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November 15, 2012

Rosemary Chiavetta, Sccretary Pennsylvania Public Utility Commission Commonwealth Keystone Building 400 North Street, 2nd Floor North P.O. Box 3265 Harrisburg, PA 17105-3265

RECEIVED 2112 NOV 15 M 9: 40 SECRETARY.

RE: Process Evaluation Report PPL Electric Utilities Corporation's Act 129 Plan Program Year Three Docket No. M-2009-2093216

Dear Secretary Chiavetta:

Enclosed for filing is the Program Year Three Process Evaluation Report of PPL Electric Utilities Corporation's ("PPL Electric") Act 129 Plan. PPL Electric is providing a copy of its process Evaluation Report to the Act 129 Statewide Evaluator. In addition, PPL Electric will post its Evaluation Report on its ePower website.

If you have any questions concerning this matter, please contact me at the address or telephone numbers provided above.

Respectfully Submitted,

AST/jl Enclosures cc: Richard F. Spellman, GDS Associates Inc., Act 129 Statewide Evaluator

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# Process Evaluation Report PPL Electric

PPL Electric EE&C Plan Program Year Three

November 15, 2012

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GROUP, INC.

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PA PUBLIC UTILITY COMMISSION SECRETARY'S BUREAU

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### INTRODUCTION

The Cadmus Group, Inc., evaluated PPL Electric's portfolio of energy-efficiency programs, as outlined in its 2010 to 2013 Energy Efficiency and Conservation (EE&C) Plan, in its third program year (PY3) under Pennsylvania Act 129. The findings from the impact evaluation, including savings by program, are publicly available in the document titled "Final Annual Report to the Pennsylvania Public Utilities Commission," dated November 15, 2012.

This report focuses on the process evaluation of PPL Electric's PY3 portfolio. It identifies opportunities and offers recommendations to improve the effectiveness of PPL Electric's energy-efficiency programs from the standpoints of design and implementation, enrollment processes, marketing and outreach, quality assurance, and other elements.

#### Scope and Methodology

As PPL Electric's independent evaluator, Cadmus conducted in-depth process evaluations of PPL Electric's programs in each of the first two years of delivery. In each of these evaluation efforts, we found that PPL Electric's programs are functioning well and largely meeting their planned savings, and that PPL Electric's management team has been proactive about identifying issues and implementing creative solutions to resolve them quickly.

In PY3, the scope of the process evaluation was more narrow and forward-looking than in previous years. It relied on both primary and secondary research to draw high-level conclusions and actionable recommendations on a portfolio-wide basis and for each of PPL Electric's programs. PPL Electric's management and Cadmus agreed that this approach was appropriate for the following reasons:

- In many ways, PY3 represents a transition year. PPL Electric's initial program portfolio
  has gained market maturity, and the utility staff, implementers, and contractors delivering
  programs have a keen understanding of local markets and program delivery conditions.
  PPL Electric's focus largely has shifted to planning for the Phase II energy-efficiency
  program cycle.
- PPL Electric's in-house research activities add to its ability to remain in touch with its customer base and to rapidly identify process issues within its energy-efficiency portfolio. The company routinely conducts market research, focus groups, customer surveys, and trade ally surveys to address topics such as satisfaction, attitudes toward energy efficiency, market barriers and opportunities, and areas for improvement. The results of this, combined with a proactive management approach, enable the company to respond quickly to issues and opportunities.
- The existing Phase I EE&C portfolio is performing very well, is on track to achieve the compliance targets within budget, and is halfway through its final year. In addition, PPL Electric filed its Phase Two EE&C Plan on November 15, 2012 for programs to be delivered June 1, 2013 May 31, 2016. Therefore, a more-extensive and costly Process Evaluation for Phase I programs would have limited benefits at this time. PPL Electric plans to conduct an extensive Process Evaluation early in Phase Two to determine the effectiveness of those new programs.

On a portfolio-wide basis, PPL Electric is exceeding its energy saving goals, is within budget, and its programs enjoy consistently high customer satisfaction.

#### **Evaluation Activities**

For the process evaluation, Cadmus fielded 11 different participant and nonparticipant surveys for a variety of programs to:

- Assess satisfaction, program awareness, reasons for participating, and demographics, and
- Identify market barriers and opportunities to improve the program.

Cadmus interviewed key PPL Electric program and EM&V management staff and conducted a materials review of PPL Electric market research efforts and results. Findings, conclusions, and recommendations are outlined below.

### **PORTFOLIO-WIDE ASSESSMENT**

At the portfolio level, PPL Electric's implementation of its Energy Efficiency and Conservation (EE&C) Plan in PY3 was a success.

PPL Electric's portfolio of EE&C programs is on track to exceed the 2013 compliance target of 1,146,000MWh/yr. This can largely be attributed to well-designed and implemented programs and the ability to make strategic adjustments to program design and delivery on a real-time basis, an area in which PPL Electric excelled during Phase I of the Act 129 program cycle. PPL Electric has achieved approximately 87% of the four-year compliance target in three program years. Meeting the 2013 demand reduction compliance target may prove more challenging; PPL Electric had achieved only 48% at the end of PY3.<sup>1</sup>

On the program level, most programs are on track to meet or exceed their cumulative four-year planned savings.<sup>2</sup> Where programs were behind or projected to exceed their planned savings, PPL Electric made adjustments to ensure compliance at the portfolio level. Program-level findings and recommendations are presented later in this report.



Figure 1. Progress toward Four-Year Planned Savings by Program (MWh/yr)

<sup>&</sup>lt;sup>1</sup> The Direct Load Control Program and Load Curtailment Program will claim savings only in PY4, from June 1 through September 30, 2012, the only period when peak load reductions apply. MW savings through PY3 largely reflect demand reductions through energy efficiency programs and not demand response programs.

<sup>&</sup>lt;sup>2</sup> Planned savings are based on the PPL Electric Energy Efficiency and Conservation Plan, Docket No. M-2009-2093216, Compliance filing to Reflect the PA Public Utility Commission's Opinion and Order Entered May 25, 2012.

#### Portfolio-Wide Findings, Conclusions, and Recommendations

This section provides key results from Cadmus' process evaluation activities at a portfolio level. In this section and in the program-specific sections that follow, the conclusions drawn from the process evaluation are displayed in bold text, followed by the supporting findings. Our recommendations identify opportunities for improving processes and outcomes.

#### **Participant Feedback**

## Satisfaction across all programs is high; some programs have improved over time.

When asked to rate their overall satisfaction with a PPL Electric program, participants in all programs and in all sectors reported high satisfaction. When participants were asked to provide a rating on a scale of 1 to 10, more than 80% of participants in most programs reported an 8, 9, or 10. The most common response that participants gave in PY3 was a 10.

Only one Efficient Equipment Direct Discount participant and one E-Power Wise participant (direct mail delivery pilot) reported low satisfaction (categorized as a rating of 1, 2, 3, or 4). The Direct Discount customer was not satisfied with the quality of work and the rebate was less than expected. The E-Power Wise participant reported they did not like the equipment received; the participant thought the CFL was too dim and that the bathroom aerator didn't have enough pressure.





For some programs and sectors, such as the commercial sector of the Efficient Equipment program, satisfaction has improved over time. In PY1, only 71% of respondents indicated they were highly satisfied with the program, compared to 81% in PY3. On a portfolio-wide basis, PPL Electric has maintained high program satisfaction over time with little variation, with the majority of respondents consistently reporting high satisfaction in all years and in all programs.



Figure 3. Average Overall Program Satisfaction over Time, All Programs

NOTE: PY1 data include Appliance Recycling (ARP), commercial Efficient Equipment, and residential Efficient Equipment programs; PY2 includes these programs plus Home Energy Assessment and Weatherization, and PY3 includes these programs plus Direct Discount, E-Power Wise direct mail participants, and Renewable Energy.

## Energy-efficiency rebate programs may have a positive impact on customer opinions of PPL Electric.

When we asked how participants rate their satisfaction with PPL Electric as their electricity provider, the majority across all programs reported high satisfaction (8, 9, or 10). In addition, 40% of respondents reported that their opinion of PPL Electric *improved* after participating in the rebate program. This indicates that: (1) customers approved of the programs; (2) they appreciated the energy saving opportunities they receive from PPL Electric; and (3) the enrollment and rebate process is operating smoothly from a customer standpoint. Only 2% of respondents reported that their opinion of PPL Electric decreased after participating in the program.

#### Recommendations

Because PPL's energy efficiency programs have an impact on customer opinions of PPL as an electric utility, these recommendations consider the customer perspective as PPL moves from Phase I programs into Phase II.

Continue to focus on customer satisfaction in the design and development of Phase II programs. Critical factors in maintaining strong customer satisfaction include consistency, communications, and quality.

*Explore ways to keep incentive levels as consistent as possible* as a percentage of the customer's total cost.

Use multiple outreach strategies to inform customers and stakeholders about program changes.

Develop a communications strategy for discontinued programs to avoid a decrease in customer satisfaction or in customer opinion of PPL Electric, which is currently high.

Continue to focus on ensuring high-quality program delivery and customer/trade ally interactions.

#### **Marketing and Outreach**

### PPL Electric's advanced, in-depth market segmentation research is likely to pay dividends for program performance in PY4 and Phase II.

Through the assistance of third-party research firms, PPL Electric embarked on a robust market research effort in PY3 to develop a sophisticated understanding of customer characteristics and perspectives. The findings from the research will be stored, organized, and accessed electronically through an interactive database called the Knowledge Platform.

The segmentation significantly improved in-house knowledge about residential customer profiles, aiding marketing efforts to target specific customer groups that are the most likely to participate in incentive programs and take action to reduce energy usage. The business segmentation plan categorized nonresidential customers into target groups based on their industry, energy usage characteristics, and prior program participation. This research allowed PPL Electric to develop a direct marketing campaign to test industry-specific messages and overcome industry-specific barriers for targeted commercial customer segments, such as restaurants.

# Retail partners (trade allies) have effectively promoted programs to residential customers, particularly efficient equipment incentives and appliance recycling rebates.

Retailers and dealers were the most common way residential customers heard about equipment rebates, and the second most common way they learned about the Appliance Recycling Program. By conducting a cross-year analysis, Cadmus found that over time, PPL Electric has become more effective at leveraging these partners to promote programs.



Figure 4. Percentage of Respondents Learning About the Program Through Retailers or Dealers

In PY1, just 35% of residential participants reported learning about the Efficient Equipment Program from a retailer, compared to 65% in PY3. Also, Appliance Recycling Program participants who heard about the program from a retailer jumped from 3% in PY1 to 28% in PY3.

In PY3, trade ally organizations and PPL Electric were the most common sources through which participants heard about programs, although the channel differed depending on sector.

- For commercial customers, the most common source of information about the program was through contractors or installers. This second most common source was PPL Electric, in the form of contact from utility representative or an electronic mailing.
- For residential customers, the most common resources for learning of the programs were PPL Electric's bill inserts and information from retail trade allies.



Figure 5. How Participants Heard about the Program in PY3

NOTE: "PPL Electric" could include bill inserts, newsletters, e-mails, or utility representatives. "Trade Ally Organization" includes dealers, vendors, national retailers, contractors, installers, and energy auditors.

#### **Participant Decision-Making**

#### On a portfolio-wide basis cost savings is the most commonly reported reason for participating, but motivators differ by program.

While cost savings remains a strong motivator for participants across all programs, other decision-making factors were also at play.

In the residential sector (Residential Efficient Equipment and Audit and Weatherization), participants commonly reported making energy-efficiency improvements to improve comfort, characterized as "Measure Performance/Features" in

- Figure 6.
- Both residential and small business customers reported that they participated in order to replace old equipment.
- "Other" reasons for participating included the convenience of making the upgrade • (Appliance Recycling), or that an energy auditor had recommended the installations (Audit and Weatherization).



#### Figure 6. Reasons for Participating in the Program

#### **Program Design and Delivery**

## Overall, CSP delivery is effective and most programs are on target to meet their planned savings, but some programs experienced difficulties.

On a portfolio-wide basis, PPL Electric's programs are over-performing, and CSP delivery and management has been effective. However, the HVAC Tune-Up and Home Assessment and Weatherization programs experienced challenges meeting goals, and the Peak Saver (Direct Load Control) program experienced technical issues that caused high dropout rates after the first two events of the summer. PPL Management was aware of these issues and immediately implemented program design and delivery solutions.

#### Conclusions and Recommendations by Program

The next sections review each program individually and offer conclusions and recommendations specific to the program. The summaries are presented alphabetically by program name.

### APPLIANCE RECYCLING PROGRAM

For the Appliance Recycling Program (ARP), the PY3 process evaluation activities were these:

- Participant surveys (n=75)
- Comparison and review of the program tracking databases (from EEMIS and JACO)
- Review of the program marketing activities

#### Achievement against Plan

After 30 months of operation, the program was on track to meet its four-year planned MWh/yr savings, MW reduction, and participation. At the end of PY3 (May 31, 2012), ARP had achieved:

- 71% of its 74,538 MWh/hr four-year planned savings,
- 86% of its 12.3 MW four-year planned demand reduction, and
- 54% of its four-year participation target of 56,908 units.

#### Table 1. Appliance Recycling Program Four-Year Planned Savings <sup>3</sup>

- - -	PY1	PY2	PY3	PY4	Total
MWh/yr	9,069	24,865	20,302	20,302	74,538
kW	187	6,750	2,654	2,654	12,245

In PY3, the program achieved 93% of its planned MWh/yr savings, 118% of its planned MW savings, and 74% of its participation target. The program's total cost over the four-year period is expected to be \$7.2 million, of which 71% had been incurred through the end of PY3.

To comply with changes to the 2011 TRM, PPL Electric began tracking replaced appliances on June 1, 2011, by asking customers through the sign-up process if they replaced their recycled appliance with a new one. In PY3, PPL Electric did not differentiate between ENERGY STAR and non-ENERGY STAR replacement appliances, in an effort to keep data tracking and the sign-up process simple and streamlined. Replacement efficiency (ENERGY STAR and non-ENERGY STAR STAR) was determined through PY3 evaluation surveys.

<sup>&</sup>lt;sup>3</sup> All planned savings are based on PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

#### Findings Conclusions and Recommendations

This section provides key results from Cadmus' process evaluation activities for ARP.

#### **Marketing and Participation**

### Participation trends across PY1, PY2, and PY3 show consistent downward trends during several months.

As shown in Figure 7, the program experienced significant dips in participation in January through March. This could be due to several factors, including poor winter weather conditions.



Figure 7. PPL Electric ARP Average Monthly Participation (PY1-PY3)

A benchmarking exercise showed that it was also typical for other recycling programs to experience a dip in participation during these specific months; however, each utility's participation pattern was unique.<sup>4</sup>

<sup>&</sup>lt;sup>4</sup> To compare participation patterns in other utility appliance recycling programs, we benchmarked participation against four other utility programs around the country by looking at the percentage of units recycled by month.



Figure 8. PPL Electric Monthly Participation (PY2 & PY3) Compared to Other Utilities

## PPL Electric can likely counteract low participation by increasing marketing activity.

To investigate further the impact of marketing on participation patterns, Cadmus overlaid marketing activities with monthly participation. As indicated in Figure 9, ARP participation correlated to season and PPL marketing activities. In reviewing the initial planned PY4 marketing activities, we noted a continuing trend of limited marketing activity during the months that typically experience participation lags. Based on the data shown in Figure 9, it is likely that a managed strategy to increase or expand marketing activities during slower months could help mitigate this trend. PPL updated the marketing plan to include an "Oldest Fridge" advertorial during November and December 2012.



#### Figure 9. PY3 Participation by Month and Marketing Activities<sup>5</sup>

#### Recommendation

*Increase intermittent marketing activities heading into winter holiday months.* We encourage PPL Electric to further explore with JACO methods to increase participation and to evaluate costs and benefits of increasing marketing activities during historically slower months.

#### **Data Tracking**

#### Data transfer inconsistencies are a recurring issue.

Cadmus conducted a records review comparing the census of records in EEMIS to the JACO database. We found that JACO recorded 389 units (2.6% of total units) that were not uploaded into PPL Electric's tracking system (EEMIS) during PY3.<sup>6</sup> PPL Electric is currently investigating the reasons these units were not uploaded at the appropriate time by JACO. All 389 units will be included in EEMIS in PY4.

<sup>&</sup>lt;sup>5</sup> Figure 9 does not include marketing activities that occurred continuously over the 12-month program year, because this comparison shows how intermittent marketing activities can affect participation by month.

<sup>&</sup>lt;sup>6</sup> PPL Electric found that approximately 75% of the missing units were never uploaded into EEMIS during PY3 although they were picked up by JACO during PY3. The remaining 25% of units were picked up in May 2012 and uploaded into EEMIS during the first month of PY4 (no QA/QC issue with these units).

Cadmus identified a similar issue in PY1, which was immediately corrected and the missing units were included in PY2 savings. PPL Electric and JACO were working to resolve the issue permanently and implement tighter quality assurance and quality control (QA/QC) protocols so that, in the future, all units are properly uploaded into EEMIS at the appropriate time.

The JACO database does not track work package upload dates, inhibiting program staff's ability to easily cross-check data uploads. JACO's internal quality control protocol looks at certain database fields such as pick-up date, while PPL Electric primarily reviews work package upload date. Because the JACO database does not include this field, there has not been a simple way to compare databases and check for discrepancies. PPL Electric reported that JACO was working to add this field to their database for PY4 so they can verify that all units have been properly uploaded into EEMIS, and expected this field to be included by the end of PY4-Q2.

#### Recommendation

**Develop a routine QA/QC procedure to proactively identify data upload issues.** In addition to including work package upload date in JACO's database, PPL Electric should formalize a QA/QC process to identify missing units after every data upload. The protocol should identify key fields to summarize within defined time periods, accounting for the lag between quarters and identify any discrepancies.

#### **Appliance Replacement**

#### Forecasting and tracking appliance replacement was a challenge in PY3.

Due to the two new measure categories included in the 2011 TRM, PPL Electric began tracking freezer and refrigerator replacements through the program sign-up process at the beginning of PY3.

Cadmus verified appliance replacement status with participant survey respondents. Survey results show significantly more customers reported replacing their refrigerator or freezer (70% replacement rate) than was reported to JACO through the sign-up process (15% replacement rate). The difference had a significant impact on the program realization rate, as savings associated with replaced units are lower than units recycled without replacement. As a result, the ARP PY3 MWh realization rate was 84% (the lowest since the program's inception).

#### Recommendation

Use PY3 replacement rates to develop assumptions and inform program planning. PPL Electric should use data collected from customers through evaluation surveys to develop a more realistic replacement rate assumption for PY4 and to inform Phase II program planning.

### **BEHAVIOR AND EDUCATION PROGRAM**

For the Behavior and Education Program, Cadmus' main PY3 process evaluation activities included:

- Telephone surveys with
  - > 76 legacy group participants (who received their first Home Energy Reports in 2010)
  - 75 expansion group participants (who received their first Home Energy Reports in 2011)
  - > 40 customers who opted out of the program in PY3
  - > 150 nonparticipants
- Interviews with the Behavior and Education Program manager and CSP staff

#### Achievement against Plan

The program exceeded its PY3 planned savings of 23,504 MWh/yr and 55,000 new participants. The program saved approximately 29,370 MWh/yr (*ex post* net verified) in PY3.<sup>7</sup> Additionally, PPL Electric sent Home Energy Reports to 55,000 new program participants (the expansion group) and to 50,000 customers who also received reports in PY2 (the legacy group).<sup>8</sup>

#### Table 2. Behavior and Education Program Four-Year Planned Savings

· · ·	PY1	ΡΥ2	PY3	PY4	_Total*	
MWh/yr	0	13,207	23,504	23,504	23,504	
kW	0	0	5,397	5,397	5,397	
Participants	1	49,789	104,000	104,000	257,790	
NOTE: Program measures have a one year measure life and savings do not carry forward after the year in which they occurred.						

#### Findings, Conclusions, and Recommendations

This section contains a summary of the main findings, conclusions, and recommendations of our evaluation of the Behavior and Education Program. Additional supporting evidence is in Appendix C.

# Most participants were satisfied or very satisfied with the program, while some reported an improvement in their opinion of PPL Electric after receiving their first report.

<sup>&</sup>lt;sup>7</sup> All planned savings are based on PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

<sup>&</sup>lt;sup>8</sup> PPL Electric customers were eligible for the expansion group if their annual consumption exceeded 22,000 kWh or if their annual consumption exceeded 16,000 kWh and they had previously participated in another PPL energy-efficiency program. In contrast, participants in PY2 were eligible for the program if their annual consumption exceeded 18,000 kWh.

Customer satisfaction with the program reports was high (see Figure 10). Seventy-three percent of homes were *somewhat* or *very satisfied* with the program (n=151).<sup>9</sup> Almost all respondents (95%) said the reports were easy to understand and most (69%) said the reports were informative (n=151). Additionally, 31% of respondents said their opinion of PPL Electric improved after receiving the reports; only 6% said their opinion worsened (n=151).

Despite additional education about the neighbor comparisons in PY3, many participants expressed doubts about the validity of the neighbor comparisons.

Of those customers reporting dissatisfaction, most found fault with the neighbor comparisons or cited privacy concerns. Of dissatisfied participants, 74% disapproved of the neighbor comparison.



Figure 10. Satisfaction with the Home Energy Reports

#### Recommendations

The program CSP and PPL Electric should continue to educate participants about the neighbor comparisons in in the Home Energy Reports. The comparisons should be made as transparent as possible, explaining the criteria used for determining "neighbors" for this comparison.

To allow for more accurate matching for the neighbor comparisons, the program CSP and **PPL** Electric should consider offering a way for participants to update details about their homes. A possible approach would be to allow participants to update their information over the Web.

Participants used the reports to obtain information about their energy use and opportunities to save energy.

<sup>&</sup>lt;sup>9</sup> Behavior and Education Program satisfaction was lower than satisfaction with other PPL Electric Energy Efficiency Programs; however, unlike other programs, participation in the Behavior and Education Program is not voluntary. This would tend to lower satisfaction.

When compared to nonparticipants, Cadmus found that participants differed in their attitudes and awareness about home energy use in a number of ways.

- They were more likely to have ideas about ways to save energy. Of legacy group participants, 43% said they would like to save energy but did not know where to start, compared to 57% of nonparticipants who reported the same.
- They had not exhausted opportunities for saving energy. Participants were approximately 10% less likely than nonparticipants to say that they had exhausted opportunities to save energy in their homes.
- They set their thermostats to reflect occupancy schedules. Eighty-four percent of participants said they adjust their thermostats in response to occupancy schedules or time of the day, whereas 78% of nonparticipants reported the same.

#### The reports helped to educate participants about PPL Electric's other energyefficiency programs.

Participants reported that they were aware of PPL Electric energy-efficiency programs more often than nonparticipants. Seventy-four percent of legacy group respondents and 68% of nonparticipants said they were familiar with PPL Electric's energy-efficiency programs (n=76 and n=150, respectively).<sup>10</sup> The Energy Efficiency Rebate Program and the Residential Time of Use Rate Option were most commonly mentioned by both participants and nonparticipants.

#### Recommendation

**PPL** Electric and the program CSP should continue to advertise other **PPL** Electric energyefficiency program offerings in the Home Energy Reports.

## Opts-outs constitute a very small percentage of homes receiving reports, and should not represent a significant source of concern for program managers.

Fewer than one percent of legacy and expansion group homes opted out of the program in PY3. In the expansion group, 561 participants opted out of the program, and in the legacy group only 169 participants opted out of the program. Respondents who opted out of the program were, on average, older and less educated than those who did not.

The majority (70%) of those who opted out of the program did so because they felt their energy usage was misrepresented in the Home Energy Reports and the neighbor comparisons did not properly take into account some special feature of their home or household that affected energy consumption.

<sup>&</sup>lt;sup>10</sup> In the expansion treatment group, 61% of respondents (n=75) said they were familiar with PPL Electric's energy-efficiency programs. Among the expansion-eligible control group participants, 76% of respondents (n=34) said this. This difference is significant with p-value=0.104, but it is not surprising that a larger share of this control group is familiar with the programs since prior participation in other PPL programs is part of the eligibility criteria for this group.



Figure 11. Reasons for Opting Out of the Program

### COMMERCIAL AND INDUSTRIAL (C&I) CUSTOM INCENTIVE PROGRAM

For the Custom Incentive Program for commercial and industrial (C&I) customers, the key PY3 evaluation activities were assessing the program impacts and conducting quality assurance/quality control (QA/QC) reviews.

#### Achievement against Plan

The Custom program appears reasonably well-positioned to meet its planned savings. At the end of PY3 (May 31, 2012), the program had achieved 59% of its May 2013 planned savings of 196,708 MWh/yr and 82% of its planned 17,328 kW.<sup>11</sup> As of September 7, 2012, reported MWh/yr savings were 65% of the four-year goal. PPL Electric has a substantial pipeline of projects with total estimated savings of 63,000 MWh/yr that are currently in progress. To meet the four-year planned savings, most of these projects need to be completed and additional applications need to be received.

	PY1	PY2	PY3	PY4	Total
MWh/yr	39	16,624	143,550	36,495	196,708
k₩	3	2,188	11,075	4,062	17,328

Table 3. C&I Custom Incentive Program Four-Year Planned Savings

In PY3, PPL announced several changes to the program to reflect market conditions. Specifically, because small C&I customers generally implement the types of projects that are eligible for prescriptive rebates, PPL Electric reallocated approximately \$13 million in small C&I program costs from the C&I Custom Incentive Program to the Efficient Equipment Incentive Program. PPL Electric also proposed to reallocate approximately \$10 million large C&I direct program costs from the Efficient Equipment Incentive Program to the Custom Incentive Program to accommodate large C&I customers' greater demand for incentives for projects that fall outside of the Efficient Equipment program.

Additionally, PPL Electric revised the rebate structure for C&I Custom Incentive Program Technical Studies. Rebates for technical studies will be calculated at the lesser of the following values:

- If the study is a comprehensive audit of an entire facility, the reimbursement will be calculated as 10 cents per square foot
- For a feasibility study that addresses specific equipment or system, the reimbursement will be calculated as 0.5 cents per kWh/yr
- Studies will be capped at 25% of the potential custom incentive, 100% of the study cost, or \$50,000, whichever is less.

<sup>&</sup>lt;sup>11</sup> All planned savings are based on PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

The program is available for all sectors and PPL Electric plans to accept applications until funding is exhausted for a sector. All projects must be operational by May 31, 2013 to receive an incentive. As funding for large C&I customers is exhausted, there is a waiting list for this sector. Applications will be taken off the waiting list if approved projects do not materialize and those funds become available for another project. This has been the case for large C&I applications since 6/1/2011.

A total of 131 projects were placed on the waiting list; of these, 16 have been cancelled, 59 moved to active, and 56 have been implemented and the incentives paid.

PPL Electric has paid a total of \$453,000 in incentives for technical studies (5% of total incentive payments).

#### Findings, Conclusions and Recommendations

This section provides key results from Cadmus' process evaluation activities for the C&I Custom Incentive Program and recommendations for possible program enhancements.

#### The program has excelled in obtaining participation by large customers.

Participation by large C&I customers was far greater than estimated in the original 2009 EE&C Plan, which underestimated market demand in this sector. Additionally, since PPL Electric allowed for retroactive eligibility following the program's launch, it received more applications for previously-completed or in-progress projects than was anticipated. This was particularly true for PPL Electric's large industrial customers. Finally, PPL Electric's Key Account Managers (KAMs), who serve primarily large C&I customers, have been a major driver for program applications.

#### The program's net-to-gross ratio is low and steps should be taken to raise it.

While the program has been successful in obtaining applications, its impact on customer decision-making is less clear. Based on analysis conducted on PY2 participants, a significant number of projects were installed prior to submission of an application. This is to be expected in the early phases of a program. However, as the program has matured the practice of allowing applications to be submitted following a project's installation has continued.

No formal net-to-gross analyses were performed in PY3, but this conclusion is based upon examination of program tracking files. The tracking that the program CSP (EPS) maintains includes a field for installation date and for the date the application was received. In many instances, the installation date field is empty, but on September 7, 2012 there were 18 projects for which the installation date is entered. For 13 of these 18 projects, the installation date precedes the application date.

#### Recommendations

As the program matures, PPL Electric should shift its focus to target customers that have not already completed projects. While this would not eliminate all free riders, it would reduce the number of free riders. A customer that installs a measure prior to applying for an incentive is likely to have installed the measure in the absence of the program.

**PPL should consider modifying the program rules and applications for Phase II.** Application forms currently do not disqualify retroactive projects. We do not recommend changing them for the remainder of Phase I; however, we suggest considering this modification for Phase II. The installation date for Phase II projects cannot be earlier than June 1, 2013 (the start of Phase II). However, PPL Electric should consider requiring a customer to submit an application for a custom project before that project is installed.

In Phase II, program staff and KAM outreach should not attempt to identify projects that customers have already installed. Customers should be regularly asked about any upcoming renovations, upgrades, expansions, or other projects, so that opportunities to improve energy efficiency can be identified and integrated into the project.

**PPL Electric should implement a pre-screening process to ascertain whether the program impacts** customer decisions to install a project. Alternatively, set limits on application submittals relative to project installation. This may help to reduce free-ridership but it will be very difficult to determine if customers committed to their project (i.e. budgeted the project, obtained internal approval to proceed, etc.) before their Act 129 EE&C rebate was approved or would have proceeded with their project in the absence of the Act 129 EE&C rebate. Over time, customers will likely be savvy enough to answer pre-screening questions in a way that ensures they will not be screened-out as "free riders."

## The inclusion of combined heat and power (CHP) projects contributed significantly to program savings but also introduced risks.

Two large CHP projects accounted for 43% of PY3 reported savings. One additional large CHP project incentive was paid in PY4-Q1 and several others are currently in progress. While the savings are significant, the predicted TRC ratio for these projects is generally between 1.0 and 1.5, so there is not a wide margin for error. If just one or two large projects significantly underperformed, the program TRC would be lowered considerably.

#### Recommendation

Continue to work to mitigate the risks to program cost-effectiveness presented by large CHP projects by collaborating with the C&I CSP and the EM&V CSP. To date, the projects have been paid after several months of post-installation performance data has been obtained. This process leads to better alignment of verified to claimed savings than would payment of the incentives at the time that the project is completed.

# The MWh/yr realization rate for large custom projects is stable due to the impact evaluation approach for the program and successful collaboration between the C&I CSP and the EM&V CSP.

Most large strata projects benefit from a collaborative process between the evaluation and program CSPs to verify savings prior to incentive payment and before claimed savings are entered into EEMIS. This process has led to consistent program realization rates. Additionally, program participant impacts are minimized because site visits and M&V activities by the EM&V CSP and C&I CSP are coordinated.

In cases where this collaboration does not take place, including some larger projects and all small projects, realization rates have been much more variable. We recommend continuing to use the collaborative process for large projects, but not for small projects. This practice of real-time evaluation of large projects has been beneficial to minimize realization rate surprises and

customer impacts; however, incurring the additional cost to adopt the same approach for small projects would not be justified since small projects contributed only 6% of claimed savings in PY3.

### **EFFICIENT EQUIPMENT PROGRAM**

The Efficient Equipment incentive program is the largest in PPL Electric's energy efficiency portfolio. It offers a diverse range of prescriptive efficiency measure incentives for the residential, commercial, and GNI sectors. For this program, the key PY3 evaluation activities were these:

- Participant surveys for:
  - Residential efficient equipment (n=99)
  - Commercial efficient equipment (n=120)
  - Direct Discount delivery channel (n=49)
- Site visits (n=184)
- Records review (n=184)

#### Achievement against Plan

After 36 months of operation, the program was on track to meet its planned energy savings. At the end of PY3, the Efficient Equipment program achieved 80% of its expected four-year energy savings, and 88% of its four-year demand savings.<sup>12</sup>

Table 4.	Efficient E	quir	oment	Program	Four-	Year	Planned	Savings

	PY1	PY2	PY3	PY4	Total
MWh/yr	9,275	205,001	181,857	143,800	539,933
kW	1,116	39,034	33,044	31,992	105,186

PPL Electric implemented several program changes to simplify the program, boost participation, and increase savings and cost effectiveness during PY3, including:

- Adding a direct discount delivery channel option to target the small commercial sector and encourage participation in lighting and refrigeration
- Implementing a number of limited time offers (LTOs) to encourage small commercial customer participation
- Discontinuing some program rebates (office equipment, time clocks, SEER 14.5 heat pumps, SEER 14 and 15 central air conditioning, demand control defrost, chiller pipe insulation, cooling tower two-speed fan motors, and programmable thermostats)
- Adjusting some rebates and eligibility requirements (de-lamping, T5 and T8 lighting, occupancy sensors, efficient motors, traffic lights, lighting power density, display cases, chillers, pin-based CFLs, and high bay lighting)
- Adding some measures (light-emitting diode or LED lighting, PTAC, PTHP, and solar thermal water heaters)

<sup>&</sup>lt;sup>12</sup> All planned savings are based on PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

#### Findings, Conclusions, and Recommendations

This section contains key results from Cadmus' process evaluation activities and recommendations for possible program enhancements.

# The QA/QC process revealed that several key variables required for calculating energy savings were missing in EEMIS for all or a large percentage of residential and commercial participants.

The findings are summarized by measure.

- Insulation. The heating and cooling system type and size was missing for some customers.
- Printers and all-in-ones. The images per minute data were not collected.
- Dishwashers. 21% of all rebate records were missing the hot water heating fuel type.
- Refrigerators. 23% of records were missing the configuration.
- Dehumidifiers. 32% of records were missing pints per day.
- Lighting. 6% of records were missing lighting type.
- Lighting. 6% of records used lighting hours of use estimates which deviated from the prescribed TRM hours of use for the correct project year.
- Chillers. All measures were missing IPLV efficiency values.
- **Ductless heat pumps.** Four customers were missing entries for the indoor unit, and EEMIS only contained entries for the outdoor unit. The result was zero claimed and verified savings for those measures.
- **HE compressors.** All measures were missing sufficient data to calculate savings. The manufacturer and model numbers were either incorrect or missing. Efficiency and capacity values were not reported in EEMIS and could not be looked up because the model numbers were incorrect or missing.

#### Recommendation

**PPL Electric should improve data collection for measures that are being continued in PY4:** chillers, HE compressors, and insulation measures. These have high savings that are hard to verify without the needed variables. A system that checks for missing values should be put into place, and rebate applications should not be accepted if this information is missing.

### The Direct Discount delivery channel was successful in boosting participation from the small C&I sector.

The Direct Discount delivery channel accounted for 835 lighting projects and eight refrigeration projects in the small C&I and government/non-profit sectors. In the small C&I sector, 802 direct discount lighting projects accounted for 16% of the total lighting savings for the small C&I sector.

## The Direct Discount delivery channel is providing an increasing and significant share of total non-residential lighting savings.

The Direct Discount Delivery channel is an important and growing source of savings for nonresidential lighting measures. The measures are installed almost exclusively in the Small Commercial & Industrial and Government/Non Profit sectors; yet accounted for 39% of total standard non-residential lighting energy savings in quarter four (Q4) of PY3.

#### 

	Q1	Q2	Q3	Q4	PY3 Total
MWh/yr Savings All NonRes Lighting	58,459	57,628	21,114	24,427	161,629
MWh/yr Savings from Direct Discount Channel	0	1,848	4,757	15,788	22,394
Percentage of Savings from Direct Discount Delivery Channel	0%	3%	18%	39%	12%
NOTE: Does not include new construction p	rojects				

## PPL Electric was effective at reaching small-business customers when compared to other utilities.

While challenges still exist to reaching small businesses, comparative research revealed that savings and participation metrics attributed to PPL Electric's Direct Discount channel are on par with or higher than other utilities, even those that provide financing options. Table 6 provides examples of participation and savings results in other jurisdictions from similar programs.

Utility	Incentive cap	Size Cut-off	Program Participation	Savings (Gross) ex post verified
PPL Electric	75% of measure	400,000 annual kWh	843	22,394 MWh/year
Southwest Utility 2010/2011	75% of measure	145,000 annual kWh	207	1,775 MWh/year
MA Utilities 2010	70% plus on bill financing and 24 month 0% interest	300 annual kW or ~900,000 Wh/year	5,689 across 5 utilities	2,930 MWh/year; ~586 MWh per utility
CT Utilities 2007	30% plus 30-36 month 0% interest financing	200 kW 12-month peak demand	1,752 across 2 utilities	42,529 MWh/year; ~21,264 per utility

#### Table 6. Direct Discount Program Comparison

#### Recommendation

**PPL Electric should continue the Direct Discount delivery channel in PY4 to improve** *participation rates in the small C&I sector and meet the planned savings.* PPL successfully increased lighting projects through this method, but refrigeration projects did not increase (only eight were installed through Direct Discount.) PPL Electric should consider replicating the marketing approach used for lighting for measures other than lighting. PPL could also consider increasing recruitment efforts for trade allies that install refrigeration and other non-lighting measures.

### More small-business customers could be reached via the Direct Discount delivery channel by increasing trade ally engagement.

PPL Electric management reported, and the EEMIS database showed, that a small group of participating contractors generated the majority of Direct Discount projects. While the PPL Electric website identified 113 participating trade allies, the EEMIS database showed just 47 companies installed lighting projects for the Direct Discount service in PY3. Of the 47 companies, 12 contractors were responsible for approximately 85% of the jobs.

PPL Electric conducted two surveys in PY3 to assess satisfaction with and barriers to contractor participation in the Direct Discount delivery channel. One survey was conducted by phone and one by e-mail. Feedback from both efforts indicated that trade allies experienced three primary challenges: (1) lack of understanding about the program or difficulty with software; (2) slow rebate processing times; and (3) slow inspection process.

#### Recommendations

### Continue and expand efforts to leverage trade ally engagement for Direct Discount program promotion, particularly through:

- One-on-one outreach to contractors that have completed low numbers of projects,
- Advertising the improvements that PPL Electric has made to the rebate processing times,
- Showcasing successful testimonials from other contractors, and
- Improving inspection processes.

#### The Limited Time Offers had a small impact on participation rates.

In PY3, PPL implemented several Limited Time Offers (LTO) to increase participation in the Efficient Equipment program non-residential sector. A description of the LTOs is provided in Appendix D. Offers were made to both Direct Discount and traditional delivery channel customers, and covered lighting and non-lighting measures. LTOs accounted for four percent of program participation in the small C&I sector and three percent of participation in the government/non-profit/institutional sector.

Segment	Total Participation in Efficient Equipment	Number of LTO Offerings	Offer Type	LTO Participation	Percentage of Customers Participating in LTO Offer
Government/ Non-Profit	1,672	3	VSD, T-12, Free Exit Sign	44	3%
Large C&I	237	4	VSD, T-12, Free Exit Sign, Chamber of Commerce	1	0%
Small C&I	5,302	5	VSD, T-12, Free Exit Sign, Direct Discount Bonus, Chamber of Commerce	60	4%

#### Table 7. Participation in Limited Time Offers in PY3

#### Recommendation

**PPL Electric should continue LTOs in PY4 to improve participation rates in the small C&I** sector to meet the planned savings; however, more marketing is needed to increase the number of participants that apply for the LTO rebates.

### **E-POWER WISE PROGRAM**

For the E-Power Wise Program, PY3 process evaluation activities included:

- Participant phone surveys (n=66)
- Participant returned mail-in surveys (n=361)
- Discussions with PPL Electric customer programs specialist and CSP
- QA/QC Record Reviews EEMIS (census) and Enrollment Records (n=140)

#### Achievement against Plan

At the end of PY3 (May 31, 2012), the program was on track to meet its four-year MWh/yr planned savings and participation. E-Power Wise had achieved 85% of its 4,268 MWh/yr four-year planned savings and 73% of its four-year planned participation of 9,048 distributed kits.<sup>13</sup>

For PY3, the program achieved 126% of its planned energy savings for the year, and 94% of its participation target.

	PY1	PY2	PY3	PY4	Total
MWh/yr	0	2,119	1,182	967	4,268
kW	0	340	231	189	760

Table 8. E-Power Wise Program Four-Year Planned Savings

PPL Electric introduced a new, direct-mail delivery channel to customers in PY3Q4. This pilot delivery method enabled eligible customers to receive an energy savings kit directly from the CSP. PPL Electric increased the program's planned savings in anticipation of participants' entering through the direct-mail delivery channel. Table 9 shows the updated planned participation s (in kits delivered) as well as the program's progress since its PY2 inception.

Measure	PY1	PY2	PY3	PY4	Total
Planned # of Kits Delivered	-	4,050	2,749	2,249	9,048
Kits Delivered (reported)	-	4,050	2,693	-	6,743
Kits Delivered (Verified)	-	3,995	2,593	-	6,588

Table 9. Achievement against Planned Kit Delivery

#### Findings Conclusions and Recommendations

This section provides key results from Cadmus' process evaluation activities for this program, which were limited to the new delivery channel.

<sup>&</sup>lt;sup>13</sup> All planned savings are based on PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

#### Participants responded favorably to the direct-mail delivery channel.

Survey respondents used a 1 to 10 scale (1-4: low; 5-7: medium; 8-10: high) to rate their satisfaction with four components of the program. At least 90% of respondents reported high satisfaction ratings with each of the program components they were asked to rate, including "overall experience with the kit," the "quick start guide," "energy saving items in the kit," and the "process to request a kit." These results are shown in Figure 12.



Figure 12. Respondent Rating of E-Power Wise Program Components

#### Participants from both delivery channels learned from the Quick Start Guide.

When asked how effective the Quick Start Guide was in helping program participants install the items in the kit, the majority of survey respondents indicated that the guide was very helpful. When asked to indicate how much they had learned about saving energy and money in their homes, respondents from both delivery channels indicated that they had "learned a lot" after completing the E-Power Wise Quick Start Guide, as shown in Figure 13. No respondents indicated that they had learned "nothing."



Figure 13. Respondent Feedback on Learning from Quick Start Guide

#### Direct-mail delivery channel is as effective in encouraging participants to change their energy behaviors and install kit items as the agency-based channel.

In PY2, a phone survey conducted with agency-based participants indicated that many customers adjusted their water heater, laundry, and home temperature settings as a result of their participation in the program. In PY3, phone surveys with direct-mail participants indicated the new delivery channel was also effective at encouraging energy-saving behaviors. As shown in Table 10, direct-mail respondents indicated making adjustments to their water and home temperature settings as a result of the program. Differences in thermostat changes between PY2 and PY3 may be a result of the timing of the surveys, as the PY3 surveys were conducted in the summer when participants would be more likely to adjust their cooling thermostat.

Energy Saving Behavior <sup>14</sup>	PY2 Participants (Agency-based; n=143)	PY3 Participants (Direct-mail; n=66)
Water Heater Temperature Setback	40%	49%
Washed Laundry in Cold Water	23%	20%
Changed Heating Thermostat	71%	57%
Changed Cooling Thermostat	19%	58%

#### Table 10. Energy Saving Behavior Comparison

## Installation rates are high compared to other programs, but aerator and showerhead installations could be improved for both delivery channels.

Participant-returned surveys were used to calculate installation rates for each of the items included in the kits. As shown in Table 11, the program experienced similar installation rates between the PY3 and PY2 programs, and for both direct-mail and agency-based participations. A review of three similar programs indicated that the E-Power Wise kit items were being installed at a high rate compared to similar programs in other jurisdictions.<sup>15</sup>

	*******	Unu	11120 110		Re Moun Miller		114100
	PY2			Y3 Insta			
	Install	ation	Agency- B	lased			
	Rate (r	ı≑851)	(n=252	2)	Direct-Mail (r	1=159)	Similar Programs
Energy Saving Kit Item	%	n	%	n	%	n	Average %
Bathroom Aerator	86%	782	81%	246	81%	100	60 <del>%</del>
Kitchen Aerator	72%	782	70%	246	67%	100	58%
Showerhead	86%	829	80%	248	80%	109	61%
Installed 20W CFL	94%	760	94%	242	89%	100	010/
Installed 15W CFL	96%	786	96%	244	95%	99	91%
Nightlight	95%	788	96%	247	94%	109	-
Count of Verified Participants		3,995		2,009		584	-

#### Table 11. E-Power Wise Program Kit Item Installation Rates

<sup>&</sup>lt;sup>14</sup> Additional factors were considered when calculating the impacts of these energy-saving behaviors. These are discussed in the annual report and Custom Measure Protocol designed for estimating energy savings resulting from energy saving behaviors.

<sup>&</sup>lt;sup>15</sup> Programs reviewed included Energy Wise (Iowa), Reach (Oregon), and the EAP Pilot Study (Indiana).

As shown in Table 11, survey respondents installed CFLs and nightlights at high rates, while the aerators and showerheads had the lowest installation rates. Six of the 159 PY3 direct-mail participants reported issues with the aerators, and two reported issues with showerheads, including ill-fitting measures, leaks, and inability to remove the existing showerhead or aerator.

The survey respondents who received the kit by direct mail did not indicate any issues with CFLs. In fact, when asked if they had installed additional CFLs beyond those included in the kits, 87% of direct-mail respondents (n=66) indicated that they had installed additional CFLs.

#### Recommendations

**Provide additional instruction to agencies and participants to on how to install aerators and showerheads**, including refinements to the showerhead and aerator instructions provided in the E-Power Wise Quick Start Guide.

#### Consider increasing the number of CFLs included in the kits in all delivery channels.

### The program is effective and participation is on track, but internal changes could improve the overall process for participants and administration.

As part of the process evaluation, Cadmus spoke with the CSP for the program, Resource Action Programs (RAP). The CSP indicated that additional participants could be recruited into the program through the direct-mail channel if PPL Electric provided more extensive lists of prequalified customers to the CSP.

Lastly, QA/QC activities revealed that participant information in EEMIS was not always complete. In some instances, participant information, such as telephone number, was not being collected during the agency-based intake process. Additionally, complete participant information, such as phone numbers and agency names, was not always uploaded to EEMIS. Accurate contact information is critical when performing phone surveys.

#### Recommendations

Consider expanding the list of prequalified potential participants so that RAP can recruit a greater number of participants through the direct-mail program.

Work with **RAP** to encourage agencies to collect participant phone numbers and ensure that phone numbers are uploaded to EEMIS for use with surveys.

# HOME ENERGY ASSESSMENT AND WEATHERIZATION PROGRAM

For the Home Assessment and Weatherization program, PY3 process evaluation activities included:

- Audit participant surveys (n=71)
- Weatherization participant surveys (n= 43)
- Comparison and review of the program tracking databases (from EEMIS, EIC, the program implementation CSP and Helgeson, the rebate processing CSP)

#### Achievement against Plan

The Home Energy Assessment and Weatherization Program has been in operation since the second quarter of PY2. Participation goals are based on the number of home surveys and audits conducted. The Home Energy Assessment and Weatherization Program is not on track to meet its four-year participation targets. At the end of PY3 (May 31, 2012), the program had achieved 47% of its four-year planned participation of 4,277 survey and audit participants.

MWh/yr and demand planned savings, as stated in the EE&C Plan,<sup>16</sup> are based on the savings from direct install measures put into place during home energy surveys and audits. Rebates were paid for infiltration measures but no savings were attributed since there is no TRM protocol. During PY3, PPL Electric attributed additional savings to the program from duct sealing, and insulation installations installed without being preceded or recommended by an audit or survey. Due to the inclusion of these additional savings, by the end of PY3 the Home Energy Assessment and Weatherization Program exceeded its four-year planned energy savings of 2,607 MWh/yr by 9%. Had the additional savings from weatherization measures not been attributed to the program, the program would have achieved only 45% of its four-year MWh/yr planned savings.

### Table 12. Home Energy Assessment and Weatherization Program Four-Year Planned Sovings

544 mgs							
	PY1	PY2	PY3	PY4	Total		
MWh/yr	0	686	924	997	2,607		
kW	0	1,432	. 19	20	1,471		

During PY3, PPL Electric refined the definitions of audit categories as follows:

- Main source electric heat and central air conditioning: \$250 rebate
- Main source electric heat or central air conditioning: \$150 rebate.

Customers with no electric heat or no central air conditioning are not eligible for the audit because the potential electric savings would be very low.

<sup>&</sup>lt;sup>16</sup> All planned savings are based on PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

Additionally, PPL Electric eliminated infiltration as a recommended measure and removed it from the list of measures that qualify for a bonus rebate. The bonus rebate was restructured to require that customers install at least two recommended measures to qualify for a \$50 bonus rebate, and three recommended measures to qualify for a \$100 bonus rebate.

#### Findings, Conclusions and Recommendations

This section provides key results from Cadmus' process evaluation activities for this program and recommendations for possible program enhancements.

#### Customers did not need an energy audit to decide to weatherize their homes.

The majority of insulation rebates were given to customers who did not have an energy audit through the Home Energy Assessment and Weatherization Program. Due to uncertainty about how to process bonus and recommended measure rebates, no weatherization measures were recorded in EEMIS until the fourth quarter of PY3, at which point almost 1,000 records were uploaded, representing 737 participants. Of these, 616 participants had installed measures after the Home Energy Assessment and Weatherization Program launched. Of this group that had the opportunity to participate in the program, only 113 (18%) also received a survey or audit.

## Under the current program structure, home energy audits and walk-through surveys did not contribute significantly to weatherization savings.

The rebate for installing ceiling and/or wall insulation was available to all customers and not limited to survey or audit participants. This separate insulation rebate drove most of the weatherization savings, which PPL Electric attributed to the Home Energy Assessment Program regardless of whether the insulation customer received an audit or survey.

## The conversion rate of audits to installations is low compared to other audit and weatherization programs.

The conversion rate for audit participants installing recommended measures is a key metric for audit program success. As none of the weatherization records uploaded in PY3 had installation dates later than the end of PY2, we calculated the conversion rate as a percent of PY2 participation, or 9%. (Because of the long delay in processing these rebates, it is possible that additional measures were installed but have not been uploaded and, therefore, the conversion rate may be understated.) A review of other audit and weatherization programs showed conversion rates of 50% to 80%.

In most cases, programs achieving higher conversion rates had program structures or design features that contributed to their higher rates, such as low or no up-front audit costs to the customer, pre-screening of audit participants to target those most likely to follow through with recommended measure installation, and generous rebate packages for installing recommended measures.

Table 13 summarizes our review's findings of other audit incentive structures.

Utility Region	Program Design	Conversion Rate	Audit Cost to Customer	Weatherization Rebates Available
Northeast	Audit participants pre-screened	80%	\$100	\$4,000
West	Audit participants pre-screened	51%	\$400	\$2,000
Southwest	Subsidized audit cost; customer pays nominal fee, compensation to auditor does not cover full audit cost, audit required for access to some but not all weatherization incentives	52%	\$99	\$1,525
Midwest	Provide audit for free if customer follows through with recommended measure installation. Otherwise, customer pays full cost of audit.	Not Available	\$0 if customer installs measures	\$1,500

Table 13. Program Design and Conversion Rates of Other Audit Programs

#### Recommendations

#### To increase the conversion rate for the Home Energy Assessment and Weatherization Program, PPL Electric should considering the following changes to the program structure:

- Pre-screen audit participants to reserve audits for those more likely to follow through on measure recommendations.
- Because cost was most often cited as a reason for not following through with recommended measure installation, and because the market cost of the audit is high, consider creating a larger insulation rebate for survey/audit participants.
- Consider reimbursing customers for the full cost of the audit if they follow through with measure installation.
- Explore using a limited-time offer for a larger weatherization rebate to encourage past survey/audit participants to install recommended measures.
- Provide dealer incentives to contractors who sell weatherization projects to audit customers.

## **PPL** Electric should work with the program's CSPs to process rebates and enter data into EEMIS on a timelier basis to improve the accuracy of the conversion rate calculation.

## A number of factors contributed to customers' decision to install weatherization upgrades.

Participant surveys (n=43) found that while customers who followed through with auditors' recommendations most commonly cited a desire to reduce energy use or energy costs or to improve home performance as their primary motivation to make weatherization upgrades, reasons for *not* making upgrades varied. Survey respondents cited the following reasons for not taking action:

- Cost (41%)
- Competing demands on their time (31%)
- Preferred to install the measures themselves, but didn't know how or it was too difficult (23%)
- Home was efficient enough (15%)

Savings from the recommended measures would be minimal and not worth the cost (15%)

These results indicated that a mix of up-front costs, lack of awareness, and lack of urgency were barriers to equipment installation. Whether customers received a survey or an audit did not appear to impact the likelihood that they would act on measure recommendations.

Nearly half of survey respondents who had not yet followed through with recommended measure installation reported they did not intend to install *any* of the recommended measures in the next 12 months.

### HVAC TUNE-UP PROGRAM

For the HVAC Tune-Up Program, PY3 evaluation activities included:

- A stakeholder interview
- Review of the HVAC Tune-Up Survey conducted by PPL Electric and the implementation CSP, Field Service Diagnostic Instruments (FDSI)
- Benchmarking against other utility tune-up programs

#### Achievement against Plan

After two years of operation, the HVAC Tune-Up Program was far behind its 2009 EE&C Plan savings.<sup>17</sup> To reflect low participation, PPL Electric adjusted its plan for PY3 and PY4.<sup>18</sup> At the end of PY3, the program had achieved 208% of its updated four-year planned demand savings of 542 kW and 63% of its updated planned energy savings of 2,047 MWh.

			• D.		
	PY1	PY2	PY3	PY4	Total
MWh/yr	0	468	741	838	2,047
kW	0	521	10	11	542

Table 14. HVAC Tune Up Program Four Year Savings Plan

To address low participation, PPL Electric adjusted the program in late PY3 (beginning May 1, 2012) by increasing the incentive to contractors performing tune-ups. PPL Electric offered an additional incentive to contractors who had performed tune-ups on at least 50 qualifying units. Incentives were capped at a total of \$3,000 per contractor and were:

- \$30 per unit for the next 50 units
- \$50 per unit for the next 20 units
- \$70 per unit for the next 20 units.

In addition, an incentive of \$500 was offered for every 12 thermostat replacement measures completed, up to a maximum of \$1,000 per contractor. According to the tracking database, none of the contractors qualified for the additional incentive. As of May 2012, PPL Electric discontinued promoting the program to end-use customers.

#### Findings, Conclusions and Recommendations

This section provides key results from Cadmus' process evaluation activities for the HVAC Tune-Up Program and recommendations for possible program enhancements.

<sup>&</sup>lt;sup>17</sup> 5,770 customers through 2013, with a total reduction of 22,180 MWh and 11 MW

<sup>&</sup>lt;sup>18</sup> The new planned savings are reflected in PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

## The FDSI diagnostic tool ensures sound data collection, but inhibited program participation.

Complete and accurate data collection ensures high realization rates and savings per measure for tune-up programs. A review of the program tracking database showed data fields were complete and accurate and the savings per measure indicated cost-effectiveness, if participation remained high. However, according to the survey fielded by PPL Electric and FDSI, contractors noted that the cost of the diagnostic tool and the additional time required to use it to conduct the tune-up were significant challenges. Because contractors were required to use the diagnostic tool for the program, these barriers discouraged participation.

#### Recommendations

Explore alternative HVAC tune-up diagnostic program models that do not require an expensive tool.

Consider an approach that qualifies contractor quality at the onset of their participation in the program, and then reduces the data reporting requirements after a number of successful tune-ups to reduce contractors' time to participate.<sup>19</sup>

#### Further research is necessary to assess total program freeridership.

Because of the limited evaluation effort in PY3, the evaluation assumed that a contractor is a freerider only if they used a similar diagnostic tool prior to the program and the diagnostic tuneup was their standard practice. If, for example, the tune-up would have occurred regardless of the program, the savings should be assessed as the difference between tune-up savings with and without the program. Although the evaluated net-to-gross ratio in PY3 was 1.0, further research might show that at least some components of the tune-up would have occurred regardless of any program incentive. This finding would reduce realized savings. Further research should consider:

#### Recommendations

#### Further research to assess freeridership should consider:

- Customer intent. Only two of 11 respondents in the survey conducted by PPL Electric and FDSI found contractors share incentives with the customer, meaning a standard practice tune-up probably would have occurred. Research should be conducted to determine whether the tune-up would have occurred without the program.
- Comparison of savings from a standard practice tune-up to savings the claimed from diagnostic tune-up.

#### Increasing incentive amounts may not be necessary to improve participation.

A benchmarking exercise showed that PPL Electric's incentives for HVAC tune-ups are similar to or higher than those in other jurisdictions. Table 15 shows several examples of utility tune-up program implementers and incentives. The incentives listed are for residential systems unless otherwise noted.

<sup>&</sup>lt;sup>19</sup> The ACCA 9 manual describes an approach for quality installation practices. A similar approach could be used for tune-up services.

Utility	Implementer	Incentive Structure
Midwest Utility	CSG	\$25 instant credit on the contractor's invoice.
Mid-Atlantic Utility	Honeywell	\$100 customer bill credit
Mid-Atlantic Utility	Honeywell	\$100 customer rebate
Mid-Atlantic Utility	ICF	\$75 proposed customer rebate
Midwest Utility	Proctor Engineering Group Honeywell	\$35 contractor incentive Additional customer incentives, paid as credit on the contractors invoice: Refrigerant charge repair: \$55 Indoor coil cleaning: \$40 Outdoor coil cleaning: \$25 Heat pump strip heat lock out (install): \$75 Heat pump strip heat lock out (reset): \$25 Customer rebates for: Tune-up: \$60 Tune-up with ECM fumace fan replacement: \$75
Kenergy	Unknown	\$25 customer rebate
Potomac Edison	Honeyweil	Customer rebates for: Tune-up: \$100 Tune-up with ECM furnace fan replacement:.\$140
APS	Unknown	\$100 customer rebate
Enterov (residential and		Customer rebate or invoice credit for: Evaporator coil cleaning: \$25 Blower motor cleaning: \$25 Refrigerant charge adjustment: \$25 Contractor incentives: documented tune-up with verified system
commercial)	CLEAResult	improvements: \$75

Table 15. Utility Tune-Up Program Benchmarking

### LOAD CURTAILMENT PROGRAM

For Load Curtailment, there were no formal PY3 evaluation activities. This is an early program review based on discussions with PPL Electric as it brought on the program's conservation service provider (CSP), as well as a review of Pennsylvania demand reduction regulatory requirements, and PPL Electric's program materials. Due to the unique nature of the program delivery strategy, and because the program is unlikely to be offered again until the PA PUC's evaluations are completed, Cadmus did not focus heavily on the Load Curtailment Program process evaluation.

#### Achievement against Plan

PPL Electric PY3 program activities entailed finalizing contracts with the implementation CSP (EnerNOC) and managing the relationship with them as they recruited participants into the program. By the end of PY3, the CSP obtained commitments from approximately 320 participants<sup>20</sup> to provide demand resources sufficient to meet the program's planned savings in PY4.<sup>21</sup>

	PY1	PY2	РҮЗ	PY4	Total
MWh/yr	0	0	0	0	-
kW	0	0	0	156,300	156,300

Table 16. Load Curtailment Program Four-Year Planned Savings

#### Findings, Conclusions, and Recommendations

#### Act 129 requirements posed challenges for the success of a long-term demandresponse program.

Act 129 required demand savings to occur during the top 100 load hours of the 2012 summer season (PY4). Traditionally, demand response programs are used on as-needed basis to address electric reliability and mitigate high electric costs during periods in which marginal electric resource prices are relatively high. While there is typically a strong correlation between the top 100 load hours, electricity reliability and economic challenges, it is not always the best indicator. For example, generation outages may cause electric prices to be higher even if they are not in the top 100 hours. By focusing the demand reductions to target the top 100 hours, PPL Electric's ability to use the program to reduce price volatility and improve reliability is limited.

The SWE and the PA PUC are studying demand response programs and their structure within Act 129 and the existing PJM demand response programs. Based on that research, the PA PUC will determine if demand response will be included in Act 129 Phase III.<sup>22</sup>

Also note that the evaluation efforts including customer surveys and data analysis will occur in PY4. Conclusions and recommendations will be made in the PY4 reports.

<sup>&</sup>lt;sup>20</sup> A participant is defined as a unique customer account number. Some customer sites have multiple accounts.

<sup>&</sup>lt;sup>21</sup> Planned savings obtained from PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

<sup>&</sup>lt;sup>22</sup> Act 129 Phase II (June 1, 2013 – May 31, 2016) has no demand reduction compliance targets.

### PEAK SAVER PROGRAM

For the Peak Saver Program, also referred to as Direct Load Control (DLC), PY3 process evaluation activities included a summary report of the initial start-up process. PPL Electric conducted participant surveys after initial cycling events and dropout surveys of participants who de-enrolled from the program during the first few event days (which occurred in PY 4).

Although the first conservation events occurred in PY4, Cadmus summarized the findings from PPL's survey activities in order to inform future program planning.

#### Achievement against Plan

PPL Electric's program implementation CSP (Converge) began recruiting participants for the program in the second quarter of 2011. The program began to realize demand savings in June 2012 (PY4), when the CSP began cycling the devices. Over the course of the approximately 15-month start-up period, the program achieved the following milestones to prepare for meeting PY4 goals:<sup>23</sup>

- Program kick-off
- Enrolled 35,000 residential and small commercial participants
- Installed 43,000 DLC devices (the plan was for approximately 50,000 devices)
- Installed M&V metering devices to support impact evaluation

	PY1	PY2	PY3	PY4	Total
MWh/yr	0	0	0	0	-
kW	0	0	0	35,644	35,644

Table 17. Peak Saver Program Four-Year Planned Savings

In its first two conservation events, the program CSP had difficulty with the DLC signaling technology (paging network) causing signaling delays and cycling issues. In addition, the days before the event was called were cool, which caused the units to operate short periods during the event (not enough cooling, since the weather was hot during the event). These issues resulted in the temperatures rising to a noticeable and uncomfortable level in some homes. The CSP's call center was not equipped to handle the resulting call volume. PPL Electric cancelled the event earlier than scheduled, to better manage these issues.

Of the 35,000 total participants in the first two conservation events, 930 (2.7%) dropped out of the program following these events.

<sup>&</sup>lt;sup>23</sup> All planned savings are based on PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

In response to the issues identified in the first conservation events, PPL Electric conducted two different electronic surveys: one for customers who continued their participation ("participants") and one for those who dropped out of the program ("dropouts").

PPL Electric used information gathered through surveys to adjust the program. PPL Electric also worked with the implementation CSP to adjust the cycling algorithm and resolve the call center issues. Participants now receive an outbound message before an event. The experiences of the first events were anomalies and not repeated in any of the subsequent events.

#### Findings, Conclusions, and Recommendations

This section provides key results from Cadmus' limited process evaluation activities for the Peak Saver Program and a review of the PPL Electric participant and dropout survey results.

### Uncomfortably high temperatures were the main contributing factor for customers choosing to drop out of the Peak Saver Program.

Seventy-nine percent of customers surveyed who dropped out of the program said they did so because the temperature in their homes was too uncomfortable. High temperatures seemed to affect dropouts much more than they did participants, as 82% of those who dropped out of the Peak Saver Program cited a temperature increase of 7 degrees or more, while only 15% of participants reported the same level of temperature increase. Specifically, 28% of dropouts indicated that their indoor temperatures increased 10 to 12 degrees and another 29% indicated that it increased more than 12 degrees.

This difference was further highlighted by participant survey responses indicating approximately four out of 10 participants thought their temperatures stayed essentially the same during the conservation events, while only one percent of the dropouts reported a similar experience. Table 18 provides a summary of the results from the survey question: "Looking back on the hours of the conservation events of these two days, did you find that when your cooling device was being controlled, that your home's indoor temperature...

A	Deeperso	Percent Participant	Percent Dropout
Answer	Response	Survey	Survey
Stayed essentially the same, within 1 to 3 degrees_	272	39%	1%
Increased 4-6 degrees	103	15%	14%
Increased 7-9 degrees	46	7%	25%
Increased 10-12 degrees	25	4%	28%
Increased more than 12 degrees	26	4%	29%
Nobody was home during the conservation event	55	8%	N/A
Don't know	165	24%	3%
Total	692	100%	100%

Table 18. Perceived Temperature Changes During Conservation Events

#### Recommendations

Verify technology and system viability before calling for curtailment events.

For the initial event—or before making system changes—conduct a test event with a sample of the participant population. This will help to ensure that the program technology is set up correctly and internal processes are functioning appropriately. PPL Electric and the CSP conducted several test events during the summer of 2011 but none of those events had the same extremely hot weather, immediately preceded by cool weather, as the first two curtailment events in 2012.

Establish both a system monitoring protocol to monitor the signals being sent to the DLC devices and a plan to revert the control strategy to normal, in the event that problems occur with the cycling strategy or duration.

*Consider the use of a temperature-dependent cycling strategy that limits temperature rise.* For example, by limiting temperature rise to four degrees, PPL Electric may have been able to minimize the severity of the problems incurred with the first event.

### Insufficient information about conservation events was a secondary factor that contributed to customers dropping out of the Peak Saver Program.

While 70% of dropouts attributed their discontinued participation to the fact that temperatures rose higher than they expected, 22 dropouts (one percent of survey respondents) also said they received incorrect information about how the program would work. Specifically, many said they were told they wouldn't feel a difference during conservation events. However, had the equipment operated correctly, it is likely that the customer would not notice the temperature change.

Both dropouts and continuing participants suggested notifying customers prior to conservation events. Survey respondents were receptive to receiving advanced communication about events, with 84% reporting that they would likely listen to weekly voicemail messages sent directly to their phones about possible conservation events, 70% were somewhat likely to visit PPL Electric's website for information about the Peak Saver program, and 49% were somewhat likely to sign up for a free text messaging service that would alert them to upcoming events.

Participants indicated the strongest preference for e-mail to receive information about events. The program CSP did notify customers via automated outbound phone messages prior to the second conservation event, and many participants expressed satisfaction with this awareness activity. However, many customers found those automated phone messages annoying after many events and the Program CSP stopped the automated phone messages. The program CSP also put event pre-notifications on the program's website and advised customers to view the website. If this program continues in future phases of Act 129 EE&C, PPL Electric should carefully evaluate whether to pre-notify customers of events and, if so, the method for that notification. PPL Electric indicated they would have to carefully balance the benefits of pre-notification against the likelihood that customers would change their practices, such as precooling their home in advance of each event.

#### Recommendations

Increase efforts to manage customer expectations regarding the Peak Saver Program participation and conservation events. PPL has already taken steps to manage expectations by sending outbound messages to customers to notify them of upcoming events.

**PPL Electric should consider revising program materials to reflect a more cautious** *description of the potential conservation event experience,* with warnings about potential higher temperature levels. However, that should be weighed against the likelihood this type of communication may discourage customers from participating.

### Customers (both participants and dropouts) who called the program's toll-free number were dissatisfied with their experience.

Twenty-six percent of dropouts who were surveyed called and could not get through to the Program CSP's support hotline; 12% called and left a message. Sixty-six percent of dropouts who called the hotline called more than two times. Of those that left voicemails, 70% said they were never called back. Of those dropouts that called the hotline and reached a representative, 41% were somewhat dissatisfied or very dissatisfied with the overall information they received from the Peak Saver representative. While participants called the hotline at a much lower rate, they also had high levels of dissatisfaction with the overall information they received from the Peak Saver representative.

#### Recommendations

In anticipation of increased customer calls during conservation events, consider increasing the number of Peak Saver representatives who are on call.

Increase training for Peak Saver representatives on how to inform customers who call the hotline and then revise any guidelines or phone scripts to accommodate unexpected issues.

### **RENEWABLE ENERGY PROGRAM**

For the Renewable Energy Program, the key PY3 process evaluation activities were conducting a records review (n=17) and surveying participants (n=2).

#### Achievement against Plan

At the end of PY3, the Renewable Energy Program had achieved 90% of its four-year planned savings of 18,875MWh/yr and 77% of its four-year planned 4,674 kW demand savings.<sup>24</sup>

- Table 17. Renewable Baergy 110gram Four Tear Than					
	PY1	PY2	PY3	PY4	Total
MWh/yr	2,942	11,731	4,202	0	18,875
kW	140	2,115	2,419	0	4,674

Table 19. Renewable Energy Program Four-Year Plan

In PY3, the Renewable Energy Program closed to new applicants, but provided incentives to two photovoltaic (PV) projects and 15 ground source heat pump (GSHP) projects that had reserved incentives before the program closed. The program was closed after exhausting its funding.

#### Findings, Conclusions and Recommendations

This section provides key results from Cadmus' process evaluation activities for the Renewal Energy Program and recommendations for possible program enhancements.

## High interest in the renewables program and the popularity of the GSHP rebate warrant consideration for inclusion under other rebate programs, if cost-effective.

PPL Electric's renewable energy program was oversubscribed in its first year of operation, with the PV portion of the program filling up immediately after the program opened. The program had a larger budget to provide GSHP rebates, and this portion of the program did not close until the end of PY3. More data must to be collected to determine the cost-effectiveness of GSHP measures, while PV measures are typically not cost-effective for any program. The cost of GSHP measures is not currently tracked through PPL Electric's program.

#### Recommendations

**Consider adding prescriptive incentives for residential and small commercial GSHP systems to the Efficient Equipment Program.** 

Nonresidential systems containing chillers, roof top units, or other equipment that complicates the energy savings calculations should be handled under the Custom program.

Collect cost data for residential and small commercial GSHPs to calculate a cost per ton for cost-effectiveness calculations. For PY3, an assumed cost per ton will be used.

<sup>&</sup>lt;sup>24</sup> All planned savings are based on PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

## Tracking information for GSHP systems can be improved to facilitate more accurate savings calculations.

Records review revealed no data tracking issues for PV systems, but several key pieces of information were incorrect or not tracked for GSHP systems, including the type of system, EER, COP, cooling capacity, heating capacity, and the size of the ground loop circulating pump. These specifications are necessary to calculate savings. In its impact evaluation, Cadmus used system assumptions that resulted in *ex post* savings results that were larger or smaller than the claimed savings, depending on the efficiency and capacity differences between a GWSHP and GSHP.

If PPL Electric offers GSHP incentives during the next program cycle, we recommend the following changes to rebate applications to facilitate calculating energy savings.

#### Recommendations

In rebate applications and EEMIS, distinguish between water source heat pumps (WSHP), groundwater source heat pumps (GWSHP), and ground source heat pumps (GSHP).

Enter the values into the EEMIS database from the AHRI certification corresponding to the specified system type and use those values to calculate savings. For example, if the system is a GSHP, the EER, COP, heating capacity, and cooling capacity for a GSHP should be used.

**Request the size of the ground loop pump(s) on rebate forms.** The TRM methodology subtracts the electricity used by the ground loop pump. Currently this pump is not taken into account in the claimed energy savings but it is included in the verified energy savings (Cadmus collects this information during the site visit). This anomaly can result in significantly lower savings.

### **RESIDENTIAL LIGHTING PROGRAM**

For the Residential Lighting program, PY3 evaluation activities were these:

- Residential customer telephone surveys (n=265)
- Lighting manufacturer interviews (n=11)
- Discussions with the program CSP and reviews of the program CSP's monthly report

#### Achievement against Plan

In PY3, PPL Electric increased the four-year planned savings and participation for the Residential Lighting Program to reflect its success in promoting energy-efficient bulbs. Table 20 shows the updated planned savings and participation.<sup>25</sup> After 29 months of operation, the Residential Lighting Program was ahead of its planned bulb quantity and energy savings, and very close to its planned demand reductions. As of May 31, 2012, the program achieved:

- Sales equal to 81% of the energy-efficient bulbs expected to be sold over the four-year program period (7,066,944 of 8,744,034 bulbs)
- 86% of its expected four-year energy savings target (335,640 MWh of 392,137 MWh)
- 75% of its expected four-year capacity savings target (18.8 MW of 24.9 MW)

ltem	PY1	PY2	PY3	PY4	Total
Quantity of Bulbs (CFLs and LEDs)	1,342,595	3,056,236	2,191,496	2,153,707	8,744,034
Energy Savings (MWh/yr)	61,839	145,999	94,234	90,065	392,137
Capacity Savings (MW)	3.6	8.6	6.4	6.3	24.9

#### Table 20. Residential Lighting Program Four-Year Plan

To date, the program has spent just over \$11.6 million, or 77%, of its expected four-year cost of \$15.2 million.

Findings, Conclusions, and Recommendations

This section contains the key results from Cadmus' process evaluation activities for the Residential Lighting Program.

### Awareness of new lighting standards is moderate; customers may benefit from more education about compliant light bulb choices.

About half of telephone survey respondents (55%) were aware of the Energy Independence and Security Act of 2007 (EISA), which mandates new efficiency standards for most light bulbs, and most of these (72%) knew that EISA's implementation would be phased in.

The manufacturers we interviewed believed even customers who were aware of EISA were often confused and had received misinformation. They suggested consumer education about EISA.

<sup>&</sup>lt;sup>25</sup> All planned savings are based on PPL Electric's revised EE&C Plan (Docket No. M-2009-2093216) filed with the Pennsylvania PUC on May 25, 2012, Table 112, TRC Benefits by Program Year, pp. 195-196.

They also suggested that offering incentives for energy-efficient bulb options would be crucial, especially as 75W (and later 60W and 40W) incandescent bulbs are phased out over the next one and a half years.

When asked what organizations should be responsible for helping them understand the new light bulb law, survey respondents most frequently replied PPL Electric (34%), don't know (30%), and a government agency (17%).

#### Recommendation

As EISA is phased in, ramp up customer education about EISA and energy-efficient light bulb choices through the ePower Website, manufacturer and retailer partners, and CFL give-away events.

#### Awareness and use of standard CFLs is high; potential exists for increases in awareness and uptake of specialty CFLs and, over time, LEDs.

While they may not be aware of EISA, most of PPL Electric's residential customers were aware of standard CFLs (88%) and most had at least one installed in their homes (85%). As shown in Figure 14, customer awareness of specialty CFLs was much lower than awareness of standard CFLs, although it has generally been increasing over the past few years.



Figure 14. Percent Aware of Specialty CFLs<sup>26</sup>

<sup>26</sup> For PY2 and PY3, values are the percent of respondents aware of the bulb type; for PY1, values are the percent of respondents somewhat or very familiar with bulb type (rated 5 to 10 on 10-point scale, where 10=very familiar).

Although the use of specialty CFLs is gradually increasing, customer use of these was much lower than that of standard CFLs. Of those who were aware, more respondents had used flood/recessed CFLs in PY3 (55%) than any other type of specialty CFL. The next most commonly used were three-way (45%), globes (41%), and dimmable CFLs (36%). Only 33% of respondents who were familiar with A-shaped CFLs reported they had used them, and only 29% who were familiar with candelabra CFLs stated they had used them.

Fewer than 20% of PPL Electric's residential customers reported they were very familiar with LEDs and only 5% reported they would definitely install LEDs within the next year.<sup>27</sup> Most of the light bulb manufacturers we spoke with expected LEDs to be cost-competitive with CFLs when LED prices reach roughly \$8 to \$10 per bulb. They anticipated LEDs would gain a significant share of the light bulb market by 2015, but did not expect that share to be as great as the share of halogens or CFLs.

Customers reported they most commonly used online searches and Websites (81%), PPL Electric (53%), retail ads and displays (20%), and word-of-mouth (6%) for reliable, objective information about energy efficient bulbs.

#### Recommendations

Reduce standard CFL incentives.

#### Continue educating customers about and providing incentives for specialty CFLs.

#### Ramp up LED promotion as more LED options become available and as prices drop.

## While PPL Electric customers are more aware than average, more education is still needed about CFL recycling.

In PY3, 46% of PPL Electric survey respondents who had disposed of a CFL in the past year said they had thrown CFLs in the regular trash, while 32% said they had taken spent CFLs to a hazardous waste center or a retail store for recycling. Cadmus conducted benchmarking to compare these results with those of CFL recycling programs in other jurisdictions. As shown in Figure 15, these values demonstrate that more customers in PPL Electric's service area are responsibly disposing of CFLs than are customers in other regions with similar programs.

Of the 46% of survey respondents who recently threw their CFLs in the trash, most (66%) reported they were not familiar with or concerned about CFL disposal issues. Similarly, most respondents (70%) who did not dispose of CFLs in the past year were not familiar with or concerned about CFL disposal issues.

<sup>&</sup>lt;sup>27</sup> PPL Electric, "Lighting/CFL Survey, PPL Power Panel," July, 2012.



Figure 15. CFL Disposal Methods for PPL Electric and Comparison Utilities\*

Overall, 17% of survey respondents said they were not sure where or how to dispose of CFLs and 22% said they were concerned about CFL disposal due to the mercury and chemicals CFLs contain or for general environmental reasons. According to PPL Electric's July 2012 Panel Study, only 18% of residential customers were aware of local CFL recycling locations and just 3% were aware that the ePower Website includes a list of CFL recycling locations.

#### Recommendations

*Expand the informational campaign about CFL disposal* at participating retailers—through retailer training and point-of-purchase displays (as permitted by retailers)—and during CFL give-away events.

On the ePower Website, display a link listing CFL recycling locations more prominently.

### APPENDIX A. SURVEY ACTIVITIES BY PROGRAM

		Target	Actual	Confidencel		
Program	Participants	Completes	Completes	Precision		
PPL Behavior and Education						
Participant and Drop Out	3000	190	191	90/10		
Nonparticipant	101,468	150	150	90/10		
Appliance Recycling (ARP)	12,948	75	76	90/10		
Efficient Equipment						
Residential	35,945	70	99	90/10		
Commercial	2,404	120	120	90/10		
Direct Discount	834	70	49	85/15		
Residential Lighting/CFL Campaign	397,041	325	265	90/10		
Home Energy Assessment & Weatherization						
Audit Participant	703	70	71	90/10		
Weatherization Participant	113*	42	43	90/10		
E-Power Wise Direct Mail Pilot	582	65	66	90/10		
Renewable Energy Participant	15	10	2	65/35		
Peak Saver (Direct Load Control)		N/A				
Load Curtailment		N/A	-			
HVAC Tune-Up		N/A				
Custom Incentive Program Survey to be conducted PY4						
NOTE: The weatherization participant sample included only those who conducted an energy assessment and went on to install weatherization measures. It included PY2 participants due to missing PY3 data.						

Table 21. Survey Activities by Program

# APPENDIX B. FURTHER ANALYSIS: BEHAVIOR AND EDUCATION

The Behavior and Education Program underwent several changes in PY3. Most notably, approximately 55,000 new homes were added to the program. These homes had different eligibility criteria for participation and were located in new ZIP code areas.

In PY3, expansion and legacy group participants received seven reports; all homes were on the same mailing schedule. The implementation CSP (OPower) also redesigned the welcome insert included with the first report. This insert addressed privacy concerns, pointed customers to online responses to frequently asked questions, and explained the data sources and calculation behind the neighbor comparison. In April 2012, the neighbor comparison computations were refined to improve the match quality based on distance, square footage, and heating type.

Cadmus conducted surveys with program participants to elicit feedback about customer comprehension of the Home Energy Reports, actions taken in response to the reports, customer satisfaction, and demographic and home characteristics. Cadmus surveyed 151 program participants, of which 76 were from the legacy group and 75 were from the expansion group. Legacy group homes receive their first reports in PY2. Expansion group homes received their first reports in PY3. Cadmus also surveyed 150 nonparticipants, all of whom were from the legacy group. To ensure similar customer characteristics when comparing responses across the treatment and control group surveys, we present comparisons of the 76 legacy group participants with the 150 legacy group nonparticipants.

#### Home Energy Reports

To explore readership and how participants use the Home Energy Reports, Cadmus asked survey respondents whether they agreed or disagreed with a series of statements about the reports (n=151). Almost all respondents (95%) agreed that the reports were easy to understand, and more than two-thirds of respondents (69%) indicated that they learned something new about their energy use from the report. The reports were also a useful tool for recruiting household members to participate in energy-efficiency efforts. Fifty-two percent of respondents said that the reports help to get other household members involved in reducing household energy use.

Customer satisfaction with the Home Energy Reports was generally high. Seventy-three percent of participants reported being satisfied with the reports. Of those who said they were not satisfied, 74% of participants (28 of 38) said the neighbor comparisons were inaccurate. Three participants said the reports should provide more information about how comparisons were calculated, and three other participants said they were dissatisfied with savings or did not see any improvement in energy usage.

Figure 16 shows the distribution of self-reported satisfaction with the reports (n=151).

Seventy-three percent of participants reported being satisfied with the reports. Of those who said they were not satisfied, 74% of participants (28 of 38) said the neighbor comparisons were inaccurate. Three participants said the reports should provide more information about how

comparisons were calculated, and three other participants said they were dissatisfied with savings or did not see any improvement in energy usage.



Figure 16. Satisfaction with the Home Energy Reports

Cadmus also asked a series of questions to elicit feedback about the neighbor comparisons provided in the Home Energy Reports (n=145). Participants reiterated their skepticism of the neighbor comparisons and reported being surprised by their results. Only 47% of respondents reported that the neighbor comparison seems accurate, and 61% of respondents said that their household electricity use compared to their neighbors' was different than they expected. The Home Energy Reports are getting households' attention, though, whether or not the participants agree with the report content. Participants largely agreed (74%) that the neighbor comparison makes them more aware of their own household electricity use and the majority of respondents (58%) said that the household actively works to improve how it compares to its neighbors.

Figure 17 illustrates participants' responses about how their opinions of PPL Electric have changed since they started receiving the Home Energy Reports (n=151).



#### Figure 17. Changes in Participants' Opinions of PPL Electric

Only nine of the 151 respondents reported that their opinion of PPL Electric declined after receiving the Home Energy Reports. Again, this was predominantly driven by respondents who believed the neighbor comparison to be invalid or inaccurate. More than half of respondents (61%) said their opinion of PPL Electric was unchanged, and nearly a third of respondents (31%) reported that receipt of the Home Energy Reports improved their opinion of PPL Electric.

#### Awareness and Attitudes

Cadmus asked participants and nonparticipants about their awareness of energy-efficiency programs and attitudes toward energy use. Participants reported they were more familiar with PPL Electric energy efficiency programs and had more ideas about ways to save energy than nonparticipants.

- Twenty-eight percent of the legacy treatment group (n=76) and 26% of the control group (n=120) reported visiting the PPL Electric Website to look for ways to save money on their bills.
- Seventy-four percent of legacy group respondents and 68% of nonparticipants said that they were familiar with PPL's energy efficiency programs (n=76 and n=150, respectively). The Energy Efficiency Rebate and Residential Time-of-Use Rate Option were most commonly mentioned by both participants and nonparticipants.
- Sixteen percent of legacy participants (n=76) and 18% of nonparticipants (n=150) were familiar with Residential Time-of-Use Rate Option, which is not a statistically significant difference (p-value=0.673).
- The difference between the shares of respondents reporting familiarity with energy efficiency rebates was statistically significant, however. Participants in the Behavior and Education Program were more likely than those in the control group (24% versus 11%) to be familiar with such rebates (p-value=0.027).

Table 24 gives the shares of participants and nonparticipants who agreed with various statements about energy use and p-values for the differences in these proportions within the legacy group.

	Expansion Group		Legacy Group	
Statement	Participants (n=75)	Participants (n=76)	Nonparticipants (n=150)	p-value
It is important to conserve as much energy as possible.	97%	97%	97%	0.990
Using whatever energy is needed to keep my home comfortable is important to me.	91%	92%	90%	0.590
Saving energy helps the environment.	96%	97%	93%	0.140
I would like to save more energy but do not know where to start.	57%	43%	52%	0.220
I have already done as much as possible to save energy in my home.	65%	64%	70%	0.410
Energy-efficient products are too expensive for me.	48%	42%	42%	0.990
I actively look for ways to reduce my carbon footprint.	73%	71%	71%	0.960

Table 22. Percent of Respondents who Agreed with Attitudinal Statements

For most statements, attitudes toward energy use and conservation were similar across the legacy participant and nonparticipant groups, though there were some important differences.<sup>28</sup> While none of the differences are significant at 10%, those who had received Home Energy Reports reported being better informed about ways to save energy.

- Legacy participants were less likely than nonparticipants to say that they either did not know where to start saving energy or that they had exhausted their energy efficiency options.
- Legacy group participants also appeared better informed than expansion group participants about ways to save energy, which suggests that it is beneficial to continue receiving Home Energy Reports after the first year of participation.

<sup>&</sup>lt;sup>28</sup> The high incidence of agreement across both groups may reflect a bias to report the socially desirable response instead of one's own values.

#### Behaviors

Cadmus asked participants and nonparticipants about the frequency with which they engage in different energy use behaviors. Table 25 shows the percentage of respondents who said they always or sometimes engaged in the behaviors.

	Expansion Group	Legacy Group		
Behavior	Participants (n=75)	Participants (n=76)	Nonparticipants (n=150)	p-value
Turn off lights in rooms that are unoccupied	100%	100%	100%	0.99
Wash laundry in cold water	89%	89%	89%	0.99
Switch off power strips when appliances or equipment are not in use	69%	50%	58%	0.26
Adjust thermostat settings according to occupancy schedules and the time or day	81%	84%	78%	0.30
Take shorter or fewer showers	72%	76%	76%	0.99
Use energy-saving or "sleep" features of your computer	77%	71%	77%	0.34

#### Table 23. Percent of Respondents Who Engage in Different Energy Use Behaviors

Participants were more likely to adjust their thermostats to reflect occupancy schedules or the time of day. Legacy group respondents who had received Home Energy Reports reported being somewhat more likely than those in the control group to adjust their thermostats based on occupancy (81% versus 78%), but they were somewhat less likely to take actions to conserve electricity by switching off power strips when appliances are not in use (50% versus 58%). None of the differences between the legacy participants (n=76) and nonparticipants (n=150) were statistically significant, however.<sup>29</sup>

<sup>&</sup>lt;sup>29</sup> This is also the case if you compare percentages of respondents who said "always" instead of "always" or "sometimes."

#### Measures Installed

Table 24 displays the percent of respondents who reported making the following energy saving improvements.

	Expansion Group	Legacy Group		
Improvement	Participants (n=75)	Participants (n=76)	Nonparticipants (n=150)	p-value
CFLs	60%	46%	57%	0.13
Changed the furnace filter	40%	39%	43%	0.58
Energy audit	8%	3%	5%	0.42
Programmable thermostat	25%	18%	20%	0.78
Energy Star or high efficiency appliances	44%	42%	39%	0.69
High efficiency furnace, boiler, heat pump, or central AC	8%	17%	13%	0.39
Air sealing, caulking, or weather stripping	32%	29%	37%	0.20
Insulation in the ceiling, walls, or foundation	21%	16%	22%	0.25

#### Table 24. Percent of Respondents who Made Energy Saving Improvements

A slightly larger share of program participants reported installing high-efficiency appliances or heating and cooling equipment than did the control group, but in all other cases the incidence of reporting such investments was lower among program participants than among nonparticipants. None of these differences are statistically significant, however. Participants in the expansion group were also more likely than those in the legacy group to report installing almost all types of energy saving improvement. The only exception was heating and cooling equipment.

### **APPENDIX C. LIMITED TIME OFFERS**

Initiative	Start	End	Description	Goal	Results achieved by end of PY3	
Direct Discount Bonus	Feb 2012	March 2012	15% bonus marketed to customer.	3 GWh/yr	49 customers indicated they were either moving forward with a Direct Discount job or had a project underway. Total of 980 MWh identified.	
VFD-VSD Limited Time Rebate	Feb 2012	May 2012	Limited time rebate bonus marketed to contractors.	1.1 GWh/yr	11 applications received (32 installations) with an estimated savings of 1.1 GWh	
T-12 Phase Out	Feb 2012	May 2012	Increase rebates from \$6 to \$8 per lamp.	2.1 GWh/yr	243 Applications received with an estimated savings of 12.8 GWh	
Chamber of Commerce Initiative	May 2012	Sept 2012	15% bonus for Direct Discount or prescriptive rebate customers who are Chamber members.	2.5 GWh/yr (3 projects per chamber at 20,000 kWh each)	Project under development at end of PY3.	
Free LED Exit signs	May 2012	July 2012	Pilot program in five counties in the Susquehanna region. Customers who receive or lighting assessment or T-12 Retrofit are eligible for free LED exit sign.	Goal of 20 projects at an average of 4 signs per project.	Contractors expressed interest in offer. Pilot project under development at end of PY3.	

#### Table 25. Summary of Limited Time Offers in PY3