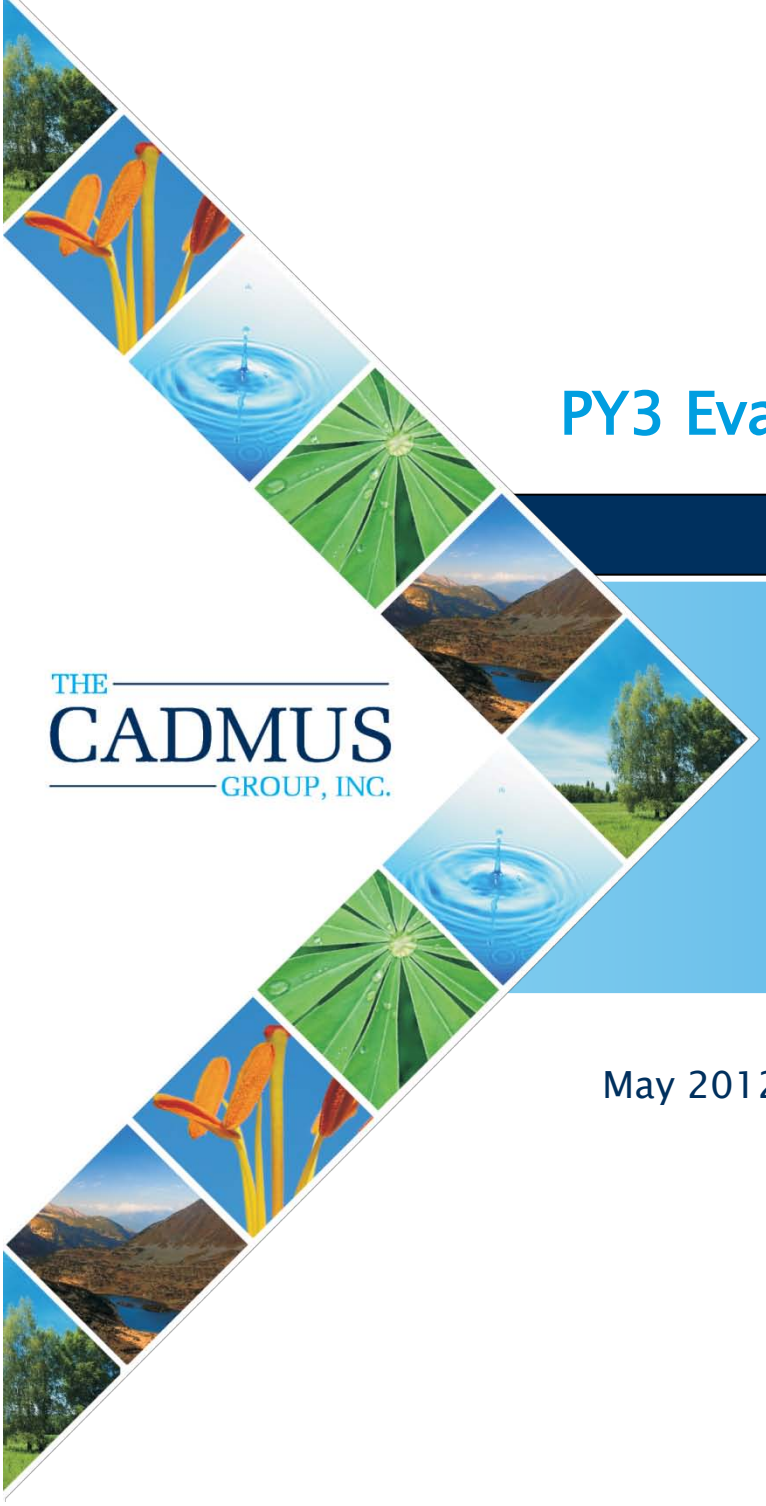

THE CADMUS GROUP, INC.

PY3 Evaluation

Lighting and Appliance Evaluation

May 2012

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May 2012
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1. Executive Summary

The Ameren Illinois Lighting and Appliances Program (L&A Program or program) offers incentives to reduce the price of CFLs in retail stores and rebates on selected ENERGY STAR® appliances. The Cadmus Group Inc.'s (Cadmus') evaluation of Program Year 3 (PY3) consisted of reviewing and analyzing the tracking database and applying savings estimates based on past PY1 and PY2 evaluation activities. Sources of savings estimates are displayed in Table ES-1.

Table ES-1. Savings Estimate Sources

Savings Estimate	Source
Lighting per unit energy savings	Lighting per unit savings were deemed by the Illinois Commerce Commission in the Order for docket 07-0539.
Air purifier per unit energy savings	Air purifier per unit savings were calculated using data supplied in the tracking database and the ENERGY STAR savings calculator assumptions.
Ceiling fan kit per unit energy savings	Ceiling fan kit (includes supplies to convert an existing ceiling fan to ENERGY STAR) per unit energy savings were calculated using data supplied in the tracking database and the ENERGY STAR savings calculator assumptions. Model numbers were used to find the wattage and number of CFLs supplied in the kit.
Ceiling fan with kit per unit energy savings	Ceiling fan with kit per unit energy savings were calculated using data supplied in the tracking database and the ENERGY STAR savings calculator assumptions. Model numbers were used to find the wattage and number of CFLs supplied in the kit.
Dehumidifier per unit energy savings	Dehumidifier per unit energy savings were calculated using data supplied in the tracking database and the ENERGY STAR savings calculator assumptions.
Room AC per unit energy savings	Room AC per unit energy savings were calculated using data supplied in the tracking database and the ENERGY STAR savings calculator assumptions.
NTG ratio - lighting	Memo, dated February 15, 2011, from The Cadmus Group and NMR Group to Karen Kansfield and Jennifer Hinman: Lighting NTG Addendum – Multistate Study, page 4. Results are based on primary data collected from consumers (n=92) and suppliers (n=10).
NTG ratio - appliances	Used the default assumptions based on limited secondary research available as discussed in the Lighting and Appliance Evaluation – PY2 Report, Dated December 2010, Revised June 2011, pages 22-23.
Lighting Installation Rate	Assumptions from the draft Statewide Technical Reference Manual (TRM)

In PY3, Ameren Illinois increased its CFL sales goals from just over 1 million in PY2 to over 3 million. Towards the end of the year, the goal increased even more, to 3.5 million CFLs. To reach these goals, additional store chains were recruited, including Walmart, Menards, and Lowe's. Incentive amounts were also increased to encourage sales. For example, a popular 4-pack was reduced to a retail price of $0.98 and an 8-pack to $1.86. The variety of CFLs also increased from about 147 different types in PY2 to over 300 in PY3.

Ameren Illinois discontinued its incentives for ceiling fans and ceiling fan kits due to low product availability and for dehumidifiers after determining they were not cost-effective. Sales reported in PY3 for ceiling fans are carry-over from PY2. Dehumidifiers were removed from the program in December 2010. Ameren Illinois continued offering incentives on room air conditioners and added incentives for air purifiers. To keep up with the additional stores, APT, one of the program implementation contractors, added an additional sales representative and increased the number of promotional events, from 36 in PY2 to 59 in PY3.

Table ES-2 summarizes program participation and gross savings for each measure in the program.

Table ES-2. Program Year 3 Gross Savings

Product	Total Quantity Sold	Realized Gross Energy Savings (MWh)	Realized Gross Demand Savings (kW)
Lighting	3,380,042	112,139	8,611
Air Purifier	492	281	176
Ceiling Fan Kit	44	5.3	0.34
Ceiling Fan with Kit	73	6.4	0.46
Dehumidifier	11,086	2,432	901
Room AC	6,300	722	556
PY3 Grand Total	3,398,037	115,586	10,245

Table ES-3 summarizes the program's *ex ante* gross savings, realized gross savings, and the realization rate, along with the net-to-gross (NTG) ratio and net energy and demand savings. Realized unit savings are slightly greater than *ex ante* savings because, similar to PY2, we assumed three percent of all CFLs are installed in non-residential facilities with longer hours of operation. Total Gross Realized Energy Savings are also adjusted to account for actual installations occurring over three years. As such, standard CFLs are adjusted to 69.5 percent, specialty CFLs are adjusted to 79.5 percent, and fixtures are adjusted to 87.5 percent of sales made in PY3.[1] Ameren Illinois had not updated the tracking database with new *ex ante* estimates following the PY2 evaluation, therefore realization rates reflect differences from initial program savings estimates rather than most recent estimates.

Table ES-3. *Ex Ante* Gross Savings, Realized Savings, and Net Savings

Measure	*Ex Ante* Gross Savings (MWh)	Realized Gross Savings (MWh)	Realization Rate	NTG Ratio	Net Energy Savings (MWh)	Net Demand Savings (kW)
Lighting	144,870	112,139	77.41%	0.83	93,075	7,147
Air Purifier	132	281	213.49%	0.760	214	134
Ceiling Fan Kit	3.5	5.3	151.43%	0.76	4.0	0.26
Ceiling Fan with Kit	5.8	6.4	110.34%	0.76	4.9	0.35
Dehumidifier	2,993	2,432	81.26%	0.760	1,848	685
Room AC	1,638	722	44.10%	0.760	549	422
PY3 Grand Total	149,643	115,586	77.24%	0.828	95,695	8,389

[1] Historically AIC evaluations adjusted for installation rate by assuming a discounted installation rate calculated by applying an algorithm to predict three-year installations assuming 98 percent are installed by the end of year 3. To meet the goal of assumptions consistency with other utilities in the state, AIC is changing the approach to comply with the Statewide TRM assumptions in this PY3.

Program sales increased during PY3, as shown in Table ES-4. A total of 3,380,042 CFLs and 17,995 other products were sold in PY3, a 235 percent increase from the previous year.

Table ES-4. L&A Program Sales

Products	PY1 Quantity Sold	PY2 Quantity Sold	PY3 Quantity Sold	% Change from PY2
CFLs	815,403	1,004,338	3,380,042	237%
Other Products	-	11,152	17,995	61%
Total Number of Products	815,403	1,015,490	3,398,037	235%

Recommendations

Cadmus recommends making some improvements to the data tracking system for future program years:

- Add the expected *ex ante* values into gross and net kW fields,
- Round *ex ante* savings values consistently,
- Include per unit energy and incentives estimates and the formulas used to calculate savings in the database,
- Incorporate most recent evaluated savings into the ex ante estimates for the following program year, and
- Include appliance-specific size information in tracking database.

Other recommendations that carry over from the PY2 evaluation include the following:

- Continue working with retailers and manufacturers to facilitate evaluation data collection, and
- Promote proper disposal of CFLs.

2. Introduction

Program Description

The Residential Lighting and Appliance Program encourages the purchase of high-efficiency lighting products, such as compact fluorescent lamps (CFLs), and ENERGY STAR®-rated air purifiers, dehumidifiers, ceiling fan kits, and room air conditioners. The lighting portion of the program is implemented through upstream mark-downs to manufacturers and is marketed through retail stores at the customer's point-of-purchase (POP) and an online store that sells discounted CFLs. A variety of lights are discounted through the program, with an average incentive of $1.13 for standard, twister-type CFLs and $1.62 for specialty bulbs (such as flood lights, candelabra base, three-way bulbs), as shown in Table 1. The appliance portion of the program is incented through mail-in rebates in the amounts listed in Table 1.

Table 1. Incentive Amounts

Appliance Type	Incentive
Standard Lighting (average)	$1.13
Speciality Lighting (average)	$1.62
Air Purifier	$20.00
Ceiling Fan Kit	$20.00
Ceiling Fan with Kit	$20.00
Dehumidifier	$25.00
Room Air Conditioner	$35.00

This report covers the program's third year (PY3).

Ameren Illinois launched the program with only CFLs in August 2008 and quickly ramped up to sell CFLs through 122 retail outlets and an online retailer. Since then, Ameren Illinois has added more stores, and it now has approximately 396 participating CFL retailers and 231 participating appliance retailers. The program also provides branded Point of Purchase (POP) materials and customer and retailer education materials, offers in-store customer educational events, and trains retail sales staff. The Company offers general advertising through billboards, television and radio ads, and bill stuffers.

Ameren Illinois hired Conservation Services Group (CSG) as its overall implementation contractor for the residential program portfolio, including for the lighting and appliance (L&A) program. In turn, CSG subcontracted some of the L&A program activities to APT and Energy Federation Incorporated (EFI). APT's responsibilities include all program fieldwork:

- Negotiating memoranda of understanding (MOU's) with retailers and manufacturers;
- Training retail store employees;
- Developing POP materials and ensuring proper placement in retail stores;
- Monitoring and adjusting the MOUs; and
- Conducting lighting clinics for retail store customers.

EFI runs the CFL catalog and Internet order fulfillment process, reviews and pays qualified rebates, and tracks and pays incentives to manufacturers on CSG's behalf.

In PY3, Ameren Illinois increased its CFL sales goals from just over 1 million sold in PY2 to over 3 million. Towards the end of the year, the goal increased even more, to 3.5 million CFLs. To reach these goals, additional store chains were recruited, including Walmart, Menards, and Lowe's. Incentive amounts were also increased to encourage sales. For example, a popular 4-pack was reduced to a retail price of $0.98 and an 8-pack to $1.86. The variety of CFLs available through the program also increased from about 147 different types in PY2 to over 300 in PY3.

Ameren Illinois discontinued its incentives for ceiling fans and ceiling fan kits due to low product availability and for dehumidifiers after determining they were not cost-effective. Sales reported in PY3 for ceiling fans are carry-over from PY2. Dehumidifiers were removed from the program in December 2010. Ameren Illinois continued offering incentives on room air conditioners and added incentives for air purifiers. To keep up with the additional stores participating in the program, APT added an additional sales representative and increased the number of promotional events from 36 in PY2 to 59 in PY3.

3. Evaluation Methods

Tracking Database Analysis

CSG tracks retail sales of incented CFLs in a database. Data from rebate applications for appliances are also tracked. These files tie payment requests to identified transactions and track the following:

- Program activity by product or product type
- Program activity on an aggregated basis of products rebated and dollars spent
- Program activity by various identified components (e.g., by product, by store chain, by manufacturer, by month)
- Ameren Illinois' estimated energy and demand savings

Cadmus reviewed the energy and demand savings assumptions in the database and summarized and analyzed the transactions to compute relevant totals for PY3.

Engineering Estimate of Appliance Savings

During PY2, Cadmus developed engineering estimates for room air conditioners, dehumidifiers, and ceiling fan kits using the ENERGY STAR calculators and were updated with PY3 specific purchase data for PY3. The new air purifier appliance measure for PY3 was developed in a similar manner.

Data Sources

The following data sources informed the impact and process evaluation:

- Final PY3 program database (provided by CSG)
- Information gathered through program manager interview
- PY1 and PY2 reports and analysis
- ENERGY STAR savings calculators

4. Program Results

Impact Findings

Impact evaluation findings are presented in the following four subsections, with each covering lighting and appliances separately:

1. Per unit savings
2. Summary of program sales
3. Determination of gross savings
4. Determination of net savings

Per Unit Savings

Lighting

Lighting per unit savings were deemed by the Illinois Commerce Commission in the Order for docket 07-0539. These estimates were included in Ameren Illinois' tracking database, and therefore *ex ante* gross savings are the sum of those per unit savings for program bulbs sold.

As discussed in the PY2[2] report, we assumed that 3 percent of all CFLs sold through the program were purchased for non-residential buildings. The hours of use assumed for a commercial building is 3724 per year, or approximately 10 hours per day, using deemed savings estimates for small commercial buildings from the Order for docket 07-0539.

Coincidence Factor. Cadmus applied the same coincidence factor as that developed in the PY1 cost effectiveness evaluation. The lighting coincidence factor is 0.000056[3] kW/kWh saved for the residential bulbs sold. To calculate the peak demand savings for the non-residential CFLs, we multiplied delta watts by a coincident peak factor of 0.86 kW-peak/kW.[4]

Table 2 summarizes per unit gross *ex ante* kWh and kW savings for the lighting portion of the program.

Table 2. Lighting per-Unit Savings Estimates

Measure	Per Unit Energy Savings (kWh)	Per Unit Demand Savings (kW)
Lighting - Residential	42.9	0.002
Lighting - Non-Residential	186.9	0.043

[2] L&A Program Addendum # 3, May 10, 2011, memo from Jane Colby to Karen Kansfield and Jennifer Hinman.
[3] The Cadmus Group: Ameren Illinois Utilities Portfolio Cost Effectiveness Evaluation, December 30, 2009
[4] L&A Program Addendum # 3, May 10, 2011, memo from Jane Colby to Karen Kansfield and Jennifer Hinman.

Appliances

Cadmus independently estimated energy savings for each type of appliance and multiplied each estimate by the number of units sold through the rebate program. We applied the per unit energy realization rate to the demand estimates of impacts to determine realized demand impacts.

Air Purifier. Gross per unit energy savings for ENERGY STAR room air purifiers were determined through an engineering analysis based on the ENERGY STAR savings calculator for room air purifiers.[5] The average clean air delivery rates (CADR) were calculated from the dust, tobacco smoke, and pollen CADR values claimed in the tracking database. These average CADRs were used to the proportion of units sold in each air purifier size. The average ENERGY STAR and baseline consumption were computed by the ENERGY STAR calculator. We then calculated the savings between the two sizes assumption 8,760 hours of use per year. Table 3 shows estimated per unit savings for each CADR size sold through the program. Overall savings were then calculated by weighting the savings of each CADR size, according to weights shown in Table 3, by the proportion of units sold. We applied the per unit energy realization rate to the demand estimates of impacts to determine realized demand impacts. Results are provided in Table 4.

Table 3. Per Unit Gross Savings and Weights by CADR for Air Purifiers

CADR	51-100 CFM	101-150 CFM	151-200 CFM	201-250 CFM	Over 250 CFM
Energy Savings	267.5	524.5	713.5	901.5	436.5*
Weights	15%	25%	25%	15%	20%

*While this value may appear out of line compared to the others, it is a computation based on the difference between the federal standard efficiency and ENERGY STAR standard efficiency, which has a lower savings spread than other air purifiers.

Table 4. Per Unit Gross Savings for Air Purifiers

Appliance	Per Unit Gross Energy Savings (kWh/Year)	Per Unit Gross Coincident Demand Savings (kW)
Air Purifier	572.2	0.359

Air Conditioner Savings. Gross per unit energy savings for ENERGY STAR room air conditioners were determined using the same approach as that used in the PY2 analysis based on the ENERGY STAR savings calculator .[6] Using Peoria, Illinois, as a reference city, energy savings were based on a full year of energy consumption with full load cooling hours of 948. The PY3 tracking system showed the average purchased EER value from the program was 10.57, replacing a standard efficiency of 9.57 EER, and average unit size was 11,994 BTU/hr. The per unit energy and peak demand savings are shown in Table 5.

[5] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=RAC

[6] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=AC

Table 5. Per Unit Gross Savings for Room Air Conditioners

Appliance	Per Unit Gross Energy Savings (kWh/Year)	Per Unit Gross Coincident Demand Savings (kW)
Room Air Conditioner	114.7	0.088

Dehumidifier Savings. Gross per unit energy savings for ENERGY STAR dehumidifiers were determined through an engineering analysis based on the ENERGY STAR savings calculator for dehumidifiers, as described in the PY2 report.[7] Savings calculations assumed a full year of energy consumption with operating hours of 1,620. The calculator assumed an ENERGY STAR dehumidifier replaced a standard dehumidifier. The ENERGY STAR savings calculator evaluates multiple capacity ranges for dehumidifiers, ranging from 1-25 pints per day to 75-185 pints per day. An energy savings result for each specific size was calculated and weights were used to determine one gross savings estimate. The per unit gross energy savings and weights based on actual program purchases are shown in Table 6.

Table 6. Per Unit Gross Savings and Weights by Size for Dehumidifiers

Size	1-25 Pints/Day	25-35 Pints/Day	35-45 Pints/Day	45-54 Pints/Day	54-75 Pints/Day	75-185 Pints/Day
Energy Savings	71	125	254	317	208*	552
Weights	6.1%	20.7%	22.0%	18.3%	30.5%	2.4%

*While this value may appear out of line compared to the others, it is a computation based on the difference between the federal standard efficiency and ENERGY STAR standard efficiency, which has a lower spread than other dehumidifier size categories.

We applied the per unit energy realization rate to the demand estimates of impacts to determine realized demand impacts. The energy and peak demand savings are shown in Table 7.

Table 7. Per Unit Gross Savings for Dehumidifiers

Appliance	Per Unit Gross Energy Savings (kWh/Year)	Per Unit Gross Coincident Demand Savings (kW)
Dehumidifier	219.4	0.081

Ceiling Fan Savings. Ceiling fan savings estimates were prepared the same way they were in the PY2 evaluation. Gross per unit energy savings for ENERGY STAR ceiling fans were determined through an engineering analysis based on the ENERGY STAR savings calculator for ceiling fans.[8] Using East North Central[9] as a reference area, energy savings were assumed to be based on a full year of energy consumption, accounting for both ceiling fan operation (more efficient

[7] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DE

[8] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CF

[9] The website http://certs.lbl.gov/pdf/lbnl1092e-puc-reliability-data.pdf indicates Ameren Illinois territory is in the East North Central region.

blades and motors) and lighting upgrades. Based on actual program purchases, Cadmus calculated the ENERGY STAR ceiling fan kit to have an average of 1.90 light bulbs and a CFL wattage of 19.1 watts. The ENERGY STAR ceiling fan with kit was found to have an average of 1.47 light bulbs and a CFL wattage of 16.8 watts. The assumed baseline wattages were chosen using the mapping shown below in Table 8.

Table 8. Ceiling Fan Baseline Wattages

CFL Wattage	Baseline Wattage
13	40
14	60
18	75
22	100
26	100
30	150

The peak demand savings were based on Ameren Illinois' original peak demand savings.[10] We applied the per unit energy realization rate to the demand estimates of impacts to determine realized demand impacts. The energy and peak demand savings are shown in Table 9.

Table 9. Per Unit Gross Savings for Ceiling Fans

Appliance	Per Unit Gross Energy Savings (kWh/Year)	Per Unit Gross Coincident Demand Savings (kW)
Ceiling Fan Kit	136.4	0.010
Ceiling Fan with Kit	100.8	0.008

Table 10 summarizes per unit kWh and kW savings for each measure.

Table 10. Per Unit kW and kWh Gross Savings by Measure

Measure	Per Unit Energy Savings (kWh)	Per Unit Demand Savings (kW)
Lighting - Residential	42.9	0.002
Lighting - Non-Residential	186.9	0.043
Air Purifier	572.2	0.359
Ceiling Fan Kit	136.4	0.010
Ceiling Fan with Kit	100.8	0.008
Dehumidifier	219.4	0.081
Room Air Conditioner	114.7	0.088

[10] Ameren EE DR Plan Appendices 11.15.07

Summary of Program Sales

Lighting

Total program sales amounted to 3,380,042 CFLs: 3,483 through the online stores and 3,376,559 through retailers. Program sales took place through 396 different retailers throughout Ameren Illinois' service territory. Table 11 summarizes the number of CFLs sold and incentives paid through the different retail channels.

Table 11. CFLs Sold and Incentives Paid by Retail Channel

Store	Qty Sold	Incentives $
Consumer Electronics	1,002	$1,112
Drug Store	6,916	$7,134
Farm Supply	7,128	$7,671
Grocery Store	14,787	$15,605
Dollar Stores	58,434	$79,255
Hardware Store	60,452	$71,184
DIY Big Box	1,411,629	$1,558,489
Warehouse	1,816,211	$2,208,277
Total	3,376,559	$3,948,728

Of the many types of CFLs sold through the program, the three top selling models from June 2010 through May, 011 were GE's 13 watt eight-packs (594,640 bulbs or 74,330 packs sold); BE's 13 watt, L13T6/27K six-packs (343,908 bulbs or 57,318 packs sold); and FEIT's 13 watt mini ESL13T/3/ECO three-packs (279,738 bulbs or 93,246 packs sold). See Figure 1.

Figure 1. Top Ten Selling Program Bulbs

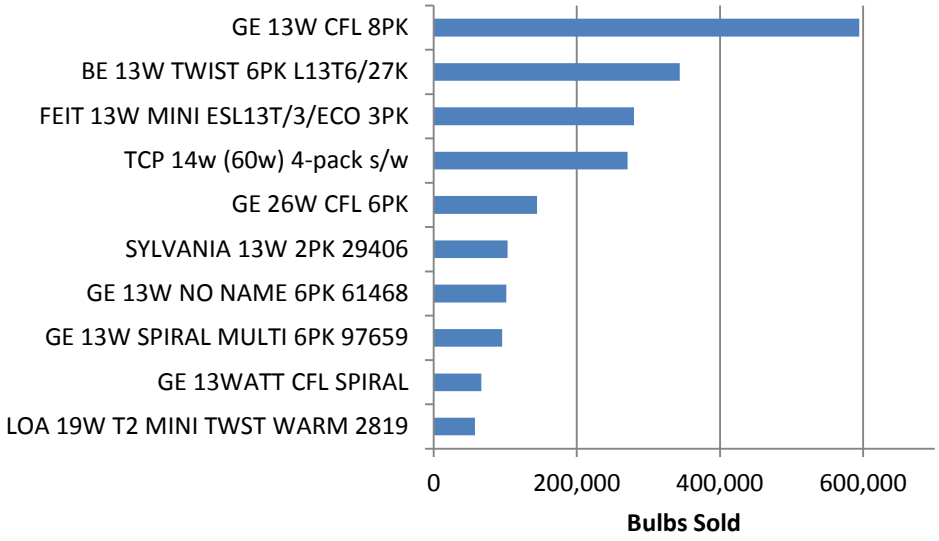


Figure 2 shows program CFL sales by month. Sales were relatively slow through September 2010, then picked up towards the end of 2010 and dropped again after February 2011. According

to program staff, Ameren Illinois focused its promotional efforts between October and January, when lighting sales already tend to be higher. Ameren Illinois also increased its promotional efforts again in May to support a decision to increase the goals for this program. Figure 3 shows the program's cumulative CFL sales.

Figure 2. CFL Sales by Program Month

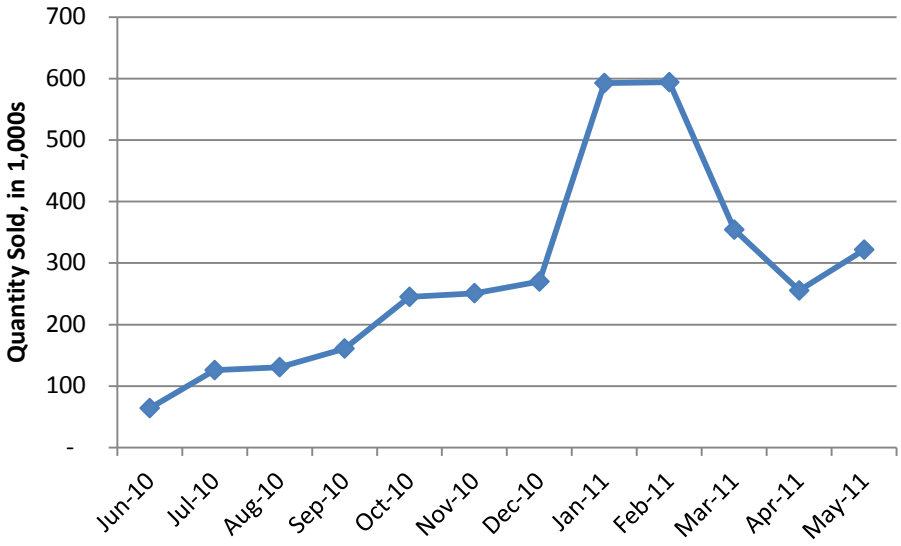
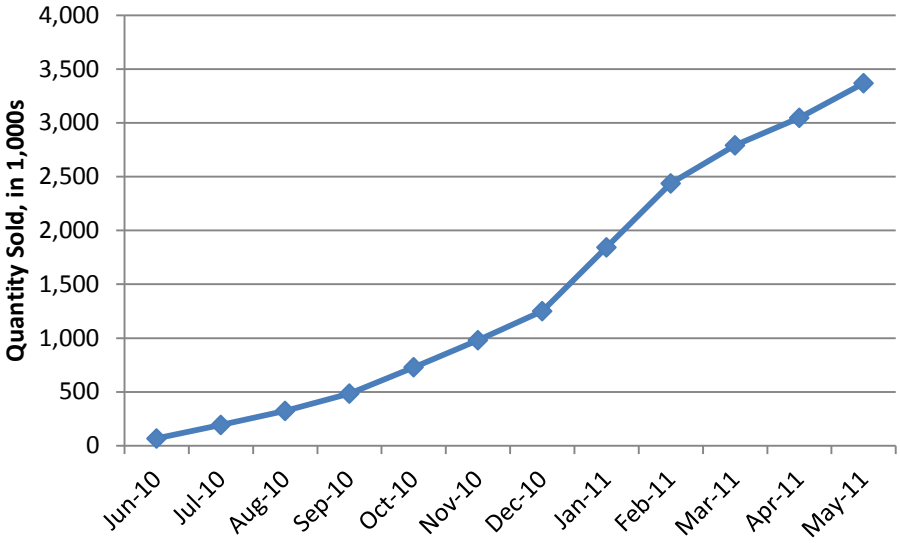


Figure 3. CFL Sales by Program Month (Cumulative)



As shown in Table 12, the majority of bulbs sold though the program were standard bulbs, which included A-line covered spirals as well as bare spirals.[11] A total of 3,113,064 standard bulbs were sold, which accounts for approximately 92 percent of total bulb sales during the PY3 program year. Specialty bulbs accounted for approximately 8 percent of bulb sales for the program year, but represented a larger portion, 11 percent, of total incentives.

Table 12. Standard and Specialty Bulb Sales

Bulb Type	Qty Sold	Incentives $
Standard Bulbs	3,113,064	$3,523,595
Specialty Bulbs	266,978	$431,715
Grand Total	3,380,042	$3,955,310

Since the specialty bulb category encompasses a wide variety of bulb types, it is interesting to note the proportions within the specialty bulb grouping. Flood lights and spotlights account for 68 percent of total specialty bulb sales. Candelabra and globe-shaped bulbs represent the second largest categories, combined accounting for approximately 24.5 percent of specialty bulb sales. The remaining bulb types collectively represent only 0.7 percent of all bulb sales. The incentive percentages by bulb type are proportionately very similar to the bulb quantity percentages, see Table 13.

Table 4. Specialty Bulb Sales by Bulb Type

Specialty Bulb Type	Qty Sold	% of Total Bulbs	Incentives $	% of Total Incentives
Bug Lights	31	0.001%	$62	0.002%
Pin-Based (GU24) Bulbs	524	0.016%	$786	0.020%
Dimmable Bulbs	7,776	0.23%	$12,059	0.30%
3-Way Bulbs	10,835	0.32%	$14,116	0.36%
Globe Bulbs	30,579	0.90%	$46,025	1.16%
Candelabra Bulbs	34,765	1.03%	$48,799	1.23%
Flood Lights and Spotlights	182,468	5.40%	$309,869	7.83%
Grand Total	266,978	7.90%	$431,715	10.91%

Appliances

The total number of units sold through the program equaled 17,995 in PY3. Table 14 summarizes the number of appliances sold and amount of incentives paid by appliance type. Dehumidifiers were the best-selling appliance.

Table 5. Appliances Sold and Incentives Paid

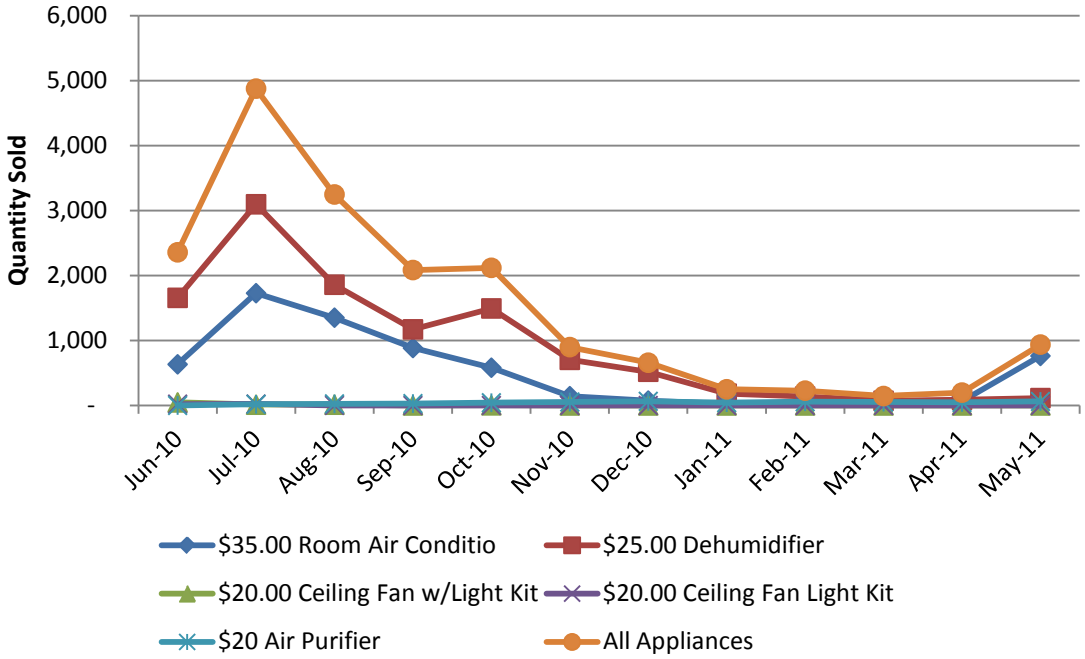
Appliance/Incentive	Qty Sold	Incentives $

[11] While A-lines should be considered a specialty product, Ameren Illinois did not track bulbs by standard or specialty and Cadmus reviewed bulb descriptions to allocate between standard and specialty. It is not always apparent from the tracking database description whether a bulb is A-line or bare spiral, therefore A-lines and base spirals are categorized together.

Ceiling Fan Light Kit[12]/$20	117	$2,340
Air Purifier/$20	492	$9,840
Room Air Conditioner/$35	6,300	$220,500
Dehumidifier/$25	11,086	$277,150
Grand Total	17,995	$509,830

Figure 4 shows appliance sales by program month. Overall, sales decreased from July 2010 through January 2011. In April 2010, sales noticeably increased for room AC. These sales patterns follow expectations, as sales of these appliances are largely weather-driven.

Figure 4. Appliance Sales by Program Month



Determination of Gross Savings

Lighting

Gross savings for lighting are determined from the following inputs:

- Average per unit energy and demand savings
- Number of product sales
- Installation rate

[12] Includes both the ceiling fan kit and ceiling fan with kit measures

Per unit energy and demand savings, as well as product sales, were discussed in the previous two sections. For PY3 Cadmus applied agreed-upon Statewide TRM installation rate of 69.5 percent for standard CFLs, 79.5 percent for specialty CFLs and 87.5 percent for fixtures.[13]

Appliances

Gross savings for appliances are determined from the following inputs:

- Average per unit energy and demand savings
- Number of product sales

Realized gross energy savings are equal to per unit energy savings multiplied by the number of products sold and by the installation rate. Table 15 shows the gross energy and demand savings for the program.

Table 6. Gross Energy and Demand Savings by Measure

Measure	Number Sold	Gross Per Unit Energy Savings (kWh)	Gross Per Unit Demand Savings (kW)	Realized Gross Energy Saved (kWh)	Realized Gross Demand Saved (kW)
Lighting	3,380,042	47.2	0.004	112,139*	8,611*
Air Purifier	492	572.2	0.359	281,498	176
Ceiling Fan Kit	44	136.4	0.010	5.3*	0.34*
Ceiling Fan with Kit	73	100.8	0.008	6.4*	0.46*
Dehumidifier	11,086	219.4	0.081	2,432,160	901
Room Air Conditioner	6,300	114.7	0.088	722,347	556
Grand Total	3,398,037			115,586	10,245

* per unit gross × number sold × installation rate

Determination of Net Savings

Lighting

In PY2 Cadmus estimated the NTG ratio for the lighting program to be 0.83 based on an average of the multistate statistical model and supplier interviews. Cadmus applied this same value for PY3. [14]

Appliances

In PY2 Cadmus applied Ameren Illinois' original default estimate of 0.76 for each appliance NTG ratio. Since appliances and fixtures are still a relatively small amount of the overall savings associated with the program, we have not performed specific research to evaluate NTG;

[13] The remaining amounts of CFLs and fixtures sold in PY3 (with the exception of the 2 percent assumed to never be installed) will be accounted for in PY5 and PY6 results.

[14] Memo, dated February 15, 2011, from The Cadmus Group and NMR Group to Karen Kansfield and Jennifer Hinman: Lighting NTG Addendum – Multistate Study, page 4.

therefore, we used the PY2 value again in PY3.[15] Table 16 reports *ex ante* savings, realized savings and net savings for the program. *Ex ante* savings were based on Ameren Illinois' original savings estimates for each product type as Ameren Illinois did not update the PY3 tracking database *ex ante* values with PY2 results.

[15] Lighting and Appliance Evaluation – PY2, Dated December 2010, Revised June 2011, pages 22-23.

Table 7. *Ex Ante* Gross Savings, Realized Savings, and Net Savings

Measure	*Ex Ante* Gross Savings (MWh)	Realized Gross Savings (MWh)	Realization Rate	NTG Ratio	Net Savings (MWh)	Net Savings (kW)
Lighting	144,870	112,139	77.41%	0.830	93,075	7,147
Air Purifier	132	281	213.49%	0.760	214	134
Ceiling Fan Kit	3.5	5.3	151.43%	0.760	4	0.26
Ceiling Fan with Kit	5.8	6.4	110.34%	0.760	5	0.35
Dehumidifier	2,993	2,432	81.26%	0.760	1,848	685
Room AC	1,638	722	44.10%	0.760	549	422
PY3 Grand Total	149,643	115,586	77.24%	0.828	95,695	8,389

Over the three years the program has been in effect, Ameren Illinois CFL and appliance sales have increased considerably. Table 17 shows the program participation and gross savings for each year in the three- year period. Figures 5 and 6 illustrate the program trends over the three-year period.

Table 8. Three Year Program Results

Measure	Number of Units Sold			Gross Energy Savings (MWh)		
	PY1	PY2	PY3	PY1	PY2	PY3
Lighting	815,403	1,004,338	3,380,042	32,631	38,452	112,139
Air Purifier	-	-	492	-	-	281
Ceiling Fan Kit	-	236	44	-	20.5	5.3
Ceiling Fan with Kit	-	-	73	-	-	6.4
Dehumidifier	-	8,994	11,086	-	1,709	2,432
Room AC	-	1,922	6,300	-	173	722
Grand Total	815,403	1,015,490	3,398,037	32,631	40,350	115,586

Figure 5. Sales by Program Year

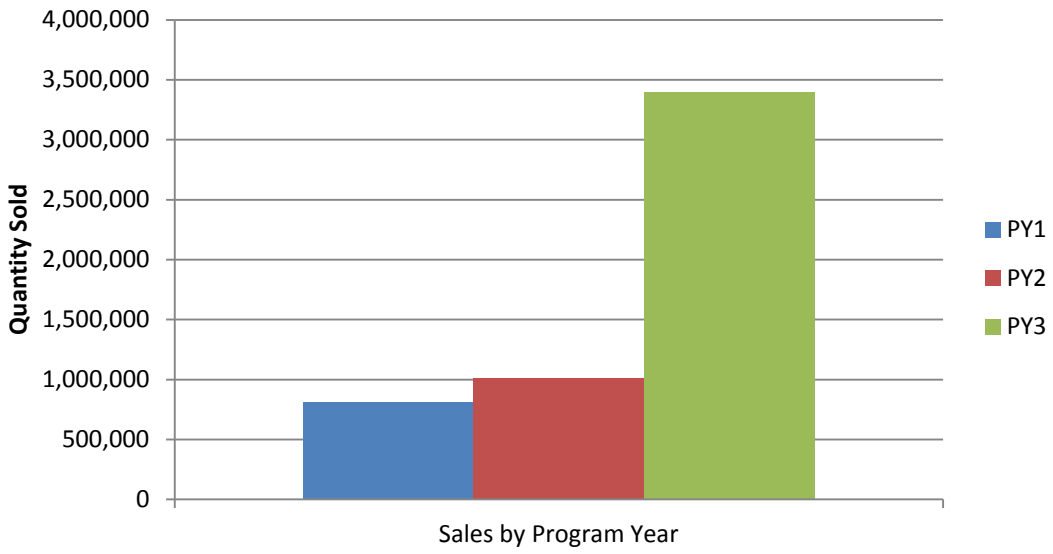
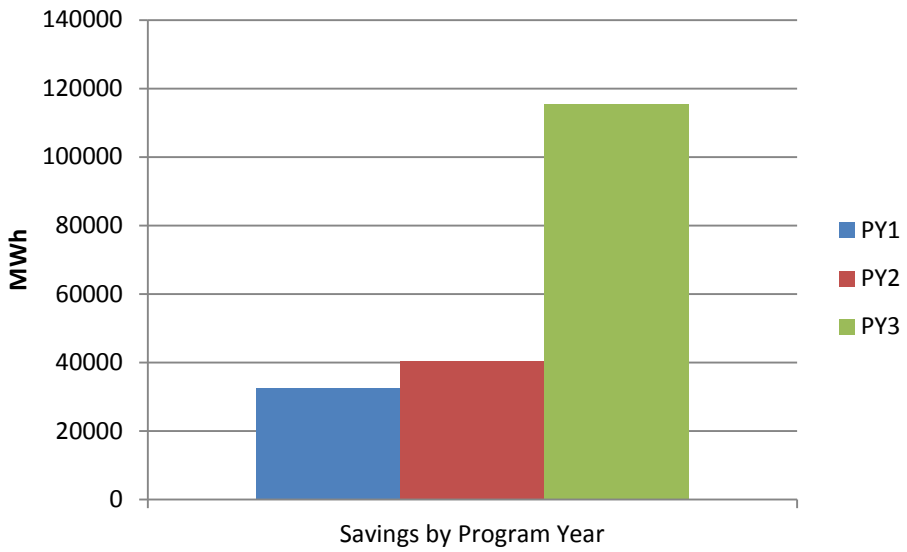


Figure 6. Energy Savings by Program Year



Process Findings

Tracking Database

When Cadmus summarized program savings from the tracking database in PY3, we found tracking issues that could be improved upon for future years:

- Columns for gross and net kW are included in the database, yet contain whole numbers ranging from zero to twenty, (kW savings are typically between zero and one for each CFL sold. Cadmus did not use this information, but applied the coincidence factor developed during the PY1 evaluation. The formula used to populate these cells should be reviewed and updated with the recommended coincidence factor.
- Cadmus suggests including per unit kWh and kW columns in the tracking database for both gross and net savings. Cadmus estimated the per unit values based on the total kWh for each entry. These additional columns will help catch any calculation issues that could occur when computing total savings. Cadmus also suggests including a per unit incentive column in the tracking database.
- The tracking database savings per measure were inconsistently rounded. Some were rounded to whole numbers, others to the hundredth decimal places or other variations. Cadmus suggests rounding kWh savings to the tenth decimal and kW savings to the thousandth to avoid this issue in the future. If this rounding method has a significant impact on program results, then make sure each measure always has the same savings in the tracking database.
- To validate lighting savings, Cadmus was supplied with Ameren Illinois' mapping of CFL wattages to assumed baseline wattages. Four of the measure savings found in the tracking database were not found in this supplied document. Cadmus recommends including wattages and specific per unit savings formulas in the database for clarity.
- While the PY2 evaluation found significant variation between *ex ante* and realized savings estimates of appliances, the new estimates were not updated in the PY3 tracking database. Cadmus recommends updating new *ex ante* values after each program evaluation to facilitate future reviews. When discussing this issue Ameren Illinois, we learned the updates were made after the program year ended, as implementers were waiting to ensure savings numbers were final.

Stakeholders Interview

Cadmus interviewed an Ameren Illinois and APT program manager as part of the PY3 evaluation. Both representatives were pleased with the program's ability to nearly meet the challenge of the significantly larger sales goals for the year. They met this challenge by adding stores as program partners, adding lighting measures, and selectively increasing incentives. The interviewees noted they could see significant changes in sales whenever they changed the incentive amounts. If one store chain had the best prices on CFLs, sales in those stores would increase while others would decrease.

Over the three-year period, the program has seen turnover in the implementation staff at CSG, overall program implementer, but the APT and Ameren Illinois staff were unchanged. They felt some of their success was due to the relationship formed between them.

We asked how the PY2 evaluation recommendations had been addressed during PY3. Table 18 lists PY2 recommendations and reports on their current status.

Table 18. PY2 Recommendations and Outcomes

Recommendation	Status
Incorporate evaluation requirements into retailer/manufacturer MOUs.	APT discussed evaluation requirements with several large corporate retailers who agreed to assist in responding to surveys for evaluation.
Continue focusing on consumer education	Focused on educating customers about specialty bulbs.
Hire additional field staff for store education events	Hired one additional representative and increased events from 36 to 59 for the year.
Improve visibility of store marketing materials	Added more color to POP signs.
Continue to promote proper disposal of CFLs, and consider offering a discount on fufure CFL purchases coupon for customers who recycle their CFLs at a local participating retailer.	According to the program manager, since cost recovery for recycling efforts is not allowed, and a grant previously secured has expired, Ameren Illinois has reduced its efforts to educate and provide opportunities for store recycling. However, some retailers still provide recycling opportunities.
Expand the appliance program.	An additional appliance was added in PY3; however, two were eliminated due to cost-effectiveness concerns.
Track appliance-specific data in database	These data were not readily available in PY3, similar to PY2. They were separately provided by EFI through model lookups, but were not available for every rebate paid.

Recommendations from Stakeholder Interviews

While some recommendations from PY2 were addressed, not all were. As such, Cadmus recommends Ameren Illinois continue to pursue the remaining recommendations from PY2:

Incorporate evaluation requirements into corporate retailer/manufacturer MOUs: While APT met with a number of large corporate retailers and obtained cooperation in responding to surveys, they were not successful in revising MOUs. Other future evaluation approaches could also include customer intercepts and shelf surveys, which retailers typically resist pointing to a "no solicitation" policies. We recommend Ameren Illinois and APT continue to educate retailers on the need to cooperate with evaluation data needs to help reduce evaluation costs and improve accuracy of results.

Ameren Illinois should continue to promote proper disposal of CFLs, and consider offering a discount coupon for future CFL purchases for customers who recycle their CFLs at a local participating retailer. By finding creative ways to encourage more recycling, Ameren Illinois can reduce the barriers to CFL purchase among those concerned about mercury.

Track appliance-specific data in database. As in PY2, Cadmus separately requested specifics on appliances sold through EFI, which performed model lookups. As this program grows, it will streamline evaluations if the information is all easily available.

Date: April 24, 2012

To: Karen Kansfield, Ameren Illinois Company

From: Jane Colby, The Cadmus Group, Inc.

Re: Addendum to PY3 Residential Lighting and Appliances Report

This memorandum is an addendum to the PY3 Residential Lighting and Appliances (L&A) Report with updated gross and net savings results. Ameren Illinois Company has been participating in discussions, driven by the preparation of a statewide technical resource manual (TRM), regarding the appropriate installation rate assumptions to be used for residential lighting programs in upcoming program evaluations. The group working on this TRM has agreed to assume that light bulb installations take place over a three-year period, according to the installation rates in Table 1.

Table 1. TRM Residential CFL Installation Assumptions

	Weighted Average ISR			
	1st Year	2nd Year	3rd Year	Final
Standard CFLs	69.5%	15.4%	13.1%	98.0%
Specialty CFLs	79.5%	10.0%	8.5%	98.0%
Fixtures	87.5%	5.7%	4.8%	98.0%
Direct Install	96.9%			

Because AIC's Plan 1 evaluations utilized different assumptions than what the TRM will use—assumptions that counted essentially all lighting installations to occur in the year purchased (on a discounted basis)—AIC will incur a three-year transition period in which assumed savings are lower than planned, followed by years in which savings are higher than planned. AIC has determined that changing its assumptions for PY3 is preferable to waiting until PY4 or PY5, as this earlier implementation will minimize the impact going forward. The remainder of the memo summarizes these revisions to the PY3 L&A Report results and savings.

Table 2 details the calculations for lighting measures according to the TRM installation rate assumptions in Table 1.

Table 2. New Lighting Measure Savings Estimates

	Quantity	Gross Per-unit kWh	Gross MWh Total	NTG	Net MWh	1st Year	2nd Year	3rd Year	Final
Standard	3,113,064	47.2	146,937	0.83	121,957	84,760	18,781	15,976	119,518
Specialty	266,978	47.2	12,601	0.83	10,459	8,315	832	70.7	69.3
Fixtures – Ceiling Fan Kit	44	136.4	6.0	0.76	4.6	4.0	0.3	0.22	4.47
Fixtures – Ceiling Fan w/Kit	73	100.8	7.4	0.76	5.6	4.89	0.32	0.27	5.48
Total						93,084	19,614	16,047	119,597

Based on the calculations in Table 2, Table 3 shows the original and revised estimates for each of these measures and the PY3 program total.

Table 3. Original and Revised Savings Estimates

Measure	Original Realized Gross Savings (MWh)	Revised Realized Gross Savings (MWh)	Original Net Energy Savings (MWh)	Revised Net Energy Savings (MWh)	Original Net Demand Savings (kW)	Revised Net Demand Savings (kW)
Lighting	149,429	112,139	124,026	93,075	9,542	7,147
Air Purifier*	281	281	214	214	134	134
Ceiling Fan Kit	6.0	5.3	4.6	4.0	0.3	0.26
Ceiling Fan w/Kit	7.4	6.4	5.6	4.9	0.4	0.35
Dehumidifier*	2,432	2,432	1,848	1,848	685	685
Room AC*	722	722	549	549	422	422
PY3 Grand Total	152,877	115,586	126,647	95,695	10,784	8,389

* Air purifiers, dehumidifiers, and room AC's have no changes based on the TRM installation rate assumptions.

Table 4 shows the amount of savings that should be carried over for PY4 and PY5 from the PY3 installations.

Table 4. PY5 and PY6 Carryover Savings

	PY4 Carryover			PY5 Carryover		
	Gross Energy Saved (MWh)	Net Energy Saved (MWh)	Net Demand (kW)	Gross Energy Saved (MWh)	Net Energy Saved (MWh)	Net Demand (kW)
Standard	22,628	18,781	1,918	19,249	15,976	1,631
Specialty	1,260	1,046	107	1,071	889	91
Fixtures - Ceiling Fan Kit	0.34	0.26	0.03	0.34	0.22	0.02
Fixtures - Ceiling Fan w/Kit	0.42	0.32	0.03	0.35	0.27	0.03
Total	23,889	19,828	2,025	20,321	16,866	1,722