownership

	Number of Jobs	% of Jobs
Own	4,487	54%
Rent	3,818	46%

Homes treated by LIURP are fairly old. The average age of homes treated was 69 years, and over 40 percent were more than 75 years old.

Table III-13
Home Age

	Number of Jobs	% of Jobs
<=25 Years	690	8%
26 – 50 Years	1,235	15%
51 – 75 Years	2,720	33%
76 Years or Older	3,597	43%
Missing	63	<1%
Mean	69 Years	

Table III-14 displays the dwelling type for the homes served under LIURP. The most common type was a row home, with 58 percent of homes served. Fifteen percent live in other types of single family homes, 11 percent live in multi-family homes, and nine percent live in duplexes.

Table III-14
Dwelling Type

	Number of Jobs	% of Jobs
Row	4,841	58%
Other Single Family	1,251	15%
Multi	929	11%
Duplex	755	9%
Mobile	74	<1%
Other	455	5%

	Number of Jobs	% of Jobs
Total	8,305	100%

Table III-15 describes the heated square footage of the homes treated by LIURP. Homes averaged 1,163 square feet. Only 31 percent of the homes were greater than 1,200 square feet.

Table III-15
Heated Square Footage

	Number of Jobs	% of Jobs
<=800	1,356	16%
801 – 1,000	2,091	25%
1,001 – 1,200	2,282	27%
1,201 or more	2,576	31%
Mean	1,163	

D. 2006 LIURP Customer 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 are female-headed, 63 percent contain at least one child, and 22 percent contain at least one elderly member.

Table III-16
Household Composition

	Number of Jobs	% of Jobs
Female Household Head	6,109	74%
Male Household Head	2,196	26%
Child in Household (<18)	5,201	63%
Elderly in Household (>62)	1,796	22%

Table III-17 shows that the mean annual household income level was \$14,023. Approximately 40 percent of the households served had annual income below \$10,000. Only 21 percent had annual income above \$20,000.

Table III-17
Annual Income

	Number of Jobs	% of Jobs
<=\$5,000	943	11%
\$5,001 - \$10,000	2,265	27%

	Number of Jobs	% of Jobs
\$10,001 - \$15,000	2,092	25%
\$15,001 - \$20,000	1,251	15%
\$20,001 or more	1,754	21%
Mean	\$14,023	

Table III-18 displays the household poverty level. Approximately 25 percent of the households had income below 50 percent of the Federal Poverty Level (FPL) and approximately eight percent had income above 150 percent of the FPL.

Table III-18
Poverty Level

	Number of Jobs	% of Jobs
<=25%	655	8%
26% - 50%	1,375	17%
51% - 100%	3,442	41%
101% - 150%	2,164	26%
151% or greater	663	8%
Missing	6	<1%
Mean	84%	

Table III-19 describes the account type of households who participated in the Program. Approximately 79 percent are CAP participants, two percent are customer choice participants, and four percent have the off peak rate.

Table III-19
Account Type

	Number of Jobs	% of Jobs
CAP	6,538	79%
Customer Choice ¹	146	2%
Off Peak	345	4%

¹ Customer Choice data were missing for 52 customers. CAP and Off Peak data were missing for 230 accounts.

Table III-20 displays the education level of the head of household. The majority of participants, 61 percent, have a high school education. Twelve percent have some high school, 15 percent have some college, and seven percent have a college degree.

Table III-20

Education Level

	Number of Jobs	% of Jobs
No Formal Education	21	<1%
Some Grade School	58	1%
Grade School	189	2%
Some High School	1,021	12%
High School	5,055	61%
Some College	1,214	15%
College Degree	548	7%
Some Graduate Work	15	<1%
Graduate Degree	30	<1%
Missing	154	2%

Table III-21 displays the primary income source for the LIURP participants. The table shows that the largest sources of income were unemployment and full time work. Twenty-eight percent had unemployment as their primary source of income, 23 percent had full time work, 18 percent had disability income, 16 percent had a pension and/or retirement, and 13 percent had part-time work.

Table III-21
Income Source

	Number of Jobs	% of Jobs
Unemployment	2,325	28%
Full Time Work	1,876	23%
Disability	1,487	18%
Pension/Retirement	1,314	16%
Part Time Work	1,060	13%
Dependent on Another	95	1%
Self Employment	53	1%
Public Assistance	49	1%
Seasonal Employment	15	<1%
Other	31	<1%

IV. Usage Impacts

This section of the report provides analysis of the impacts of LIURP on participants' 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 2006 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, 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 for the year after Program 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 330 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 include 74 percent of the treated population in the usage analysis.

Table IV-1
Usage Impact Data Attrition

	Electric Baseload	Electric Heating	Gas Heating	All Jobs ¹
Original Population	6,073	277	1,531	8,305
Not Enough Pre-Treatment Days	761	22	87	912
Not Enough Post-Treatment Days	609	27	120	798
Pre Usage Below 1200 kWh or 300 ccf	133	1	5	142
Post Usage Below 1200 kWh or 300 ccf	14	0	12	27
Change in Total Usage>65%	139	8	71	246
Final Sample	4,417	219	1,236	6,180
% Included in Analysis	73%	79%	81%	74%

¹There are a small number of jobs that are not classified as electric baseload, electric heating, or gas heating.

Energy usage data are weather normalized in the pre and the post usage period to ensure that changes in energy usage are due to changes in usage patterns, rather than due to changes in weather. We use a degree-day normalization process to conduct this analysis. This process involves 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 much 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 have chosen to conduct 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. We do find somewhat lower savings for the normalized baseload savings.

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 savings of approximately 742 kWh, or 6.9 percent of pre-treatment usage.
- Electric heat jobs had average savings of approximately 1,433 kWh, or 6.5 percent of pre-treatment usage.
- Gas heat jobs had average savings of approximately 91 ccf, or eight percent of pre-treatment usage.

Table IV-2
Average Usage and Savings

	#	Pre-Use	Post-Use	Savings	% Savings
Electric Baseload (kWh)					
Non Normalized	4,417	10,557	9,600	957	9.1%
Degree Day Normalized	4,417	10,695	9,953	742	6.9%
Electric Heat (kWh)					
Non Normalized	219	21,074	19,438	1,636	7.8%
Degree Day Normalized	219	21,890	20,458	1,433	6.5%
Prism Normalized	181	21,760	20,279	1,481	6.8%
Gas Heat (ccf)					
Non Normalized	1,236	1,052	964	88	8.4%
Degree Day Normalized	1,236	1,128	1,037	91	8.0%
Prism Normalized	621	1,086	997	89	8.2%

In the rest of the report we focus on the degree day normalized savings, which were shown to be somewhat lower than the non-normalized savings for the baseload jobs and similar to the PRISM estimated savings for the electric heat and gas heat jobs.

Table IV-3 provides the historical comparison of energy savings by job type.

- Electric baseload jobs had lower average pre-usage and lower savings than in 2005. Pre-treatment usage averaged 10,695 in 2006 compared to 11,188 kWh in 2005. (However, 2006 pre-treatment usage was somewhat higher than the historical average.) Savings were only 6.9 percent in 2006 compared to ten percent in 2005 and the historical average of ten percent. Weatherization spending, at \$214 in 2006, was also approximately the same as in the recent history of the Program.
- Electric heat jobs had pre-treatment usage and average savings that were lower than the 1999-2005 average. Savings were 6.5 percent in 2006 compared to 8.6 percent for the seven-year average. Costs for 2006 are also lower than the seven-year average.
- Gas heat jobs had pre-treatment usage and savings that were significantly lower than the 1999-2005 average. Pre-treatment usage was 1,128 compared to the seven year average of 1,242, more than nine percent lower. Gas savings were 8.0 percent in 2006, as compared to 11.8 percent for the seven-year average. Gas heat measure costs were approximately the same as the seven-year average.

Table IV-3
Time-Series Comparison of Usage Savings

	Pre-Use	Post-Use	Savings	Percent Savings	Wx Cost
Electric Baseload (kWh)					
2006	10,695	9,953	742	6.9%	\$214
1999-2005 Average	10,145	9,121	1,024	10.0%	\$228
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
Electric Heat (kWh)					
2006	21,890	20,458	1,433	6.5%	\$1,643
1999-2005 Average	22,403	20,511	1,892	8.4%	\$1,734
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
Gas Heat (ccf)					
2006	1,128	1,037	91	8.0%	\$1,640
1999-2005 Average	1,242	1,096	146	11.8%	\$1,693
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

The lower pre-treatment usage for the electric baseload and gas heating jobs may be due to the longevity of PECO's LIURP and their historical treatment of high usage customers. After so many years of providing LIURP to the highest use customers, the customers who have not yet received service have lower usage. Additionally, recent increases in energy prices may have caused customers to conserve energy prior to receiving services.

Table IV-4 displays the seasonal analysis of energy savings by job type. The table shows that while electric baseload and electric heating jobs had significant baseload and heating savings, they had significant increases in cooling usage. Gas heat households had more than 80 percent of their savings from heating usage and the remainder from baseload usage.

Table IV-4
Seasonal Usage Analysis

	#	Pre-Use	Post-Use	Savings	% Savings	Share of Savings
Electric Baseload (kWh)						
Baseload	4,417	6,856	6,412	444	6.5%	59%
Heating		2,104	1,681	422	20.1%	57%
Cooling		1,736	1,859	-124	-7.1%	-17%
Electric Heat (kWh)						
Baseload	219	10,482	9,654	828	7.9%	58%
Heating		10,200	9,503	697	6.8%	49%
Cooling		1,208	1,300	-92	-7.6%	-6%
Gas Heat (ccf)						
Baseload	1,236	223	209	14	6.5%	16%
Heating		885	809	76	8.6%	84%

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 2006 PECO LIURP savings are consistent with this expectation.

- Baseload jobs with pre-treatment usage over 12,000 kWh have savings of 10.5 percent, compared to savings of 5.8 percent for baseload jobs with pre-treatment usage between 8,000 and 12,000 kWh, and 2.0 percent savings for baseload jobs with pre-treatment usage of below 8,000 kWh. The higher usage jobs had higher measure expenditures, but the cost per kWh saved is much lower for the higher usage jobs. The jobs with over 12,000 kWh in pre-treatment usage cost just 14 cents per kWh saved, as compared to a cost of 1.23 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 9.9 percent, compared to jobs with usage between 16,000 and 26,000 kWh that had average savings of 5.9 percent and jobs with usage below 16,000 kWh that did not have savings. Again, the expenditures are greater for the higher usage jobs, but the cost per kWh saved is lower for the higher usage jobs.
- Gas heat jobs with pre-treatment usage over 1,400 ccf had average savings of 10.4 percent, compared to average savings of 7.3 percent for jobs with usage between 800 and

1,400 ccf, and 5.7 percent savings for jobs with usage below 800 ccf. Costs are higher for the higher usage jobs, but the cost-effectiveness is greater for these jobs.

Table IV-5
Change in Usage
By Pre Program Usage

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost/Unit Saved
Electric Baseload							
< 8,000 kWh	804	7,572	7,423	148	2.0%	\$182	\$1.23
8,000 – 12,000 kWh	2,603	9,427	8,882	544	5.8%	\$216	\$0.40
> 12,000 kWh	1,010	16,449	14,725	1,724	10.5%	\$236	\$0.14
Electric Heat							
< 16,000 kWh	53	13,706	13,724	-18	-0.1%	\$1,439	--
16,000 – 26,000 kWh	110	20,125	18,931	1,194	5.9%	\$1,368	\$1.14
> 26,000 kWh	56	33,104	29,831	3,273	9.9%	\$2,378	\$0.73
Gas Heat							
< 800 ccf	206	726	685	41	5.7%	\$1,240	\$30.12
800 – 1,400 ccf	794	1,050	973	77	7.3%	\$1,672	\$21.75
> 1,400 ccf	236	1,742	1,562	181	10.4%	\$1,880	\$10.40

Table IV-6 shows usage impacts by job type and by whether the household participated in CAP in the pre or post-treatment period. The table shows that for electric and gas heat jobs, savings are somewhat lower for CAP participants, and the difference is statistically significant for the electric heat jobs.

It is important to emphasize that energy savings measures are applied in accordance with the opportunities that are found in the home. While CAP customers have lower savings on the heating jobs, they also have lower service delivery costs.

Table IV-6
Change in Usage
By CAP Participation

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost/Unit Saved
Electric Baseload							
CAP	3,695	10,707	9,959	748	7.0%	\$211	\$0.28
Non-CAP	722	10,631	9,922	710	6.7%	\$230	\$0.32
Electric Heat							
CAP	173	21,215	20,024	1,192	5.6%	\$1,524	\$1.28
Non-CAP	46	24,430	22,091	2,339	9.6%	\$2,091	\$0.89
Gas Heat							
CAP	957	1,114	1,028	86	7.7%	\$1,582	\$18.39

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost/Unit Saved
Non-CAP	279	1,177	1,070	107	9.1%	\$1,839	\$17.17

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 very small percentage of customers served by LIURP are customer choice. Differences in savings between the choice and non-choice participants are not statistically significant.

Table IV-7
Change in Usage
By Customer Choice

	#	Pre-Use	Post-Use	Savings	% Savings
Electric Baseload					
Choice	68	11,046	10,405	641	5.8%
Non-Choice/No Data	4,349	10,689	9,946	744	7.0%
Electric Heat					
Choice	1	17,915	20,772	-2,857	-15.9%
Non-Choice/No Data	218	21,909	20,456	1,452	6.6%
Gas Heat					
Choice	45	1,195	1,033	162	13.5%
Non-Choice/No Data	1,191	1,126	1,038	88	7.8%

Table IV-8 displays energy savings by whether the customer had the off-peak rate in the pre or the post-treatment period. Only a small percentage of customers have this rate. Differences in savings between customers who did and did not have the off-peak rate were not statistically significant.

Table IV-8
Change in Usage
By Peak Service

	#	Pre-Use	Post-Use	Savings	% Savings
Electric Baseload					
Off-Peak	175	13,460	12,444	1,017	7.6%
Not Off-Peak	4,242	10,581	9,850	731	6.9%
Electric Heat					
Off Peak	20	21,305	20,324	981	4.6%
Not Off-Peak	199	21,949	20,471	1,478	6.7%

	#	Pre-Use	Post-Use	Savings	% Savings
Gas Heat (electric usage)					
Off Peak	40	9,551	8,611	941	9.8%
Not Off Peak	1,183	8,562	8,426	136	1.6%

Thirteen Gas Heat job accounts do not have electricity usage data.

Table IV-9 displays the change in usage by home ownership status. Approximately half of the customers who received baseload services were renters. Renters have baseload savings that average 5.1 percent, compared to average savings of 8.6 percent for owners. Renters have measure costs that average only \$90, as compared to measure costs that average \$329 for owners. None of the renters received refrigerator replacement, a major source of saving for baseload homes.

Table IV-9
Change in Usage
By Home Ownership

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost Per Unit Saved
Electric Baseload							
Owner	2,288	10,932	9,995	937	8.6%	\$329	\$0.35
Renter	2,129	10,440	9,907	532	5.1%	\$90	\$0.17
Electric Heat							
Owner	152	23,175	21,503	1,672	7.2%	\$1,995	\$1.19
Renter	67	18,976	18,087	889	4.7%	\$845	\$0.95
Gas Heat							
Owner	1,010	1,140	1,051	88	7.8%	\$1,777	\$20.12
Renter	226	1,077	975	102	9.4%	\$1,025	\$10.09

Table IV-10 displays energy savings by whether the customer used supplemental heat. Customers with supplemental heat have a significantly greater reduction in usage for Baseload jobs. Baseload jobs with supplemental heat have average savings of 11.6 percent, compared to average savings of only 1.9 percent for baseload jobs without supplemental heat.

Table IV-10
Change in Usage
By Supplemental Heat

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost Per Unit Saved
Baseload							
Supplemental Heat	2,094	11,665	10,331	1,354	11.6%	\$243	\$0.18
No Supp Heat	2,323	9,820	9,630	191	1.9%	\$188	\$0.99

Electric Heat							
Supplemental Heat	28	24,360	23,099	1,261	5.2%	\$2,263	\$1.80
No Supp Heat	191	21,528	20,071	1,458	6.8%	\$1,552	\$1.06
Gas Heat							
Supplemental Heat	209	1,206	1,121	85	7.0%	\$1,881	\$22.15
No Supp Heat	1,027	1,112	1,020	92	8.3%	\$1,591	\$17.30

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, water heater replacement, and electric water heater timers.
- Electric heat jobs: Major measures include refrigerator replacement, air conditioner replacement, water heater replacement, electric water heater timers, heat pumps, 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 do not receive one of the major measures listed above are considered to have basic measures.

Table IV-11 displays energy savings by whether the job received one or more major measures.

- Baseload Jobs: Only about 15 percent of baseload jobs received major measures. Costs for these jobs averaging \$818 were significantly higher than costs for baseload jobs that did not receive major measures, averaging \$104. Savings for baseload jobs with major measures averaged 12.9 percent, as compared to savings that averaged 5.8 percent for baseload jobs that did not receive major measures.
- Electric Heat Jobs: Almost 70 percent of electric heat jobs received major measures. Savings for jobs that received major measures averaged 8.1 percent, as compared to average savings of 2.7 percent for jobs that did not receive major measures. Spending on jobs that received major measures averaged \$2,213, compared to average spending of \$351 for jobs that did not receive major measures.

- **Gas Heat Jobs – Gas Measures:** Approximately 75 percent of gas heat jobs received major measures aimed at reducing gas usage. Gas savings for jobs with major measures averaged 9.6 percent, compared to average savings of 2.7 percent for jobs that did not receive major measures. Costs for gas jobs with major measures averaged \$2,006 compared to average costs of \$450 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 6.1 percent compared to 1.2 percent for those who received only basic electric measures.

Table IV-11
Change in Usage
By Level of Service

	#	Pre-Use	Post-Use	Savings	% Savings	Measure Cost	Cost per Unit Saved
Electric Baseload							
Basic	3,734	10,610	9,996	614	5.8%	\$104	\$0.17
Major	683	11,156	9,714	1,442	12.9%	\$818	\$0.57
Electric Heat							
Basic	67	20,403	19,842	560	2.7%	\$351	\$0.63
Major	152	22,546	20,729	1,817	8.1%	\$2,213	\$1.22
Gas Heat – ccf							
Basic	291	1,094	1,065	29	2.7%	\$450	\$15.48
Major	945	1,139	1,029	110	9.6%	\$2,006	\$18.28
Gas Heat – kWh							
Basic	1,100	8,293	8,189	104	1.2%	\$1,533	\$14.63
Major	123	11,294	10,604	691	6.1%	\$2,633	\$3.81

Table IV-12 displays energy savings by whether or not participants received particular measures. Some of the key findings in this table include:

- *Air conditioner:* Baseload participants who received an air conditioner had higher savings (9.3%) than those who did not (6.8%).
- *Refrigerator:* Baseload participants who received a refrigerator had higher savings (15.3%) than those who did not (5.9%). Gas heat customers who received a refrigerator had higher electric savings (9.0%) than those who did not (1.0%).
- *Electric Water Heater Timer:* Participants who received an electric water heater time did not have savings that were significantly different from those who did not.

- *Blower Door Guided Air Sealing*: Gas heating customers who received blower door guided air sealing had higher savings (9.5%) than those who did not (4.1%).
- *Insulation*: Gas heating customers who received insulation had higher savings (11.2%) than those who did not (4.3%).
- *Furnace*: Gas heating customers who received a new furnace had higher savings (21.2%) than those who did not (6.9%).

Table IV-12
Change in Usage
By Major Measures

	#	Pre-Use	Post-Use	Savings	% Savings	Total Measure Cost
Electric Baseload						
Air Conditioner	201	10,684	9,691	992	9.3%	\$704
No Air Conditioner	4,216	10,695	9,965	730	6.8%	\$191
Refrigerator	488	10,858	9,202	1,656	15.3%	\$922
No Refrigerator	3,929	10,675	10,046	629	5.9%	\$126
Air Conditioner/Refrigerator	43	10,725	8,996	1,729	16.1%	\$1,238
Air Conditioner/ No Refrigerator	158	10,672	9,880	792	7.4%	\$559
No Air Conditioner/ Refrigerator	445	10,871	9,222	1,649	15.2%	\$891
No Air Conditioner/ No Refrigerator	3,771	10,675	10,053	622	5.8%	\$108
Electric Water Heater Timer	55	17,202	15,692	1,510	8.8%	\$742
No Electric Water Heater Timer	4,362	10,613	9,880	732	6.9%	\$207
Electric Heat						
Refrigerator	31	23,880	22,188	1,691	7.1%	\$2,714
No Refrigerator	188	21,562	20,173	1,390	6.4%	\$1,467
Blower Door Test	95	23,484	21,870	1,613	6.9%	\$2,169
No Blower Door Test	124	20,670	19,376	1,294	6.3%	\$1,240
Electric Water Heater Timer	65	22,689	21,300	1,390	6.1%	\$2,623
No Electric Water Heater Timer	154	21,553	20,103	1,451	6.7%	\$1,230
Insulation	87	23,428	21,938	1,491	6.4%	\$2,175
No Insulation	132	20,877	19,483	1,394	6.7%	\$1,293
Gas Heat - ccf						
Blower Door Test	891	1,143	1,034	109	9.5%	\$1,983
No Blower Door Test	345	1,090	1,046	45	4.1%	\$754
Insulation	678	1,128	1,002	126	11.2%	\$2,135
No Insulation	558	1,129	1,081	48	4.3%	\$1,038
Furnace	102	1,114	878	236	21.2%	\$4,084
No Furnace	1,134	1,129	1,052	78	6.9%	\$1,420

	#	Pre-Use	Post-Use	Savings	% Savings	Total Measure Cost
Gas Heat - kWh						
Refrigerator	96	11,638	10,592	1,046	9.0%	\$2,579
No Refrigerator	1,127	8,335	8,248	87	1.0%	\$1,564

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

CFL savings could not be predicted through the regression analysis, as there was almost no variation in the distribution of CFLs – almost all participants received 4 CFLs, and no data were available on the type of CFLs provided. Therefore, we attempt to estimate the savings due to CFL installation by examining savings for the 1079 Electric Baseload jobs that only received CFLs. The table shows that these savings averaged 500 kWh, higher than the 274 kWh that might be expected to be saved if each of the four CFLs replaced 60 watt incandescents that were used an average of four hours per day.¹¹ Therefore, we expect that a significant part of these savings is due to education and resulting changes in behavior.

In the cost and cost-effectiveness columns in the table we provide estimates using only the CFL costs and estimates that include the CFL costs 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 is only \$0.12. This indicates that there may be potential to cost-effectively increase savings by providing more CFLs to LIURP participants, and that the education process is very effective.

The table also shows estimates of savings for furnaces, boilers, and insulation.

Table IV-13
Measure Savings Estimates

	Savings	Cost/Home	\$/Unit Saved	Measure Life	\$/Unit Saved Over Lifetime
Electric Baseload					
CFL Only	500 (±114)	\$74/\$252	\$0.15/\$0.50	5	\$0.03/\$0.12
Refrigerator	876 (±255)	\$726	\$0.83	12	\$0.09
Gas Heat - ccf					
Gas Furnace	152 (±42)	\$2,322	\$15.28	15	\$1.47
Boiler	134 (±44)	\$2,986	\$22.28	15	\$2.15
Insulation	67 (±27)	\$288	\$4.30	15	\$0.41

¹¹ (60 watts-13 watts)*0.001*365 days*4 hours/day* 4 bulbs=274 kWh

D. Cost Effectiveness

This section examines the cost-effectiveness of the Program services delivered by job type. Measure costs are allocated to electric and gas costs, and audit and administrative costs are 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 is calculated as the average total cost divided by the unit savings. The cost per kWh saved is \$0.58 for baseload jobs, \$1.32 for electric heat jobs, and \$1.15 for gas heat jobs. The cost per ccf saved is \$1.40 for electric baseload jobs and \$18.73 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
Electric Baseload							
Electric (kWh)	4,417	742	\$214	\$154	\$63	\$431	\$0.58
Gas (ccf)	66	49	\$34	\$24	\$10	\$68	\$1.40
Electric Heat							
Electric (kWh)	219	1,433	\$1,643	\$178	\$73	\$1,894	\$1.32
Gas Heat							
Electric (kWh)	1,223	163	\$162	\$18	\$7	\$187	\$1.15
Gas (ccf)	1,236	91	\$1,478	\$160	\$66	\$1,704	\$18.73

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. This table shows that some of the electric investments are 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 eight 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
Electric Baseload							
Electric (kWh)	4,417	742	\$431	\$0.58	\$0.13	\$0.08	\$0.06
Gas (ccf)	66	49	\$68	\$1.40	\$0.32	\$0.18	\$0.13
Electric Heat							
Electric (kWh)	219	1433	\$1,894	\$1.32	\$0.31	\$0.17	\$0.13

	#	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)	1,223	163	\$187	\$1.15	\$0.26	\$0.15	\$0.11
Gas (ccf)	1,236	91	\$1,704	\$18.73	\$4.33	\$2.43	\$1.80

V. Bill and Payment Impacts

This section of the report examines the bill and payment impacts for 2006 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. As with the usage impact analysis, accounts were required to have between 330 and 390 days of transactions data to be included in the analysis. Due to an IT conversion during the post-treatment period, it was necessary to align data between the two systems. A small number of additional accounts were removed from the analysis when the gap between the old and new data was larger than 30 days. Table V-1 displays the data attrition statistics. Fewer data were available for the billing and payment analysis than for the usage analysis. However, available data are adequate to analyze the impact of LIURP on billing and payment statistics.

Table V-1
Payment Impact Data Attrition

	Electric Baseload	Electric Heating	Gas Heating	All Jobs
Original Population	6,073	277	1,531	8,305
Not Enough Pre-Treatment Days	1,274	38	272	1,661
Not Enough Post-Treatment Days	1,266	73	384	1,817
Gap Between Old and New IT System Billing	515	17	221	803
Data Outliers	448	30	132	643
Final Sample	2,570	119	522	3,381
% Included in Analysis	42%	43%	34%	41%

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 overall electric revenue declined by an average of \$149 or 12 percent. Gas revenue declined by \$44 or 13 percent. Total revenue declined by 12.5 percent.

Table V-2
Billing Revenue

	#	Pre	Post	Change	Percent Change
Electric Baseload					
Electric Revenue	4,417	\$1,246	\$1,040	-\$206	-16.5%
Gas Revenue		\$42	\$44	\$2	4.7%
Total Revenue		\$1,287	\$1,083	-\$204	-15.9%
Electric Heat					
Electric Revenue	219	\$1,881	\$1,604	-\$276	-14.7%
Gas Revenue		\$10	\$8	-\$1	-14.2%
Total Revenue		\$1,890	\$1,613	-\$278	-14.7%
Gas Heat					
Electric Revenue	1,236	\$1,089	\$1,147	\$58	5.3%
Gas Revenue		\$1,473	\$1,246	-\$227	-15.4%
Total Revenue		\$2,562	\$2,393	-\$169	-6.6%
All Job Types					
Electric Revenue	6,180	\$1,225	\$1,075	-\$149	-12.2%
Gas Revenue		\$327	\$283	-\$44	-13.4%
Total Revenue		\$1,552	\$1,358	-\$193	-12.5%

Table V-3 displays the change in customer electric and gas bills and total charges, between the pre and the post-treatment periods. Total charges declined by 7.5 percent for electric baseload jobs, 6.8 percent for electric heat jobs, and 13.2 percent for gas heat jobs.

Table V-3
Bills and Total Charges

	#	Pre	Post	Change	Percent Change
Electric Baseload					
Electric and Gas Charges	2,570	\$1,203	\$1,119	-\$84	-7.0%
Other Charges		\$44	\$35	-\$9	-21.0%
Total Charges		\$1,247	\$1,154	-\$93	-7.5%
Electric Heat					
Electric and Gas Charges	119	\$1,860	\$1,741	-\$119	-6.4%
Other Charges		\$47	\$36	-\$11	-23.4%
Total Charges		\$1,907	\$1,777	-\$130	-6.8%
Gas Heat					
Electric and Gas Charges	522	\$2,372	\$2,071	-\$301	-12.7%
Other Charges		\$45	\$27	-\$18	-40.0%
Total Charges		\$2,417	\$2,098	-\$319	-13.2%

	#	Pre	Post	Change	Percent Change
All Job Types					
Electric and Gas Charges	3,381	\$1,402	\$1,288	-\$115	-8.2%
Other Charges		\$44	\$34	-\$10	-23.4%
Total Charges		\$1,447	\$1,322	-\$125	-8.6%

Table V-4 displays payment statistics for the 2006 LIURP participants. The number of payments made declined for all groups of participants between the pre and post-treatment years, by between one half and one payment on average. There was a decline in cash payments, a small increase in assistance payments, an increase in other credits, and a decline in the total credits made to the accounts.

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

	#	Pre	Post	Change	Percent Change
Electric Baseload					
# Payments	2,570	9.3	8.3	-0.9	-10.1%
Cash Payments		\$960	\$789	-\$171	-17.8%
Assistance Payments		\$43	\$47	\$4	9.0%
Other Credits		\$44	\$120	\$76	172.9%
Total Credits		\$1,047	\$956	-\$91	-8.7%
Electric Heat					
# Payments	119	9.9	9.3	-0.6	-5.9%
Cash Payments		\$1,540	\$1,275	-\$266	-17.3%
Assistance Payments		\$61	\$69	\$8	13.2%
Other Credits		\$38	\$144	\$106	279.9%
Total Credits		\$1,639	\$1,488	-\$151	-9.2%
Gas Heat					
# Payments	522	10.6	10.0	-0.5	-5.1%
Cash Payments		\$1,960	\$1,529	-\$432	-22.0%
Assistance Payments		\$73	\$93	\$20	27.1%
Other Credits		\$38	\$198	\$160	421.0%
Total Credits		\$2,071	\$1,819	-\$252	-12.2%
All Job Types					
# Payments	3,381	9.5	8.6	-0.9	-9.1%
Cash Payments		\$1,130	\$918	-\$213	-18.8%
Assistance Payments		\$52	\$58	\$6	10.9%
Other Credits		\$43	\$136	\$93	217.2%
Total Credits		\$1,225	\$1,112	-\$114	-9.3%

Table V-5 displays payments for CAP and Non-CAP customers in the year prior to and after receipt of LIURP. This table shows that CAP customers decreased their cash payments by an average of \$218 or 21 percent. However the decline in cash payments was somewhat balanced out by an increase in assistance payments and other credits. Non-CAP customers also had a decline in cash payments that was somewhat balanced out in the assistance payments and other credits.

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

	#	Pre	Post	Change	Percent Change
CAP Customers – All Job Types					
# Payments	2,765	9.4	8.5	-0.8	-8.8%
Cash Payments		\$1,032	\$814	-\$218	-21.1%
Assistance Payments		\$62	\$65	\$3	4.3%
Other Credits		\$49	\$146	\$97	197.3%
Total Credits		\$1,143	\$1,025	-\$118	-10.3%
Non-CAP Customers – All Job Types					
# Payments	616	10.0	9.0	-1.0	-10.4%
Cash Payments		\$1,572	\$1,382	-\$189	-12.0%
Assistance Payments		\$6	\$25	\$19	324.7%
Other Credits		\$16	\$93	\$77	492.0%
Total Credits		\$1,593	\$1,500	-\$93	-5.8%

Table V-6 displays a more detailed analysis of the types of assistance payments received in the pre and the post-treatment periods by 2006 LIURP participants. The table shows large increases in LIHEAP Cash assistance and large declines in LIHEAP crisis assistance.

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

	#	Pre	Post	Change	% Change
Electric Baseload					
LIHEAP Cash	2,570	\$17	\$37	\$20	113.3%
LIHEAP Crisis		\$26	\$9	-\$17	-64.0%
MEAF		\$0	<\$1	<\$1	-
Total Assistance		\$43	\$47	\$4	9.0%
Electric Heat					
LIHEAP Cash	119	\$4	\$57	\$52	1200.2%
LIHEAP Crisis		\$56	\$10	-\$46	-82.3%
MEAF		\$0	\$2	\$2	--

	#	Pre	Post	Change	% Change
Total Assistance		\$61	\$69	\$8	13.2%
Gas Heat					
LIHEAP Cash	522	\$5	\$63	\$59	1295.0%
LIHEAP Crisis		\$68	\$29	-\$40	-58.1%
MEAF		\$0	<\$1	<\$1	-
Total Assistance		\$73	\$93	\$20	27.1%
All Job Types					
LIHEAP Cash	3,381	\$15	\$44	\$29	187.4%
LIHEAP Crisis		\$36	\$13	-\$24	-65.7%
MEAF		\$0	<\$1	<\$1	-
Total Assistance		\$52	\$58	\$6	10.9%

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 job types.

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

	#	Pre	Post	Change	Percent Change
Electric Baseload					
Cash Coverage Rate	2,570	77.7%	70.9%	-6.9%	-8.8%
Total Coverage Rate		85.6%	88.8%	3.2%	3.8%
Electric Heat					
Cash Coverage Rate	119	80.7%	72.3%	-8.4%	-10.4%
Total Coverage Rate		87.2%	88.3%	1.1%	1.3%
Gas Heat					
Cash Coverage Rate	522	80.7%	73.3%	-7.4%	-9.1%
Total Coverage Rate		86.1%	90.1%	4.1%	4.8%
All Job Types					
Cash Coverage Rate	3,381	78.1%	70.9%	-7.2%	-9.2%
Total Coverage Rate		85.9%	89.3%	3.4%	4.0%

Table V-8 displays changes in customer balances. Because customers were not covering their full bill, as shown in Table V-7, customer balances increased during the post treatment period. For all job types, average balances increased from \$252 to \$403 during the post period. However, the percentage increase was smaller than in the percentage increase in the pre period.

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

	#	Start	End	Change	Percent Change
Electric Baseload					
Pre Balance	2570	\$136	\$240	\$104	77%
Post Balance		\$246	\$404	\$158	64%
Electric Heat					
Pre Balance	119	\$37	\$147	\$110	297%
Post Balance		\$166	\$306	\$140	84%
Gas Heat					
Pre Balance	522	\$130	\$286	\$155	119%
Post Balance		\$313	\$437	\$125	40%
All Job Types					
Pre Balance	3381	\$131	\$240	\$110	84%
Post Balance		\$252	\$403	\$151	60%

VI. Summary of Findings and Recommendations

PECO's LIURP cost-effectively delivered energy efficiency services and energy education to over eight thousand customers in 2006, many of whom had vulnerable household members. They have kept program administration costs low, at just nine percent of program expenditures.

Reductions in energy usage were somewhat lower than in previous years. This reduction is probably due to lower pre-treatment energy usage. PECO has been providing LIURP services for many years, and has furnished LIURP to many of its highest usage customers. Additionally, lower pre-treatment usage may be due to higher energy bills and customers' energy conservation efforts.

We have the following recommendations to continue to deliver effective services and potentially improve savings.

- *Targeting:* It is a challenge to continue to find high usage customers to treat in the program. Lower energy savings for 2006 participants may be related to lower pre-treatment usage for these households. PECO should continue to make targeting the highest usage households a priority for the program.
- *CFL's:* The program provides four CFLs to nearly every household served in LIURP. The measure saving analysis found that customers who only received CFLs had high average savings. PECO should modify LIURP procedures to evaluate each customer's lighting usage, and provide CFLs for any bulb used more than 2 hours per day. This may require the use of a broader range of CFLs than are currently used, but would probably be a very cost-effective investment.
- *Education:* The high savings for households that only received CFLs, as well as previous customer survey research conducted as part of PECO's 2006 USF evaluation, indicate that the energy education conducted as part of LIURP is successful. We believe this is due to the extensive education process that occurs during the audit and the reinforcement that occurs through letters and phone calls. PECO should continue the emphasis on education.
- *Evaluation:* The evaluation methodology that has been used examines gross savings, the difference between weather-normalized pre and post usage. PECO should consider using a comparison group to calculate the net savings due to the program. The net savings would be measured as the difference between the change for the treatment group and the change for the comparison group. Because electric baseload usage has been increasing over time, this may show a more accurate estimate of a greater reduction in electric usage that is due to LIURP. Such an analysis would also control for other factors, such as increases in energy prices, which may lead customers to conserve even in the absence of LIURP. Failure to account for this change may lead to an overestimate of LIURP savings, particularly on the gas side. However, the Pennsylvania Public Utility Commission does not require the use of a comparison group.

