NAVIGANT

Residential ENERGY STAR® Lighting PY6 Evaluation Report

Final

Energy Efficiency/Demand Response Plan: Plan Year 6 (6/1/2013-5/31/2014)

Presented to Commonwealth Edison Company

February 16, 2015

Prepared by:

Amy Buege
Itron, Consulting and Analysis

Vanessa Arent
Itron, Consulting and Analysis

Itron

Opinion Dynamics

MichaelsEnergy

www.navigant.com

NAVIGANT

Submitted to:

Commonwealth Edison Company
Three Lincoln Centre
Oakbrook Terrace, IL 60181

Submitted by:

Navigant Consulting, Inc.
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606

Contact:

Randy Gunn, Managing Director
312.583.5714
Randy.Gunn@Navigant.com

Jeff Erickson, Director
608.497.2322
Jeff.Erickson@Navigant.com

NAVIGANT

Table of Contents

NAVIGANT

List of Figures and Tables

Figures:

Tables:

NAVIGANT

Executive Summary

This report presents a summary of the findings and results from Navigant Consulting, Inc.'s (Navigant's) impact and process evaluation of the Residential ENERGY STAR® (ES) Lighting program's sixth program year (PY6).[1] The main goal of this Residential lighting program is to increase the market penetration of energy-efficient lighting within the Commonwealth Edison Company's (ComEd's) service territory by offering incentives for bulbs purchased through various retail channels. The program also seeks to increase customer awareness and acceptance of energy-efficient lighting technologies, as well as proper bulb disposal, through the distribution of educational materials. In PY6, the Residential ES Lighting program offered incentives for the purchase of standard and specialty compact fluorescent lamps (CFLs).[2]

E.1 Program Savings

Table E-1 summarizes the gross and net electricity savings from the ComEd PY6 Residential ES Lighting program, including the carryover savings resulting from bulbs sold in PY4 and PY5 that are installed in PY6. As this table shows, the total verified net energy savings including carryover and bulbs attributable to both the Energy Efficiency Portfolio Standard (EEPS) and the Illinois Power Agency (IPA) portfolios, is 320,135 megawatt-hours (MWh).[3] Table E-2 and Table E-3 separate the overall PY6 Residential ES Lighting program savings into the portions attributable to the EEPS and IPA portfolios. These two tables do not include PY6 carryover savings (savings from bulbs purchased during PY4 and PY5 that are installed in PY6). PY6 carryover savings are presented in Table E-4, Table E-5, and Table E-6.

Table E-1. PY6 Residential ES Lighting Program Electric Savings – Total PY6 Incentivized

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Program Savings[4]	537,555	n/a	n/a
Verified Gross Program Savings	421,032	351.9	50.2
Verified Net Program Savings	224,950	188.0	26.8
Verified Net Carryover Savings	95,185	79.1	10.4
Verified Total PY6 Net Savings	320,135	267.1	37.1

Source: ComEd tracking data and evaluation team analysis

[1] PY6 began June 1, 2013, and ended May 31, 2014.

[2] LEDs and CFL/LED fixtures were offered in PY5 but were not offered in PY6. LED bulbs have been reintroduced to the program in PY7.

[3] Eighty-seven percent of total net savings is attributable to the EEPS portfolio (279,203 MWh) and the remaining 13 percent is attributable to the IPA portfolio (40,931 MWh).

[4] The ex ante gross savings estimates shown in this table and the following EEPS and IPA tables have not been adjusted by the gross realization rate which applies the first year installation rate and interactive effect estimates.

Table E-2. PY6 Residential ES Lighting Program Electric Savings - EEPS

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	442,599	n/a	n/a
Verified Gross Savings	340,774	282.8	40.0
Verified Net Savings	184,018	152.7	21.6

Source: ComEd tracking data and evaluation team analysis

Table E-3. PY6 Residential ES Lighting Program Electric Savings - IPA

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	94,956	n/a	n/a
Verified Gross Savings	80,258	69.1	10.2
Verified Net Savings	40,931	35.2	5.2

Source: ComEd tracking data and evaluation team analysis

Table E-4. PY6 Residential ES Lighting Program Electric Savings from Carryover (EEPS only, no IPA)

Savings Category	Energy Savings (MWh)	Demand Saving (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	176,194	n/a	n/a
Verified Gross Savings	176,194	146.5	19.2
Verified Net Savings	95,185	79.1	10.4

Source: ComEd tracking data and evaluation team analysis

Table E-5. PY6 Residential ES Lighting Program Electric Savings from Carryover - EEPS

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	176,194	n/a	n/a
Verified Gross Savings	176,194	146.5	19.2
Verified Net Savings	95,185	79.1	10.4

Source: ComEd tracking data and evaluation team analysis

Table E-6. PY6 Residential ES Lighting Program Electric Savings from Carryover - IPA[5]

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	n/a	n/a	n/a
Verified Gross Savings	n/a	n/a	n/a
Verified Net Savings	n/a	n/a	n/a

Source: ComEd tracking data and evaluation team analysis

E.2 Program Savings by Bulb Type

Table E-7 summarizes the electricity savings from the ComEd PY6 Residential ES Lighting program by program bulb type. As this table shows, Standard CFLs made up 82 percent of the total verified net savings, Specialty CFLs made up the remaining 18 percent of the savings, and light-emitting diodes (LEDs) were not incentivized through the program in PY6. Table E-8 and Table E-9 contain similar findings for megawatts (MW) and peak MW savings. These tables do not include any PY6 carryover savings (savings from bulbs purchased during PY4 and PY5 that are installed in PY6). PY6 carryover savings are presented in Table E-10, Table E-11, and Table E-12.

Table E-7. PY6 Program MWh Results by Measure[6]

Savings Category	Standard CFLs	Specialty CFLs	LEDs
Ex Ante Gross Savings (MWh)	442,599	94,956	n/a
Unadjusted Gross Savings (MWh)	451,199	94,740	n/a
Verified Gross Installed Savings Realization Rate[7]	76%	85%	n/a
Verified Gross Savings (MWh)	340,774	80,258	n/a
Net-to-Gross Ratio (NTGR)	0.54 *	0.51 **	n/a
Verified Net Savings (MWh)	184,018	40,931	n/a

* A deemed value from "ComEd PY5-PY6 Proposal Comparisons with SAG.xls," available on the IL SAG website: http://ilsag.info/net-to-gross-framework.html

** Based on evaluation research findings.

Source: ComEd tracking data and evaluation team analysis

[5] PY6 carryover savings are all attributable to the EEPS portfolio. This table is included as a placeholder for future program years.

[6] These tables do not include PY6 carryover savings.

[7] The verified gross installed savings realization rate adjusts the unadjusted gross savings estimates to account for the first year installation rate and any interactive effects associated with the measure. It is different from them ex ante realization rate which is the ratio of the ex post verified savings estimate over the ex ante savings estimate.

Table E-8. PY6 Program MW Results by Measure

Savings Category	Standard CFLs	Specialty CFLs	LEDs
Ex Ante Gross Demand Reduction (MW)	n/a	n/a	n/a
Unadjusted Gross Demand Reduction (MW)	406.9	87.4	n/a
Verified Gross Installed Savings Realization Rate[7]	70%	79%	n/a
Verified Gross Demand Reduction (MW)	282.8	69.1	n/a
Net-to-Gross Ratio (NTGR)	0.54 *	0.51 **	n/a
Verified Net Demand Reduction (MW)	152.7	35.2	n/a

* A deemed value from "ComEd PY5-PY6 Proposal Comparisons with SAG.xls," available on the IL SAG website: http://ilsag.info/net-to-gross-framework.html
** Based on evaluation research findings.
Source: ComEd tracking data and evaluation team analysis

Table E-9. PY6 Program Peak MW Results by Measure

Savings Category	Standard CFLs	Specialty CFLs	LEDs
Ex Ante Gross Peak Demand Reduction (MW)	n/a	n/a	n/a
Unadjusted Gross Peak Demand Reduction (MW)	48.1	11.2	n/a
Verified Gross Installed Savings Realization Rate[7]	83%	91%	n/a
Verified Gross Peak Demand Reduction (MW)	40.0	10.2	n/a
Net-to-Gross Ratio (NTGR)	0.54 *	0.51 **	n/a
Verified Net Peak Demand Reduction (MW)	21.6	5.2	n/a

* A deemed value from "ComEd PY5-PY6 Proposal Comparisons with SAG.xls," available on the IL SAG website: http://ilsag.info/net-to-gross-framework.html
** Based on evaluation research findings.
Source: ComEd tracking data and evaluation team analysis

Table E-10. PY6 Carryover MWh Savings Results by Measure

Savings Category	Standard CFLs	Specialty CFLs	Other[8]
Ex Ante Gross Savings (MWh)	n/a	n/a	n/a
Verified Gross Savings (MWh)	164,986	10,609	599
Net-to-Gross Ratio (NTGR)	0.55*	0.46*	0.54*
Verified Net Savings (MWh)	89,946	4,918	321

* Based on evaluation research findings.
Source: ComEd tracking data and evaluation team analysis

[8] The "Other" measure category includes LED bulbs, and LED and CFL fixtures.

Table E-11. PY6 Carryover MW Savings Results by Measure

Savings Category	Standard CFLs	Specialty CFLs	Other
Ex Ante Gross Demand Reduction (MW)	n/a	n/a	n/a
Verified Gross Demand Reduction (MW)	137.4	8.6	0.5
Net-to-Gross Ratio (NTGR)	0.55*	0.46*	0.54*
Verified Net Demand Reduction (MW)	74.9	4.0	0.3

* Based on evaluation research findings.
Source: ComEd tracking data and evaluation team analysis

Table E-12. PY6 Carryover Peak MW Savings Results by Measure

Savings Category	Standard CFLs	Specialty CFLs	Other
Ex Ante Gross Peak Demand Reduction (MW)	n/a	n/a	n/a
Verified Gross Peak Demand Reduction (MW)	17.9	1.2	0.1
Net-to-Gross Ratio (NTGR)	0.55*	0.46*	0.54*
Verified Net Peak Demand Reduction (MW)	9.8	0.6	0.0

* Based on evaluation research findings.
Source: ComEd tracking data and evaluation team analysis

E.3 Impact Estimate Parameters for Future Use

In the course of our PY6 study, the evaluation team conducted research on parameters used to estimate program impacts. Some of these parameters are eligible for inclusion in future versions of the Illinois Statewide Technical Reference Manual for Energy Efficiency (Illinois TRM) or as recommended values for the net-to-gross ratio (NTGR) framework. Table E-13 shows the evaluation team's parameter updates available for future use. The evaluation team also completed in-store intercepts as part of its PY7 research designed (among other things) to calculate NTGR values for LED program bulbs. The LED value in the following table is from that research.

Table E-13. Impact Estimate Parameters for Future Use

Parameter	Value	Data Source
Res/NonRes Split	96% / 4%	3-year rolling average (PY4-PY6) of Evaluation Research Findings
1st Year Installation Rate	72.6% Standard CFL 88.0% Specialty CFL	3-year rolling average (PY4-PY6) of Evaluation Research Findings
	95.0% LEDs[9]	PY7 Evaluation Research Findings
NTGR	0.59 Standard CFL 0.54 Specialty CFL	PY6 Evaluation Research Findings
	0.56 Standard CFL 0.50 Specialty CFL	3-year rolling average (PY4-PY6) of Evaluation Research Findings
	0.73 LEDs[9]	PY7 Evaluation Research Findings

Source: Evaluation team analysis

E.4 Program Volumetric Detail

In PY6 the Residential ES Lighting program incentivized 8,965,546 Standard CFLs and 2,125,179 Specialty CFLs as shown in Table E-14

Table E-14. PY6 Volumetric Findings Detail

Participation	EEPS Portfolio	IPA Portfolio
PY6 Incentivized Bulbs	8,965,546	2,125,179
PY6 1st Year Installed Bulbs	6,231,054	1,681,017
PY4 Carryover Bulbs – Installed in PY6 [10]	1,660,241	0
PY5 Carryover Bulbs – Installed in PY6	1,606,495	0
Total Installed Bulbs in PY6	9,497,791	1,681,017

Source: ComEd tracking data and evaluation team analysis

[9] LEDs were not sold through the program in PY6 and sales in PY5 were too low to be able to estimate a first year installation rate. PY7 in-store intercepts were conducted in the fall of 2014 and included a large enough sample of customers purchasing LEDs which allowed for the estimation of a distinct LED installation rate.

[10] The PY4 and PY5 carryover bulbs include Specialty CFLs (which were not moved to the IPA portfolio until PY6).

E.5 Results Summary

Table E-15 summarizes the key metrics from PY6.

Table E-15. PY6 Verified Savings Results Summary

Key Metrics	Units	EEPS Portfolio	IPA Portfolio	EEPS Carryover	IPA Carryover
Unadjusted Gross Savings	MWh	451,199	94,740	n/a	n/a
Unadjusted Gross Demand Reduction	MW	406.9	87.4	n/a	n/a
Unadjusted Gross Peak Demand Reduction	MW	48.1	11.2	n/a	n/a
Installed Savings Realization Rate (MWh)[11]	%	76%	85%	n/a	n/a
Installed Savings Realization Rate (MW)[11]	%	70%	79%	n/a	n/a
Installed Savings Realization Rate (Peak MW)[11]	%	83%	91%	n/a	n/a
Verified Gross Savings	MWh	340,774	80,258	176,194	n/a
Verified Gross Demand Reduction	MW	282.8	69.1	146.5	n/a
Verified Gross Peak Demand Reduction	MW	40.0	10.2	19.2	n/a
NTGR	#	0.54 *	0.51 **	n/a	n/a
Verified Net Savings	MWh	184,018	40,931	95,185	n/a
Verified Net Demand Reduction	MW	152.7	35.2	79.1	n/a
Verified Net Peak Demand Reduction	MW	21.6	5.2	10.4	n/a
Standard CFLs incentivized	#	8,965,546	0	3,025,183[12]	n/a
Specialty CFLs incentivized	#	0	2,125,179	229,557	n/a
Other Bulbs incentivized[13]	#	n/a	n/a	11,996	n/a

* A deemed value from "ComEd PY5-PY6 Proposal Comparisons with SAG.xls," available on the IL SAG website: http://ilsag.info/net-to-gross-framework.html

** Based on PY5 evaluation research, that recommended a weighted 3-year rolling average of Specialty CFL evaluation findings from PY3-PY5.

Source: ComEd tracking data and evaluation team analysis

E.6 Findings and Recommendations

The PY6 Residential ES Lighting program was successful in accomplishing its goals and objectives. The program significantly exceeded both its planning targets by selling nearly 1.5 million bulbs more than the program goal (15 percent) and exceeding their net energy savings goal by 19 percent (net savings goal was 189,086 MWh, versus 224,950 MWh verified). The following provides insight into key program

[11] The verified gross installed savings realization rate adjusts the unadjusted gross savings estimates to account for the first year installation rate and any interactive effects associated with the measure.

[12] Carryover bulbs were incentivized in PY4 and PY5.

[13] Includes LED bulbs, and CFL and LED fixtures.

findings and recommendations.[14] Numbered findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

» **Program Tracking Data**

- **Finding 1.** In PY6 the Residential ES Lighting program tracking database and the PY6 goals tracker continue to not line up entirely requiring additional manual effort in order to collect the bulb information necessary to estimate ex post program impacts (lumens, wattage, etc.). Additionally, as in previous years, there were no fields for specialty bulb type, dimmable/non-dimmable, or reflector bulb type (PAR38, BR30, etc.). These variables were again extracted from the "Description" field in the goals tracker spreadsheet for the purposes of this evaluation, but this is an imperfect process as the bulb description does not always specify the bulb type. These designations are important for establishing base wattages and would be helpful in future evaluations.
- **Recommendation 1.** Model matching to the goals tracker was an imperfect process in PY6, as it has been in previous years, and thus we again recommend creating a bulb information database with a clear one-to-one match with the model numbers in the tracking data. It was our understanding that was had been addressed in the PY6 Goals Tracker, but our evaluation research found otherwise.

» **Program Volumetric Findings**

- **Finding 4.** The total number of bulbs sold during the PY6 Residential ES Lighting program was estimated to be 11,090,725, which is a 2 percent increase from the bulbs sold in the fifth program year (PY5). Eighty-one percent of the bulbs sold in PY6 were Standard CFLs and the remaining 19 percent were Specialty CFLs. No LED fixtures or LED bulbs were incentivized through the program in PY6. The volume of Standard CFLs incentivized through the program decreased by 7 percent in PY6, while the volume of Specialty CFLs nearly doubled. This significant increase in Specialty CFL sales is likely largely attributable to the increase in Specialty CFLs incentives between PY5 and PY6 (they increased by nearly $1 between the two program years). This is also reflected in the evaluation research NTGR estimate for Specialty CFLs which increased by 6 percent between the two program years.
- **Finding 5.** Analysis of PY6 program CFL sales found that despite the reduction in delta watts resulting from the continued implementation of EISA 2007, the average cost per MWh of energy saved from a Specialty CFLs is still more than two times higher than it is for a Standard CFLs (roughly $24/MWh versus $53/MWh). In PY7 the 40- and 60-watt EISA standards will come into effect which will drop Standard CFLs energy savings even further.[15] Despite this decline in delta watts for Standard CFLs, and thus the drop

[14] Numbered findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

[15] The average delta watts for Standard CFLs are projected to fall approximately 15 percent overall when the 40- and 60-watt EISA standards come into effect in PY7.

in the resulting energy savings, the cost per kWh saved will continue to be lower for Standard CFLs than for Specialty CFLs as Specialty CFLs continue to require greater incentives to encourage market uptake.

» **Awareness of ComEd Incentives Offered**

- **Finding 6.** Awareness of ComEd's Residential ES Lighting program continues to be low. In PY6, 55 percent of survey respondents purchasing bulbs incentivized by ComEd were aware that the bulbs they were buying were discounted, and only 29 percent of those knew the incentive was provided by ComEd. This means 85 percent of respondents did not know they were purchasing program bulbs incentivized by ComEd. This is significantly lower than the results found in Ameren IL service territory to similar questions (78 percent were aware of the incentives and 58 percent knew it was Ameren IL who provided them). At all 10 stores where shelf surveys were conducted as part of the PY6 evaluation materials were visible that promoted ComEd's CFLs discount program. Additionally, only 13 percent of non-program bulb purchasers were aware that the store they were shopping in was selling CFLs incentivized by ComEd. Such low program awareness is surprising for a program that has now been in place for six years. The evaluation team will discuss with ComEd including a PY7 evaluation task to review and compare the in-store marketing materials and activities that are currently part of ComEd's Residential ES Lighting program with those in similar jurisdictions (such as Ameren IL) or service territories where program awareness has been found to be significantly higher.

» **PY5/PY6 Lighting Logger Study Findings**

As part of the PY5 and PY6 evaluations a lighting logger study was conducted in the ComEd service territory that included 85 single-family and multi-family homes. As part of this study a total of 706 lighting loggers were installed on CFLs and LEDs in order to update the hours of use (HOU) and peak coincidence factor (CF) estimates that were calculated from the lighting logger study that was conducted as part of PY3 evaluation. The complete lighting logger study results are attached to this report in Appendix Section 7.7.

- **Finding 11.** A lighting inventory completed at all 85 homes where lighting loggers were installed found that CFL socket saturation has increased from 20 percent from a lighting logger study in PY3 to 35 percent in PY5/PY6. This large increase in CFL socket saturation was not unexpected as an average of 11.5 million CFLs were incentivized each year through the ComEd Residential ES Lighting program. That equates to an average of nearly four CFLs per Residential customer per year. The average number of sockets per household was found to be approximately 60, which would result in a 20 percent increase in socket saturation (12/60 = 20 percent) based on program bulb sales alone.
- **Finding 12.** The PY5/PY6 lighting logger study found an ex post result for overall HOU was 15 percent lower than the deemed estimate based on the PY3 logger study results. The 90 percent confidence intervals around the HOU estimates from the two studies

overlap which indicates the results are not statistically significantly different from one another at the 90 percent confidence level. The ex post peak CF estimate for Standard CFLs was 14 percent lower than the deemed estimate and again the 90 percent confidence intervals around the peak CF studies overlap indicating the results are not statistically significantly different from one another at the 90 percent confidence level. Specialty CFL HOU estimates declined by 5 percent for interior reflectors, 10 percent for decorative bulbs and 24 percent for globes. Similarly, Specialty CFL peak CF estimates declined by 1 percent for interior reflectors and decorative bulbs and 36 percent for globes. The large increase in socket saturation from PY3 to PY6, accompanied by the significant reduction in HOU and peak CF during this period makes a strong case for conducting additional logger studies at least every 3-years.

- **Recommendation 12.** Update the HOU and peak CF estimates included in the Illinois TRM based on the results from the recent PY5/PY6 logger study.

Complete findings and recommendations can be found in Section 6.

1 Introduction

1.1 Program Description

This report presents a summary of the findings and results from Navigant Consulting, Inc.'s (Navigant's) impact and process evaluation of the Residential ENERGY STAR® (ES) Lighting program's sixth program year (PY6).[1] The PY6 Residential ES Lighting program provides incentives to increase the market share of ES-qualified compact fluorescent lamps (CFLs) sold through retail sales channels. The program distributes educational materials designed to increase customer awareness and acceptance of energy-efficient lighting technology, as well as promote proper bulb disposal. The PY6 Residential ES Lighting program accounted for a substantial portion of the Commonwealth Edison Company's (ComEd's) Residential energy efficiency portfolio, making an important contribution to meeting ComEd's energy efficiency goals.

The PY6 Residential ES Lighting program is delivered upstream (at the retailer level), which minimizes the burden on consumers and lowers barriers to participation, but makes program participant identification (and thus evaluation) more difficult. As a result, it is not possible to match specific purchases in the program tracking data to other characteristics of those bulb purchasers or to specific details on how the bulbs will be used.

During PY6, 17 retailers participated in the Residential ES Lighting program, which resulted in 1,250 retail outlets selling program bulbs within ComEd service territory. Across the 17 retailers, over 500 unique lighting measures[16] were available to ComEd customers.

1.2 Evaluation Objectives

The Evaluation Team identified the following key researchable questions for PY6.

1.2.1 Impact Questions

1. What is the level of gross annual energy (kilowatt-hours [kWh]) and peak demand (kilowatts [kW]) savings induced by the program?
2. What are the net impacts from the program? What is the level of free-ridership associated with this program? What is the level of participant and nonparticipant spillover from the program?
3. Did the program meet its energy and demand goals? If not, why not?

1.2.2 Process Questions

1. How aware are customers of the ComEd-sourced CFL (and light-emitting diodes (LEDs) in PY7) bulb discounts? How effective are the in-store displays and marketing materials?
2. How aware are customers of changes in available lighting products as a result of the implementation of the Energy Independence and Security Act of 2007 (EISA 2007)? How have

[16] Unique by manufacturer, model number, and retailer.

customers lighting purchasing decisions been affected by the changes in the options available for purchase?

3. What does the lighting marketplace currently look like within ComEd service territory for Medium-Screw Based (MSB) bulbs (including CFL, halogen, incandescent, and LED technologies)?

2 Evaluation Approach

The analytical methods used for the evaluation of the Residential ES Lighting program were driven to a large extent by the data available for this program due to its upstream retail-level delivery. This delivery approach, while allowing for ease of program implementation and customer participation, increases the complexity of the program evaluation, since the program participants cannot be easily identified.

2.1 *Overview of Data Collection Activities*

The core data collection activities included in-store intercept surveys, shelf surveys, mystery shopper surveys and a multi-year metering study. The full set of data collection activities is shown in the following tables.

Table 2-1. Primary Data Collection Activities

What	Who	Target Completes	Completes Achieved	When	Comments
In-store Intercept Survey	Retail Lighting Purchasers	800	909[17]	February – April 2014	Data collection supporting Gross and Net impact assessment and process analysis.
Shelf Surveys	All medium-screw based Lamps	10	10	February – March 2014	Data collection supporting impact and process analysis.
Mystery Shopper Survey	Retail stores in ComEd Territory	70 Program 70 Non-Program	72 Program 72 Non-Program	March – April 2014	
Metering Study	Program Bulb Purchasers	85 Homes	85 Homes	May 2013 – January 2014	

Source: Evaluation team

Table 2-2. Additional Resources

Reference Source	Author	Application	Gross Impacts	Process
Illinois TRM	VEIC	Verified Savings Ex Ante Savings Assumptions	X	

Source: Evaluation team

[17] Ten completed surveys were dropped from the analysis dataset as they were only purchasing pin-based bulbs. Forty-two percent of the surveys completed were conducted with retail customers who were purchasing one or more ComEd incentivized bulb.

2.2 *Verified Savings Parameters*

Verified gross and net savings (energy and coincident peak demand) resulting from the PY6 Residential ES Lighting program were calculated using the following algorithms as defined by the Illinois TRM v2.0[18]

Verified Gross Annual kWh Savings = Program Bulbs × Delta Watts ÷ 1000 × HOU × IEe × ISR

Verified Gross Annual kW Savings = Program Bulbs × Delta Watts ÷ 1000 × ISR

Verified Gross Annual Peak kW Savings = Gross Annual kW Savings × Peak Load CF × IEd × ISR

Where:

- Delta Watts = Difference between the Baseline Wattage and CFL Wattage
- HOU = Annual hours of use
- ISR = Installation rate
- Peak Load CF = Peak load coincidence factor, the percentage of Program Bulbs turned on during peak hours (weekdays from 1 to 5 p.m.) throughout the summer
- IEe = Energy interactive effects
- IEd = Demand interactive effects

[18] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 2.0 (effective 6/1/2013). Available here: http://www.ilsag.info/technical-reference-manual.html

Table 2-3 presents the parameters that were used in the verified gross and net savings calculations and indicates which were examined through evaluation activities and which were deemed.

Table 2-3. Verified Savings Parameter Data Sources

Verified Savings Parameters	Data Source	Deemed or Evaluated?
Program Bulbs	PY6 Program Tracking Data	Evaluated
Delta Watts	Illinois TRM v2.0	Deemed
Res / NonRes Split	Illinois TRM v2.0	Deemed
Hours of Use (HOU)	Illinois TRM v2.0, PY6 Intercept Survey, and PY5/PY6 Logger Study	Deemed/Evaluated
Peak Coincidence Factor (CF)	Illinois TRM v2.0,PY6 Intercept Survey, and PY5/PY6 Logger Study	Deemed/Evaluated
Energy Interactive Effects	Illinois TRM v2.0	Deemed
Demand Interactive Effects	Illinois TRM v2.0	Deemed
Realization Rate	Illinois TRM v2.0	Deemed
NTGR	IL Stakeholder Advisory Group consensus process (EEPS);[19] Evaluation Research (IPA)[20]	Deemed/Evaluated

Source: Evaluation team

2.2.1 Verified Gross Program Savings Analysis Approach

Where data allowed, the evaluation team calculated verified savings by measure. For PY6, the evaluation team calculated verified savings for Standard CFLs and Specialty CFLs. The data used to estimate the verified gross program savings came from the PY6 program tracking data, the Illinois Statewide Technical Reference Manual for Energy Efficiency Version 2.0 (Illinois TRM v2.0), and PY6 in-store intercept surveys.

2.2.2 Verified Net Program Savings Analysis Approach

Verified net energy and demand (coincident peak and overall) savings were calculated by multiplying the verified gross savings estimates by a net-to-gross ratio (NTGR). The NTGR estimates applied to calculate verified net savings were 0.54 for the Energy Efficiency Portfolio Standard (EEPS) portfolio (comprising all Standard CFLs) and 0.51 for the Illinois Power Agency (IPA) portfolio (comprised of all Specialty CFLs). In PY6, the NTGR estimate used to calculate the net verified savings for the EEPS portfolio was based on past evaluation research and approved through the Illinois Stakeholder Advisory Group (IL SAG) consensus process.[19]

In PY6, specialty bulbs were attributed to the IPA portfolio. The evaluation determined that the NTG found in the PY5 evaluation research of the ComEd Residential ES Lighting program is an appropriate value to use for this evaluation. The PY5 evaluation-recommended NTGR for specialty bulbs of 0.51,

[19] ComEd PY5-PY6 Proposal Comparisons with SAG.xls, available on the IL SAG website here: http://ilsag.info/net-to-gross-framework.html

[20] The appropriate NTGR estimate used for the IPA portfolio was left to the evaluation team to determine. The evaluation team recommends using the PY5 evaluation research NTGR for specialty CFLs (all bulbs in the IPA portfolio in PY6 were specialty CFLs).

which was calculated as the weighted 3-year rolling average of Specialty CFL evaluation results (PY3-PY5) and approved for the PY5 Residential ES Lighting program through the IL SAG consensus process.

2.3 Process Evaluation

The process evaluation of the PY6 Residential ES Lighting Evaluation assessed the impact of program processes (e.g., the mechanics of how the program was implemented) on consumers who participated in the program. For these consumers, we examined the reach of program marketing, prior usage of program bulb types, key considerations when making lighting purchasing decisions, awareness of bulb types, federal regulatory changes, and program discounts, and barriers to purchasing CFLs. The primary data sources for the process evaluation were the in-store intercept surveys (n=899), in-store shelf surveys (n=10) and mystery shopper telephone surveys with participating and non-participating program retailers (n=144).

3 Gross Impact Evaluation

This section presents the results of the verified gross impact findings, including a review of the tracking data analyzed and the parameter estimates used to calculate the verified gross savings. The resulting verified gross energy savings estimate was 421,032 MWh, verified gross demand savings of 351.9 MW, and verified gross peak demand savings of 50.2 MW.

3.1 Tracking System Review

The Residential Lighting Project Information Database was the upstream lighting database used for the PY6 evaluation. This database contained a record for all retail program bulb sales invoices (by model number and store) that were sold during PY1 through PY6. The key variables in this database included the retailer store name and address, the bulb description and model number, the number of program bulbs sold, and the rebates paid for these program bulbs. The Residential Lighting Project Information Database included all upstream program CFL sales since the program inception. A number of data cleaning steps were taken to make sure PY6 bulb sales were complementary and non-overlapping with bulb sales attributed to PY1 through PY5. The PY6 analysis dataset was finalized based on the most recent program tracking database received from ComEd (dated July 6, 2014). This dataset contained 258,541 records, representing 11,090,725[21] program bulbs sold in PY6.

As in prior years, in PY6 the evaluation team was also provided a spreadsheet created by the implementation contractor[22] for ComEd which is entitled the goals tracker. This spreadsheet tracks cumulative weekly program bulb sales compared to sales goals and allocated program dollars. Along with bulb sales, the record for each combination of model number and retailer included the suggested retail price per package and incentive(s) requested from sponsor per package. Records also included manufacturer, product description, bulb type, actual bulb wattage, rated life, and the number of bulbs per package. Again in PY6, the goals tracker was relied upon for all bulb information because the Residential Lighting Project Information Database did not contain complete records of the data required by the evaluation team. Again in PY6, ex ante gross measure level savings were not available in the tracking database and thus the overall ex ante gross and net savings were taken from the Final PY6 goals tracker spreadsheet.

Finding 1. We were able to extract most of the necessary information from the Residential Lighting Project Information Database and the PY6 Goals Tracker spreadsheet, but similar to previous program years, these two data sources did not align perfectly. Matching across these two databases by manufacturer and model number initially matched 70 percent of unique model numbers (down from an 84 percent in PY5). There were, however, 109 unique retailer and model number combinations in the tracking data that did not have a direct match in Goals Tracker.[23] For all 109 unmatched tracking records,

[21] This matched the Goals Tracker data exactly.

[22] As of August 2014, the implementation contractor is CLEAResult.

[23] In some cases, the remaining non-matches were due to one data set listing the manufacturer model number and the other data set listing the manufacturer model number and the retail model number. In other cases, one data set sometimes listed the manufacturer model number plus some sort of bulb descriptor.

it was necessary to do a manual comparison of model number with the Goals Tracker. While the large majority of necessary bulb information was ultimately matched using the data provided, matching and partial matching across multiple incomplete databases and looking up model numbers and manufacturer names with manual internet research was a time consuming process.

Recommendation 1. Model matching to the Goals Tracker was again an imperfect process in PY6, due to persisting problems with missing manufacturer names and incomplete model numbers in the databases. We recommend creating a bulb information database (Goals Tracker or otherwise) with a clear one-to-one match with the model numbers in the tracking data would streamline future evaluation efforts. It was our understanding that this was happening for the PY6 Goals Tracker, but we found it was not the case. We support this endeavor and provide the following recommendations:

- All manufacturer names should be provided for all bulbs rather than "N/A."
- Include a flag for dimmable / non-dimmable.

3.2 *Program Volumetric Findings*

The total number of bulbs sold during the PY6 Residential ES Lighting program is estimated to be 11,090,725, which is a 2 percent increase from the bulbs sold in the fifth program year (PY5). Eighty-one percent of these were Standard CFLs and the remaining 19 percent were Specialty CFLs. No CFL or LED fixtures or LED bulbs were incentivized through the program in PY6. The volume of Standard CFLs incentivized through the program decreased by 7 percent in PY6, while the volume of Specialty CFLs nearly doubled. Table 3-1 shows the volume of bulbs, by bulb type, incentivized through the Residential ES Lighting program between PY3 and PY6.

Table 3-1. Incentivized Program Bulbs by Year, PY3 to PY6

Program Year	Standard CFL	Specialty CFL	CFL Fixtures	LED Bulb	LED Fixtures	Coupons	Total
PY6 Sales	8,965,546	2,125,179	0	0	0	0	11,090,725
PY5 Sales	9,633,227	1,197,896	8,767	28,230	24,268	5,506	10,897,894
PY4 Sales	11,419,752	1,097,670	84,539	24,919	16,551	5,599	12,649,030
PY3 Sales	9,893,196	1,217,723	86,943	0	0	0	11,197,862

Source: ComEd tracking data and evaluation team analysis

Table 3-2 provides the volume of bulbs incentivized through the Residential ES Lighting program estimated to have been installed during PY6. This includes bulbs sold in prior program years and installed in PY6 and is broken down by the EEPS and IPA portfolios.

Table 3-2. PY6 Volumetric Findings Detail

Participation	EEPS Portfolio	IPA Portfolio
PY6 Incentivized Bulbs	8,965,546	2,125,179
PY6 1st Year Installed Bulbs	6,231,054	1,681,017
PY4 Carryover Bulbs – Installed in PY6	1,660,241[24]	0
PY5 Carryover Bulbs – Installed in PY6	1,606,495[24]	0
Total Installed Bulbs in PY6	9,497,791	1,681,017

Source: ComEd tracking data and evaluation team analysis

3.3 Gross Program Impact Parameter Estimates

As described in Section 2, energy and demand savings are estimated using the following formulas as specified in the Illinois TRM:

Verified Gross Annual kWh Savings = Program Bulbs × Delta Watts ÷ 1000 × HOU × IEe × ISR

Verified Gross Annual kW Savings = Program Bulbs × Delta Watts ÷ 1000 × ISR

Verified Gross Annual Peak kW Savings = Gross Annual kW Savings × Peak Load CF × IEd

Where:

- Delta Watts = Difference between Baseline Wattage and CFL Wattage
- HOU = Annual hours of use
- ISR = Installation rate
- Peak Load CF = Peak load coincidence factor, the percentage of Program Bulbs turned on during peak hours (weekdays from 1 to 5 p.m.) throughout the summer
- IEe = Energy interactive effects
- IEd = Demand interactive effects

The EM&V team conducted research to validate the parameters that were not specified in the Illinois TRM. The final list of parameter estimates used to calculate the PY6 verified gross savings are shown in Table 3-3.

[24] The PY4 carryover bulbs include Specialty CFLs (which were not moved to the IPA portfolio until PY6).

Table 3-3. Verified Gross Savings Parameters

Gross Impact Parameters	Population	Ex Ante	Verified[25] Savings
Program Bulb Sales[26]	Standard CFLs	8,965,546	
	Specialty CFLs	2,125,179	
	All Bulbs	11,090,725	
Delta Watts	Standard CFLs	45.4	
	Specialty CFLs	41.1	
	All Bulbs	44.6	
1st Year Installation Rate	Standard CFLs	69.5%	
	Specialty CFLs	79.5%[27]	
Res/NonRes Split	All Bulbs	96% / 4%	
Hours of Use & Peak CF	Res HOU - Stan	2.74 (1000 hrs)	
	Res HOU - Spec	2.74 (1000 hrs)	2.67 (975 hrs)
	Res CF - Stan	NR[28]	0.095
	Res CF - Spec	NR	0.105
	NonRes HOU	8.76 (3198 hrs)	10.19[29] (3721 hrs)
	NonRes CF	NR	0.677
Leakage	All Bulbs	2.0%[30]	
Interactive Effects	Energy - Res	1.06	
	Demand - Res	NR	1.11
	Energy - NonRes	1.06	1.26
	Demand - NonRes	NR	1.48
Carryover Bulbs	PY4 and PY5 Sales	3,266,736	

Source: Illinois TRM v2.0, available on the IL SAG website: http://www.ilsag.info/technical-reference-manual.html

[25] Based on deemed parameters from the Illinois TRM v2.0 (available on the IL SAG website at http://www.ilsag.info/technical-reference-manual.html) or, in cases where the Illinois TRM did not deem a parameter estimate, from evaluation research.
[26] LEDs and Fixtures were not incentivized through the Residential ES Lighting program in PY6.
[27] The C&I portion of the Illinois TRM v2.0 does not include a section for Specialty CFLs and thus the C&I Standard CFL installation rate (69.5 percent) was applied to all CFLs installed in nonresidential locations.
[28] Not Reported.
[29] This was calculated as the weighted average Illinois TRM results from Multi-family Common Area and non-residential Miscellaneous using a 19 percent/81 percent (based on in-store intercept survey data).
[30] The leakage rate applied for Residential Lighting was calculated as 1 – final lifetime installation rate (0.98). No additional estimate of leakage was applied in addition to that estimate.

3.4 *Verified Gross Program Impact Results*

The resulting total program verified gross savings is 421,032 MWh, 351.9 MW and 50.2 peak MW as shown in the following tables. These tables present savings at the portfolio level (EEPS included standard bulbs and IPA included specialty bulbs), as well as splitting out the savings attributable to the Residential versus Non-Residential sectors. These saving estimates are based on deemed parameter estimates from the Illinois TRM v2.0. The evaluation team verified the quantity of bulbs sold based on the tracking data and found they matched 100 percent with the ex ante estimates. The installed savings realization rates shown in the following tables are calculated as the installation rate times the interactive effects estimate. They do not represent the proportion of ex ante savings found within the verified savings analysis.

Table 3-4. PY6 Verified Gross Impact Savings Estimates by Measure Type - MWh

	Standard CFLs	Specialty CFLs	Total
Residential			
Verified Gross MWh Savings	287,782	68,880	356,661
Installed Savings Gross MWh Realization Rate	74%	84%	76%
Non-Residential			
Verified Gross MWh Savings	52,993	11,378	64,371
Installed Savings Gross MWh Realization Rate	88%	88%	88%
Total			
Verified Gross MWh Savings	340,774	80,258	421,032
Installed Savings Gross MWh Realization Rate	76%	85%	77%

Source: Evaluation team analysis

Table 3-5. PY6 Verified Gross Impact Savings Estimates by Measure Type - MW

	Standard CFLs	Specialty CFLs	Total
Residential			
Verified Gross MW Savings	271.5	66.7	338.2
Installed Savings Gross MW Realization Rate	70%	80%	71%
Non-Residential			
Verified Gross MW Savings	11.3	2.4	13.7
Installed Savings Gross MW Realization Rate	70%	70%	70%
Total			
Verified Gross MW Savings	282.8	69.1	351.9
Installed Savings Gross MW Realization Rate	70%	79%	71%

Source: Evaluation team analysis

Table 3-6. PY6 Verified Gross Impact Savings Estimates by Measure Type – Peak MW

	Standard CFLs	Specialty CFLs	Total
Residential			
Verified Gross Peak MW Savings	28.6	7.8	36.4
Installed Savings Gross Peak MW Realization Rate	77%	88%	79%
Non-Residential			
Verified Gross Peak MW Savings	11.3	2.4	13.8
Installed Savings Gross Peak MW Realization Rate	103%	103%	103%
Total			
Verified Gross Peak MW Savings	40.0	10.2	50.2
Installed Savings Gross Peak MW Realization Rate	83%	91%	85%

Source: Evaluation team analysis

The PY6 Residential ES Lighting program is able to claim energy and demand savings from program bulbs purchased during PY4 and PY5, but not installed (i.e., used by the consumer) until PY6. Table 3-7 below provides estimates of the verified gross savings resulting from these carryover bulbs. PY6 carryover savings from Standard and Specialty CFLs, as well as LED bulbs and CFL and LED fixtures were attributed to the EEPS portfolio.

Table 3-7. PY6 Verified Gross Impact Savings from PY4 and PY5 Carryover Bulbs

	Standard CFLs	Specialty CFLs	Other Bulbs and Fixtures	Total
PY6 Verified Gross Carryover Savings				
Verified Gross MWh Savings	164,986	10,609	599	176,194
Verified Gross MW Savings	137.4	8.6	0.5	146.5
Verified Gross Peak MW Savings	17.9	1.2	0.1	19.2

Source: Evaluation team analysis

Table 3-8 below shows the total PY6 Verified Gross Impact Savings from PY6 sales and carryover bulbs.

Table 3-8. PY6 Total Verified Gross Impact Savings from PY6 Sales and Carryover Bulbs

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Verified Gross Program Savings	421,032	351.9	50.2
Verified Gross Carryover Savings	176,194	146.5	19.2
Verified Total PY6 Gross Savings	597,226	498.4	69.4

Source: Evaluation team analysis

4 Net Impact Evaluation

Verified net energy and demand (coincident peak and overall) savings were calculated by multiplying the verified gross savings estimates by a NTGR. The NTGR estimates applied to calculate verified net savings were 0.54 for the EEPS portfolio (comprised of all Standard CFLs) and 0.51 for the IPA portfolio (comprised of all Specialty CFLs). In PY6, the NTGR estimate used to calculate the net verified savings for the EEPS portfolio was based on past evaluation research and approved through the IL SAG consensus process.[19]

4.1 PY6 Program and Carryover Savings Estimate

In PY6, Specialty CFLs were attributed to the IPA portfolio. The evaluation determined that the NTGR found in the PY5 evaluation research of the ComEd Residential ES Lighting program is an appropriate value to use for this evaluation. The PY5 evaluation-recommended NTGR for Specialty CFLs of 0.51 that was calculated as the weighted 3-year rolling average of Specialty CFL evaluation results (PY3-PY5). Using these NTGR values, the evaluation team calculated verified net savings of 224,950 MWh, 188.0 MW and 26.8 peak MW as shown in Table 4-1, Table 4–2 , and Table 4-3.

Table 4-1. PY6 Verified Net Impact Savings Estimates by Measure Type - MWh

	Standard CFLs	Specialty CFLs	Total
Residential			
Verified Gross MWh Savings	287,782	68,880	356,661
Verified Net MWh Savings	155,402	35,129	190,531
Non-Residential			
Verified Gross MWh Savings	52,993	11,378	64,371
Verified Net MWh Savings	28,616	5,803	34,419
Total			
Ex Ante Gross MWh Savings	442,599	94,956	537,555
Installed Savings Gross MWh Realization Rate[31]	76%	85%	77%
Verified Gross MWh Savings	340,774	80,258	421,032
NTGR	0.54	0.51[32]	n/a
Verified Net MWh Savings	184,018	40,931	224,950

Source: Evaluation team analysis

[31] The installed savings realization rate for the Residential ES Lighting program includes the program bulb first year installation rate and interactive effects.

[32] The evaluation found that PY5 evaluation research NTGR for Specialty CFLs (3-year weighted rolling average of Specialty CFL evaluation research PY3-PY5) was an appropriate NTGR estimate for Specialty CFLs.

Table 4-2. PY6 Verified Net Impact Savings Estimates by Measure Type –MW

	Standard CFLs	Specialty CFLs	Total
Residential			
Verified Gross MW Savings	271.5	66.7	338.2
Verified Net MW Savings	146.6	34.0	180.6
Non-Residential			
Verified Gross MW Savings	11.3	2.4	13.7
Verified Net MW Savings	6.1	1.2	7.3
Total			
Ex Ante Gross MW Savings	n/a	n/a	n/a
Installed Savings Gross MW Realization Rate[33]	70%	70%	70%
Verified Gross MW Savings	282.8	69.1	351.9
NTGR	0.54	0.51	n/a
Verified Net MW Savings	152.7	35.2	188.0

Source: Evaluation team analysis

[33] The installed savings realization rate for the Residential ES Lighting program includes the program bulb first year installation rate and interactive effects.

Table 4-3. PY6 Verified Net Impact Savings Estimates by Measure Type – Peak MW

	Standard CFLs	Specialty CFLs	Total
Residential			
Verified Gross Peak MW Savings	28.6	7.8	36.4
Verified Net Peak MW Savings	15.5	4.0	19.4
Non-Residential			
Verified Gross Peak MW Savings	11.3	2.4	13.8
Verified Net Peak MW Savings	6.1	1.2	7.4
Total			
Ex Ante Gross Peak MW Savings	n/a	n/a	n/a
Installed Savings Gross Peak MW Realization Rate[33]	83%	91%	85%
Verified Gross Peak MW Savings	40.0	10.2	50.2
NTGR	0.54	0.51	n/a
Verified Net Peak MW Savings	21.6	5.2	26.8

Source: Evaluation team analysis

Table 4-4 provides estimates of the verified net savings resulting from PY4 and PY5 carryover bulbs installed in PY6. PY6 carryover from Standard and Specialty CFLs, as well as LED bulbs and CFL and LED fixtures were attributed to the EEPS portfolio.

Table 4-4. PY6 Verified Net Impact Savings from PY4 and PY5 Carryover Bulbs

	Standard CFLs	Specialty CFLs	Other Bulbs and Fixtures	Total
PY6 Verified Net Carryover Savings				
Verified Net MWh Savings	89,946	4,918	321	95,185
Verified Net MW Savings	74.9	4.0	0.3	79.1
Verified Net Peak MW Savings	9.8	0.6	0.0	10.4

Source: Evaluation team analysis

Table 4-5 shows the total PY6 verified net impact savings from PY6 sales and carryover bulbs.

Table 4-5. PY6 Total Verified Net Impact Savings from PY6 Sales and Carryover Bulbs

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Verified Net Program Savings	224,950	188.0	26.8
Verified Net Carryover Savings	95,185	79.1	10.4
Verified Total PY6 Net Savings	320,135	267	37.1

Source: Evaluation team analysis

4.2 *PY7 Carryover Savings Estimate*

Calculation of the PY7 carryover estimate relies upon the Illinois TRM (v2.0 and v3.0) and the PY5 and PY6 reports. At this time all of these data sources are available and thus it is possible to estimate the gross and net carryover energy savings that the evaluation team recommends for PY7. The energy and demand savings from these PY5 and PY6 late installed bulbs are calculated based on the following parameters:

- Delta Watts – Verified savings estimate from the year of installation (source: Illinois TRM v3.0)
- Res/NonRes Split - Evaluation research from the year of purchase (PY5 and PY6 Reports)
- HOU and Peak CF – Verified savings estimate from the year of installation (source: Illinois TRM v3.0)
- Energy and Demand IE – Verified savings estimate from the year of installation (source: Illinois TRM v3.0)
- Installation Rate - Verified savings estimate from the year of purchase (source: IL TRM v1.0 and Illinois TRM v2.0)
- NTGR – Evaluation research from the year of purchase (source: PY5 and PY6 Reports)

Table 4-6 shows that in PY7, 2,747,164 EEPS portfolio bulbs and 217,108 IPA portfolio bulbs that were purchased during either PY5 or PY6, are expected to be installed within ComEd service territory. The table below provides both the gross and net energy and demand savings from these bulbs attributable to the EEPS and IPA portfolios. Combined across these two portfolios, the total net energy savings is estimated to be 63,144 MWh, 53.9 MW and 7.1 peak MW, which will be counted in PY7 as Residential ES Lighting program carryover savings. Estimated carryover savings for PY7 is roughly two-thirds of the PY6 carryover savings. This decrease is due primarily to a 28 percent reduction in delta watts that occurred as a result of the EISA standards becoming effective in PY7 for 40- and 60-watt replacement bulbs, the largest program CFL segment. There was also a 9 percent drop in the volume of carryover bulbs being installed in PY7.

Table 4-6. PY7 Carryover Savings Estimates by Portfolio

PY7 Verified Savings Carryover Estimate	EEPS Portfolio			IPA Portfolio		
	PY5 Bulbs	PY6 Bulbs	PY7 EEPS Carryover	PY5 Bulbs	PY6 Bulbs	PY7 IPA Carryover
Carryover Bulbs Installed in PY7	1,366,470	1,380,694	2,747,164	0	217,108	217,108
Average Delta Watts	31.6	32.1	n/a	n/a	37.6	n/a
Average Daily Hours of Use	2.9	3.0	n/a	n/a	3.0	n/a
Peak Load Coincidence Factor	0.10	0.12	n/a	n/a	0.13	n/a
Gross kWh Impact per unit	33.4	35.6	n/a	n/a	41.6	n/a
Gross kW Impact per unit	0.03	0.03	n/a	n/a	0.04	n/a
Installation Rate	100%	100%	n/a	n/a	100%	n/a
Energy Interactive Effects	1.06	1.09	n/a	n/a	1.10	n/a
Demand Interactive Effects	1.12	1.19	n/a	n/a	1.23	n/a
Carryover Gross MWh Savings	48,483	53,365	101,847	n/a	9,940	9,940
Carryover Gross MW Savings	43.1	44.3	87.4	n/a	8.2	8.2
Carryover Gross Peak MW Savings	5.0	6.3	11.3	n/a	1.3	1.3
Net-to-Gross Ratio	0.54	0.59	n/a	n/a	0.54	n/a
Carryover Net MWh Savings	26,291	31,485	57,776	n/a	5,368	5,368
Carryover Net MW Savings	23.4	26.1	49.5	n/a	4.4	4.4
Carryover Net Peak MW Savings	2.7	3.7	6.4	n/a	0.7	0.7

Source: Evaluation team analysis

5 Process Evaluation

The process evaluation of the PY6 Residential ES Lighting Evaluation assessed the impact of program processes (e.g., the mechanics of how the program was implemented) on consumers who participated in the program. For these consumers, we examined the reach of program marketing, usage of CFLs and purchasing decisions, awareness of bulb types, federal regulatory changes, and program discounts, and barriers to purchasing CFLs. The primary data sources for the process evaluation were the in-store intercept surveys (n=899), the in-store shelf surveys (n=10) and mystery shopper telephone surveys with a participating and non-participating program retailers. Complete process evaluation results are presented in Appendix Section 7.2. The following list summarizes the key process findings from the study:

- **Program Awareness:** In PY6, 55 percent of survey respondents purchasing bulbs incentivized by ComEd were aware that the bulbs they were buying were discounted, and only 29 percent of those knew the incentive was provided by ComEd. This means 85 percent of respondents did not know they were purchasing program bulbs incentivized by ComEd. This is significantly lower than the results found in Ameren IL service territory to similar questions. At all 10 stores where shelf surveys were conducted as part of the PY6 evaluation materials were visible that promoted ComEd's CFLs discount program. The top reported source of program awareness from respondents purchasing program bulbs was a ComEd sticker on shelf where the bulbs were located (50 percent). Awareness of in-store material was down in PY6, with only 27 percent of respondents purchasing program bulbs reporting they had seen information about CFLs in the stores and only 17 percent reporting they had seen information on CFLs sponsored by ComEd.
- **State of the LED Market:** Our PY6 analysis of the current LED market found, as anticipated, a continued increase in familiarity with LED technology with 73 percent of respondents either purchasing LEDs or reporting familiarity with LEDs. The percentage of respondents who reported they had at least one LED installed increased from 26 percent in PY4, to 33 percent in PY5, and now to 40 percent in PY6. Cost was still the primary hurdle for most lighting purchasers (although down 6 percent from last year), followed by lack familiarity with LED technology, and a dislike of the look of LED's. The shelf surveys completed for the PY6 evaluation found LED bulbs had an increased presence at program retailers and were available in substantially greater numbers in the higher lumen output levels (75- and 100-watt equivalents) than in prior years. LEDs are still very expensive with the average retail price for Specialty LEDs nearly $26 and the average retail price for Standard LEDs nearly $17.
- **75- and 100-watt Replacement Lamp Availability:** PY6 mystery shopper surveys of standard 75- and 100-watt incandescent replacement lamps revealed that, nearly 30-months after the 100-watt EISA standard went into effect and 18-months after the 75-watt EISA standard went into effect, 100 and 75-watt incandescent bulbs were still on the shelves at 28 percent of program retailers and 46 percent of non-program stores.
- **Impact of EISA 2007 on Marketplace:** Customer's awareness of EISA again continued to rise in PY6 but does not appear to be impacting their purchase decisions. Seventy-one percent of those

surveyed in PY6 reported they had heard of the EISA standards, up from 64 percent in PY5[34], 53 percent in PY4 and 35 percent in PY3. Respondents who reported being aware of the EISA standards were more likely to purchased incandescent, halogen and LED bulbs than those who were unaware of EISA (although only the LED purchase rate between those aware and those unaware was statistically significant) and less likely to purchase CFLs (this difference was also statistically significant).

[34] Difference between PY5 and PY6 was statistically significant.

6 Findings and Recommendations

This section summarizes the key impact and process findings and recommendations.

The PY6 Residential ES Lighting program planning target was to sell 9,625,000 incentivized CFL bulbs to Residential customers within ComEd's service territory. The program exceeded this goal by selling a total of 11,090,725 Standard and Specialty CFLs. These CFL sales led to the program achieving 119 percent of its targeted net energy savings. Retailer participation in the Residential ES Lighting program remained stable between PY5 and PY6. In total, there were 17 retail chains participating in the PY6 Residential ES Lighting program (1 less than in PY5), resulting in a total of just over 900 individual retail locations where program bulbs could be purchased. As in PY5, Big Box, Do-It-Yourself (DIY), and Warehouse stores remained the dominant retail categories (responsible for selling over 87 percent of PY6 program bulbs).

» **Program Tracking Data**

- **Finding 1.** In PY6 the Residential ES Lighting program tracking database and the PY6 goals tracker continue to not line up entirely requiring additional manual effort in order to collect the bulb information necessary to estimate ex post program impacts (lumens, wattage, etc.).
- **Recommendation 1.** Model matching to the goals tracker was an imperfect process in PY6, as it has been in previous years, and thus we again recommend creating a bulb information database with a clear one-to-one match with the model numbers in the tracking data. It was our understanding that was had been addressed in the PY6 Goals Tracker, but our evaluation research found otherwise. We provide the following specific recommendations:
  - All manufacturer names should be provided for all bulbs rather than "N/A."
  - Include an additional field for whether a bulb is dimmable.

» **Verified Gross Impacts and Installed Savings Realization Rate**[35]

- **Finding 2.** The PY6 gross verified energy savings were estimated to 421,032 MWh of which 81 percent (comprised of Standard CFLs) was attributable to the EEPS portfolio and the remaining 19 percent (comprised of Specialty CFLs) was attributable to the IPA portfolio. The installed savings realization rate on this savings estimate is 77 percent. This realization rate is primarily driven by the first year installation rate, which was 71.3 percent across all bulbs sold in PY6, but also accounts for a 7 percent increase in energy savings due to the energy interactive effects which reflect a reduction in a building's cooling load due to the reduction in heat given off by incandescent bulbs.

[35] The verified gross installed savings realization rate adjusts the unadjusted gross savings estimates to account for the first year installation rate and any interactive effects associated with the measure. It is different from them ex ante realization rate which is the ratio of the ex post verified savings estimate over the ex ante savings estimate.

» **Demand and Peak Demand Reduction**

- **Finding 3.** The PY6 gross verified savings (ex post) demand and peak demand reduction were found to be 351.9 MW and 50.2 MW and the net verified savings (ex post) demand and peak demand reduction were found to be 188.0 MW and 26.8 MW. While both the gross demand and peak demand reduction in PY6 were larger than the PY5 estimates, the significantly lower NTGR estimates used to estimate the verified net savings in PY6 (overall average was 0.53 in PY6 vs. 0.73 in PY5) resulting in lower demand and peak demand reductions in PY6 (demand was 25 percent lower and peak demand was 12 percent lower). Roughly 80 percent of the PY6 gross and net demand and peak demand reductions were attributable to the EEPS portfolio. Carryover bulbs sold in PY4 and PY5 and installed in PY6 contributed another 19.2 MW of gross peak demand and 10.4 MW of net peak demand in PY6 (all attributable to the EEPS portfolio). Thus, the overall net peak demand reduction in PY6 across both the EEPS and IPA portfolios including carryover was 37.1 MW.

» **Program Volumetric Findings**

- **Finding 4.** The total number of bulbs sold during the PY6 Residential ES Lighting program was estimated to be 11,090,725, which is a 2 percent increase from the bulbs sold in PY5. Eighty-one percent of the bulbs sold in PY6 were Standard CFLs and the remaining 19 percent were Specialty CFLs. No CFL or LED fixtures or LED bulbs were incentivized through the program in PY6. The volume of Standard CFLs incentivized through the program decreased by 7 percent in PY6, while the volume of Specialty CFLs nearly doubled. This significant increase in Specialty CFL sales is likely largely attributable to the increase in Specialty CFLs incentives between PY5 and PY6 (they increased by nearly $1 between the two program years). This is also reflected in the evaluation research NTGR estimate for Specialty CFLs which increased by 6 percent between the two program years.
- **Finding 5.** Analysis of PY6 Residential ES Lighting program CFL sales found that despite the reduction in delta watts resulting from the continued implementation of EISA 2007, the average cost per MWh of energy saved from a Specialty CFLs is still more than two times higher than it is for a Standard CFLs (roughly $24/MWh versus $53/MWh). In PY7 the 40- and 60-watt EISA standards will come into effect which will drop Standard CFLs energy savings even further.[36] Despite this decline in delta watts for Standard CFLs, and thus the drop in the resulting energy savings, the cost per kWh saved will continue to be lower for Standard CFLs than for Specialty CFLs as Specialty CFLs continue to require greater incentives to encourage market uptake.

» **Awareness of ComEd Incentives Offered**

- **Finding 6.** Awareness of ComEd's Residential ES Lighting program continues to be low. In PY6, 55 percent of survey respondents purchasing bulbs incentivized by ComEd were aware that the bulbs they were buying were discounted, and only 29 percent of those knew the

[36] The average delta watts for Standard CFLs are projected to fall approximately 15 percent overall when the 40- and 60-watt EISA standards come into effect in PY7.

incentive was provided by ComEd. This means 85 percent of respondents did not know they were purchasing program bulbs incentivized by ComEd. This is significantly lower than the results found in Ameren IL service territory to similar questions (78 percent were aware of the incentives and 58 percent knew it was Ameren IL who provided them). At all 10 stores where shelf surveys were conducted as part of the PY6 evaluation materials were visible that promoted ComEd's CFLs discount program. Additionally, only 13 percent of non-program bulb purchasers were aware that the store they were shopping in was selling CFLs incentivized by ComEd. Such low program awareness is surprising for a program that has now been in place for six years. The evaluation team will discuss with ComEd including a PY7 evaluation a task to review and compare the in-store marketing materials and activities that are currently part of ComEd's Residential ES Lighting program with those in similar jurisdictions (such as Ameren IL) or service territories where program awareness has been found to be significantly higher.

» **Impact of EISA 2007 on Marketplace**

- **Finding 7.** Customer's awareness of EISA continues to rise (71 percent in PY6), but with both 75- and 100-watt incandescent bulbs were still found to be present on store shelves,[37] these changes do not appear to have a significant impact on customers lighting purchase decisions.
- **Finding 8.** Evaluation team analysis of shelf survey data collected in PY5 and PY6 indicated that overall the volume of incandescent bulbs stocked on program retailers' shelves has continued to fall (from 30 percent in PY5 to 22 percent in PY6). This reduction has been primarily driven by 75-watt replacement lamps where the percentage of incandescent bulbs stocked on program retailers' shelves fell from 26 percent to 6 percent. Unfortunately, during this same time period, EISA-compliant halogen bulbs have more than filled space left by the incandescent bulbs (halogen bulbs increased their relative shelf space from 10 percent to 20 percent). LEDs have increased their presence (11 percent to 16 percent) which CFLs saw a similar decline (48 percent to 43 percent).
- **Finding 9.** LED bulbs have made a significant increase in the availability of bulbs in the higher lumen output levels. Data collected during PY5 found no LEDs at the 100-watt replacement level and LEDs making up only 9 percent of the 75-watt replacement level. In PY6, 5 percent of 100-watt replacement lamps were LEDs and 21 percent of 75-watt replacement lamps were LEDs.
- **Recommendation 7 / 8 / 9.** Again in PY6, the evaluation team recommends that ComEd continue to capitalize on the changes being brought by the EISA standards by continuing to provide in-store and out-of-store educational information on the benefits of high efficiency CFL and LED products, as well as the incentives available to promote these purchases. Awareness of both of these items is currently quite low. The opportunity is currently at its peak as the EISA standard changes impact all 40- to 100-watt standard replacement lamps.

[37] PY6 mystery shopper surveys found that nearly 30-months after the 100-watt EISA standard went into effect and 18-months after the 75-watt EISA standard went into effect, 100 and 75-watt incandescent bulbs were still on the shelves at 28 percent of program retailers and 46 percent of non-program stores.

Conducting annual shelf surveys is a good means of tracking bulb availability on program retailers' shelves. While LED prices are expected to come down significantly over the next few years (DOE SSL Program Goals are to bring down the LED Lamp Price to $5/klm by 2020),[38] the incentives offered in the next few years will still likely need to be substantial as LEDs are still nearly $15 more expensive than the other lighting options available.

» **PY7 Carryover Savings Estimate**

- **Finding 10.** In PY7 the savings from nearly 3 million high efficiency bulbs, purchased during either PY5 or PY6, are expected to be installed within ComEd service territory. These bulbs are estimated to yield a total of 63,144 MWh, 53.9 MW and 7.1 MW of peak MW savings. Estimated carryover savings for PY7 is roughly two-thirds of the PY6 carryover savings. This decrease is due primarily to a 28 percent reduction in delta watts that occurred as a result of the EISA standards becoming effective in PY7 for 40- and 60-watt replacement bulbs, the largest program CFL segment, but also a 9 percent drop in the volume of carryover bulbs being installed in PY7. Approximately 91 percent of the PY7 carryover savings are attributable to the EEPS portfolio (57,776 MWh) and the remaining 9 percent of carryover savings are attributable to the IPA portfolio (5,368 MWh).

» **PY5/PY6 Lighting Logger Study Findings**

As part of the PY5 and PY6 evaluations a lighting logger study was conducted in the ComEd service territory that included 85 single-family and multi-family homes. As part of this study a total of 706 lighting loggers were installed on CFLs and LEDs in order to update the HOU and peak CF estimates that were calculated from the lighting logger study that was conducted as part of PY3 evaluation. The complete lighting logger study results are attached to this report as Appendix 7.7.

- **Finding 11.** A lighting inventory completed at all 85 homes where lighting loggers were installed found that CFL socket saturation has increased from 20 percent from a lighting logger study in PY3 and to 35 percent in PY5/PY6. This large increase in CFL socket saturation was not unexpected as an average of 11.5 million CFLs were incentivized each year through the ComEd Residential ES Lighting program. That equates to an average of nearly four CFLs per Residential customer, per year. The average number of sockets per household was found to be approximately 60, which would result in a 20 percent increase in socket saturation (12/60 = 20 percent) based on program bulb sales alone.
- **Finding 12.** Table 6-1 and Table 6-2 are from the PY5/PY6 Lighting Logger Results Memo (included as an attachment to this report in Section 7) show the ex ante versus ex post HOU and peak CF results for Standard and Specialty CFLs based on the PY5/PY6 Residential Lighting logger study. The first table shows the ex post result for overall HOU was 15 percent lower than the deemed estimate based on the PY3 logger study results. The 90 percent confidence intervals around the HOU estimates from the two studies overlap which

[38] Navigant Consulting, Inc., *Energy Savings Forecast of Solid-State Lighting in General Illumination Applications*, Prepared for the U.S. Department of Energy, August 2014, http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/energysavingsforecast14.pdf.

indicates the results are not statistically significantly different from one another at the 90 percent confidence level. The ex post peak CF estimate for Standard CFLs was 14 percent lower than the deemed estimate and again the 90 percent confidence intervals around the peak CF studies overlap indicating the results are not statistically significantly different from one another at the 90 percent confidence level. The second table shows similar results for Specialty CFLs.

Table 6-1. PY6 Standard CFL Ex Ante versus Ex Post HOU and Peak CF Results

Parameter and Installation Location	Deemed Estimate	Ex Post	Lower 90% CL	Upper 90% CL	% Change in Ex Post
HOU					
Interior Single-Family/Multi-Family In-unit	2.57	2.08	1.88	2.28	-19%
Multi-Family Common Area	16.29	n/a	n/a	n/a	n/a
Exterior	5.00	6.78	4.51	9.06	36%
Unknown	2.74	2.32	2.10	2.53	-15%
Peak CF					
Interior Single-Family/Multi-Family In-unit	0.095	0.071	0.061	0.082	-25%
Multi-Family Common Area	0.750	n/a	n/a	n/a	n/a
Exterior	n/a	0.273	0.119	0.427	n/a
Unknown	0.095	0.081	0.069	0.093	-14%

Source: Evaluation team analysis

Table 6-2. PY6 Specialty CFL Ex Ante versus Ex Post HOU and Peak CF Results

Parameter and Specialty Bulb Type	Deemed Estimate	Ex Post	% Change in Ex Post
HOU			
Reflector - Interior	2.57	2.36	-5%
Reflector - Exterior	5.00	6.78	36%
Reflector - Unknown	n/a	2.44	n/a
Decorative	3.64	3.26	-10%
Globe	2.32	1.75	-24%
Peak CF			
Reflector - Interior	0.095	0.091	-1%
Reflector - Exterior	0.184	0.273	48%
Reflector - Unknown	n/a	0.094	n/a
Decorative	0.122	0.121	-1%
Globe	0.116	0.075	-36%

Source: Evaluation team analysis

- **Recommendation 11.** The large increase in socket saturation from PY3 to PY6, accompanied by the significant reduction in HOU and peak CF during this period makes a strong case for conducting additional logger studies at least every 3-years. Additionally, assuming the projected significant increase in the socket saturation of LEDs comes to fruition, future studies should be designed to determine whether significant differences exist between the HOU and peak CF estimates of CFLs versus LEDs. Future studies should also ensure that the population of customers included in the logger study is adequately randomized to ensure the results are representative of the average socket saturation of program participants.
- **Recommendation 12**. Update the HOU and peak CF estimates included in the Illinois TRM based on the results from the recent PY5/PY6 logger study.

7 Appendix

7.1 Evaluation Research Impact Approaches and Findings

7.1.1 Evaluation Research Gross Impact Parameter Estimates

As described in Section 2, gross energy and demand savings are estimated using the following formula as specified in the Illinois TRM:

Verified Gross Annual kWh Savings = Program Bulbs × Delta Watts ÷ 1000 × HOU × IEe × ISR

Verified Gross Annual kW Savings = Program Bulbs × Delta Watts ÷ 1000 × ISR

Verified Gross Annual Peak kW Savings = Gross Annual kW Savings × Peak Load CF × IEd × ISR

Where:

- Delta Watts = Difference between the Baseline Wattage and CFL Wattage
- HOU = Annual hours of use
- ISR = Installation rate
- Peak Load CF = Peak load coincidence factor, the percentage of Program Bulbs turned on during peak hours (weekdays from 1 to 5 p.m.) throughout the summer
- IEe = Energy interactive effects
- IEd = Demand interactive effects

Table 7-1 contains the evaluation research gross savings parameter estimates. These estimates differ slightly from the verified savings estimates in the following places:

- Evaluation research estimated installation rates were found to be 4 percent higher for Standard CFLs and 17 percent higher for Specialty CFLs than the estimates included in Illinois TRM v2.0. The evaluation research estimates for Standard and Specialty CFLs were based on customer self-reports during the PY6 in-store intercept surveys.
- Evaluation research estimated HOU and peak CF rates were based upon the recently completed PY5/PY6 ComEd Residential Lighting Logger study.[39] The HOU estimates for Standard and Specialty bulbs were approximately 10 percent lower than the HOU estimates included in Illinois TRM v2.0 and the peak CF estimates for Standard and Specialty bulbs were approximately 5 percent lower than the peak CF estimates included in Illinois TRM v2.0.

[39] *PY5/PY6 Lighting Logger Study Results – Final*, dated December 5, 2014. The PY5/PY6 Lighting Logger Study memo is included as an Appendix to this report.

Table 7-1. Evaluation Research Gross Savings Parameters

Gross Impact Parameters	Population	PY6 Evaluation Research
Program Bulb Sales	Standard CFLs	8,965,546
	Specialty CFLs	2,125,179
	All Bulbs	11,090,725
Delta Watts	Standard CFLs	45.4
	Specialty CFLs	41.1
	All Bulbs	44.6
Installation Rate	Standard CFLs	72.6%
	Specialty CFLs	92.4%
Res/NonRes	All Bulbs	95%/5%
Hours of Use & Peak CF	Res HOU - Stan	2.32
	Res HOU - Spec	2.38
	Res CF - Stan	0.081
	Res CF - Spec	0.091
	NonRes HOU	9.37
	NonRes CF	0.72
Leakage	All Bulbs	2.60%
Interactive Effects	Energy - Res	1.06
	Demand - Res	1.11
	Energy - NonRes	1.31
	Demand - NonRes	1.29
Carryover Bulbs	PY4 and PY5 Sales	3,266,736

Source: Evaluation team analysis

The remainder of this section provides details on how each of the evaluation research gross savings parameters shown in the table above were estimated.

7.1.1.1 PY6 Bulb Sales Estimates

Verified savings and evaluation research program bulb sales estimates were derived from the PY6 tracking databases provided by ComEd to the evaluation team. The total number of bulbs sold during the PY6 Residential ES Lighting program is estimated to be 11,090,725, which is a 2 percent increase from the bulbs sold in PY5. Eighty-one percent of these were standard bulbs and the remaining 19 percent were specialty bulbs. Specialty bulb became a significantly large portion of the program in PY6 with sales increasing by 927,283 bulbs (77 percent increase over PY5). The primary growth was in 3-way, globe, and A-lamp bulb types (372 percent, 217 percent, and 103 percent growth, respectively). Table 7-2, shows that the large majority of standard and specialty bulbs were sold in multi-packs (97 percent and 82 percent, respectively). This is a slight decrease from PY5 in the percentage of bulbs sold in multi-packs.

Table 7-2. PY6 Sales of Single Pack vs. Multi-Packs

Single vs. Multi-Pack	Standard CFL	Specialty CFL	Total	
Single Pack	239,600	386,841	626,441	6%
Multi-Pack	8,725,946	1,738,338	10,464,284	94%
PY6 Total Bulb Sales	8,965,546	2,125,179	11,090,725	100%

Source: Evaluation team analysis

Table 7-3 shows bulb sales by retailer type. Across all bulb types, 70 percent were sold at DIY or Warehouse stores, which is down from PY5 due to a decline in Warehouse bulb sales by 25 percent. Small Hardware, Electronic, and Big Box stores increased their sales compared to PY5 by 97 percent, 46 percent, and 30 percent. In PY6, Discount Stores and Pharmacies began selling program bulbs, however, their total bulb sales were low compared to the other program retailers so their sales are included in the "Other" category along with Electronic and Grocery stores in the table below.

Table 7-3. PY6 Bulb Sales by Type of Retailer

Retailer Type	Standard CFL	Specialty CFL	Total	
Big Box	1,605,220	219,439	1,824,659	17%
DIY	4,655,412	927,757	5,583,169	50%
Dollar Store	409,054	61,050	470,104	4%
Small Hardware	410,516	278,615	689,131	6%
Warehouse	1,667,566	587,865	2,255,431	20%
Other[40]	217,778	50,453	268,231	3%
PY6 Total Bulb Sales	8,965,546	2,125,179	11,090,725	100%

Source: Evaluation team analysis

[40] Includes the following retailer types: Discount Stores, Electronic Stores, Grocery Stores, and Pharmacies.

7.1.1.2 PY6 Delta Watts

Displaced watts or "delta watts" is calculated as the difference between the program bulb wattage and baseline incandescent equivalent wattage. Program bulb wattages as specified by the manufacturer were easily obtained from the goals tracker. Appropriate baseline wattages are more difficult to establish as this metric depends on various factors including bulb type / shape, directionality, and federal standards.[41] In previous program years (PY4 and PY5), the verified savings delta watts estimates were based on the deemed base wattage estimates outlined in the Illinois TRM v2.0 and the evaluation research delta watts were estimated by applying a custom lumen mapping based on the program bulb type, bulb shape, and directionality (omni-directional, globes, directional, decorative). The evaluation research method from PY4 and PY5 has now been integrated into Illinois TRM v2.0 (which was effective beginning June 1, 2013 which coincides with ComEd PY6). Accordingly, the lumen mapping outlined in Section 5.5 of the current Illinois TRM is the only method used for calculating delta watts in this year's analysis. This evaluation approach is technology neutral, meaning that lumen ranges for specific bulb types are consistent across technologies.

Using the baseline wattages methods established in the Illinois TRM v2.0, delta watts was calculated for each program bulb by subtracting the program bulb wattage from the Illinois TRM baseline wattage. Average delta watts values by bulb type are presented in Table 7-4.

Table 7-4. Average Delta Watts Value across All Bulbs

	Standard CFLs	Specialty CFLs	All PY6 Bulbs
Bulbs Sold	8,965,546	2,125,179	11,090,725
Average Bulb Wattage	17.0	16.8	16.9
Average Delta Watts	45.4	41.1	44.6

Source: Evaluation team analysis

7.1.1.3 PY6 CFL Installation Rates

The overall evaluation research estimated installation rate (IR) across bulb and retailer types based on the PY6 in-store intercepts to be 76 percent.[42] This estimate is 2.0 percent lower than the PY5 evaluation research estimate of 78 percent. The installation rate for Standard CFLs was found to be slightly lower in PY6 than in PY5 (72.6 percent versus 76 percent), while the installation rate for Specialty CFLs remained the same from PY5 to PY6 (92 percent).

As seen in past evaluation years, the installation rate for Specialty CFLs was found to be higher (92.6 percent) than the installation rate of Standard CFLs (72.6 percent).[43] Standard CFLs represent 81 percent of program bulb sales in PY6, so despite the high Specialty CFL installation rate, the overall PY6

[41] The Energy Independence and Security Act 2007 (EISA) and the Energy Policy and Conservation Act of 2012 (EPACT).

[42] This is a retailer sales-weighted estimate.

[43] These results are retailer sales-weighted results, meaning the intercept survey results were weighted back by retailer type to the overall retailer type distribution of the population of program bulbs sold.

installation rate (across all bulb types) was just 4 percent higher than the Standard CFLs IR, at 76.1 percent.

Table 7-5 shows the Standard and Specialty CFLs installation rates broken down by retailer type (e.g., Big Box, DIY, Warehouse) and the total number of CFLs purchased at the time of the in-store survey.

Table 7-5. Installation Rate Estimates by CFL Type and Respondent Characteristic

Population		In-store Intercept Installation Rate		
		Standard	Specialty	All CFLs
Retailer Type	Big Box	74%	97%	77%
	DIY	75%	87%	77%
	Warehouse	65%	100%[44]	74%
	Retailer Sales Weighted	72.6%	92.4%	76.1%
Total CFLs Purchased	1	100%	100%	-
	2-4	81%	95%	-
	5-10	72%	91%	-
	11+	64%	67%[45]	-

Source: Evaluation team analysis

As the table above shows, installation rates varied by bulb type across all three retailers. Customers purchasing Standard CFLs from DIY or Big Box stores reported installation rates approximately 15 percent higher than customers who purchased Standard CFLs from Warehouse stores (75 percent versus 65 percent, respectively). The table above also shows that there is an inverse relationship between installation rate and the number of CFLs purchased.[46] This relationship helps explains why the standard CFL installation rates at Big Box and DIY stores, where survey respondents purchased on average six Standard CFLs, were higher than at Warehouse stores, where the average number of Standard CFLs purchased was nine.

The installation rate found for Specialty CFLs sold at Big Box and Warehouse stores were close to 100 percent, while the installation rate for specialty bulbs sold at DIY stores was 87 percent. The correlation between the number of bulbs purchased and installation rate that was seen among standard bulb purchasers held for Big Box and DIY stores (where survey respondents who purchased Specialty CFLs purchased an average of two four bulbs, respectively). It did not hold for Warehouse stores (where the average number of Specialty CFLs purchased was close to five), however this results is based on a very small sample (five respondents) of customers who purchased Specialty CFLs.

[44] It should be noted that this result is based on a small sample of five intercept survey respondents who purchased Specialty CFLs at a Warehouse store.
[45] It should be noted that this result is based on a small sample of three intercept survey respondents who purchased 11 or more Specialty CFLs.
[46] This trend was found to be statistically significant for both Standard and Specialty CFLs.

Again in PY6, the evaluation team analyzed the in-store data to determine if surveys conducted while a demonstration event was occurring in the retail store had an impact on the forecasted program bulb installation rates.[47] Similar to PY5, no statistically significant difference was detected. The evaluation team also looked into whether or not customers who purchased a package of one of the three top-selling standard CFL models[48] reported any difference in forecasted installation rate. The analysis did find a 10 percent lower installation rate for the top-selling models, however this difference was not statistically significant at the 90 percent level.

7.1.1.4 PY6 Program Bulb Leakage Rate

In PY6, the overall leakage rate across bulb types and retailer types was estimated to be 2.6 percent,[49] which is very similar to the PY5 value of 2.3 percent. The PY6 program bulb leakage was driven by 12 program bulb purchasers who said that they were planning to install the bulbs that they purchased in homes that were located outside of ComEd service territory. Ten of the customers who purchased program bulbs said that they do not receive a ComEd bill, while the remaining two customers said that they do not live in the area.

7.1.1.5 PY6 Residential/Non-residential Installation Location Split

The percentage of program bulbs being installed in Residential versus Non-Residential locations in PY6 was estimated to be 95/5[50] based on data collected during the in-store intercept surveys. The proportion of the PY6 Residential versus Non-Residential installations is equal to the average across the past four program years (PY5: 98/4; PY4: 95/5; PY5: 97/3; PY4: 90/10; Average: 95/5). Respondents who indicated that they were planning to install their purchased program bulbs in a business that was reported to be either an apartment building or a hotel/motel were asked a follow up question about whether the bulbs would be installed in a common area of the building or within an individual unit/room. Those respondents who reported that the program bulbs would be installed within an individual unit/room were classified as Residential installations and assigned Residential HOU and CF estimates.

7.1.1.6 PY6 Hours of Use and Peak Coincidence Factor

Residential Evaluation Research Estimates

The Residential HOU and peak CF estimates used to calculate the evaluation research impact estimates for the PY6 Residential Lighting evaluation were taken from the PY5/PY6 Logger Study.[51]

[47] The theory being tested was that the information customers received from program reps during demo events may encourage them to install a greater percentage of the bulbs they were purchasing immediately.

[48] These three packs were all 4-packs of Standard CFLs manufactured by TCP and received a higher than average program incentive.

[49] The 90/10 confidence interval on the leakage estimate based on the intercept surveys is a lower bound of 1.3 percent and an upper bound of 4.0 percent.

[50] This analysis excluded program bulbs that were reportedly installed in locations outside of ComEd service territory.

[51] The complete PY5/PY6 Lighting Logger Study is included in the Appendix.

The bulb type and overall weighted Residential HOU and peak CF estimates for both the verified savings and the evaluation research are shown in Table 7-6. The overall evaluation research HOU and peak CF estimates shown in the table below are 16 percent lower than the verified savings estimates.

Table 7-6. Residential HOU and Peak CF Estimates

Bulb Type	Verified Savings			Evaluation Research		
	Bulbs[52]	Daily HOU	Peak CF	Bulbs[53]	Daily HOU	Peak CF
Standard - Twist	8,606,924	2.74	0.095	8,532,482	2.32	0.081
3-way	75,115	2.46	0.081	74,466	2.32	0.081
A-lamp	252,511	2.74	0.095	250,327	2.32	0.081
Candelabra	200,959	3.64	0.122	199,221	1.94	0.063
Dimmable Reflector	36,085	2.57	0.095	35,773	2.36	0.091
Dimmable Twist	21,401	2.46	0.081	21,216	2.32	0.081
Globe	351,156	2.32	0.116	348,118	1.75	0.075
High Wattage	17,044	2.57	0.095	16,896	2.32	0.081
Post	2,335	5.00	0.184	2,315	6.78	0.273
Reflector	1,081,596	2.61	0.104	1,072,241	2.36	0.091
Twist	1,971	2.74	0.095	1,954	2.32	0.081
Bulb Wt'd Average	10,647,096	2.73	0.097	10,555,009	2.30	0.082

Source: Evaluation team analysis

Non-Residential Impact Evaluation Research Estimates

The Non-Residential HOU and peak CF estimates used to calculate the evaluation research impact estimates are also taken from the commercial lighting portion of the Illinois TRM v2.0, however as part of the evaluation research the business types of Non-Residential customers purchasing program bulbs are collected and the business type specific estimates are applied and weighted accordingly. The Non-Residential portion of the Illinois TRM does not provide separate estimates for Standard and Specialty CFLs.

Of the intercept survey respondents who reported purchasing bulbs for their business, 25 percent reported that the bulbs would be installed in a retail/service building, 19 percent said that the bulbs would be installed in an apartment building, followed by an equal number of respondents who reported that the bulbs would be installed in either an office, a grocery store, a high /middle school, or a light industry facility (13 percent each), and the remaining 6 percent of respondents reported said that the bulbs would be installed in a public assembly locations (e.g. church, theater, conference center). The distribution of business types purchasing program bulbs, along with their associated HOU and peak CF, and the overall weighted HOU and peak CF estimates are shown in Table 7-7.

[52] Representative of the deemed 96 percent of PY6 bulb sales estimated to have been installed in Residential locations.

[53] Representative of the 95 percent of bulb sales estimated to have been installed in Residential locations based on evaluation research.

Table 7-7. Non-Residential HOU and Peak CF Estimates

ComEd Business Type	%	Bulbs	Annual HOU	Daily HOU	Peak CF
Apartment	19%	16	5,950	16.30	0.75
Office	13%	8	3,088	8.46	0.66
Grocery	13%	20	3,650	10.00	0.69
Retail/Service	25%	27	2,935	8.04	0.83
High School/Middle School	13%	10	2,327	6.38	0.22
Public Assembly[54]	6%	16	3,198	8.76	0.66
Light Industry	13%	18	2,629	7.20	0.92
Bulb Weighted Average	100%	115	3,420	9.37	0.72

Source: Evaluation team analysis

7.1.1.7 Interactive Effects

The interactive effects estimates (both energy and demand) used to estimate the verified savings and evaluation research impacts were taken from the Residential and C&I portions of the Illinois TRM v2.0. The Non-residential verified savings estimates were taken directly from the "Miscellaneous" category estimates. Similar to the method used to calculate the Non-residential evaluation research HOU and peak CF estimates, evaluation research energy and demand IE were calculated by taking a weighted average of the business type specific IE estimates using the distribution of business types found during the in-store intercept surveys. Table 7-8 presents these Illinois TRM based IE estimates.

Table 7-8. PY6 Energy and Demand Interactive Effects

Sector	Verified Savings		Evaluation Research	
	Energy IE	Demand IE	Energy IE	Demand IE
Residential	1.06	1.11	1.06	1.11
Non-residential	1.24	1.46	1.31	1.29

Source: Evaluation team analysis

7.1.1.8 Carryover Bulb Savings Estimation

The PY6 Residential CFL energy and demand savings estimates include savings resulting from bulbs purchased during PY4 and PY5, but that were not installed (i.e., used by the consumer) in the program year during which they were purchased. Similarly, saving from program bulbs purchased in PY6, but not installed in PY6, can be counted in future program years. This section presents the verified savings estimates for the carryover bulbs installed in PY6.

[54] The Illinois TRM v2.0 did not include deemed HOU or peak CF estimates for bulbs installed within public assembly buildings, and thus the "Miscellaneous" category estimates were used for these program bulbs.

PY6 Carryover Savings Estimation

The source for the parameter estimates that go into the energy and demand impact calculations for the PY6 carryover bulbs are provided in Table 7-9.

Table 7-9. PY6 Carryover Parameter Sources

Parameter Estimate	Parameter Timing	PY4 Sales	PY5 Sales
Installation Rate	Year of Bulb Purchase	PY4 Report	Illinois TRM v1.0
Delta Watts	Year of Bulb Installation	Illinois TRM v2.0	Illinois TRM v2.0
Res/NonRes Split	Year of Bulb Purchase	PY4 Report	Illinois TRM v1.0
HOU and Peak CF	Year of Bulb Installation	Illinois TRM v2.0	Illinois TRM v2.0
Energy/Demand IE	Year of Bulb Installation	Illinois TRM v2.0	Illinois TRM v2.0
NTGR	Year of Bulb Purchase	PY4 Report	PY5 Report

Source: Evaluation team analysis

Table 7-10 shows that 3,266,736 bulbs sold through the program in PY4 or PY5 were estimated to have been installed in PY6. The estimate of the number of PY4 bulbs installed in PY6 results in a lifetime program bulb installation rate of 100 percent.[55] The estimate of the number of PY5 program bulbs installed in PY6 was calculated based on the Illinois TRM v1.0[56] deemed second year installation rates of 15.4 percent for Standard CFLs, 10 percent for Specialty CFLs, and 5.7 percent for CFL fixtures. The Illinois TRM v1.0 did not have a deemed second year installation rate for LEDs and thus the lifetime installation rate curve for the other bulb types was applied to the uninstalled LEDs to derive a second year installation rate of 1.6 percent for LEDs.

Table 7-10. PY6 Carryover Bulb Estimates

Carryover Bulbs	PY4 Verified Savings Estimate	PY5 Verified Savings Estimate
Program Year Total Bulbs Sold	12,649,030	10,897,894
Installed During PY4	9,328,548	n/a
Installed During PY5	1,660,241	7,706,971
Installed During PY6	1,660,241	1,606,495
Installed During PY7	n/a	1,366,470
Total Installed	12,649,030	10,679,936
Lifetime Installation Rate	100%	98%

Source: Evaluation team analysis

[55] Prior to the Illinois TRM v1.0 (effective in PY5) there were no lifetime installation rate caps for program bulbs and thus 100 percent of the PY4 bulbs sold were eventually assumed to be installed.

[56] The Illinois TRM v1.0 (effective in PY5) was in place at the time the program bubs were sold and, thus, govern the estimated installation rates for PY5 bulbs.

Table 7-11 provides estimates of energy and demand savings in PY6 resulting from the delayed installation of PY4 and PY5 program bulbs.

Table 7-11. PY6 Verified Savings Estimate for Carryover Bulbs

PY6 Verified Savings Carryover Estimate	PY4 Program Bulbs	PY5 Program Bulbs	Total PY6 Carryover
Program Bulbs Installed During PY6	1,660,241	1,606,495	3,266,736
Average Delta Watts	45.1	44.6	44.8
Average Daily Hours of Use	3.22	2.92	3.07
Peak Load Coincidence Factor	0.12	0.11	0.11
Gross KWh Impact per Unit	53.0	47.5	50.3
Gross KW Impact per Unit	0.05	0.04	0.04
Installation Rate	100%	100%	100%
Energy Interactive Effects	1.07	1.07	1.07
Demand Interactive Effects	1.15	1.15	1.15
PY6 Carryover Gross Energy Savings (MWh)	94,357	81,837	176,194
PY6 Carryover Gross Demand Savings (MW)	74.8	71.6	146.5
PY6 Carryover Gross Peak Demand Savings (MW)	10.5	8.7	19.2
Net-to-Gross Ratio	0.54	0.54	0.54
PY6 Carryover Net Energy Savings (MWh)	50,811	44,374	95,185
PY6 Carryover Net Demand Savings (MW)	40.3	38.8	79.1
PY6 Carryover Net Peak Demand Savings (MW)	5.7	4.7	10.4

Source: Evaluation team analysis

7.1.2 Evaluation Research Gross Program Impact Results

The total PY6 Residential ES Lighting program evaluation research gross savings is estimated to be 403,966 MWh, 376.1 MW, and 49.8 peak MW. Table 7-12 shows evaluation research gross savings by portfolio (EEPS and IPA) and overall, and presents the evaluation research gross realization rates[57] that are associated with these impact estimates.

Table 7-12. PY6 Evaluation Research Gross Impact Savings Estimates

	EEPS Portfolio	IPA Portfolio	Total
PY6 Evaluation Research Gross Savings			
Gross MWh Savings	315,733	88,233	403,966
Gross MW Savings	295.4	80.7	376.1
Gross Peak MW Savings	38.5	11.4	49.8
PY6 Evaluation Research Gross Savings Realization Rates[57]			
Gross MWh Savings	93%	110%	96%
Gross MW Savings	104%	117%	107%
Gross Peak MW Savings	96%	85%	93%

Source: Evaluation team analysis

As the table above shows, the evaluation research gross realization rates were higher for the IPA portfolio than for the EEPS portfolio, and were higher for demand savings (MW) than they were for energy (MWh) or peak demand (peak MW).

[57] The evaluation research gross realization rates are equal to the evaluation research gross savings/verified savings gross estimate.

7.1.3 Evaluation Research Net Impact Parameter Estimates

As shown in Table 7-13, the PY6 evaluation research NTGR for Standard CFLs was estimated to be 0.59 and the PY6 evaluation research NTGR for Specialty CFLs was estimated to be 0.54. While this is an increase in the evaluation estimated NTGR for both Standard and Specialty CFLs over the PY5 result, the 90 percent Confidence Interval (CI) from the two program years overlap indicating the results are not statistically significantly different from one another.

Table 7-13. NTGR by Bulb Type

Bulb Type	Wt'd Free-Ridership	Spillover	WT'd NTGR	90% Lower CI	90% Upper CI
Standard CFLs	0.41	0.01	0.59[58]	0.55	0.64
Specialty CFLs	0.47	0.01	0.54	0.40	0.67

Source: Evaluation team analysis

Table 7-14, compares the free-ridership, spillover and NTGR estimates for PY6 to those from the previous program years. This increase in the NTGR estimate for specialty bulbs is not unanticipated as the average incentive for a Specialty CFL increased by nearly $1 between PY5 and PY6. This also explains the significant increase in Specialty CFL sales in PY6.

Table 7-14. PY6 FR, Spillover, and NTGR Estimates Compared to Prior Program Years

Net Impact Parameters	Population	PY2	PY3	PY4	PY5	PY6
Free-ridership	Standard CFLs	n/a	n/a	0.47	0.47	0.41
	Specialty CFLs	n/a	n/a	0.58	0.53	0.47
	All Program Bulbs	0.46	0.31	0.48	0.48	0.43
Spillover	Standard CFLs	n/a	n/a	0.02	0.02	0.01
	Specialty CFLs	n/a	n/a	0.02	0.02	0.01
	All Program Bulbs	0.05	0.02	0.02	0.02	0.01
NTGR	Standard CFLs	n/a	n/a	0.55	0.55	0.59
	Specialty CFLs	n/a	n/a	0.44	0.48	0.54
	All Program Bulbs	0.60	0.71	0.54	0.54	0.58

Source: Evaluation team analysis

[58] These results include additional significant digits not shown in this table.

7.1.3.1 Evaluation Research NTGR Methodology

As was done in PY4 and PY5, the PY6 NTGR was estimated using the customer self-report method based on data collected during the PY6 in-store intercept surveys. The in-store intercept data was used to estimate the level of PY6 free-ridership, as well as the PY6 participant and nonparticipant spillover. Once these parameters were estimated, NTGR was calculated as follows:

NTGR = 1 – Free-ridership + Spillover (participant and nonparticipant)

The customer self-report method used for this analysis estimated free-ridership by first calculating the following two scores:

1. *Program Influence Score* (PI Score) - The degree of influence the program had on the customers' decision to install CFLs, on a scale of 0 to 10.
2. *No-Program Score* (NP Score) – The customer's self-reported purchasing plans if the ComEd incentive had not been offered and the bulbs had been more expensive.

Once these two scores were calculated for each survey respondent purchasing program bulbs, free-ridership was calculated as:

Free-Ridership = 1 – (PI Score + NP Score) ÷ 20

The method used to estimate free-ridership in PY6 applied the same algorithm used to estimate free-ridership in PY5.

7.1.3.2 PY6 Evaluation Verified Free-ridership Results

Table 7-15 and Table 7-16 present the free-ridership estimates for Standard and Specialty CFLs, respectively. As these tables show, free-ridership segmentation analysis was conducted using numerous segmentation variables including:

- Whether the intercept survey occurred during a demonstration event;
- The retail store at which the intercept was conducted;
- The retail store type (Big Box, DIY, Warehouse) where the intercept was conducted; and
- Whether the respondent was aware of the ComEd discount.

The unweighted free-ridership estimates for Standard CFLs based on these segmentation variables are provided in the Table 7-15.

Table 7-15. Unweighted Standard CFL Free-Ridership Segmentation Analysis

Standard CFL Free-Ridership Segmentation Analysis		N	%	Unweighted FR	Lower 90%CL	Upper 90%CL	Statistically Significant[59]
All Standard CFLs		308	100%	0.37	0.34	0.40	
Demo Event	Yes	84	27%	0.24	0.20	0.29	A
	No	224	73%	0.42	0.39	0.46	A
Demo Event & Retailer	Big Box	37	12%	0.21	0.14	0.27	
	DIY	32	10%	0.33	0.25	0.41	B1
	Warehouse	15	5%	0.18	0.08	0.28	B2
Non-Demo Event & Retailer	Big Box	84	27%	0.32	0.27	0.37	
	DIY	92	30%	0.55	0.50	0.59	B1
	Warehouse	48	16%	0.40	0.33	0.47	B2
Retailer Type	Big Box	121	39%	0.28	0.24	0.33	C
	DIY	124	40%	0.49	0.44	0.53	C
	Warehouse	63	20%	0.34	0.28	0.40	C
Retail Store	DIY #1	111	36%	0.49	0.44	0.53	D
	DIY #2	13	4%	0.48	0.34	0.62	
	Warehouse#1	63	20%	0.34	0.28	0.40	D
	Big Box #1	121	39%	0.28	0.24	0.33	D
Awareness of Discount	Aware	173	56%	0.30	0.27	0.34	F
	Unaware	131	43%	0.48	0.43	0.52	F
	Don't know	4	1%	0.68	0.53	0.82	

Source: Evaluation team analysis

A few notable findings from the standard CFL segmentation analysis shown in the table above:

- Free-ridership varied significantly across retailer type with Big Box stores having the lowest levels of free-ridership, Warehouse stores having slightly higher free-ridership and DIY stores having significantly higher levels of free-ridership than either of the other store types. Analysis by individual retail store chain did not add any additional significance as only the DIY retailer type where intercept surveys were performed include two distinct retail chains (there was a third DIY chain in the program but they did not allow for in-store intercept to be performed) and the free-ridership estimates for these two chains were not statistically significantly different from one another (the sample from one of the two stores was very small);
- At two of the three retailer types where intercepts were conducted, in-store demo events were correlated with significantly lower levels of free-ridership. This is a strong indication that these demo events are providing customers with information that is increasing the programs

[59] Letters in this column represent paired results that are statistically significant from one another.

influence. In PY6, 27 percent of the intercepts conducted with customer purchasing Standard CFLs took place during a demo event, in PY5, 29 percent took place during demo events; and

» Survey respondents who were aware the bulbs they were purchasing were discounted were found to have significantly lower levels of free-ridership.

The unweighted free-ridership estimates for Specialty CFLs are provided in Table 7-16.

Table 7-16. Unweighted Specialty CFL Free-Ridership Segmentation Analysis

Specialty CFL Free-Ridership Segmentation Analysis		N	%	Unweighted FR	Lower 90%CL	Upper 90%CL	Statistically Significant[59]
All Specialty CFLs		65	100%	0.50	0.44	0.57	
Demo Event	Yes	12	18%	0.41	0.28	0.55	
	No	53	82%	0.53	0.46	0.60	
Retailer Type	Big Box	18	28%	0.35	0.22	0.47	C
	DIY	43	66%	0.55	0.48	0.63	C
	Warehouse	4	6%	0.39	0.16	0.62	
Retail Store	DIY #1	39	60%	0.56	0.48	0.63	D
	DIY #2	4	6%	0.48	0.05	0.91	
	Warehouse #1	4	6%	0.39	0.16	0.62	
	Big Box #1	18	28%	0.35	0.22	0.47	D
Awareness of Discount	Aware	33	51%	0.48	0.40	0.56	
	Unaware	32	49%	0.53	0.43	0.63	

Source: Evaluation team analysis

Similar to the standard CFL segmentation analysis, Big Box stores had the lowest levels of free-ridership and DIY stores had the highest level of free-ridership (a difference that was statistically significantly at the 90 percent level). Conducting intercepts at a store while a demo event was correlated with lower levels of free-ridership, as was awareness of the ComEd. Neither of these differences were statistically significant at the 90 percent level.

Weights

Case weights were applied to the retailer-type free-ridership estimates for Standard and Specialty CFLs in order to come up with overall standard and Specialty CFL free-ridership estimates that were representative of the distribution of PY6 bulb sales. Table 7-17 shows the distribution of PY6 standard and Specialty CFL sales by retailer type based on the final tracking database provided to the evaluation team. As this table shows, the final weighting of the free-ridership estimates makes the estimates representative of 88 percent of the Standard CFLs sold in PY6 and 82 percent of Specialty CFLs sold in PY6.

Table 7-17. Standard and Specialty PY6 Bulb Sales used for Analysis Weights

Intercept Store?	Retailer Type	Standard CFLs	%	Specialty CFLs	%
Yes	Big Box	1,605,220	18%	219,439	10%
	DIY	4,655,412	52%	927,757	44%
	Warehouse	1,667,566	19%	587,865	28%
	Intercept Stores	7,928,198	88%	1,735,061	82%
No	Discount	86,714	1%	20,182	1%
	Dollar Store	409,054	5%	61,050	3%
	Electronic	6,836	0%	527	0%
	Grocery	117,302	1%	29,626	1%
	Pharmacy	6,926	0%	118	0%
	Hardware	410,516	5%	278,615	13%
	Non-Intercept Stores	1,037,348	12%	390,118	18%
Total		8,965,546	81%	2,125,179	19%

Source: Evaluation team analysis

Weighted Free-ridership Results

Table 7-18 presents the weighted standard and Specialty CFL free-ridership estimates for PY6 based on the customer self-report method.

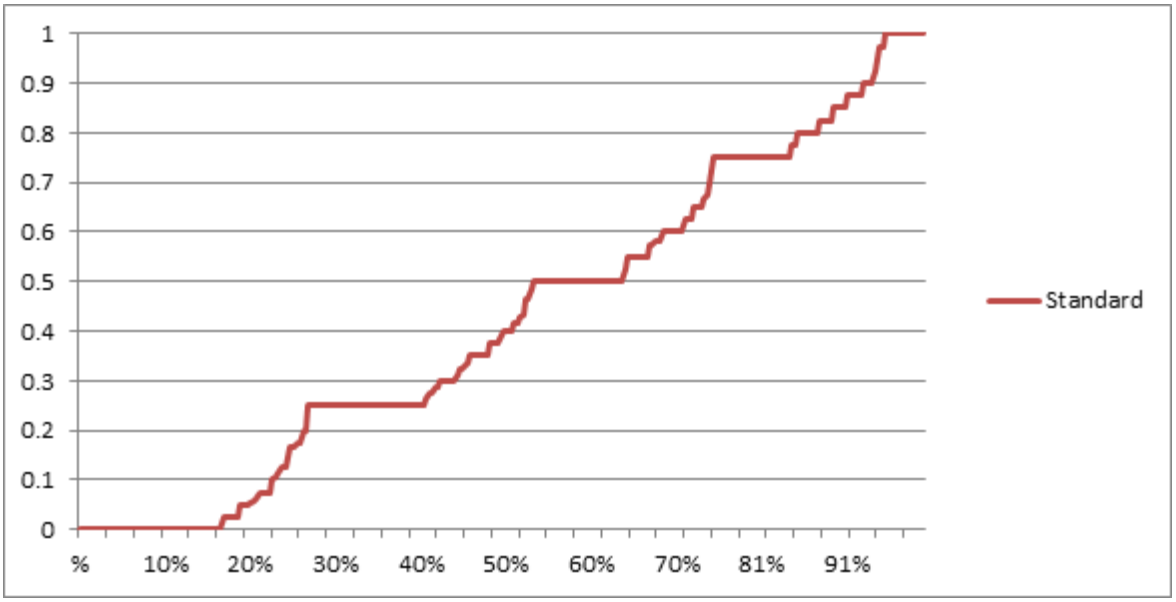
Table 7-18. Standard and Specialty Weighted Free-Ridership Estimates

Retailer Type	PY6 Bulb Sales Weighted Free-Ridership	
	Standard CFLs	Specialty CFLs
Big Box	0.28	0.35
DIY	0.49	0.55
Warehouse	0.34	0.39
Overall Weighted	0.41	0.47

Source: Evaluation team analysis

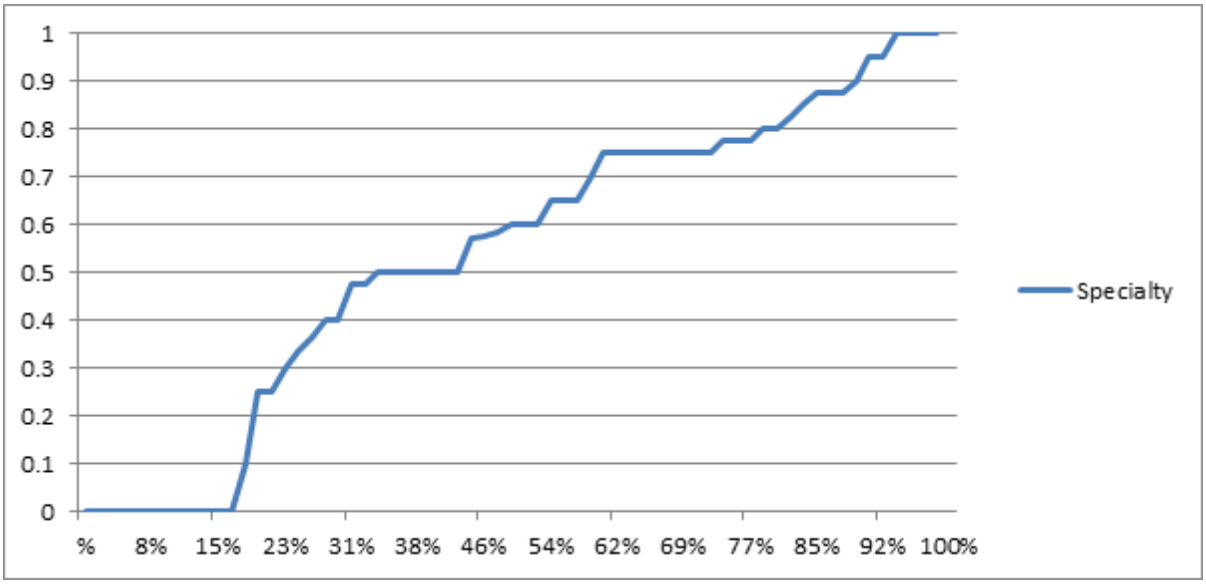
Figure 7-1 and Figure 7-2 show the distribution of standard CFL and Specialty CFL free-ridership scores across the in-store intercept analysis population.

Figure 7-1. Distribution of Standard CFL Free-Ridership Scores



Source: Evaluation team analysis

Figure 7-2. Distribution of Specialty CFL Free-Ridership Scores



Source: Evaluation team analysis

7.1.3.3 Spillover

In PY6, both participant and nonparticipant spillover were estimated based on data collected during the in-store intercept surveys. The participant and nonparticipant spillover results are presented below.

Participant Spillover

Four customers surveyed who were purchasing program bulbs also reported purchasing non-incentivized CFLs in PY6. A portion of the non-program CFL purchases of these respondents were classified as spillover since the respondent stated the ComEd Residential ES Lighting program at least partially influenced their non-program CFL purchase decision.[60] Using this data, participant spillover was calculated as the ratio of the spillover purchases to the program purchases. This yielded a participant spillover rate of 0.4 percent as shown in Table 7-19.

Table 7-19. PY6 Participant Spillover Results – Self-Report Method

Participant Spillover	n	Bulb/Purchase	Bulbs
Non-Program CFL Purchases By Participants	4	3.0	12
Spillover Purchases	4	2.35	9
Program Purchases	382	6.26	2,393
Participant Spillover Rate			0.4%

Source: Evaluation team analysis

Nonparticipant Spillover

Seven customers who were not purchasing program bulbs also reported they were influenced to some degree by ComEd's program which led them to purchase the non-program CFLs. Based on this data, the nonparticipant spillover rate was extrapolated to the population of ComEd customers to yield an estimated 52,188 non-program bulbs being purchased by program nonparticipants. Dividing these bulbs by the total number of program bulbs sold in PY6 resulted in an estimated nonparticipant spillover rate of 0.5 percent, as shown in Table 7-20.

Table 7-20. PY6 Nonparticipant Spillover Results – Self-Report Method

Nonparticipant Spillover	n	Average Bulbs / Purchase	Total Bulbs
Nonparticipant Spillover Purchases	7	2.2	16
Population Extrapolated Spillover Purchases	23,418	2.2	52,188
PY6 Program Bulb Sales			11,090,725
Nonparticipant Spillover Rate			0.5%

Source: Evaluation team analysis

7.1.4 Evaluation Research Net Impact Results

Applying the evaluation research NTGR to the evaluation research gross savings estimates resulted in evaluation research net savings of 233,928 MWh, 217.9 MW, and 28.8 peak MW as shown in Table 7-21.

[60] This portion is based on the number of non-program bulbs they purchased as well as the influence level they provided for the program.

This table also shows that all but one of the evaluation research net energy savings estimates exceeded the verified savings net estimates. The only place the evaluation research net savings realization rate[61] was less than 100 percent was for the net peak MW savings estimate for the IPA portfolio. These high realization rates are primarily the result of the evaluation research NTGR being slightly higher than the deemed verified savings NTGR (9 percent higher for Standard CFLs, 0.59 vs. 0.54, and 6 percent for Specialty CFLs, 0.51 vs. 0.54).

Table 7-21. PY5 Evaluation Research Net Impact Savings Estimates

	EEPS Portfolio	IPA Portfolio	Total
PY6 Evaluation Research Net Savings			
Net MWh Savings	186,282	47,646	233,928
Net MW Savings	174.3	43.6	217.9
Net Peak MW Savings	22.7	6.1	28.8
PY6 Evaluation Research Net Savings Realization Rates			
Net MWh Savings	101%	116%	104%
Net MW Savings	114%	124%	116%
Net Peak MW Savings	105%	90%	101%

Source: Evaluation team analysis

7.2 Detailed Process Findings

The process evaluation of the PY6 Residential ES Lighting Evaluation assessed the impact of program processes (e.g., the mechanics of how the program was implemented) on Residential lighting consumers who participated in the program. For these consumers, we examined the reach of program marketing, usage of CFLs and purchasing decisions, awareness of bulb types, federal regulatory changes, and program discounts, and barriers to purchasing CFLs. The primary data sources for the process evaluation were the in-store intercept surveys (n=899)[62], the in-store shelf surveys (n=10), and mystery shopper telephone surveys with a participating and non-participating program retailers (n=144).

Table 7-22 shows the distribution of in-store intercept respondent's bulb purchases by retailer type. This table is at a bulb level so respondent bulb purchases, both program and non-program, are included. As this table shows, overall 45 percent of the bulbs that respondents were buying were CFLs (standard or specialty and program or non-program) and 35 percent were incandescent (this is down from 40 percent in PY5). It is interesting to note that 50 percent of the bulbs respondents were buying at Big Box stores were program CFLs (a significant increase over PY5) compared with 29 percent of the bulbs at DIY stores. Respondents at DIY stores purchased significantly more LEDs (8 percent of bulbs purchases compared to less than 1 percent at Big Box). Sales of program bulbs to intercept survey respondents were much higher at Warehouse stores (87 percent) as the retailer visited no longer sells incandescent bulbs.

[61] The evaluation research net realization rates are equal to the evaluation research net savings/verified savings net estimate.

[62] 383 of 899 respondents were purchasing at least one program bulb.

Table 7-22. Distribution of In-Store Intercept Respondent Bulb Purchases by Retailer Type

Program vs. Non-Program	Bulb Type	Big Box		DIY		Warehouse		Total	
		Bulbs Sold	%	Bulbs Sold	%	Bulbs Sold	%	Bulbs Sold	%
Program Bulbs	Standard CFLs	787	47%	771	23%	576	84%	2,134	38%
	Specialty CFLs	43	3%	194	6%	22	3%	259	5%
	Total	830	50%	965	29%	598	87%	2,393	42%
Non-Program Bulbs	Incandescent	583	35%	1,417	43%	0	0%	2,000	35%
	Halogen	197	12%	499	15%	54	8%	750	13%
	Non-program CFL	48	3%	137	4%	7	1%	192	3%
	LED	7	0%	265	8%	27	4%	299	5%
	Total	835	50%	2,318	71%	88	13%	3,241	58%

Source: In-Store Intercept Survey (PY6)

Table 7-23 provides the average number of bulbs purchased by survey respondents across the various bulb types and program retailer types where intercepts were conducted. This table shows that on average, across all bulb types, survey respondents tended to purchase higher volumes of bulbs at Warehouse stores (8.2 per respondent). DIY and Big Box stores had lower average bulb sales (5.9 and 6.2). Overall, the average number of bulbs purchased per intercept survey respondent remained very similar to last year (5.9 in PY5 vs. 6.3 in PY6).

Table 7-23. Average Number of Bulbs Purchased per Intercept Respondent by Retailer Type

Retailer Type	Program Bulbs			Non-Program Bulbs						All Intercepts
	Stan CFL	Spec CFL	Pgm Avg	Stan CFL	Spec CFL	LED	Hal	Inc	NonPgm Avg	
Big Box	6.4	2.4	5.9	4.0	3.1	0.0	4.6	5.8	5.4	5.9
DIY	5.9	4.2	5.5	2.3	7.5	3.4	6.7	6.5	6.2	6.2
Warehouse	9.0	5.5	8.8	0.0	4.0	2.5	10.8	0.0	4.9	8.2
Total	6.7	3.8	6.3	2.7	5.7	3.3	6.1	6.3	5.9	6.3

Source: In-Store Intercept Survey (PY6)

7.2.1 Program Bulbs

In PY6, APT[63] and ComEd have continued to work to ensure that a wide variety of independently tested ES CFLs are available for incentivized purchase through the ComEd Residential ES Lighting program. In PY6, the program did not offer incentives on CFL fixtures or LED bulbs or fixtures. Table 7-24 shows the distribution of program bulbs sold in PY6 across bulb types and specific product subcategories (base wattages for standard bulbs and bulb type for specialty bulbs). As this table shows, in PY6 81 percent of the bulbs sold through the program were Standard CFLs and the remaining 19 percent were Specialty CFLs. Within Standard CFLs, the majority of bulbs sold continued to be low-wattage CFLs (13 and 14-watts, with lumens equivalent to a 60-watt incandescent), although their percentage of the overall program total continues to decline (60 percent in PY6 vs. 69 percent in PY5 and 76 percent in PY4). Reflectors continue to be the predominant specialty bulb type sold through the program. In PY6 ComEd increased their focus on Specialty CFLs which resulted in a near doubling of their Specialty CFL sales.

Table 7-24. Distribution of PY6 Residential ES Lighting Program Sales across Bulb Types

Bulb Type	Product	% of Bulbs Sold	% of Bulbs Sold
Standard CFL	40 Watt Replacement	4.8%	81%
	60 Watt Replacement	60.3%	
	53 (75) Watt Replacement	3.7%	
	72 (100) Watt Replacement	12.1%	
Specialty CFL	Reflector	10.2%	19%
	Globe	3.3%	
	A-Lamp	2.4%	
	Candelabra	1.9%	
	Other Specialty	1.4%	
Residential ES Lighting Program		100%	100%

Source: Evaluation team analysis of PY6 ComEd Tracking data

7.2.2 Prior Usage of CFLs and LEDs

Survey respondents purchasing program bulbs were asked about prior usage of CFLs in their homes and businesses, and 89 percent reported they had CFLs installed in their homes and 94 percent reported they had CFLs installed in their businesses. The Residential rate is very similar to rate found in PY5 (91 percent), but the business rate is up 7 percent (88 percent). Table 7-25 shows the self-reported prior purchasing experience that program and non-program bulb purchasers had with various bulb types. Ninety percent of those purchasing Standard CFLs (program and non-program bulbs) reported they had purchased them in the past, and 88 percent of specialty bulb purchasers said that they had purchased them in the past (up from 67 percent in PY5).[64]

[63] As of August 2014 APT is now CLEAResult.

[64] Navigant looked at the program and non-program participants' prior purchase history separately and found that they followed the same trend that is reflected by the overall prior purchase experience in Table 7-25.

Table 7-25. Prior Purchasing of CFLs and LEDs by PY6 Program Participants

Prior Purchases?	Standard CFL	Specialty CFL
Yes	90%	88%
No	9%	10%
Don't Know	1%	2%
N	318	69

Source: PY6 In-Store Intercept Survey

Respondents who purchased CFLs (program and non-program) were asked if were planning to use their CFLs to replace incandescent bulb that was still in working order to start saving energy sooner. Fifty-six percent reported that they were planning to use all of their CFLs to replace incandescent bulbs, 21 percent said that they would not use any of the CFLs that they purchased to replace incandescent bulbs, and 21 percent said they would use at least some of their CFLs to replace incandescent bulbs. In PY5, fewer respondents (29 percent) said that they would use the CFLs that they purchased to replace incandescent bulbs.

7.2.3 Effectiveness of Program Marketing

All in-store intercept respondents who were purchasing program CFLs were asked if they knew that they were purchasing an incentivized bulb and if they knew the incentive was provided by ComEd. In PY6, 55 percent of respondents said that they knew that they were purchasing incentivized CFLs, as shown in Table 7-26, however only 29 percent were aware that the incentive was provided by ComEd (down from 43 percent in PY5). In total, 16 percent of PY6 program participants surveyed reported they were aware of the CFL incentive offered by ComEd, which is a decrease from PY5 (24 percent). Respondents who were purchasing program bulbs but reported they were not aware of the discount were asked if they thought the list price was low for CFLs and 67 percent reported that they thought it was low.

Table 7-26. Program Participants' Self-Reported Awareness of Lighting Discounts

Aware of a CFL discount	Overall	Warehouse	DIY	Big Box
Yes	55%	51%	56%	56%
No	44%	49%	42%	44%
Don't know	1%	0%	2%	0%
N	383	68	174	141

Source: PY6 In-Store Intercept Survey

As shown in Table 7-27, the majority (81 percent) of the survey respondents who were aware that the program bulbs that they were purchasing were incentivized by ComEd reported that a ComEd sticker on the shelf or a retail lighting demonstration made then aware of the ComEd price discount. Non-program bulb purchasers reported that they primarily learned about the ComEd discount through a

ComEd sticker on the shelf (34 percent), a ComEd bill (21 percent), or in-store marketing materials (15 percent). Several (4 percent) non-program bulb purchasers reported that they had learned about the program through a ComEd representative but based on the survey responses provided we are unable to determine exactly who the ComEd representatives were and where they interacted with the survey respondents.

Table 7-27. Respondents Self-Reported Method of Learning about ComEd Discounts

Source of ComEd Discount Awareness	Purchasing Program Bulbs	Not Purchasing Program Bulbs	Overall
ComEd sticker on the shelf	50%	34%	42%
Saw a retail lighting demonstration	31%	3%	16%
Read about it in ComEd Bill	6%	21%	14%
In-store Marketing Materials (unspecified)	5%	15%	10%
Store employee	3%	4%	4%
Friend	3%	3%	3%
Internet	2%	0%	1%
Newspaper/TV/Radio ad	0%	9%	5%
ComEd representative	0%	3%	2%
Don't know or Other	0%	8%	4%
N	62	68	130

Source: PY6 In-Store Intercept Survey

All intercept respondents who were purchasing program CFLs were asked whether or not they had seen any information or displays about CFLs in the store. Table 7-28 shows that most respondents (73 percent) reported they had not seen any in-store information about CFLs. Warehouse shoppers had the least awareness of in-store CFL materials, with 79 percent reporting that they had not seen in-store information or displays about CFLs. Big Box and DIY shoppers were not far behind with 75 percent and 68 percent of respondents, respectively, reporting that they had not seen the in-store CFL materials. The high rates of unawareness among shoppers continue to be surprising as the PY6 shelf surveys found in-store CFL materials in all stores where shelf surveys were conducted. Sixty-five percent of customers who saw CFL information in the store reported that it was provided by ComEd, 21 percent did not know who sponsored the CFL information, and the remaining 10 percent reported it was sponsored by the retailer.

Table 7-28. Program Purchaser Self-Reported Awareness of CFL In-Store Materials

Awareness of CFL In-Store Materials	Overall	Warehouse	DIY	Big Box
Yes	27%	21%	31%	25%
No	73%	79%	68%	75%
N	383	68	174	141

Source: PY6 In-Store Intercept Survey

Over two-thirds (77 percent) of respondents who purchased program bulbs and saw CFL information or displays in the store, reported that materials were extremely influential. Overall, the Specialty CFL purchasers found the marketing materials to be more influential than the standard CFL purchasers, as shown in Table 7-29. Based on respondent's self-reported ratings, the in-store marketing materials were most influential in Big Box stores and least influential in Warehouse stores.

Table 7-29. Influence of CFL In-Store Materials

	Overall	Warehouse	Big Box	DIY	Standard	Specialty
Not Very Influential (0 to 3)	14%	22%	6%	19%	15%	9%
Moderately Influential (4 to 6)	9%	14%	3%	11%	10%	0%
Extremely Influential (7 to 10)	77%	64%	91%	70%	75%	91%
N	103	14	35	54	92	11

Source: PY6 In-Store Intercept Survey

7.2.4 Customer Purchasing Decisions

The influence of in-store marketing materials can also be seen by comparing customers' purchase plans against their eventual purchases. Table 7-30 shows that 78 percent of the in-store intercept survey respondents reported that they had planned to buy light bulbs when they came to the store; 33 percent of these respondents were planning on buying CFLs exclusively, 57 percent planned to buy only non-CFLs, while another 3 percent planned to buy CFLs combined with other bulb types. As shown in the table below, the majority of customers surveyed purchased the types of bulbs that they had planned to buy when they entered the store; 97 percent of the respondents who planned to exclusively purchase CFLs only bought CFLs, and 92 percent of respondents who planned to purchase bulbs other than CFLs did not purchase any CFLs. Of the respondents who planned to purchase a combination of CFLs/non-CFLs and exclusively non-CFLs, 26 percent (n=5) and 5 percent (n=18) changed their plan, respectively, and purchased only CFLs.

Table 7-30. CFL Purchase Intentions and Actual Purchases

Purchasing Intentions	(n=899)
Planned on purchasing light bulbs prior to entering the store	78%
Of them, planned on purchasing…	(n = 702)
CFLs only	33%
CFLs and another type of bulb	3%
Bulbs other than CFLs	57%
Don't know	8%
Customers who planned on purchasing only CFLs purchased…	(n = 229)
CFLs Only	97%
CFLs and another type of bulb	1%
Bulbs other than CFLs	2%
Customers who planned on purchasing bulbs other than CFLs purchased…	(n = 443)
CFLs Only	5%
CFLs and another type of bulb	3%
Bulbs other than CFLs	92%
Customers who planned on purchasing CFLs and another type of bulb purchased…	(n = 19)
CFLs Only	26%
CFLs and another type of bulb	63%
Bulbs other than CFLs	11%

Source: PY6 In-Store Intercept Survey

Respondents were asked about the factors that influenced their decision to purchase CFLs and their responses did not point to any one factor that significantly influenced the customers' purchase decisions over others, as shown in Table 7-31. In PY6, the top three factors that customers said most influenced their decision to buy CFLs included: reduced energy use (24 percent), the purchase price of CFLs (22 percent), and the light quality that CFLs produce (17 percent). However, there was overlap among the factors that were most and least important in influencing customers' decisions to purchase CFLs; 17 percent of respondents said that the purchase price of CFLs was the least influential factor, along with longevity of CFLs and the environmental impact of using CFLs.

Table 7-31. Factors Influencing CFL Purchase Decisions

Influence Factor	Most Important	Least Important
The energy used by CFLs	24%	5%
The purchase price of CFLs	22%	17%
The light quality that CFLs produce	17%	7%
How long the CFLs will last	16%	23%
The monthly bill savings resulting from using CFLs	15%	13%
The environmental impact of using CFLs	5%	22%

Source: PY6 In-Store Intercept Survey

Overall, respondents who purchased a mix of bulbs tended towards CFLs, but when asked why they were purchasing more than one type of bulb respondents gave a variety of responses and no one response stood out as an overwhelming reasons why shoppers were choosing to purchase both CFLs and non-CFLs. The top three reasons for purchasing a combination of bulbs included the following: 24 percent said they needed bulbs for a fixture that did not use CFLs, 18 percent said they prefer the light quality of incandescent bulbs in certain fixtures, and 17 percent said they prefer the look of incandescent bulbs in certain fixtures. When respondents were asked, if the price of CFLs were the same as, or less than the price of an incandescent or halogen bulb, how likely they would be on a scale from zero to 10 (with 0 being not likely and 10 being extremely likely) to purchase all CFLs, 54 percent of respondents gave a score of 8 or higher.

The majority (93 percent) of respondents purchasing standard CFL opted for ComEd discounted program bulbs and 74 percent of respondents purchasing Specialty CFLs selected program bulbs. The primary reason that Specialty CFL purchasers provided for not purchasing program CFLs was that they were not able to find discounted CFLs in the type of Specialty CFL that they needed (35 percent). Other reasons provided included having prior experience with another model (20 percent) and that they had no knowledge of the discount (15 percent).

7.2.5 Barriers to CFL Use

Forty-three percent of the customers completing an in-store intercept survey (all of whom were purchasing light bulbs) did not purchase CFL or LED bulbs, and the majority of these respondents (90 percent) reported that they had not considered purchasing any CFLs during their current shopping trip (n=386). When the respondents were asked why they were not purchasing CFLs, they gave a variety of reasons including: they did not like the light quality/color of CFLs (18 percent), did not like the way CFLs fit or look in fixtures (15 percent), they needed another specialty bulb (11 percent), CFLs are too expensive (10 percent), and they do not know enough about CFLs (9 percent). The respondents who reported that they did not like the look of CFLs were asked why they did not choose to purchase an A-lamp bulb which look more like incandescent bulbs. The majority of the respondents either said they were not aware of A-lamp CFLs (42 percent) or that A-lamp CFLs were too expensive (16 percent).

Table 7-32 presents the barriers to purchasing CFLs reported by survey respondents. As this table shows, very few Warehouse store respondents are included in this analysis because the Warehouse retailer where intercepts were conducted primarily sold CFLs and thus there were few non-CFL purchasers surveyed.

Table 7-32. Barriers to CFL Purchase

Reasons for not buying CFLs	Overall	DIY	Big Box	Warehouse
Dislike the light quality/color of CFLs/flicker	19%	20%	14%	33%
Needed other specialty bulb (including needed a dimmable, 3-way, or exterior bulb)	16%	17%	11%	17%
Don't like the way CFLs fit or look in fixtures	16%	17%	12%	0%
Don't know enough about CFLs/Not aware of CFLs before today	15%	12%	19%	17%
CFLs are too expensive	10%	7%	16%	0%
Accustomed to incandescent bulbs	6%	7%	4%	0%
Matching/replacing existing bulbs with the same kind	5%	4%	6%	0%
CFLs take too long to reach full brightness	4%	4%	4%	0%
Don't know	3%	2%	5%	0%
Other	2%	7%	5%	0%
Burn out too fast/Don't work well	2%	1%	1%	33%
Mercury/Dangerous	2%	1%	2%	0%
N	425	299	140	6

Source: PY6 In-Store Intercept Survey

7.2.6 EISA 2007

EISA raises the energy efficiency standards for incandescent lighting over time and will impact consumer lighting purchase behavior. During the past few program evaluations, intercept survey respondents have been asked a series of questions aimed at assessing awareness and familiarity with EISA 2007 and how it has, or respondents anticipate it will, impact their future lighting purchases. Survey respondents were first provided with a brief description of EISA and were asked whether or not they had heard of the new standards. Seventy-one percent said they were aware of the law, which is an increase over the last three program years (64 percent in PY5, 53 percent in PY4 and 35 percent in PY3). In PY6, 89 percent of respondents who had heard of EISA said that they were somewhat or very familiar with the law. Knowledge of EISA did not seem to impact purchase behavior among the survey respondents. Customers who were unaware of EISA (n=262) purchased CFLs more frequently than did those who were aware, and those who were aware purchased incandescent bulbs more frequently than those who were unaware.

During the survey respondents were asked whether they planned to stock up on standard incandescent bulbs while they are still available so that they would have some on hand when stores sell through their existing inventory. The majority of respondents (69 percent) reported that they did not plan to stock up on standard incandescent bulbs.

As shown in Table 7-33, when asked what type of bulb respondents would buy the next time a light bulb is needed and incandescent bulbs are not available, 51 percent said they would buy a CFL with equivalent light output, 21 percent said they would buy an LED, and 13 percent said they would buy a halogen bulb. The same percentage of respondents said that they would buy a CFL with equivalent light output in PY5 and PY6, but more than double the number of respondents in PY6 said that they would purchase an LED than in PY5 (21 percent compared to 9 percent). A larger portion of respondents said that they did not know what they would purchase (15 percent) than those who said that they would purchase a halogen bulb (13 percent). It was not surprising that the halogen bulbs were respondents' least chosen replacement for incandescent bulbs because close to half of the respondents said that they had never heard of or seen halogen bulbs. The table below, also shows that Warehouse store shoppers reported being more likely to purchase CFLs the next time they needed new bulbs and less likely to purchase halogens and LEDs than Big Box and DIY store shoppers, which is likely the result of the Warehouse stores included in the intercept sample no longer selling standard incandescent bulbs.

Table 7-33. Respondent Self-Reported 75-Watt and 100-Watt Purchasing Plans Post EISA

What Will You Purchase Next Time You Need a bulb and Incandescent bulbs are not Available?	Overall	Warehouse	DIY	Big Box
Equivalent light CFL	51%	68%	43%	61%
Equivalent light LED bulb	21%	12%	27%	14%
Equivalent light Halogen bulb	13%	11%	14%	13%
Don't know	15%	9%	16%	12%
N	899	84	533	282

Source: PY6 In-Store Intercept Survey

7.2.7 LED Usage and Awareness

LEDs are often mentioned as the next alternative lighting technology and a potential direction for utility lighting programs. We asked some questions during the in-store intercept survey to gauge ComEd lighting purchasers' current awareness level and usage of LEDs.

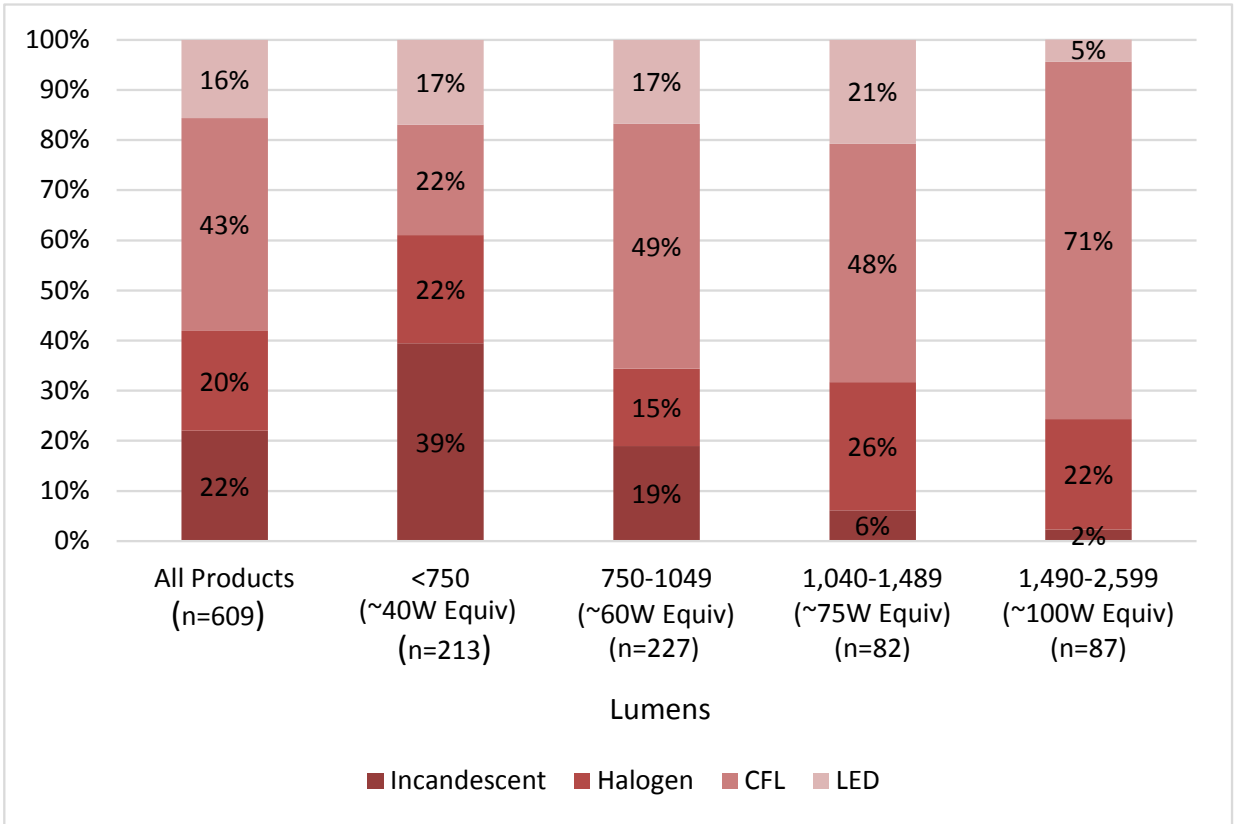
In PY6, 73 percent of respondents purchased LEDs or reported that they were familiar with LED bulbs, which is a very small increase from PY5 (70 percent). In total, 40 percent of those surveyed were either purchasing an LED to install in their home or indicated they had previously installed an LED bulb in their home or business (up from 33 percent in PY5). Those who had not purchased an LED in the past were asked about their barriers to purchasing LEDs and the majority reported that the price of LEDs was too high (48 percent), they were unfamiliar with LED technology (19 percent), or they disliked the look of LEDs (9 percent).

7.2.8 Lighting Product Stocking

As mentioned previously, the evaluation team conducted an inventory of the lighting products on the shelves at ten of the participating retailers where in-store intercepts were conducted from February to April 2014. Looking at all standard lighting products without regard to wattage, this inventory found that more energy-efficient bulb types—CFLs and LEDs—comprised a slight majority of the lighting products on retailers' shelves. Combined, these bulb types accounted for 59 percent of lighting products stocked (see Figure 7-3). However, we found large differences in the availability of less efficient bulbs by lumen output.

While energy-efficient bulbs make up the majority of bulbs stocked, incandescent bulbs are still available across all four lumen ranges. Incandescent bulbs only made up 2 percent of 100-watt equivalent products and 6 percent of 75-watt equivalent products on shelves, but they still made up 19 percent of 60-watt equivalent and 39 percent of 40-watt equivalent bulbs stocked. Since EISA legislation first impacted 40- and 60-watt bulbs in January 2014, it is anticipated that these bulbs will follow the path of the higher wattage incandescent bulbs and become less available in the coming years.

Figure 7-3. Standard Lighting Products on Shelves (Affected by EISA Legislation)

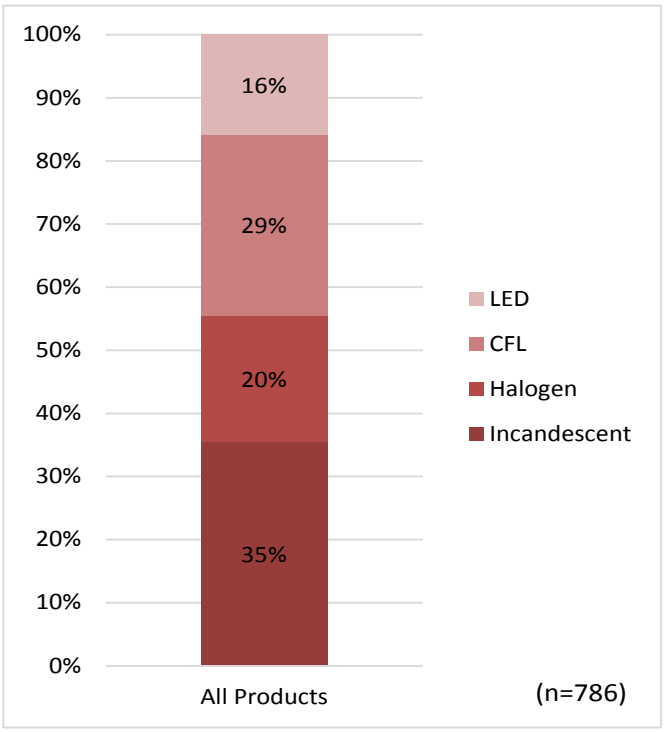


Note: The numbers ("n") in this figure represent the number of different types of products, not bulb counts.
Source: PY6 Shelf Stocking Survey

Comparing the PY5 and PY6 shelf survey results shows that overall the percentage of incandescents has continued to decline (from 30 percent to 22 percent), the percentage of halogen has doubled (from 10 percent to 20 percent), the percentage of LEDs has increased (from 11 percent to 16 percent) and the percentage of CFLs has dropped slightly (from 48 percent to 43 percent).

The stocking of specialty bulbs, which are not impacted by EISA, is different than that of standard products. Less energy-efficient bulb types—incandescents and halogens—comprised a slight majority of specialty bulb products stocked in program stores. These less efficient bulbs made up 55 percent of all the specialty lighting products on the shelves as shown in Figure 7-4. Incandescent bulbs were the most common specialty product making up over one-third (35 percent) of the products on shelves and CFLs were next most common product comprising over a quarter (29 percent) of the specialty products.

Figure 7-4. Specialty Lighting Products on Shelves[65]
(Not Affected by EISA Legislation)



Note: The numbers ("n") in this figure represent the number of different types of products, not bulb counts.
Source: PY6 Shelf Stocking Survey

The mystery shopper telephone survey assessed the availability of 100- and 75-watt incandescent light bulbs in ComEd's service territory across a wider range of stores, both participating and non-participating retailers. In total, 144 stores were called (half were participating and half were non-

[65] While the lumens and wattage of all specialty products were recorded, it is difficult to present the results by lumen range for specialty bulbs as was done for standard bulbs. The baseline wattages vary by bulb type (globe, reflector, candelabra, etc.) for different lumen ranges. As such there is no meaningful way to group all specialty products by lumen range.

participating retailers) and, posing as a customer, asked whether they stocked 100- or 75-watt incandescent bulbs. Table 7-34 summarizes the results. Approximately two-thirds reported neither wattage was in stock.[66] One-third of the sales staff said they had 100-watt incandescent bulbs in stock and the same proportion of stores reported having 75-watt incandescent bulbs in stock. More non-participating stores stocked both 100- and 75-watt incandescents (46 percent) than participating stores (28 percent).

Table 7-34. Availability of 100- and 75-Watt Incandescent Bulbs

	All Stores (n=144)	Participating Stores (n=72)	Non-Participating Stores (n=72)
Have both 100W and 75W	32%	28%	46%
Have Only 100W	1%	1%	0%
Have Only 75W	1%	2%	0%
Have neither 100W or 75W	65%	70%	54%

Source: PY6 Mystery Shopper Survey

7.2.9 Lighting Product Pricing

As part of the shelf stocking study, pricing information was collected for all products. For discounted products, both the regular retail price and discounted pricing, where available, were recorded. Whether the provider of the discounts was ComEd or the retailer/manufacturer was also noted.

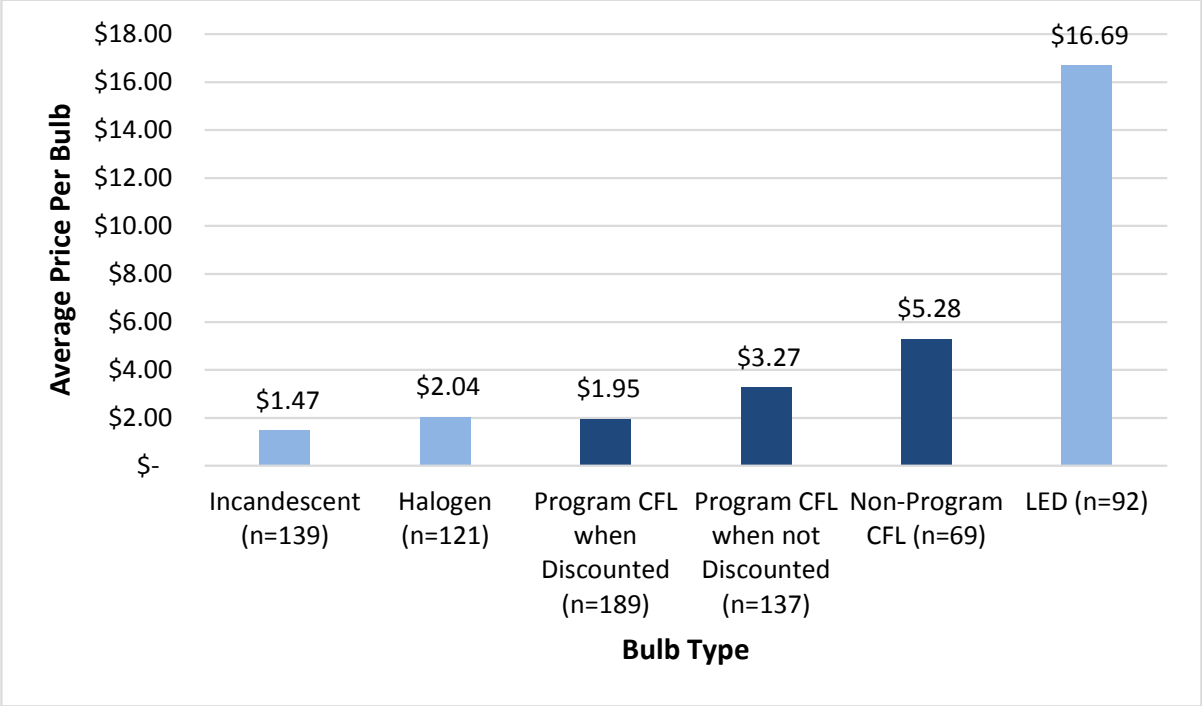
Figure 7-5 compares the pricing of standard incandescent bulbs, EISA-compliant halogens, CFLs, and LEDs.[67] For CFLs, Figure 7-5 provides three average prices. Two of the prices are for the CFLs that ComEd incentivizes; the figure shows the average discounted price of these CFLs and also what these bulbs would cost if they were not incentivized by ComEd. There are also CFLs available at these retailers that are not incentivized by ComEd and the average price of these non-incentivized CFLs is presented as well.

The Standard CFLs that are incentivized by ComEd cost about $0.50 more per bulb on average than an equivalent incandescent bulbs and cost slightly less per bulb than an equivalent halogen. Without the ComEd discount, the average price of program Standard CFLs per bulb would be more than double the average price per bulb of an incandescent and approximately $1.25 more than an EISA-compliant halogen. Standard LEDs continue to cost significantly more than all bulb types with an average price of over $16 per bulb.

[66] So that the results reflect the stores where most customers purchase light bulbs, the data was weighted so that the stores where more high levels of bulbs were sold were weighted more heavily in the results. For participating stores, the results were weighted by program sales. Since we did not have access to sales data for non-participating stores, these stores were weighted using participating store data. Each store was given a store type (DIY, Warehouse, Big Box, Grocery, Discount, Drug, or Small Hardware). The average sales by store type were then calculated using program sales data and then applied to construct a weight for non-participating retailers.

[67] We compare regular and discounted pricing in this section. The data presented come from all ten stores where we conducted shelf stocking studies as part of our in-store customer interviews. However, some of these stores only present the discounted price so data was not available for the regular price of some items.

Figure 7-5. Average Price of Standard Light Bulbs

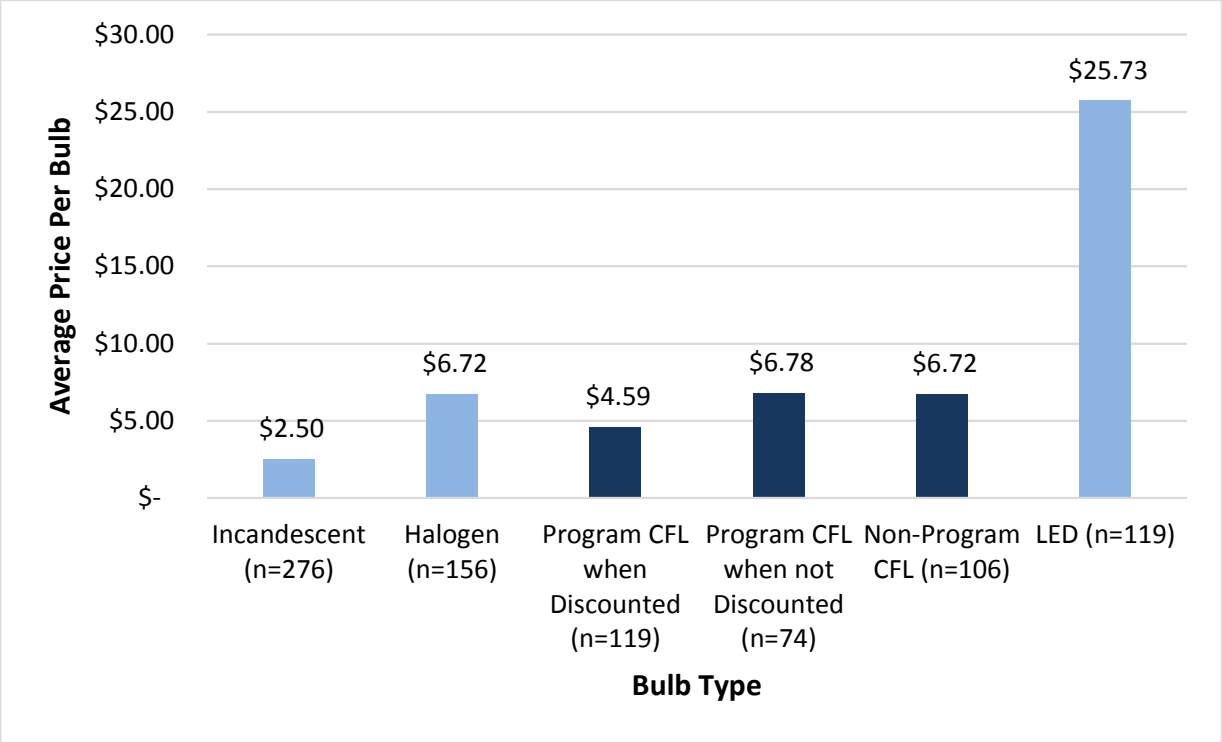


Note: The non-discounted price for program CFLs was not available for all products in stores, so the number of products used to estimate the discounted price is higher than number of products used to estimate the non-discounted price.

Source: PY6 Mystery Shopper Survey

Figure 7-6 makes the same comparisons for the pricing of specialty bulbs. The average Specialty CFL without the program incentive would cost over $4 more than a specialty incandescent and about the same amount as a specialty halogen bulb. With the program incentive, Specialty CFLs cost about $2 more per bulb on average than a specialty incandescent bulb. However, the program incentive makes program Specialty CFLs more than $2 less expensive than specialty halogen bulbs. Again, the price of Specialty LEDs is significantly higher than the other bulb types at over $25 per bulb on average.

Figure 7-6. Average Price of Specialty Light Bulbs



Note: The non-discounted price for program CFLs was not available for all products in stores, so the number of products used to estimate the discounted price is higher than the number of products used to estimate the non-discounted price.
Source: PY6 Mystery Shopper Survey

7.2.10 Materials Present in Stores

During the shelf survey, the evaluation team also recorded the types of informational materials concerning lighting that were present in the stores. As shown in Table 7-35, information about the CFL incentives was found at all ten of the retailers, while 9 of 10 retailers had information about the benefits of CFL bulbs more generally. Slightly fewer stores had information regarding LED bulbs and proper CFL disposal (7 and 6 of 10, respectively). Information explaining lumens and EISA regulations were found in half of the stores. Seven of the ten stores where shelf surveys were conducted used off-shelf lighting displays, such as endcaps, wingstacks, and register displays, to promote CFLs.

Table 7-35. In-Store Informational Materials Present

Informational Materials Present	Number of Retailers (n=10)
Information on CFL Discounts	10
Information on CFL Bulbs	9
Information on LED Bulbs	7
Information on Proper CFL Disposal	6
Explanation of Lumens	5
Information on EISA Regulations	5

Source: PY6 Shelf Survey

7.3 Illinois TRM Recommendations

As part of the PY6 study, research was conducted to support updates to the Illinois TRM.

7.3.1 Recommendations for Updates to the Illinois TRM

As noted in the PY5 evaluation report, the evaluation team recommends updating the Illinois TRM annually based on 3-year rolling averages of the evaluation primary research based parameter estimates. It should be noted that including a 3-year rolling average of research findings in the Illinois TRM reduces volatility that a single year of research could introduce and ensures that the most recent evaluation research estimates are being applied. However, if a significant change is made to the Residential ES Lighting program that would render the 3-year rolling average inappropriate and justifiably warrants a change to the parameter estimate away from a 3-year rolling average, this should be considered. The evaluation team's recommended parameters for the IL TRM are shown in Table 7-36.

Table 7-36. Impact Estimate Parameters for Future Use

Parameter	Value	Data Source
Res/NonRes Split[68]	96% / 4%	3-year rolling average (PY4-PY6) of Evaluation Research Findings
1st Year Installation Rate	72.6% Standard CFL 88.0% Specialty CFL	3-year rolling average (PY4-PY6) of Evaluation Research Findings
	95% LEDs[69]	PY7 Evaluation Research Findings

Source: Evaluation team analysis

The Res/NonRes split was included in the Illinois TRM v2.0. Including this parameter as a deemed value in the Illinois TRM helps improve the verified savings realization rate by removing the uncertainty that surrounds this estimate within the calculation of verified savings. In Illinois TRM v3.0, the Res/NonRes

[68] Residential/Nonresidential (Res/NonRes).

[69] LEDs were not sold through the program in PY6 and sales in PY5 were too low to be able to estimate a first year installation rate. PY7 in-store intercepts were conducted in the fall of 2014 and included a large enough sample of customers purchasing LEDs to allow for the estimation of a 1st year installation rate for LEDs.

split is deemed at 97 percent/3 percent "based on a weighted (by sales volume) average of ComEd PY3, PY4, and PY5 and Ameren PY5 in-store intercept survey results."[70] The evaluation team recommends updating the deemed Res/NonRes split annually based on a rolling 3-year average from the most recent evaluation research findings from ComEd and Ameren. It is not possible for the evaluation team at this time to estimate what the statewide deemed Res/NonRes split would be for Illinois TRM v5.0 (effective June 1, 2015 to correspond to ComEd PY8) due to the lack of Ameren IL data; however, the table below provides three years of evaluation research results for the ComEd program, which could be used to estimate the statewide assumption in the future. This is shown in Table 7-37.

Table 7-37. 3-Year Average Res/NonRes Split for ComEd

Program Year	Bulbs	Res/NonRes Split
PY4	12,649,030	95% / 5%
PY5	10,897,894	98% / 2%
PY6	11,090,725	95% / 5%
3-year Weighted Average		96% / 4%

Source: Evaluation team analysis

The evaluation team recommends updating the deemed installation rates for CFLs annually based on a rolling 3-year average from the most recent evaluation research findings (from both ComEd and Ameren IL when available). This insures the deemed installation rates are reflective of the most recent data available. It is not possible at this time to estimate the statewide deemed installation rate for the Illinois TRM due to the lack of Ameren IL data, however Table 7-38 provides three years of CFL evaluation research results and one year of LED evaluation research results for the ComEd program which can be used to estimate the statewide assumptions. The 3-year weighted average installation rate for Specialty CFLs increased by 6 percent between PY5 and PY6 due to the increase in the estimated PY6 installation rate and the doubling of Specialty CFLs sold through the program in PY6.

[70] Illinois TRM v3.0 at p. 576

Table 7-38. 3-Year Average Standard and Specialty Installation Rates for ComEd

Program Year	Standard CFLs		Specialty CFLs		LEDs	
	Bulbs	1st Year ISR	Bulbs	1st Year ISR	Bulbs	1st Year ISR
PY4	11,419,752	69.7%	1,097,670	75.5%		
PY5	9,633,227	76.0%	1,197,896	91.6%		
PY6	8,965,546	72.6%	2,125,179	92.4%		
PY7					649,962[71]	95%
3-year Weighted Average	-	72.6%	-	88.0%		95%[72]

Source: Evaluation team analysis

During the PY6 study a number of workpapers were created to either correct errata or make other significant changes to the draft Illinois TRM v4.0. These workpapers included the following (date of workpaper included in parentheses):

- Update the C&I Lighting section with Res/NonRes Split from Final PY5 Results and Include MF Common Area Parameters where missing (August 4, 2014).
- Revise Residential Interactive Effects Estimates for CFLs installed in MF Common Areas (August 4, 2014).
- Residential Lighting Changes: Remove Residential MF Common Area parameters from Residential Section of Illinois TRM, Fix Typo in LED Downlights DW tables (August 4, 2014).
- Update HOU and peak CF for Residential Lighting Measures (September 9, 2014).
- Illinois_Statewide_TRM_Workpaper_Revision_Residential HOU and Peak CF for DI Pgms.docx (December 4, 2014).
- Illinois Statewide_TRM_Workpaper_Revision_Residential PY6 Report ISR and ResNonRes split.docx (December 5, 2014).

In addition to these workpaper submissions, the evaluation team conducted a thorough review of the draft of the Illinois TRM v4.0. This review resulted in a comprehensive list of errors, omissions and changes needed within the Residential and C&I Lighting sections of the Illinois TRM.

Additional analysis was performed in order to revise the HOU and peak CF estimates that came out of the PY5/PY6 Lighting Logger study with all bulbs installed in closets excluded from the analysis dataset. These revised results will be included in Illinois TRM v4.0 as a proxy for HOU and peak CF estimates for bulbs installed in Residential locations through direct install programs.

[71] Projected PY7 LED sales based on the PY7 Goals Tracker spreadsheet (week ending 0706).
[72] Only a single year of results is available and thus this result is not a 3-year weighted average.

7.4 NTGR Recommendations

7.4.1 NTGR Estimate for Future Use

The NTGR for PY6 was deemed for bulbs sold through the EEPS portfolio based on a Statewide Advisory Group process.

Table 7-39 provides three years of evaluation research NTGR estimates (PY4-PY6) for Standard and Specialty CFLs, as well as the 3-year weighted NTGR estimates which are available for future use.

Table 7-39. 3-Year Average Standard and Specialty NTGR Available for Future Use

Program Year	Standard CFLs		Specialty CFLs	
	Bulbs	NTGR	Bulbs	NTGR
PY4	11,419,752	0.55	1,097,670	0.44
PY5	9,633,227	0.55	1,197,896	0.48
PY6	8,965,546	0.59	2,125,179	0.54
3-year Weighted Average		0.56		0.50

Source: Evaluation team analysis

Table 7-40 provides the NTGR Parameters available for deeming for future use, based on previous evaluation research.

Table 7-40. NTGR Parameters Available for Future Use

Parameter	Value	Data Source
NTGR	0.59 Standard CFL 0.54 Specialty CFL	PY6 Evaluation Research Findings
	0.56 Standard CFL 0.50 Specialty CFL	3-year rolling average (PY4-PY6) of Evaluation Research Findings
	0.73 LEDs[73]	PY7 Evaluation Research Findings

Source: Evaluation team analysis

[73] LEDs were not sold through the program in PY6 and sales in PY5 were too low to be able to estimate a LED specific NTGR. PY7 in-store intercepts were conducted in the fall of 2014 and included a large enough sample of customers purchasing LEDs which allowed for the estimation of a distinct LED NTGR estimate.

7.5 PJM Data and Findings

ComEd Residential ENERGY STAR® Lighting Program
Program Year 6 – June 2013 – May 2014

PY6 Ex Post Program Gross Evaluation Research Peak Demand Savings = 49.8 MW

PY6 Ex Post Carryover Gross Evaluation Research Peak Demand Savings = 19.2 MW

Parameters included in the Ex Post Gross Peak Demand calculation include:

1. PY6 Program Bulbs Sold
2. Delta Watts
3. Residential / Non-residential Split
4. Peak Coincidence Factor (Peak CF)
5. Installation Rate
6. Demand Interactive Effects

7.6 Data Collection Instruments

7.6.1 PY6 In-Store Intercept Survey Instrument

COMED PY6 LIGHTING INTERCEPT SURVEY

Customer Bulb Inventory

(RECORD UP TO 12 PACKAGES ALWAYS START WITH THE CFL PACKAGE WITH THE HIGHEST NUMBER OF BULBS. ALWAYS PRIORITIZE CFLS OVER OTHER BULB TYPES)

Q0. Enter Retailer

1. **Home Depot**
2. **Lowe's**
3. **Sam's Club**
4. **Wal-Mart**

Q1. Record Bulb Type

Bulb Type	**Package 1**	**Package 2**	**Package 3**	**Package 4**
CFL				
Incandescent				
Halogen				
LED				

Q2. Record number of bulbs in the package

	Package 1	**Package 2**	**Package 3**	**Package 4**
# of Bulbs				

Q3. Record Bulb Shape

Bulb Type	**Package 1**	**Package 2**	**Package 3**	**Package 4**
Spiral				
A-lamp				
Reflector				
Globe				
Candelabra				
Post				
Torpedo				

Q3a. Does this bulb have any of these other special features: dimmable, 3-way bulb, G-24 base (pin), candelabra base, ceiling fan bulb? [Multiple Response]

	Package 1	**Package 2**	**Package 3**	**Package 4**
Dimmable				
3-way				
G24 Base				
Ceiling Fan Bulb				
Candelabra Base				
None of the above				

Q4. Record Bulb Wattage *(IF Halogen, CFL OR LED RECORD ACTUAL WATTAGE – CFL TYPICALLY BETWEEN 9 AND 30 WATTS; LED TYPICALLY ARE SLIGHTLY LESS)*

	Package 1	**Package 2**	**Package 3**	**Package 4**

Bulb Wattage				

Q5. ComEd Program Bulb? *(DISPLAY COMED PROGRAM BULB MODEL NUMBERS HERE BASED ON ANSWERS TO QUESTIONS ABOVE)*

	Package 1	**Package 2**	**Package 3**	**Package 4**
1.Program Model Number Match				
2. Model Number not in list but believe it is a program bulb (specify model number)				
3. Not a program bulb				

Q6. How many of these packages are being purchased? *(RECORD # PACKAGES)*

	Package 1	**Package 2**	**Package 3**	**Package 4**
# of Packages				

Q7. Are there any more unique lighting packages in the customers' basket?

1. Yes – If Yes, please go back to first question and record information for next package
2. No

CREATE FLAGS TO CLASSIFY BULB PURCHASES AND SUM PURCHASES:
If Q1(i) = CFL then BULBTYPE(i) = CFL
If Q1(i) = LED then BULBTYPE(i) = LED
If Q1(i) = Incandescent then BULBTYPE(i) = INC
If Q1(i) = Halogen then BULBTYPE (i)= HALOGEN

If Q5(i) in (1,2) then PGMBULB(i) = YES, ELSE PGMBULB(i) = NO

If Q1(i) = CFL and Q3 = Spiral and Q3a = None then BULBGROUP(i) = STANDARD
If Q1(i) = CFL and (Q3 = Spiral and Q3a ne None) or (Q3 ne Spiral) then BULBGROUP (i)= SPECIALTY

PSTANCFL = sum of (Q2(i)*Q6(i)) where BULBGROUP(i) = STANDARD and PGMBULB(i) = YES
PSTANCFL = sum of (Q2(i)*Q6(i)) where BULBGROUP(i) = SPECIALTY and PGMBULB(i) = YES

STANCFL = sum of (Q2(i)*Q6(i)) where BULBGROUP(i) = STANDARD
SPECCFL = sum of (Q2(i)*Q6(i)) where BULBGROUP(i) = SPECIALTY
LED = sum of (Q2(i)*Q6(i)) where BULBGROUP(i) = LED
HALOGEN = sum of (Q2(i)*Q6(i)) where BULBTYPE(i) = HALOGEN
INCAND = sum of (Q2(i)*Q6(i)) where BULBTYPE (i) = INC

IF BUYING CFLS (STANDARD + SPECIALTY > 0) READ:
"Going forward we are going to be asking you a number of questions corresponding to the CFLs you are purchasing today."

IF BUYING <u>STANDARD</u> CFLS (STANCFL >0) READ:
"When I refer to Standard CFLs I am talking about spiral shaped CFLs that can be used to replace your basic incandescent bulbs."

IF BUYING <u>SPECIALTY</u> CFLS (SPECCFL >0) READ:
"When I refer to Specialty CFLs I am talking about CFLs that either have a special shape (such as a globe, a candelabra or a covered glass (a-lamp) bulb) or special feature (such as dimmable, 3-way, floodlights, high wattage or non-Medium Screw Base)."

(IF PURCHASING PROGRAM STANDARD CFLS, *(PSTANCFL >0)*)
Q15stan. Where are you planning to install the **<u>STANDARD</u>** CFLs you are buying today - in your home, a business, or both?

1. Home
2. Business
3. Both
4. Don't know

(IF PURCHASING PROGRAM SPECIALTY CFLS *(PSPECCFL >0)*)
Q15spec. Where are you planning to install the **<u>SPECIALTY</u>** CFLs you are buying today - in your home, a business, or both?

1. Home
2. Business
3. Both
4. Don't know

(IF ANY OF THE BULBS WILL BE INSTALLED IN A BUSINESS, if Q15stan or Q15spec in (2,3))
Q16. What type of business is it?

1. Apartment Building/Multi-Family Dwelling
2. Office
3. Restaurant
4. Grocery
5. Retail/Service
6. Warehouse
7. Garage
8. Hospital
9. Health care clinic
10. Elementary School
11. High School/Middle School
12. College/University
13. Hotel/Motel
14. Public assembly, e.g. church/theater/conference
15. Heavy Industry
16. Light Industry
17. Other _____
18. Don't Know

(IF THE BULBS IN Q16 ARE FOR A HOTEL, MOTEL, OR APARTMENT, if Q16 = 1 or 12)
Q17. Will you install the bulbs you are buying today in common spaces such as hallways, or inside the individual units?

1. Common spaces

2. Within individual apartment units or hotel/motel rooms
3. Both
4. Don't know

Customer Intentions and History

Q9. Were you planning to purchase light bulbs when you entered the store today?

1. Yes (SKIP TO Q10)
2. No (SKIP TO Q9b)
3. Don't know (SKIP TO Q18)

Q9b. What factors influenced you to buy them today? (Do not read, Select all that apply)

1. Low price
2. Saw them and was reminded I needed them
3. Lighting Demo / Information in the store
4. These bulbs are hard to find – limited availability
5. Other – Record Verbatim
6. Don't Know

(IF Q9 =1)

Q10. What type (or types) of bulbs were you planning to buy? (Do not read, select all that apply)

1. CFLs
2. Incandescent
3. Halogen
4. LED
5. Other_____
6. Don't know

(IF ANY OF THE BULBS WILL BE INSTALLED IN A BUSINESS- Q15stan=2 or 3 or Q15spec=2 or 3)

Q18. Do you have any CFLs installed right now in your business?

1. Yes
2. No
3. Don't know

(IF ANY OF THE BULBS WILL BE INSTALLED IN A BUSINESS- Q15stan=2 or 3 or Q15spec=2 or 3)

Q19. Does ComEd deliver electricity to your business?

1. Yes
2. No
3. Don't know

(If Q19 = 2 or 3)

Q19_B. Does your business receive a bill from ComEd for your electricity usage**? (IF NEEDED, READ: "Some businesses in this region purchase their electricity from a Retail Electric Supplier but ComEd still handles the billing of these customers.")**

1. Yes we receive a ComEd bill

2. No we don't receive a ComEd bill
3. Business is not in this area/Illinois
4. Don't know

(IF THE PROGRAM BULBS ARE FOR A HOME- Q15stan = 1 or 3 or Q15spec =1 or 3)
Q20. Do you have any CFLs installed right now in your home?

1. Yes
2. No
3. Don't know

(IF THE PROGRAM BULBS ARE FOR A HOME- Q15stan = 1 or 3 or Q15spec =1 or 3)
Q21. Does ComEd deliver electricity to your home?

1. Yes
2. No
3. Don't know

(IF Q21 = 2 or 3)
Q21_B. Do you receive a bill from ComEd for your electricity usage? **(IF NEEDED, READ: "Some customers in this region purchase their electricity from a Retail Electric Supplier but ComEd still bills these customers.")**

1. Yes I receive a ComEd bill
2. No I don't receive a ComEd bill
3. I do not live in this area/Illinois
4. Don't know

(ASK Q11 and QPRICE IF PURCHASING CFLs AND INCANDESCENT BULBS OR HALOGEN BULBS, (STANCFL > 0 or SPECCFL > 0) and (HALOGEN > 0 or INCAND > 0 or LED > 0))

Q11. We are interested in learning more about how people use different types of light bulbs. I see that you are purchasing multiple types of bulbs including CFLs, <READ IN IF BUYING LEDs> LEDs <READ IN IF BUYING INCANDESCENT> incandescents <READ IN IF BUYING HALOGEN> halogen bulbs. Why are you buying these other bulb types in addition to CFLs? **(DO NOT READ; SELECT ALL THAT APPLY. NOTE: IF NONE OF THE ANSWERS FIT, PLEASE USE THE OPTION TO WRITE IN RESPONDENTS ANSWERS)**
Why are you buying a mix of bulb types? **(DO NOT READ- ACCEPT MULTIPLE)**

1. Need multiple bulbs and it is too expensive to buy only CFLs
2. CFLs were on sale/inexpensive
3. Want to try CFLs
4. Want to try LEDs
5. Has fixtures that need 3-way bulbs
6. Has fixtures that need dimmable bulbs
7. There are certain fixtures where they prefer the look of incandescent bulbs
8. There are certain fixtures where they prefer the light quality of incandescent bulbs
9. For fixtures that can't use CFLs (not reason 4 – 7) List reason: _____
10. Other_____
11. Don't Know

(ASK IF Q11 = 5 and (HALOGEN > 0 or INCAND > 0) and (STANCFL > 0 or SPECCFL > 0))
Q11a. Why did you choose an incandescent/halogen bulb for your 3-way light socket instead of a 3-way CFL? **(DO NOT READ)**

1. The 3-way CFL was too expensive
2. Did not know they made 3-way CFLs
3. Do not like 3-way CFLs
4. Other: _____
5. Don't know

(ASK IF Q11 = 6 and (HALOGEN > 0 or INCAND > 0) and (STANCFL > 0 or SPECCFL > 0)
Q11b. Why did you choose an incandescent/halogen bulb for your dimmable light socket instead of a dimmable CFL? **(DO NOT READ)**

1. The dimmable CFL was too expensive
2. Did not know they made specialty CFLs with a dimmable function
3. Do not like dimmable CFLs
4. Other: _____
5. Don't know

(ASK IF Q11 = 7 and (HALOGEN > 0 or INCAND > 0) and (STANCFL > 0 or SPECCFL > 0)
Q11c. For the light sockets where you don't like the look of CFLs, why did you choose an incandescent/halogen light bulb instead of a CFL that has a glass cover to look more like a regular incandescent light bulb? **(DO NOT READ)**

1. The specialty CFL with a glass covering was too expensive
2. I did not know they made covered CFLs
3. Other: _____
4. Don't know

(ASK IF Q11 = 8 and (HALOGEN > 0 or INCAND > 0) and (STANCFL > 0 or SPECCFL > 0)
Q11d. What do you not like about the light quality of CFLs? **(DO NOT READ)**

1. CFLs take too long to reach full brightness
2. CFLs flicker
3. Just don't like the light of CFLs in this fixture
4. Other: _____
5. Don't know

(ASK IF (HALOGEN > 0 or INCAND > 0) and (STANCFL > 0 or SPECCFL > 0))
QPRICE. Using a scale of 0 to 10 where 0 means not at all likely and 10 means extremely likely, if the price of CFLs were the same as, or less than, the price of an incandescent or halogen bulb, how likely would you be to purchase all CFLs?

1. Record Influence Level: 0 (not likely) – 10 (extremely likely) _____
2. Don't know

(IF NOT PURCHASING ANY CFLS SKIP TO Q30)
Q22a-f. Next I'm going to read you six different factors that some people consider when deciding which light bulbs to buy. Thinking **JUST** about the **CFLs** that you are purchasing **TODAY**, I'd like you to tell me which was the **MOST IMPORTANT** factor and which was the **LEAST IMPORTANT factor. [PROGRAMMING**

WILL AUTOMATICALLY ROTATE ORDER IN WHICH ITEMS ARE READ, READ LIST TWICE, ONCE FOR MOST IMPORTANT FACTOR AND ONCE FOR LEAST IMPORTANT FACTOR]

	Most Important	Least Important
The purchase price of the CFLs		
The light quality that CFLs produce		
The energy used by CFLs		
The monthly bill savings resulting from using CFLs		
The environmental impact of using CFLs		
How long the CFLs will last		

(IF PURCHASING STANDARD CFLS, STANCFL > 0)
Q25stan. Of the <STANCFL> **Standard** CFLs you are purchasing today, how many do you expect to install in the next 6 months?

1. Record Number _____ [1 – STANCFL]
2. None of Them
3. All of Them
4. Don't Know

(IF PURCHASING SPECIALTY CFLS, SPECCFL > 0)
Q25spec. Of the <SPECCFL> **Specialty** CFLs you are purchasing today, how many do you expect to install in the next 6 months?

1. Record Number _____ [1 – SPECCFL]
2. None of Them
3. All of Them
4. Don't Know

Q29. Of the <STANCFL + SPECCFL> CFLs you are purchasing today, how many will you use to replace incandescent bulbs that still work?

1. Record Number _____ [1 – (STANCFL + SPECCFL)]
2. None of Them
3. All of Them
4. Don't Know

(IF PURCHASING LEDs,LED > 0 ASK Q25led and Q29led)
Q25led. Of the <LED> **LEDs** you are purchasing today, how many do you expect to install in the next 6 months?

1. Record Number _____ [1 – LED]
2. None of Them
3. All of Them
4. Don't Know

Q29led. What bulb type will these LEDs replace? (Accept Multiple)

1. Incandescent
2. CFL
3. Halogen

4. LED
5. Don't Know

Program CFL Purchase Decision

(IF CUSTOMER IS PURCHASING 1 OR MORE CFLS DISCOUNTED BY COMED (PSTANCFL + PSPECCFL > 0), ASK Q33, OTHERWISE, SKIP TO Q30)

Q33. Did you know that you are purchasing some discounted CFLs today?

1. Yes
2. No
3. Don't know

Q33b. (If Q33 = 2,3 then read: "Although you may not have noticed the CFLs were discounted,) do you think the listed price for the CFLs you are purchasing today is a low price for CFL bulbs?

1. Yes, I thought the price was low for CFLs
2. No, I did not think the price was low for CFLs
3. I am not sure if the price was low for CFLs – not sure what they normally cost
4. I am not sure if the price was low for CFLs - I did not look at the price of the bulbs
5. Don't know

(IF Q33 = 1)

Q34. Did you know that the discount on the price of these CFLs is provided by ComEd?

1. Yes
2. No
3. Don't know

(IF Q34 = 1)

Q35. How did you first find out about ComEd's discounts on CFLs?

1. ComEd sticker on the shelf
2. Saw marketing materials in the store
3. Read about it in my bill from ComEd
4. Discount was advertised in newspaper/tv/radio
5. Store employee made me aware of the discount
6. Saw a retail lighting demonstration
7. Friend
8. Other_____
9. Don't know

(IF Q34 = 1)

Q36. Did you come into the store today specifically to buy CFLs discounted by ComEd?

1. Yes
2. No
3. Don't know

IF BUYING PROGRAM CFLS (PSTANCFL + PSPECCFL > 0) READ:

*"The discount ComEd offers on select CFLs is around $1.25 per bulb for Standard CFLs and $1.50 per bulb for Specialty CFLs. The < PSTANCFL + PSPECCFL*1.25> CFLs you are purchasing today that have been*

*discounted by ComEd would have cost a total of $<PSTANCFL*1.25 + PSPECCFL*1.5> more without the ComEd incentive."*

(IF PURCHASING PROGRAM STANDARD CFLS, PSTANCFL > 0)
Q23stan. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the (<IF Q33 = 1 READ> **discounted)** (<IF Q33=2 or 8 AND Q33B = 1 READ> **low)** price in your decision to purchase **Standard** CFLs today?

1. Record Influence Level: 0 (not influential) – 10 (extremely influential) _____
2. Didn't know Standard CFLs were discounted
3. Don't know

(IF PURCHASING PROGRAM SPECIALTY CFLS, PSPECCFL > 0)
Q23spec. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the (<IF Q33 = 1 READ> **discounted)** (<IF Q33B = 1 READ> **low)** price in your decision to purchase **Specialty** CFLs today?

1. Record Influence Level: 0 (not influential) – 10 (extremely influential) _____
2. Didn't know Standard CFLs were discounted
3. Don't know

(IF PURCHSING STANDARD CFLS DISCOUNTED BY COMED, PSTANCFL > 0)
Q37stan. If the ComEd discount had not been offered, and the <PSTANCFL> discounted standard CFL(s) you are purchasing had instead cost approximately $1.25 more per bulb, or a total of <$**1.25*PSTANCFL>** more, would you still have purchased all of these **Standard** CFLs, some of them, or none of them?

1. All
2. Some
3. None
4. Don't know

(ASK IF Q37stan=2)
Q37stan2. How many of the <PSTANCFL> standard CFLs would you have purchased if they had cost $1.25 more per bulb?

___ [NUMERIC OPEN END, 1 – <PSTANCFL>];
00 None
98. Don't know

(ASK IF Q37stan=2, 3)
Q38stan. Would you have purchased a different type of light bulb instead of the standard CFLs?

1. Yes, Would have purchased a different type of light bulb
2. No, Would NOT have purchased a different type of light bulb
3. Don't know

[ASK IF Q38stan =1]
Q38stan2. What type of light bulbs would you have purchased instead of the standard CFLs? Would you have purchased... (**ALLOW MULTIPLE RESPONSES)**

1. Incandescent light bulbs
2. Halogen light bulbs
3. LED light bulbs
4. Don't know

(IF PURCHASING SPECIALTY CFLS DISCOUNTED BY COMED, PSPECCFL > 0)
Q37spec.If the ComEd discount had not been offered, and the <PSPECCFL> discounted specialty CFL(s) had instead cost **$1.50** more per bulb, or a total of <**1.50*PSPECCFL>** more, would you still have purchased all of these **Specialty** CFLs, some of them, or none of them?

1. All
2. Some
3. None
4. Don't know

(ASK IF Q37spec=2)
Q37spec2. How many of the <PSPECCFL> **Specialty** CFLs would you have purchased if they had cost $1.50 more per bulb?

___ [NUMERIC OPEN END, 1 – < PSPECCFL >];
00 None
98. Don't know

(ASK IF Q37spec=2, 3)
Q38spec. Would you have purchased a different type of light bulb instead of the specialty CFLs?

1. Yes, Would have purchased a different type of light bulb
2. No, Would NOT have purchased a different type of light bulb
3. Don't know

[ASK IF Q38Spec=1]
Q38spec2. What type of light bulbs would you have purchased instead of the specialty CFLs? Would you have purchased… (**ALLOW MULTIPLE RESPONSES)**

1. Incandescent light bulbs
2. Halogen light bulbs
3. LED light bulbs
4. Don't know

Q39. Did you see information or displays about CFLs in this store?

1. Yes
2. No
3. Don't know

(ASK IF Q39 = 1)
Q40. Who sponsored the information about CFLs that you saw?
(DO NOT READ. CIRCLE ALL THAT APPLY)

1. ComEd
2. The store
3. Other_____
4. Don't know

(IF PURCHASING STANDARD CFLS DISCOUNTED BY COMED (PSTANCFL > 0) AND SAW INFO OR DISPLAYS (Q39 = 1))

Q41stan. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the in-store information in your decision to buy **Standard** CFLs?

1. Record Influence Level: 0 (not influential) – 10 (extremely influential) _____
2. Don't know

(IF PURCHASING SPECIALTY CFLS DISCOUNTED BY COMED (PSPECCFL > 0) AND SAW INFO OR DISPLAYS (Q39 = 1))
Q41spec. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the in-store information in your decision to buy **Specialty** CFLs?

1. Record Influence Level: 0 (not influential) – 10 (extremely influential) _____
2. Don't know

Non-Program CFL Purchases

(IF CUSTOMER IS NOT PURCHASING ANY CFL BULBS DISCOUNTED BY COMED, (PSTANCFL + PSPECCFL = 0), ELSE SKIP TO Q32)
Q30. Do you know that THIS STORE is selling CFLs that are discounted through a program by ComEd?

1. Yes
2. No **(SKIP TO Q32)**
3. Don't know **(SKIP TO Q32)**

(IF Q30 = 1)
Q31. How did you first find out about ComEd's discounts on CFLs?

1. ComEd sticker on the shelf
2. Saw marketing materials in the store
3. Read about it in my bill
4. Discount was advertised in newspaper/TV/radio
5. Store employee made me aware of the discount
6. Saw a retail lighting demonstration
7. Friend
8. Open End_____
9. Don't know

(IF CUSTOMER IS PURCHASING SOME NON-DISCOUNTED CFLS, IF (STANCFL+SPECCFL) > (PSTANCFL+PSPECCFL))
Q32. (Some of) The bulbs you are buying are NOT discounted by ComEd. Why did you choose these CFLs instead of the discounted ones? **(DO NOT READ, CIRCLE ALL MENTIONED)**

1. Prefer this brand/manufacturer
2. Prior experience with this model
3. No discounted CFLs in this bulb category
4. Didn't want to buy a multi-pack
5. Didn't know about the discount
6. Thought these bulbs were discounted
7. Other_____
8. Don't Know

(IF CUSTOMER IS PURCHASING NON-DISCOUNTED CFLS (STANCFL + SPECCFL) > (PSTANCFL + PSPECCFL) AND KNEW ABOUT THE COMED DISCOUNT (Q30 = 1))

Q32a. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was ComEd's program (either the financial incentives or the informational material) in your decision to purchase the **non-discounted** CFLs you are purchasing today?

1. Record Influence Level: 0 (not influential) – 10 (extremely influential) _____
2. Don't know

Incandescent or Halogen Purchaser Section

(IF NOT PURCHASING CFLs (STANCFL + SPECCFL = 0) & LED =0)

Q42. Did you consider purchasing any CFLs today?

1. Yes
2. No
3. Don't Know **(SKIP TO LED1)**

Q43. We are interested in learning more about how people decide which light bulbs to buy. Why aren't you purchasing CFLs? **(DO NOT READ. SELECT ALL THAT ARE STATED)**

1. Not aware of CFLs before today
2. CFLs are too expensive
3. Don't know enough about CFLs
4. Don't like the way CFLs fit or look in fixtures
5. Dislike the light quality/color of CFLs
6. Need dimmable bulbs
7. Need 3-way bulbs
8. Need other specialty bulb
9. CFLs take too long to reach full brightness
10. CFLs flicker
11. Accustomed to incandescent bulbs
12. Other _____
13. Don't Know

(IF Q43 = 7)

TWAY. Why did you choose an incandescent/halogen bulb for your 3-way light socket instead of a 3-way CFL?

1. The 3-way CFL was too expensive
2. Did not know they made 3-way CFLs
3. 3-way CFLs are too big
4. Do not like 3-way CFLs
5. Other: _____
6. Don't Know

(IF Q43 = 6)

DIM. Why did you choose an incandescent/halogen bulb for your dimmable light socket instead of a dimmable CFL??

1. The dimmable CFL was too expensive

2. Did not know they made dimmable CFLs
3. Do not like dimmable CFLs
4. Other: _____
5. Don't Know

(IF Q43 = 4)
LOOK. For the light sockets where you don't like the look of CFLs, why did you choose an incandescent/halogen light bulb instead of a CFL that has a glass cover to look more like a regular incandescent light bulb?

1. The specialty CFL with a glass covering was too expensive
2. I did not know they made covered CFLs
3. Other: _____
4. Don't Know

(IF NOT PURCHASING CFLs (STANCFL + SPECCFL = 0))
QPRICE2. Using a scale of 0 to 10 where 0 means not at all likely and 10 means extremely likely, if the price of CFLs were the same as, or less than, the price of an incandescent or halogen bulb, how likely would you be to purchase a CFL instead of the bulbs you are purchasing today?

1. Record Influence Level: 0 (not likely) – 10 (extremely likely) _____
2. Don't know

(IF THE CUSTOMER IS <u>NOT</u> PURCHASING LED BULBS)
LED1. Are you familiar with LED light bulbs that can be used to replace standard light bulbs in your home?
[NOTE TO INTERVIEWER: POINT OUT STANDARD AND REFLECTOR LEDS ON THE SHELF WHEN ASKING THIS QUESTION]

1. Yes
2. No **(SKIP TO LAW1)**
3. Don't Know **(SKIP TO LAW1)**

(IF LED1 = 1)
LED2. Have you ever purchased an LED bulb for your home (or business)?

1. Yes **(SKIP TO LAW1)**
2. No
3. Don't Know

(IF LED2 = 2 or 3)
LED3. What has kept you from purchasing LED bulbs for your home (or business)?

1. Price of LEDs too high
2. Do not like look of LEDs
3. Unfamiliar with LED technology
4. Waiting for LED technology to become more mainstream
5. Other_____
6. Don't Know

(IF LED3 = 1)
LED4. What is the most you would consider paying for an LED bulb?

1. Record in $$
2. Don't Know

EISA 2007 QUESTIONS

LAW1. In 2007, Congress passed a law to set higher energy standards for light bulbs. The law phases out 40 to 100 watt standard incandescent light bulbs from 2012 through 2014. Have you heard of these new light bulb standards before today?

1. Yes
2. No **(SKIP TO LAW4a)**
3. Don't know **(SKIP TO LAW4a)**

(IF LAW1 = 1)

LAW2. How familiar are you with the new light bulb standards? Would you say you are…

1. Not very familiar
2. Somewhat familiar
3. Very familiar
4. Don't Know

(IF LAW1 = 1)

LAW3b. Once stores sell through their existing inventory of standard incandescent bulbs, you will no longer be able to purchase them. Do you plan on stocking up on extra incandescent bulbs while they are still available?

1. Yes
2. No
3. Don't know

LAW4a. There is a new type of light bulb called a halogen bulb that looks like a traditional incandescent light bulb, produces the same amount of light, has the same one year bulb life, but uses about one-third less energy than a traditional incandescent. The new halogen bulbs use 150% more energy than a CFL and last only one-fifth as long as a CFL. The new halogen bulbs cost about $1.25 more per bulb than a traditional incandescent light bulb, but about $1.20 less per bulb than a CFL. Have your heard about or seen this new halogen light bulb?

1. Yes
2. No
3. Don't know

LAW4b. The next time you need to buy an incandescent bulb and it is not available, do you think you will purchase a CFL, a halogen bulb, or an LED?

1 Equivalent light CFL
2 Equivalent light Halogen
3 Equivalent light LED
4 Don't know

READ TO CUSTOMER:

Thank you for your time today. Here is a $10 gift card for this store which may be used today.

AFTER CUSTOMER HAS LEFT, PLEASE FILL OUT INFORMATION:

QA1. Field Staff Name: _____

QA2. Date: _____

QA3. Store location: _____

1. 1232 West North Ave, Chicago (if Q0 = Home Depot)
2. 4005 167th St, Country Club Hills (if Q0 = Walmart)
3. 8500 West Golf Rd, Niles (if Q0 = Walmart)
4. 20101 S LaGrange Rd, Frankfort (if Q0 = Home Depot)
5. 1054 N Weber Road, Bolingbrook (if Q0 = Home Depot)
6. 621 Brook Forest Ave, Shorewood (if Q0 = Home Depot)
7. 2601 S Cicero, Cicero (if Q0 = Sam's Club)
8. 2630 N. Narragansett Ave, Chicago (if Q0 = Lowe's)
9. 900 South Barrington Rd, Streamwood (if Q0 = Sam's Club)
10. 27315 West Hartigan Rd, Volo (if Q0 = Home Depot)
11. 475 South Schmale Rd. Carol Stream (if Q0 = Home Depot)
12. 1205 Illinois Route 31 South, Crystal Lake (if Q0 = Walmart)
13. 7200 Woodward Ave, Woodridge (if Q0 = Home Depot)
14. 1580 West Lane Rd, Machesney Park (if Q0 = Home Depot)
15. 100 Barrington Rd., Schaumburg (if Q0 = Home Depot)
16. 4555 S Western Blvd, Chicago (if Q0 = Home Depot)
17. 2050 Sycamore Rd, Dekalb (if Q0 = Lowe's)
18. 3801 Running Brook Farms Blvd, Johnsburg (if Q0 = Walmart)
19. 3500 N. Kimball Ave, Chicago (if Q0 = Home Depot)
20. 200 W 87th Street, Chicago (if Q0 = Home Depot)
21. 1300 S. Clinton, Chicago (if Q0 = Home Depot)
22. 10900 S. Doty Ave, Chicago (if Q0 = Walmart)
23. 5670 NW Hwy, Crystal Lake (if Q0 = Sam's Club)
24. 7151 Walton Street, Rockford (if Q0 = Sam's Club)
25. Other (Note store name and city)

QA4. Demo Period at Store

1. Yes
2. No

QA6. Where in store interview was completed:

1. Main lighting aisle / display
2. End-cap display (end of aisle)
3. Stand alone / Pallet display
4. Other _____

7.6.2 PY6 Shelf Survey Instrument

COMED PY6 RESIDENTIAL LIGHTING SHELF SURVEY

Field Staff Name:	
Store name:	Date:
Store address:	
Store city:	Store zip code:

SS1. **What types of lighting information materials are present?** [CHECK ALL THAT APPLY.

Information On:	**ComEd Sponsored (Smart Ideas)**	**Retailer**	**Manufacturer**
CFL Bulbs	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Proper CFL Disposal	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
CFL Discounts	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Explanation of Lumens	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
EISA Regulations	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
LED Bulbs	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

SS2. **Are there any off-shelf lighting displays (endcaps, wingstacks, register)?** (If no, skip to SS3) **Yes** ☐ **No** ☐

a. Are CFL bulbs featured in the displays? …… …….. **Yes** ☐ **No** ☐

b. Are ComEd-discounted CFL bulbs featured in the displays?……. **Yes** ☐ **No** ☐

c1. How did you determine that the discounted bulbs were in the display? (Check 1)

- ☐ By promotional materials on the end cap that showed ComEd as sponsor
- ☐ By consulting my shelf inventory sheet to see which bulbs were discounted
- ☐ Other (Please describe):_____

c. Are EISA compliant bulbs featured in the displays? …….. **Yes** ☐ **No** ☐

SS3. **How are the prices displayed for the ComEd discounted lighting?**

1 Discounted/sale price only displayed ..... **Yes** ☐ **No** ☐

2 Original price and discount price displayed ..... **Yes** ☐ **No** ☐

3 Price tag missing for discounted bulbs ..... **Yes** ☐ **No** ☐

4 Other (Describe) _____

Inventoried Products – includes all Standard and Specialty Medium Screw Base (MSB) bulbs:

All CFLs

- 40W-100W Equivalents

All Incandescents

- 40W-100W

All Halogens

- 40W-100W Equivalents

All LEDs

- 40W-100W Equivalents

CFLs - 100W Equivalent Spiral Bulbs

Type	CFL Wattage	Incand Equiv Wattage	Lumens	Bulbs in Pack	Manufacturer	Model Number	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? C = ComEd R=Retailer N=None
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N
CFL		100									☐C ☐R ☐N

CFLs - 75W Equivalent Spiral Bulbs

Type	CFL Wattage	Incand Equiv Wattage	Lumens	Bulbs in Pack	Manufacturer	Model Number	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? C = ComEd R=Retailer N=None
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N
CFL		75									☐C ☐R ☐N

CFLs - 60W Equivalent Spiral Bulbs

Type	CFL Wattage	Incand Equiv Wattage	Lumens	Bulbs in Pack	Manufacturer	Model Number	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? C = ComEd R=Retailer N=None
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N
CFL		60									☐C ☐R ☐N

CFLs - 40W Equivalent Spiral Bulbs

Type	CFL Wattage	Incand Equiv Wattage	Lumens	Bulbs in Pack	Manufacturer	Model Number	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? C = ComEd R=Retailer N=None
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N
CFL		40									☐C ☐R ☐N

CFLs - Specialty Bulbs

Type	CFL Wattage	Incand Equiv Wattage	Bulb Type A=A-lamp 3=3-way D=Dimmable R=Reflector G=Globe C=Candelabra	Lumens	Bulbs in Pack	Manufacturer	Model Number	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? C = ComEd R=Retailer N=None
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N

CFLs - Specialty Bulbs (Con't)

Type	CFL Wattage	Incand Equiv Wattage	Bulb Type A=A-lamp 3=3-way D=Dimmable R=Reflector G=Globe C=Candelabra	Lumens	Bulbs in Pack	Manufacturer	Model Number	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? C = ComEd R=Retailer N=None
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N

CFLs - Specialty Bulbs (Con't)

Type	CFL Wattage	Incand Equiv Wattage	Bulb Type A=A-lamp 3=3-way D=Dimmable R=Reflector G=Globe C=Candelabra	Lumens	Bulbs in Pack	Manufacturer	Model Number	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? C = ComEd R=Retailer N=None
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N
CFL			☐A ☐D ☐3 ☐R ☐G ☐C									☐C ☐R ☐N

Incandescent Bulbs

Type	Bulb Type S=Standard 3=3-way R=Reflector G=Globe C=Candelabra RS = Rough Service O=Other	Wattage	Lumens	Bulbs in Pack	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? U = Utility R=Retailer N=None
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N

Incandescent Bulbs (Con't)

Type	Bulb Type S=Standard 3=3-way R=Reflector G=Globe C=Candelabra O=Other	Wattage	Lumens	Bulbs in Pack	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? U = Utility R=Retailer N=None
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N
Incandescent	☐S ☐3 ☐R ☐G ☐C ☐RS ☐ O____________								☐U ☐R ☐N

Halogen Bulbs

Type	Bulb Type S=Standard 3=3-way R=Reflector G=Globe C=Candelabra O=Other	Halogen Wattage	Incand Equiv Wattage	Lumens	Bulbs in Pack	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? U = Utility R=Retailer N=None
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
Halogen	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N

LED Bulbs

Type	Bulb Type S=Standard 3=3-way R=Reflector G=Globe C=Candelabra O=Other	LED Wattage	Incand Equiv Wattage	Lumens	Bulbs in Pack	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Price	Original Price (if on sale)	Discounted? U = Utility R=Retailer N=None
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N
LED	☐S ☐3 ☐R ☐G ☐C ☐ O_____________									☐U ☐R ☐N

7.6.3 PY6 Mystery Shopper Instrument

ComEd PY6 Residential Lighting Program
Mystery Shopper Survey

INTRO: Hi, I'm calling because I'm looking to buy some light bulbs and I wanted to see if you have what I need before I stop by. Can you help me with that?

1. Yes – **CONTINUE**
2. No (do not sell light bulbs) – **THANK & TERMINATE**
8. (Don't know) – **ASK TO SPEAK TO SOMEONE WHO CAN ANSWER; OTHERWISE THANK & TERMINATE**
9. (Refused) – **THANK & TERMINATE**

Q1. I am looking to buy some standard incandescent light bulbs but I need different wattages. Do you have any 100 watt incandescent light bulbs in stock?
[INTERVIEWER: IF THEY ASK WHAT TYPE OF BULBS, SAY "STANDARD FIXTURE BULBS" – I.E., NOT 3-WAY, FLOOD OR OTHER SPECIALTY BULBS] [IF THEY DON'T KNOW, ASK IF THEY CAN CHECK]

1. Have 100w in stock
2. Do not have any in stock – **SKIP TO Q1B**
8. (Don't know) – **SKIP TO Q2**
9. (Refused) – **SKIP TO Q2**

Q1a. I am looking to buy at least 20 of these bulbs, do you have that many on hand?

1. Yes – **SKIP TO Q2**
2. No
8. (Don't know) – **SKIP TO Q2**
9. (Refused) – **SKIP TO Q2**

[ASK IF Q1A=2 OR Q1=2]
Q1b. Do you expect to get more any time soon?

1. Yes – **SKIP TO Q2**
2. No
8. (Don't know) – **SKIP TO Q2**
9. (Refused) – **SKIP TO Q2**

[ASK IF Q1B=2]
Q1c. Why not?

01. Phasing them out (due to federal regulations)
02. No consumer demand for these bulbs

00. Other, specify
98. Don't know
99. Refused

Q2. I am also looking to get 75 watt incandescent light bulbs. Do you have any in stock? [INTERVIEWER: IF THEY ASK WHAT TYPE OF BULBS, SAY "STANDARD FIXTURE BULBS" – I.E., NOT 3-WAY, FLOOD OR OTHER SPECIALTY BULBS] [IF THEY DON'T KNOW, ASK IF THEY CAN CHECK]

1. Have 75w in stock
2. Do not have any in stock – **SKIP TO Q2B**
8. (Don't know) – **SKIP TO Q3**
9. (Refused) – **SKIP TO Q3**

[ASK IF Q2=1]

Q2a. I am looking to buy at least 20 of these bulbs, do you have that many on hand?

1. Yes – **SKIP TO Q3**
2. No
8. (Don't know) – **SKIP TO Q3**
9. (Refused) – **SKIP TO Q3**

[ASK IF Q2A=2 OR Q2=2]

Q2b. Do you expect to get more any time soon?

1. Yes– **SKIP TO Q3**
2. No
8. (Don't know) – **SKIP TO Q3**
9. (Refused) – **SKIP TO Q3**

[ASK IF Q2B=2]

Q2c. Why not?

01. Phasing them out (due to federal regulations)
02. No consumer demand for these bulbs
00. Other, specify
98. (Don't know)
99. (Refused)

[ASK IF Q1=1 OR Q2=1]

Q3**.** Before I come in to buy these bulbs, I just want to make sure that these are incandescent light bulbs and not halogen bulbs. Halogen bulbs look very similar and sometimes the packages show the incandescent equivalent wattage of 100 or 75 watts when really halogens are 72 or 53 watt bulbs. Can you make sure these bulbs are incandescent bulbs and not halogens? [IF THEY DON'T KNOW, ASK IF THEY CAN CHECK]

1. (Yes are incandescent bulbs)
2. (No are actually halogen bulbs)
8. (Not sure what type of bulbs they are/Don't know)
9. (Refused)

[ASK IF Q1=2, 8, 9 AND Q2=2, 8, 9]
Q4. What is the highest wattage of standard incandescent bulbs that you currently have in stock? [IF THEY DON'T KNOW, ASK IF THEY CAN CHECK] [NUMERIC RESPONSE]

96. (Do not have any incandescents)
98. (Don't know)
99. (Refused)

(ASK IF Q1=2 OR Q2=2)
Q5. Since you don't have all of the incandescent bulbs that I am looking for, what would you recommend instead? [OPEN END]

98. (Don't know)
99. (Refused)

End of Survey: Thank You!

DO NOT ASK, BUT HAVE A FIELD AT THE END OF THE SURVEY FOR NOTES:
(Do you have any comments that you would like to pass on to your supervisor about this survey?) [OPEN RESPONSE]

7.7 PY5/PY6 Lighting Logger Memo

230 Horizon Drive
Suite 101B
Verona, WI 53593

Memorandum

Date: December 5, 2014
To: ComEd Residential Lighting Program & Interested Parties
CC: Jeff Erickson, Rob Neumann and Randy Gunn; Navigant
From: Amy Buege and George Jiang; Itron/Navigant Evaluation Team
RE: PY5/PY6 Lighting Logger Study Results - Final

This memorandum presents results from the lighting logger study conducted as part of the PY5/PY6 ComEd Residential Lighting Program evaluation. This memo outlines the data collection and analysis activities that have taken place as part of this study and presents the hours of use (HOU) and peak coincidence factor (CF) estimates stemming from these activities.

Background

As part of the PY5/PY6 evaluation of ComEd's Residential Lighting program the Navigant Consulting team, led by Itron and supported by Michael's Energy, conducted a lighting logger study.[1] The Goal of this study was to estimate the average Hours of Use (HOU) and Peak Coincidence Factor (Peak CF) of CFLs installed within the homes of ComEd residential customers who have purchased program bulbs through the Residential Lighting Program.[2] HOU and Peak CF are two key parameters used to estimate residential lighting gross energy and peak demand savings. In PY6, HOU and Peak CF are deemed parameters specified in Version 2.0 of the Illinois Technical Reference Manual (IL TRM). Table 1 below shows the HOU and Peak CF estimates included in Version 2.0 of the IL TRM. While loggers were installed on Specialty CFLs and LEDs, the study was not designed to develop independent statistically significant regression based HOU and Peak CF estimates for these bulb types. These bulb types made up only 3% each (the Specialty CFLs category includes Reflectors, Globes and Decorative bulbs) of the bulbs installed in the sample of logged homes, and would thus require a logger study roughly 10 times larger to develop bulb type specific HOU and Peak CF estimates.

1 A detailed description of the lighting logger study can be found in a document titled *ComEd PY5/PY6 Residential Energy Star Lighting Program Metering Study Protocols*. Finalized on April 22, 2013.

2 Loggers were also installed on a portion of the LEDs found on-site, but the quantity of LEDs installed and logged was insufficient to develop distinct estimates of HOU and Peak CF for LEDs.

Table 1. Deemed HOU and Peak CF Estimates based on V2.0 of the IL TRM

Installation Location	Hours of Use		Peak CF
	Annual	Avg Daily	
Interior Single Family or Multi-Family In-unit[3]	938	2.57	9.5%
Multi-Family Common Area	5,950[4]	16.29	75%[5]
Exterior	1,825[6]	5.0	n/a
Unknown	1,000[7]	2.74	9.5%

Sampling and Data Collection

To estimate HOU and Peak CF for ComEd's residential lighting program, the Navigant Consulting Team installed HOBO UX90 Lighting Loggers (hereafter referred to as "loggers") in 85 households where CFLs were currently in use. These loggers allow for the calculation of the usage of a particular CFL by recording the exact date and time each light is switched on or off. The sample of ComEd customers being called for recruitment into the lighting logger study was pulled from a number of current (PY5) and past (PY3 and PY4) residential lighting program participant sources for which we had contact information (In-store Intercept survey respondents, Coupon bulb purchasers, General Population survey respondents, and PY3 metering study participants). This list of program participants was prioritized by how recently they made their program bulb purchase. This contact list was then contacted to see if they would be willing to participate in the lighting logger study. All customers who agreed to participate in the logger study were called back within a few weeks of the initial prescreen call to schedule a time for a technician to come to their home to complete a lighting inventory and install lighting loggers on a sample of the CFLs they had installed inside and outside their home. All customers who participated in the logger study received two $50 gift cards (one at the time of logger installation and one at the time of logger removal) in appreciation for their participation in the light logger study.

3 These results are based on lighting logger study conducted as part of the PY3 ComEd Residential Lighting Program evaluation. http://www.icc.illinois.gov/downloads/public/edocket/323818.pdf

4 Multi-family common area lighting assumption is 16.3 hours per day (5950 hours per year) based on Focus on Energy Evaluation, ACES Deemed Savings Desk Review, November 2010.

5 Coincidence factor is based on healthcare/clinic value (used as proxy for multi-family common area lighting with similar hours of use) developed using Equest models for various building types averaged across 5 climate zones for Illinois for the following building types.

6 Based on secondary research conducted as part of the PY3 ComEd Residential Lighting Program evaluation. http://www.icc.illinois.gov/downloads/public/edocket/323818.pdf

7 Assumes 7% exterior lighting, based on lighting logger study conducted as part of the PY3 ComEd Residential Lighting Program evaluation.

A total of 739 lighting loggers were installed across the final sample of 85 homes[8] between May and July 2013. These loggers were left in place for approximately 7.5 months and were removed from the field between December 2013 and January 2014.[9]

Data Quality Inspection

A total of 706 of the initially installed 739 loggers were removed from the field. Loggers were not removed for the following reasons:

- 15 loggers were lost due to the customer moving (two residences)
- 18 loggers could not be found

Data from the remaining 706 loggers was downloaded and visually inspected for signs of unrealistic patterns of on/off switching that could be the result of the logger picking up ambient light or other mechanical or measurement problems. The purpose of this individual logger visual inspection was to ensure that the loggers had been installed correctly and had functioned properly throughout the monitoring period. Also, additional loggers were excluded from the analysis for the following reasons:

- Logger damaged or not working, data could not be extracted (broke, melted, dead battery) – 17 loggers
- Empty socket, burned out/broken bulb – 12 Loggers
- Wrong bulb type in socket at time of extraction (Incandescent or Halogen) – 12 Loggers
- Customer removed loggers or logger fell off the lamp during study period – 25 Loggers
- Insufficient logger data[10] – 2 Loggers
- Logger Failed Visual Inspection Test[11] – 32 Loggers

In all, 100 loggers (14% of recovered loggers) were identified as problematic and were thus dropped from the analysis dataset based on this inspection. This quality inspection of the logger data yielded a final sample of 606 loggers[12] with good data from a total of 83 homes.

8 The sample of 85 homes was determined based on an average of a minimum of 8 loggers installed per home, logger attrition rates similar to those from the PY3 study (although based on a combination of increased training and technology deployment we hoped to significantly improve the attrition rates in PY6), the Peak CF mean and standard deviation found in PY3, and the desire to achieve a 90/10 one-tailed confidence/precision level.

9 A comprehensive protocols document was developed and approved by ComEd prior to conducting this logger study. This document is included at the end of this memo as an attachment.

10 All loggers with less than 16 weeks of good data were flagged and underwent a secondary data review to confirm their inclusion in the final analysis dataset. This resulted in keeping 16 out of the 18 flagged loggers.

11 A typical reason that a logger was thrown out was that the logger was logging natural or ambient light, rather than the intended lamp. Often this was identified by the technician when they were extracting the logger and confirmed by the visual inspection of the data.

12 These 597 loggers include 35 loggers installed on LED bulbs. These loggers are addressed in further detail below.

Inventory of Bulbs Installed in Logger Study Homes

Table 2 below shows the distribution of bulbs found to be installed across the sample of 83 homes included in the logger study analysis. As the table below shows, at the time the lighting loggers were installed 35% of the light bulbs installed in customers' homes were CFLs, 3% were LEDs, 53% were incandescent bulbs, and 9% were halogen bulbs.

Table 2: PY5/PY6 Installed Lighting Inventory Distribution

Room Type	CFL Bulbs	% CFLs	LED Bulbs	% LEDs	Incand Bulbs	% Incand	Halogen Bulbs	% Halogen	Total %
Basement	179	10%	13	8%	204	7%	43	9%	8%
Bathroom	275	15%	27	16%	438	16%	45	9%	15%
Bedroom	319	18%	33	20%	439	16%	67	14%	16%
Closet	78	4%	4	2%	130	5%	5	1%	4%
Dining	81	4%	8	5%	242	9%	15	3%	7%
Hallway	170	9%	23	14%	325	12%	50	10%	11%
Kitchen	207	11%	37	22%	263	10%	126	26%	12%
Laundry	48	3%	0	0%	40	1%	2	0%	2%
Living Room	221	12%	22	13%	312	11%	52	11%	12%
Office/Den	50	3%	0	0%	65	2%	9	2%	2%
Other	100	5%	0	0%	152	6%	11	2%	5%
Outdoor	93	5%	2	1%	136	5%	67	14%	6%
Total Bulbs	1,821	100%	169	100%	2,746	100%	492	100%	100%
Total Fixtures	1,015		71		1285		191		
% of All Bulbs	**35%**		**3%**		**53%**		**9%**		

As shown in Table 2 above, the sample of 83 homes included in this logger study did not include a large enough sample of installed LEDs on which a robust estimate of the HOU and Peak CF for LED bulbs could be calculated. During the lighting inventory, only 71 fixtures across the 82 homes were found to have LED bulbs installed in them. Loggers were installed on 35 of these fixtures where LEDs were installed and the evaluation team estimate both an overall LED HOU, as well as distinct LED HOU estimates for the four room types where more than five fixtures containing LEDs were logged.[13] As anticipated, the standard errors on the LED HOU estimates were large due to the small sample sizes and thus the results have very large 90% Confidence Intervals. The results are presented below for information purposes only and are not recommended for use at this time.

[13] Our hypothesis going into the study was that the HOU of LEDs would be similar to the HOU of CFLs. The LED data collected during this study does not reject the initial hypothesis and thus the evaluation team recommends applying the results from this study to LEDs purchased through ComEd's Residential Lighting Program.

Table 3 below shows the CFL socket saturation based on data collected for the PY3 and PY5/PY6 ComEd light metering studies. This table shows that overall the percentage of sockets filled with CFLs has increased from 20 percent to 35 percent, a 71 percent increase, during this 3-year period. Increases in CFL socket saturation were greatest in Laundry rooms and Basements and smallest in Outdoor locations.

Table 3: PY3 versus PY5/PY6 CFL Socket Saturation

Room Type	PY5/PY6		PY3[14]		Increase	% Increase[15]
	CFLs	% Sockets	CFLs	% Sockets		
Basement	179	41%	225	19%	22%	112%
Bathroom	275	35%	304	19%	16%	88%
Bedroom	319	37%	371	24%	13%	57%
Closet	78	36%	72	21%	15%	74%
Dining	81	23%	61	11%	12%	112%
Hallway	170	30%	116	14%	16%	114%
Kitchen	207	33%	265	22%	11%	51%
Laundry	48	53%	58	18%	36%	202%
Living Room	221	36%	322	25%	12%	48%
Office/Den	50	40%	94	29%	11%	38%
Other	100	38%	24	13%	25%	185%
Outdoor	93	31%	216	23%	9%	39%
Total Bulbs	1,821	35%	2,128	20%	14%	71%

HOU Analysis

The Navigant Consulting Team estimated an average annual HOU for each lighting logger installed that passed the data quality inspection (analysis sample consisted of 571 loggers, 81% of retrieved loggers). For each of the lighting loggers, the percent-on per hour was calculated by summing the intervals during which the logger was detecting light for each hour in each day installed. These values were then aggregated by date to produce a raw daily hours-on time for each logger. These daily logger totals comprised the dependent variable for the HOU regression.

[14] The PY3 values come from a total of 143 sites that included a sample of sites inventoried for the multi-state study conducted in PY3 and that were not included in the logger study.

[15] The percentage increase in CFL socket saturation is presented for informational purposes only two show the difference between these two study years. Due to the sample sizes of the two studies the evaluation team does not recommend using these results to predict future increases in CFL socket saturation by room type.

HOU Logger Data Weighting

In order to expand the collected lighting logger data to the entire ComEd customer population, two levels of weighting were applied to each logger. The first weight, the Logger Weight, served to weight each individual logger up to the total number of CFLs controlled by the same light switch as the logged CFL. The second weight, the Room Weight, was applied by room-type and served to align the room-type distribution of the logged CFLs used in the HOU analysis (from 83 homes, 571 loggers, and 1,010 lamps logged) to the room-type distribution of the installed CFLs found during the onsite lighting inventories (83 homes, 1,821 total lamps). The Room Weight was calculated as the ratio of the number of CFLs installed by room type over the number of CFLs logged[16] by room-type. Table 4 below shows the distribution of the installed CFLs from the onsite inventory population, the distribution of the logged CFLs (weighted by the Logger Weight) used in the HOU analysis, and the resulting HOU Room Weights that were applied. As the table below shows, the average HOU Room Weight applied was approximately 1.80. The quantity of usable logger data on CFLs that were located in outdoor locations was more than four times larger than in the PY3 study due to significantly increased robustness of the exterior CFL logger installation and removal protocols, as well as the use of optical eyes to reduce the ambient light issues. However, logger data on exterior CFLs is still lacking on a percentage basis (i.e. the percentage of CFLs installed in Outdoor locations is equal to the percentage of logger data from CFLs installed in Outdoor locations), which is evident from the HOU Room Weight for the Outdoor room-type.

16 The number of logged CFLs in this ratio was calculated after the first weight had been applied so that it was representative of all CFLs controlled by the same light switch as the single logged CFL.

Table 4. Distribution of CFLs by Room Type, Inventory vs. HOU Analysis Population

Room Type	Distribution of CFLs Installed from Onsite Inventory (n=1,034[17])		Distribution of Logged CFLs (Logger Wt) used in Analysis (n=571)		HOU Room Weight
Basement	179	10%	88	9%	2.03
Bathroom	275	15%	157	16%	1.75
Bedroom	319	18%	183	18%	1.74
Closet	78	4%	42	4%	1.86
Dining	81	4%	42	4%	1.93
Hallway	170	9%	88	9%	1.93
Kitchen	207	11%	124	12%	1.67
Laundry	48	3%	32	3%	1.50
Living Room	221	12%	142	14%	1.56
Office/Den	50	3%	35	3%	1.43
Other	100	5%	51	5%	1.96
Outdoor	93	5%	26	3%	3.58
Total	**1,821**	**100%**	**1,010**	**100%**	**1.80**

Logger Data Annualization

Because the logger data used in the analysis was collected over only a portion of the year (roughly 7 1/2 months) it was necessary to annualize the logger data in order to generate an average HOU estimate representative of the entire year. Because the days when loggers were installed were more heavily weighted toward winter days when the shorter daylight hours typically lead to longer average HOU, it was anticipated that the annualization process would yield an average annual HOU lower than that of the raw logger data. To annualize the data a LengthOfDay variable was created for each day that was included in the analysis dataset. This variable was created using a sinusoid curve and took a value between -1 (on the winter solstice) and 1 (on the summer solstice) and was equal to 0 on the spring equinox and fall equinox. The formula used in SAS to derive this variable was as follows:

```
LengthOfDay = sin(3.14159*('22SEP2013'd - date)/182.5)
```

where `('22SEP2013'd - date)` is the number of days between the current date and the fall equinox.

A regression was then run in SAS for each of the loggers in the analysis dataset that generated a modeled sinusoid estimate of daily HOU across the entire year.[18] The estimated annual hours of use for each

[17] The n here represents the number of unique fixture groups logged. It is smaller than the total number of CFLs inventoried (1,821) since many fixtures had more than one bulb installed in them.

[18] A model was estimated for each logger to adjust for the seasonality that exists between bulbs installed within a particular room. Not all bulbs installed within a particular room type will have the same seasonal variation. The form of the regression was: $HOU/day_{L,t} = \alpha_L + \beta_L LengthOfDay_{L,t} + \varepsilon_{L,t}$, where L represents each individual logger.

logger could then be aggregated to generate an overall average HOU estimate across all loggers, by household, or by specific room type.

CFL HOU Results

The weights described above were applied to the individual CFL logger HOU estimates to come up with the average overall CFL HOU estimate of 2.32 hours/day +/- 0.22 (9.4%). The estimated HOU for CFLs installed in interior locations estimate was 2.08 hours/day +/- 0.20 (9.4%) and the estimated HOU for CFLs installed in exterior locations estimate was 6.78 hours/day +/- 2.28 (34%). Table 5 below provides the HOU estimates by room type, as well as for all interior locations, exterior locations and overall. The table also provides the 90% (two-tailed) confidence intervals for each of these estimates and the number of loggers each estimate is based on for each of the room types or locations. As this table shows, the CFL HOU estimates vary significantly by room type from a low of 0.10 hours/day in closet areas to a high of 3.49 hours/day in kitchen areas (followed by dining areas at 3.17 hours/day). It should be noted that some of these results (such as those for laundry and dining areas) are based on relatively small sample sizes and thus have high levels of uncertainty at the room type level. As one might expect, the CFLs found in the common living spaces have HOU estimates around the mean (such as living rooms and offices/dens), while CFLs in kitchens typically have higher than average use and those in bedrooms and bathrooms have lower than average use. The average exterior HOU estimate is 6.78 hours/day, but it should be noted this is also based on a relatively small sample size.[19]

[19] For the PY5/PY6 lighting logger study the evaluation team put a significant focus on installing lighting loggers on CFLs installed in exterior locations. Collecting quality data from exterior loggers is difficult due to ambient light issues which are much more problematic in exterior locations. In total 31 exterior bulbs were logged but only 17 produced useable data, which is a 45% logger drop rate compared with loggers installed in interior locations which had a 17% drop rate.

Table 5: Average Daily Hours of Use by Room Type

Room Type	n	Average Daily HOU	Lower 90% CL	Upper 90% CL
Basement	37	2.10	1.51	2.69
Bathroom	64	1.44	1.02	1.87
Bedroom	123	1.62	1.33	1.91
Closet	36	0.10	0.07	0.13
Dining	16	3.17	1.19	5.16
Hallway	54	2.85	1.93	3.77
Kitchen	48	3.49	2.60	4.38
Laundry	19	1.04	0.24	1.85
Living Room	102	2.33	1.92	2.74
Office/Den	25	2.19	1.23	3.15
Other	30	1.63	0.93	2.33
Interior HOU	**554**	**2.08**	**1.88**	**2.28**
Exterior HOU	**17**	**6.78**	**4.51**	**9.06**
Overall HOU	**571**	**2.32**	**2.10**	**2.53**

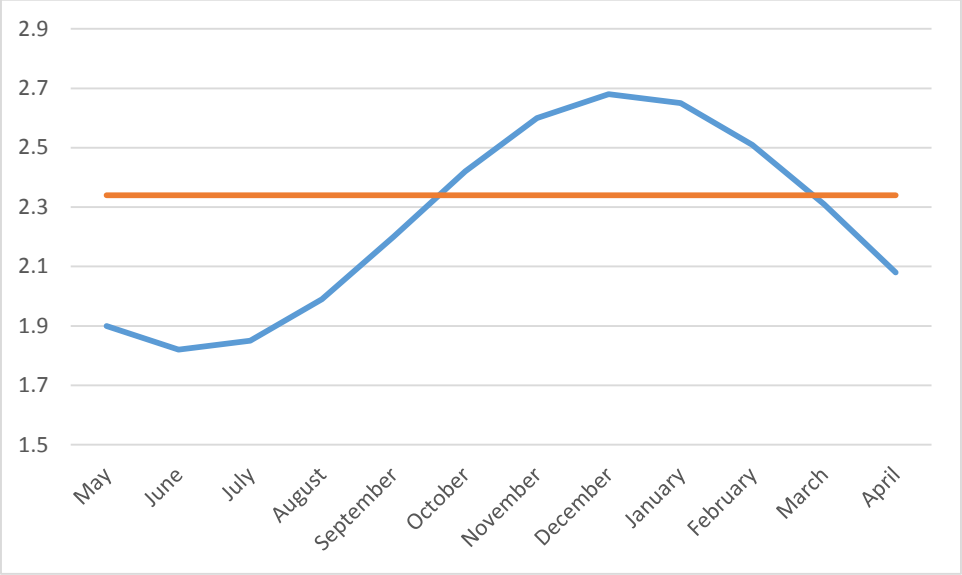
CFL HOU Results by Month

Table 6 below shows the average daily CFL HOU by month that resulted from the regression models and the percentage of the maximum monthly HOU each of these values represented. As this table shows, the longest regression based daily CFL HOU estimate for the year was found in December (2.64 hours/day) and the shortest was found in June (1.81 hours/day and 68% of the December daily HOU estimate).

Table 6: Average CFL Daily Hours of Use Estimates by Month

Month	Regression-Based Average Daily HOU Estimate	% of Max HOU
May	1.89	72%
June	1.81	68%
July	1.84	70%
August	1.98	75%
September	2.18	82%
October	2.39	91%
November	2.56	97%
December	2.64	100%
January	2.61	99%
February	2.48	94%
March	2.28	86%
April	2.06	78%

Figure 1: Average CFL Daily Hours of Use Estimates by Month



CFL vs. LED HOU Estimates

As mentioned previously in this memo, due to the small sample of LED bulbs found in customers' homes during the lighting logger study (3% of all installed bulbs) loggers were only installed on 35 fixtures containing LEDs. As a result, the estimated LED HOU estimates have very large 90% Confidence Intervals surrounding them. Table 7 below presents the estimated LED HOU based on these small samples of loggers, alongside the CFL results by room-type (for rooms where 5 or more LEDs were logged) and overall.

Table 7: CFL vs. LED Average Daily HOU Estimates

Room Type	CFL				LED			
	n	Avg Daily HOU	Lower 90% CL	Upper 90% CL	n	Avg Daily HOU	Lower 90% CL[20]	Upper 90% CL
Bathroom	64	1.44	1.02	1.87	6	2.68	0	7.45
Bedroom	123	1.62	1.32	1.91	6	1.56	0.12	3.00
Hallway	54	2.85	1.93	3.77	6	2.49	0.36	4.62
Kitchen	48	3.49	2.60	4.38	7	1.99	0.77	3.20
Overall	**571**	**2.32**	**2.10**	**2.53**	**35**	**2.30**	**1.40**	**3.19**

As the above table shows, the overall HOU estimate for LEDs was very close to the overall estimate for CFLs (although the confidence interval is much larger). It is for this reason that we recommend applying the CFL HOU estimate to medium screw based LED bulbs in the absence of a better LED specific estimate.

Snapback/Rebound Effects

In accordance with the Uniform Methods Project (UMP),[21] no adjustments for snapback/rebound effects were made to the HOU estimates developed as part of this study. The UMP states:

> *"Due to the nature of residential lighting programs, it is not typically possible to conduct metering both before and after installation of energy-efficient lighting. Therefore, the Residential Lighting Protocol* ***does not recommend adjusting for snapback/rebound effects in the hours of use estimates****."*

Peak Coincidence Factor (CF) Analysis

In order to estimate the Peak CF resulting from the lighting logger study the Navigant Consulting Team calculated the percentage of time a given logger was turned on during the "peak" time period. The results presented here are for the ComEd "peak" defined as weekdays from 1 p.m. to 5 p.m.[22] Logger data from the period between June 1st and August 31st was used to estimate the Peak CF and all loggers having at least 11 days' worth of data during this period were included in the analysis dataset (571 loggers, 1,010 lamps logged).

[20] Lower Confidence Limits were limited to a minimum of 0.

[21] Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Chapter 6: Residential Lighting Evaluation Protocol. National Renewable Energy Laboratory. April 2013. http://energy.gov/sites/prod/files/2013/05/f0/53827-6.pdf

[22] This is also the PJM bidding "peak" (2 p.m. to 6 p.m. Eastern Standard Time).

Peak CF Weighting

Weights for the Peak CF analysis were developed in the same manner as for the HOU analysis. The HOU and Peak CF weights differ slightly due to the different population of loggers used in the two analyses.[23] Table 8 below shows the distribution of the installed CFLs from the onsite inventory population, the distribution of the logged CFLs (weighted) used in the Peak CF analysis, and the resulting room-based Peak CF weights that were applied. As the table below shows, the average room-based weight applied was approximately 1.80.

Table 8. Distribution of CFLs by Room Type, Inventory vs. Peak CF Analysis Population

Room Type	Distribution of CFLs Installed from Onsite Inventory (n=1,034)		Distribution of Logged CFLs Installed used in Analysis (n=571)		Room-based Peak CF Weights
Basement	179	10%	88	9%	2.03
Bathroom	275	15%	157	16%	1.75
Bedroom	319	18%	182	18%	1.75
Dining	78	4%	42	4%	1.86
Foyer	81	4%	42	4%	1.93
Hallway	170	9%	88	9%	1.93
Kitchen	207	11%	124	12%	1.67
Laundry/Closet	48	3%	32	3%	1.50
Living Room	221	12%	140	14%	1.58
Office/Den	50	3%	35	3%	1.43
Other	100	5%	51	5%	1.96
Outdoor	93	5%	29	3%	3.21
Total	**1,821**	**100%**	**1,010**	**100%**	**1.80**

Peak CF Results

The weights described above were applied to the individual logger Peak CF estimates to come up with the average overall estimate of 0.081 +/- 0.012 (15%). The estimated Peak CF for CFLs installed in interior locations was 0.071 +/- 0.010 (15%) and the estimated Peak CF for CFLs installed in exterior locations was 0.273 +/- 0.154 (56%). Table 9 below provides the Peak CF estimates, the 90% confidence intervals for each of these estimates and the number of loggers each estimate is based on across all interior room types. As this table shows, the Peak CF estimates vary significantly by interior room types from lows of 0.005 in closets and 0.037 in living rooms to a high of 0.133 in office/den areas. The exterior CF estimate is 0.273 for outdoor spaces. Again, it should be noted that some of these results (such as those for laundry and dining areas and exterior locations) are based on relatively small sample sizes and thus have high levels of uncertainty that surround around them at the room type level.

[23] A slightly different population of loggers was included in the Peak CF analysis as compared to the HOU analysis due to the different timespans of data required for these two analyses.

The evaluation team was surprised to find the high Peak CF (0.273) estimate for bulbs installed in exterior locations and as a result conducted a supplemental individual review of each of the 19 loggers used to derive this estimate. This review found that the exterior light fixtures logged could be divided into three distinct groups:

- Bulbs never on during Peak ~ 40%, many on timers or photocells,
- Bulbs on for a small portion of Peak ~ 40%, all on switches and average Peak on period was 0.144, and
- Bulbs on for most of Peak ~ 20%, average Peak on period was 0.904.

It is this last group (comprised of only four loggers) that is driving the Peak CF to the high level estimated. The supplemental review confirmed the assessment that each of these loggers were valid and should be included in the analysis dataset. If these four loggers are excluded the Peak CF drops to 0.071, which clearly indicates the volatility in the exterior Peak CF estimate and the need for this estimate to be interpreted within the context of the small sample size and wide confidence intervals.

Table 9: Peak CF Results by Room Type

Room Type	n	Average Peak CF	Lower 90% CL	Upper 90% CL
Basement	37	0.100	0.068	0.132
Bathroom	64	0.055	0.031	0.080
Bedroom	122	0.044	0.033	0.056
Closet	36	0.005	0.003	0.008
Dining	16	0.097	0.011	0.183
Hallway	54	0.110	0.056	0.164
Kitchen	48	0.112	0.067	0.158
Laundry	19	0.060	0.006	0.113
Living Room	101	0.037	0.027	0.047
Office/Den	25	0.133	0.044	0.221
Other	30	0.087	0.025	0.149
Interior CF	**552**	**0.071**	**0.061**	**0.082**
Exterior CF	**19**	**0.273**	**0.119**	**0.427**
Overall CF	**571**	**0.081**	**0.069**	**0.093**

HOU and Peak CF Results by Bulb Shape

The HOU and Peak CF results presented above were estimated based on all CFLs logged and include CFLs spanning a number of bulb shapes (Spiral, A-lamp, Reflector, Decorative, Globe and a few other non-MSB bulb shapes). The total quantity of CFLs logged for this study (~737 fixtures) and the relatively small number of non-Spiral, non-A-lamp bulbs installed (91% of the CFLs installed at the sample of 85 homes included in the logger study were either Spiral or A-lamp CFLs) did not allow for the development of HOU or Peak CF estimates for individual specialty bulb shapes. In the absence of logger

specific estimates for specialty bulb shapes, the evaluation team recommends estimating HOU and Peak CF for Reflector, Decorative and Globe lamps by applying the room-type HOU and Peak CF estimates estimated by this study to the distribution of specialty bulb shapes found during the CFL lighting inventory collected at the time of logger installation. This is very similar to the method currently being employed in the TRM, except that it uses the actual CFL lighting inventory from this logger study as opposed to an estimation of the location where specialty bulb shapes are often installed. Table 10 below shows the HOU estimates from this study by room type, the room-type distribution of Reflectors, Decorative and Globe CFLs, and the resulting Interior and Overall CFL HOU estimates for each of these bulb shapes. As this table shows, the Overall HOU estimate for Decorative[24] bulbs is the highest (3.26 hours/day) of the three bulb shapes and is driven by the large percentage of Decorative CFLs installed in Exterior locations (27%). If we look solely at Decorative bulbs installed in Interior locations the HOU estimate drops to 1.94 hours/day. The Overall HOU estimate for Globe CFLs is the lowest (1.75 hours/day) and is driven by the majority of these bulbs being installed in bathrooms (65%). The Interior and Overall estimates are identical as no Globe CFLs were installed in Exterior locations.

Table 10: Specialty CFL Bulb Shape HOU Estimation

Room Type	HOU Estimate	Reflector % (n = 118)	Decorative % (n = 33)	Globe % (n = 17)
Basement	2.10	20%	0%	0%
Bathroom	1.44	6%	27%	65%
Bedroom	1.62	11%	24%	6%
Closet	0.10	1%	0%	0%
Dining	3.17	0%	18%	0%
Hallway	2.85	9%	0%	12%
Kitchen	3.49	27%	0%	0%
Laundry	1.04	0%	0%	0%
Living Room	2.33	3%	0%	0%
Office/Den	2.19	2%	0%	18%
Other	1.63	19%	3%	0%
Outdoor	6.78	2%	27%	0%
Interior HOU Estimate	**2.08**	**2.36**	**1.94**	**1.75**
Overall HOU Estimate	**2.32**	**2.44**	**3.26**	**1.75**

Table 11 provides similar information to Table 10 for the Peak CF estimates of the three shapes of Specialty CFLs.

[24] These bulbs are primarily candelabra lamps.

Table 11: Specialty CFL Bulb Shape Peak CF Estimation

Room Type	Peak CF Estimate	Reflector % (n = 118)	Decorative % (n = 33)	Globe % (n = 17)
Basement	0.100	20%	0%	0%
Bathroom	0.055	6%	27%	65%
Bedroom	0.044	11%	24%	6%
Closet	0.005	1%	0%	0%
Dining	0.097	0%	18%	0%
Hallway	0.110	9%	0%	12%
Kitchen	0.112	27%	0%	0%
Laundry	0.060	0%	0%	0%
Living Room	0.037	3%	0%	0%
Office/Den	0.133	2%	0%	18%
Other	0.087	19%	3%	0%
Outdoor	0.273	2%	27%	0%
Interior Peak CF Estimate	0.071	**0.091**	**0.063**	**0.075**
Overall Peak CF Estimate	**0.081**	**0.094**	**0.121**	**0.075**

Ex-Ante versus Ex-Post Results

Table 12 below presents the Ex-Ante versus Ex-Post HOU and Peak CF results for Standard CFLs based on the PY5/PY6 ComEd Residential Lighting logger study. This table shows the Ex-Post result for overall HOU was 15% lower than the deemed estimate based on the PY3 logger study results. The 90% confidence intervals around the HOU estimates from the two studies overlap which indicates the results are not statistically significantly different from one another at the 90% confidence level. The Ex-Post Peak CF estimate for Standard CFLs was 14% lower than the deemed estimate and again the 90% confidence intervals around the Peak CF studies overlap indicating the results are not statistically significantly different from one another at the 90% confidence level.

Table 12: PY6 Standard CFL Ex-Ante versus Ex-Post HOU and Peak CF Results

Parameter and Installation Location	Deemed Estimate	Ex-Post	Lower 90% CL	Upper 90% CL	% Change in Ex-Post
HOU					
Interior Single Family/Multi-Family In-unit	2.57	2.08	1.88	2.28	-19%
Multi-Family Common Area	16.29	n/a	n/a	n/a	n/a
Exterior	5.00	6.78	4.51	9.06	36%
Unknown	2.74	2.32	2.10	2.53	-15%
Peak CF					
Interior Single Family/Multi-Family In-unit	0.095	0.071	0.061	0.082	-25%
Multi-Family Common Area	0.750	n/a	n/a	n/a	n/a
Exterior	n/a	0.273	0.119	0.427	n/a
Unknown	0.095	0.081	0.069	0.093	-14%

Table 13: PY6 Specialty CFL Ex-Ante versus Ex-Post HOU and Peak CF Results

Parameter and Specialty Bulb Type	Deemed Estimate	Ex-Post	% Change in Ex-Post
HOU			
Reflector - Interior	2.57	2.36	-5%
Reflector - Exterior	5.00	6.78	36%
Reflector - Unknown	n/a	2.44	n/a
Decorative	3.64	3.26	-10%
Globe	2.32	1.75	-24%
Peak CF			
Reflector - Interior	0.095	0.091	-1%
Reflector - Exterior	0.184	0.273	48%
Reflector - Unknown	n/a	0.094	n/a
Decorative	0.122	0.121	-1%
Globe	0.116	0.075	-36%

The decrease in both the HOU and Peak CF estimates for all interior locations[25] in the current study is not unexpected as CFL socket saturation increased from 20% to 35% between the PY3 logger study and the PY5/PY6 study. Numerous lighting studies have found that as CFL socket saturation increases, the

[25] The HOU and Peak CF estimates for bulbs installed in Exterior locations have increased. It is important to keep in mind when reviewing this increase that the PY3 estimate was based on a ratio estimation using secondary data as opposed to any logger data collected in ComEd service territory. Additionally, the sample sizes for Exterior bulbs in the current study are quite small and the confidence intervals on the estimate are quite wide (+/- 33%).

average number of hours per day a CFL is used decreases due to the bulbs being installed into a wider variety of lower usage sockets. California has a long history of conducting lighting large scale logger studies and as part of their 2006-2008 evaluation they developed an ANCOVA model that was used to predict HOU based on a variety of variables. One of these variables was CFL socket saturation (the ratio of MSB sockets containing a CFL over the total number of MSB sockets found in the residence). Within CA, this CFL saturation variable has a coefficient of -0.423 indicating that as CFL saturation increases, HOUs decreases. Table 14 below shows both HOU and Socket Saturation estimates for several utility service territories across the US. As these studies show, HOU have decreased over time as socket saturation has increased.

Table 14: Longitudinal HOU Estimates

Location	Evaluation Year	Estimation Method	HOU Estimate	Socket Saturation
CA	2010-2012[26]	ANCOVA Model	1.7	49%
	2006-2008	Logger Study	1.9	37%
	2005	Logger Study	2.34	TBD
MA/RI/VT	2005	Logger Study	2.73	31%
	2003	Logger Study	2.9	26%
ComEd	2013	Logger Study	2.32	35%
	2010	Logger Study	2.74	20%

Recommended HOU and Peak CF for Future Use

The table below shows the recommended HOU and Peak CF estimates that should be used to estimate savings from program bulbs sold through upstream retail programs based on this study. These estimates are the basis for the proposed changes to the IL TRM (for Version 4). As this table shows, it is recommended that the Standard CFL HOU and Peak CF estimates are also used for omni-directional medium screw based LED bulbs.

[26] These results are based on the California Upstream and Residential Lighting Impact Evaluation Final Report. This report was published in July of 2014. (http://www.energydataweb.com/cpucFiles/pdaDocs/1127/WO28%20-%20California%20Upstream%20and%20Residential%20Lighting%20Impact%20Evaluation%20Final%20Report.pdf)

Table 15: Recommended HOU and Peak CF Estimates for Future Use – Retail Programs

Bulb Type	Installation Location	HOU Estimate	Peak CF Estimate
Standard CFL	Residential and in-unit Multi Family	2.08	0.071
	Exterior	6.78	0.273
	Unknown	2.32	0.081
CFL Reflector	Residential and in-unit Multi Family	2.36	0.091
	Exterior	6.78	0.273
	Unknown	2.44	0.094
CFL Decorative	Unknown	3.26	0.121
CFL Globe	Unknown	1.75	0.075
Standard CFL > 2601 lumens	Residential, Multi Family in-unit	2.08	0.071
	Exterior	6.78	0.273
	Unknown	2.32	0.081
LED Downlights	Residential and in-unit Multi Family	2.36	0.091
	Exterior	6.78	0.273
	Unknown	2.44	0.094
LED Omni-directional	Residential and in-unit Multi Family	2.08	0.071
	Exterior	6.78	0.273
	Unknown	2.32	0.081

ComEd currently offers a Direct Install program that installs CFLs in residential homes. In an effort to increase the impact coming from these direct install bulbs, the program specifies that no program bulbs shall be installed in closets (due to their lower HOU). In order to approximate the HOU and Peak CF estimates used to calculate savings for this Direct Install program, the PY5/PY6 logger study data was reanalyzed excluding all bulbs installed in closets. The table below shows the HOU and Peak CF

estimates, excluding bulbs installed in closets, which can be used to estimate Direct Install program savings.[27]

Table 16: Recommended HOU and Peak CF Estimates for Future Use – Direct Install Programs

Bulb Type	Installation Location	HOU Estimate	Peak CF Estimate
Standard CFL	Residential in-unit	2.17	0.074

Attachments

PY5/PY6 Metering Study Protocols Final_04_22_13

[27] It is important to note that the PY5/PY6 logger study was not designed to estimate HOU and Peak CF parameters for DI programs and that these results are not statistically significantly different from the results including the bulbs installed in closets. At this time, in the absence of Illinois DI program-specific logger data, the evaluation team believes these parameter estimates are the best approximation of the HOU and Peak CF for ComEd residential CFL DI programs.

NAVIGANT

ComEd PY5/PY6 Residential Energy Star Lighting Program Metering Study Protocols

Presented to
Commonwealth Edison Company

April 22, 2013

Prepared by:
Randy Gunn
Managing Director
Navigant Consulting
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606

Phone 312.583.5700
Fax 312.583.5701

www.navigant.com

NAVIGANT

Submitted to:

ComEd
Three Lincoln Centre
Oakbrook Terrace, IL 60181

Submitted by:

Navigant Consulting, Inc.
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606
Phone 312.583.5700
Fax 312.583.5701

Contact:

Randy Gunn, Managing Director
312.938.4242
randy.gunn@navigant.com

Jeff Erickson, Director
608.497.2322
jeff.erickson@navigant.com

Prepared by:

Amy Buege, Principal Energy Consultant
Itron, Consulting and Analysis
510.844.2873
amy.buege@itron.com

NAVIGANT

Table of Contents

NAVIGANT

List of Figures and Tables

Figures:

Tables:

1. Introduction

ComEd's Residential Energy Star® Lighting program provides financial incentives to customers to increase the market share of Energy Star® (ES) qualified compact fluorescent lamp (CFL) and LED bulbs sold through retail sales channels. The majority of the Residential ES Lighting program is delivered upstream (at the retailer level) which minimizes the burden on consumers, thus lowering barriers to participation, but making program participant identification (and thus evaluation) somewhat difficult. .

The Navigant Consulting team will soon be launching a PY5/PY6 in-home lighting metering study of 85 homes within ComEd service territory to assess how lighting is typically used by program participants. The primary goal of this data collection effort is to develop updated hours-of-use (HOU) and Peak Coincidence Factor (CF) estimates for program bulbs purchased through ComEd's Residential ES Lighting Program that can be used to support the PY6 (and later) impact evaluation[1]. The metering study has two main components, 1) a whole-house lighting inventory and 2) the installation of lighting logger equipment that accurately captures when the lamps are turned on and off. In addition to the estimation of updated HOU and Peak CF estimates, this study will also provide other key information, such as current high efficiency lighting saturation levels and CFL/LED storage levels, which can be used for future program planning.

The study protocols that are included in this document are similar to those used for the ComEd PY3 metering study.

[1] The existing ex ante hours-of-use estimate (2.74 hours/day), which was used to calculate program savings in PY3, PY4 and will be used in PY5, is based on a ComEd light metering study that was done as part of the PY3 evaluation.

2. On-site Overview

Each of the on-site visits occurring as part of this study will have two components. The first involves taking a whole-house lighting inventory of each study participant's home. This involves recording information about all light bulbs installed inside and outside of a program participant's home. The second piece is to install light metering equipment on an average of 8 CFL or LEDs per home. These meters will record when the light is turned on and off and will allow for the estimation of the annual average HOU and Peak CF for CFLs (and LEDs if the number of LEDs found in customers' homes is sufficient).

2.1 Home Lighting Inventory

For each lamp installed inside or outside of a home, the following characteristics will be recorded:

Installation location (Room type)

Fixture type (ceiling fixture, floor lamp, etc.)

Fixture control type (by switch, dimmer, etc.)

Wattage of bulb

Bulb type (incandescent, CFL, halogen, LED, other)

Bulb shape (spiral, reflector/flood, globe, a-lamp, post, tube, other)

Bulb features (dimmable, 3-way)

Base type (candelabra, pin, standard medium screw, etc.)

In addition, all lamps in storage at the time of the site visit will be inventoried. See Section 5.5 for the Lighting Inventory Forms.

2.2 Light Metering Equipment Installation

As stated above, this information will be used to estimate the average HOU and Peak CF across the CFLs (and LEDs) metered as a proxy for the average HOU and Peak CF of ComEd's program bulbs. Where possible we will analyze this data in combination with the lighting inventory data to calculate HOU and Peak CF estimates by room-type, lamp-type, fixture-type, and bulb-type[2].

Meters will be installed on an average of 8 CFLs or LEDs per household (up to a maximum of 12 meters per household). Program bulbs will always be prioritized for metering over non-Program bulbs. In order to maximize the amount of data collected as part of this effort to come up with accurate HOU and Peak CF estimates, non-Program bulbs (CFLs or LEDs) will be monitored if the

[2] Note that this additional segmentation analysis will be completed only for cases where the samples sizes are deemed adequate to support such granular segmentation.

number of Program bulbs within the home is less than 10. The meters will be installed by a Michaels Energy technician and will be left in place for approximately 7 months, at which time the technician will return to remove the metering equipment and ask any follow-up survey questions. The currently proposed schedule of activities is presented below in Table 2-1. This schedule allows for an optimal 7 months of data to be collected including summer and winter usage extremes, as well as metering during the majority of the PJM peak period (June 1 through August 31).

Table 2-1: Overview of Lighting Metering Study Schedule

Activity	Start	End
Metering Study Recruitment	April 2013	May 2013
Site Visit Scheduled	April 2013	May 2013
Meter Installation	May 2013	June 2013
Meter Removal	December 2013	January 2014

3. On-site Visit Logistics

The following is an overview of guidelines for how site visits will be recruited, scheduled and conducted.

3.1 On-site Recruitment

Starting in April we will begin recruiting ComEd residential customers to participate in the on-site metering study. The sample of customers being called for the on-site recruitment will be pulled from a number of current (PY5) and past (PY3 and PY4) residential lighting participant sources (In-store Intercept survey respondents, Coupon bulb purchasers, General Population survey respondents, and PY3 metering study participants). If we are unable to recruit a large enough sample of metering study participants from these sources we will then begin recruiting from a random sample of ComEd residential customers who have purchased CFLs at a program store in the last year.

During the on-site recruitment customers will be asked a series of questions (provided below in Section 5.1) to determine whether they would be interested in participating in the metering study, for which they would received a $100 incentive. All recruits at this stage are considered "soft" and thus may still change their minds about their participation in the study.

3.2 On-site Scheduling

Once a sample of ComEd Residential customers has been recruited for the metering study, we will start the on-site scheduling process. Each of the recruited customers will be called and reminded about their indicated interest in participating in the on-site metering study. The customer will then be asked if they are still interested in participating.

If the customer is still interested in participating, we will review the purpose of the study and the procedure for the on-site study. The customer will be reminded that that participation in the study qualifies them for a $100 incentive.

The script for the on-site scheduling is provided below in Section 5.2. All recruits at this stage are considered "hard" recruits; however, it is acknowledged that the customer still has the potential to change their minds about their participation in the study.

3.3 Letter of Association Sent by ComEd

After the metering on-site visits have been scheduled, the evaluation team will send to ComEd a file[3] of the scheduled appointments and ComEd will mail each of these customers a Letter of Association stating the legitimacy of the metering study effort and providing them with a contact at ComEd in the event they have any questions about their participation in the study. Adequate time is needed

[3] This file will contain the name and address of the ComEd customer, as well as the date and time of the scheduled appointment.

between scheduling the site visit and the site visit itself in order for this letter to reach the customer prior to the scheduled visit. A copy of this Letter of Association is included in Section 5.3.

3.4 On-site Confirmation

After the metering on-site visits have been scheduled, each of the technicians working on this data collection effort will be given a set of appointments for the on-site visits they are to make during the week within a designated portion of ComEd's service territory. The technician will look over all information gathered about the site prior to arriving, such as the customer name and address, the type of dwelling, and any other special instructions. The technician will call each customer again on the day before the on-site visit to confirm the appointment and information given to them by the recruiters/schedulers.

3.5 Introduction

Upon arrival at a customer's home, the on-site technician will introduce him/herself to the customer and provide the customer with another copy of the ComEd letter of association (if needed) and the technician's identification badge.

3.6 Customer Demographics and Lighting Inventory

Prior to starting to collect data for the lighting inventory, the technician will interview each customer about general residence characteristics and household demographics. Once this data has been collected the technician will walk through the home and complete the lighting inventory. This inventory will include information such as the room types, fixture types, bulb types and whether or not the bulbs are program/discounted bulbs purchased within the last year. The technician will also collect information about the bulbs currently in storage for future use. Section 5.4 shows a sample inventory form, and Section 5.5 presents the Inventory Protocols the technician will follow. Depending on the wishes of the participating customer, the technician can proceed to conduct the inventory unaccompanied or accompanied by a resident of the home. If they proceed unaccompanied they will ask the customer at the conclusion of the inventory which bulbs were program/discounted bulbs. This portion of the on-site visit will vary in length of time depending on the size of the home, type of fixtures in the home, and experience of the technician. This should be done efficiently in a uniform fashion, but it should not be rushed.

3.7 Meter Installation

Upon completion of the inventory, the technician will then install meters on a selection of CFLs and LEDs installed either inside or outside the home. See the Metering Protocols discussion found in Section 4 below.

4. Metering Protocols

After the lighting inventory has been completed, up to 12 meters will be installed on CFLs and LEDs located around the home[4]. To determine which CFLs or LEDs to meter, the information collected in the Lighting Inventory will first be used to determine the total number of CFL or LED "fixture groups". **A "fixture group" refers to all fixtures that are controlled by the same switch. If both CFLs/LEDs and non-CFLs/LEDs are being used within the same fixture group, the fixture group will be considered a CFL/LED fixture group. If a fixture group has both Program CFLs/LEDs and non-Program CFLs/LEDs it will be considered a Program CFL/LED fixture group. If a fixture group has no Program CFLs/LEDs and at least one non-Program CFL/LED it will be considered a non-Program CFL/LED fixture group.**

If installation of a meter on any fixture group prescribed to receive a meter per the protocol described in this section is determined to be technically infeasible, the technician will fully document all conditions that rendered the meter installation infeasible. If the customer objects to the technician installing a meter on any prescribed fixture group, then the technician will fully document the reasons given by the customer. In the event that a fixture group is skipped due to one of the reasons above the subsequent fixture group should be metered. See the examples below of various metering configurations.

Table 4-1: Metering Protocol Example

	Number of Program CFL/LED fixture Groups	Total Number of CFL/LED Fixture Groups	# of Meters Installed on Program CFL/LED fixture Groups	# of Meters Installed on Non-Program CFL/LED fixture Groups	Total Number of Meters Installed
Site1	3	5	3	2	5
Comment: Only 5 meters installed because dwelling only had 5 CFL/LED fixture groups.					
Site2	4	10	4	6	10
Comment: All meters installed per the protocol.					
Site3	2	12	2	10	12
Comment: Home had 2 Program CFL/LED fixture groups, 8 of 10 remaining CFL/LED fixture groups selected					
Site4	4	8	3	4	7
Comment: Meter could not be installed on 1 CFL/LED fixture group because it was located by the living room window.					
Site5	3	6	2	3	5
Comment: Meter could not be installed on one CFL/LED fixture group because the customer refused.					

[4] We realized that some homes will have fewer than 6 CFLs or LEDs which can be metered and thus a maximum of 12 CFLs or LEDs will be metered in order to achieve an overall average of 8 meters per home.

Based on the lighting inventory, if 12 or fewer Program CFL/LED fixture groups are present in the home, all of these Program CFL/LED fixture groups will be metered. If fewer than 12 Program CFL/LED fixture groups are metered, additional non-Program CFL/LED fixture groups will be selected (based on the random selection process detailed below) up to a total of 12 CFL/LED fixture groups. For homes with fewer than 12 CFL/LED fixture groups, all CFL/LED fixture groups will be metered (where feasible).

Each site will be assigned a random start number based on the total number of CFL/LED fixture groups present at the site (see Table 4-2 and Table 4-3 below). The technician will count from that point a pre-determined number of CFL/LED fixture groups (Program or Non-Program, e.g., every 5th Program CFL/LED fixture group) and install meters according to the protocol. The tables below present the protocol for selecting which CFL/LED fixture groups to meter.

Table 4-2: Random Metering Selection Protocol for Program CFL/LED Fixture Groups

Number of Program CFL/LED Fixture Groups at Site	Random Fixture Group Start Number for Program CFLs/LEDs	Meter Every
1-12	All bulbs metered	N/A
13-20	4	5th
21-30	2	8th
31-40	6	10th
41-50	11	13th
More than 50	9	17th

If the number of Program CFL/LED fixture groups is less than 12, a similar selection protocol is used to select non-Program CFL/LED fixture groups.

Table 4-3: Random Metering Selection Protocol for Non-Program CFL/LED Fixture Groups

Number of All CFL/LED Fixture Groups at Site	Random Fixture Group Start Number for Non-Program CFLs/LEDs	Meter Every
1-12	All bulbs metered	N/A
13-20	3	5th
21-30	1	8th
31-40	5	10th
41-50	8	13th
More than 50	9	17th

For example, assume a site has between 21 to 30 CFL fixture groups (of which 15 are Program fixture groups) and the random start number for the Program bulbs at this site is 2. The technician will go to the Lighting Inventory Form and identify the 2nd Program CFL/LED fixture group on the form.

According to the protocol, the technician will then count Program CFL/LED fixture groups from the 2nd Program CFL/LED fixture group until he/she gets to the 8th Program CFL/LED fixture group past the random start assignment. A meter will be installed on this fixture group and then the surveyor will continue counting (starting again from one) from the previous loggered fixture group until the 8th Program CFL/LED past the previous loggered fixture group is identified. Again a meter is installed on this fixture group and the same process continues again.

NAVIGANT

5. Attachments

5.1 Metering Study Recruitment Script

5.2 Scheduling Script

5.3 ComEd Letter of Association

5.4 Lighting Inventory Forms

5.5 Lighting Inventory Protocol

5.6 Lighting Metering Protocol

5.7 Meter Information Tracking Protocol

5.8 Meter Installation Protocol

5.9 Meter Removal Protocol

5.10 Meter Extraction Form

5.11 Field Training on Customer Interaction

5.1 Metering Study Recruitment Script

INTRO: Hello, this is _____ from Itron calling on behalf of ComEd and their Smart Ideas for Your Home energy efficiency program. We are not selling anything. We are currently recruiting households who use and have purchased compact florescent light bulbs [If strata in (1, 2, 3, 4) read "through ComEd's residential lighting program", else if strata = 5 read "within the last year"] to participate in an important research study about household lighting. We are offering $100 per household if you are selected to participate in this study.

[If STRATA in 1,2,4 ask INTRO2]

INTRO2: According to our records, [NAME, If NAME = "" then read "someone"] in your household purchased CFLs for your home at [STORE] in [MONTH AND YEAR] making you an eligible participant for this study.

1 Enter 1 if customer does not speak up here

2 Enter 2 if customer says this information is incorrect [SKIP TO INTRO4]

[If STRATA =3 ask INTRO3]

INTRO3: Our records show your household participated in a similar lighting study three years ago making you an eligible participant for this study. Do you recall participating in this past lighting study?

1 Yes

2 No [SKIP TO INTRO4]

3 Don't know [SKIP TO INTRO4]

[IF NEEDED READ: "As part of this study a technician would have visited your home to install light metering equipment on a few of the light bulbs installed in your home. These metering devices would have been left in place for approximately 6 months at which time a technician would have returned to your home to remove them."]

[If INTRO2 = 2 OR INTRO3 = 2 read OOPS]

OOPS: I apologize for having the incorrect information. You may however still be eligible for this study.

[If STRATA =5 or INTRO2 = 2 OR INTRO3 in (2,3) ask INTRO4]

INTRO4: Do you know if anyone in your household has purchased one or more compact florescent light bulbs for use in your home within the last year?

1 Yes

2 No [T&T]

3 Don't know [T&T]

[If INTRO2 = 1 or INTRO3 = 1 or INTRO4 = 1 ask LOG1]

LOG1: The study we are currently recruiting for consists of two brief in-home visits. During the first visit a technician will gather information on the lighting products used in your home and install metering equipment on a few of the light bulbs you have installed in your home. These metering devices record the number of hours a bulb is in use each day. The meters will be installed for approximately 6 months at which time the technician will return to your home collect them. We will pay you $50 at the time of the first visit and then another $50 at the time of the last visit, for a total of $100

Can we count on your participation in this important research study?

1 Yes
2 No [T&T]
3 Don't know [T&T]
4 Refused [T&T]

[IF NEEDED MORE DETAILS ON STUDY:

During the first visit, we will conduct a survey of all the lighting in your home. Also during this visit, we will be installing a few devices on some of your lights that record when they are on and when they are off. These devices are small and you will probably not even notice most of them. None of these devices will interfere with how your lights work; they will simply record information each time the light is turned on or off. You will be given a check card for $50 following the completion of this first visit. We will then come back in approximately 6 months to remove the metering devices. You will be given a check card for the final $50 payment following the completion of this final visit.]

READ: I have just a few additional questions to insure your eligibility for this study.

Q1. Do you currently have any compact fluorescent light bulbs installed in any lighting fixtures inside or outside of your home?

1. Yes
2. No [Skip to END 1]
3. Don't know [Skip to END 1]

Q2. Approximately how many compact fluorescent light bulbs are you using in your home?

1. _____ Number of fixtures using CFLs
2. Don't know

Q3. What type of home do you live in? Is it...

1. A one-family home detached from any other house?
2. A one-family home attached to one or more houses?
3. A building with 2 apartments?
4. A building with 3 or 4 apartments?

5. A building with 5 or more apartments?
6. [DO NOT READ] Other [SPECIFY_____]
7. [DO NOT READ] Don't know

Q4. Counting yourself, how many people live in your household year round?

1. _____ Number of People
2. Don't know
3. Refused

[If STRATA = 3, 4 or 5 ask Q5]

Q5. Is [ADDRESS] in [CITY] still your current home address?

1. Yes
2. No [SKIP TO Q6]
3. (Don't know) [SKIP TO ENDADDR]
4. (Refused) [SKIP TO ENDADDR]

[IF STRATA = 1 or 2 OR Q5=2 ASK Q6]

Q6. Can you please give me your current home address and city?

1. [ENTER ADDRESS AND CITY]
2. (Don't know) [SKIP TO ENDADDR]
3. (Refused) [SKIP TO ENDADDR]

Q5b. Do you plan to be residing at this location through January of 2014?
(NOTE: Vacations from this home are fine, as well as snow birds traveling south for the winter, as long as they will be home at some point in December or January so the loggers can be removed).

1. Yes
2. No [Skip to END3]
3. (Don't know) [Skip to END3]
4. (Refused) [Skip to END3]

Q7. Who should the technician ask for when calling this number to schedule the home visit?

1. [ENTER NAME]
2. (Don't know) [SKIP TO ENDNAME]
3. (Refused) [SKIP TO ENDNAME]

Q8. Is this the best number to reach you?

1. Yes
2. No
3. (Don't know) [SKIP TO ENDPHONE]
4. (Refused) [SKIP TO ENDPHONE]

[IF Q8=2 ASK Q9]
W9. What would be a better number?

1. [ENTER BEST NUMBER TO REACH PERSON AT]
2. (Don't know) [SKIP TO ENDPHONE]
3. (Refused) [SKIP TO ENDPHONE]

END1. This study requires participants to have CFLs installed in fixtures inside or outside their home. Since you do not have any CFLs installed you are not eligible for this study. Thank you very much for your time.

END2. That is all of the questions I have for you today. As I said earlier, we will be scheduling these visits in the next few weeks and will contact you again soon to find a convenient time that works for you. Thank you very much for your time and have a nice day.

END3. This study requires participants to reside in their homes until January of 2014. Since you will be moving out of your home prior to that time you are not eligible for this study. Thank you very much for your time.

ENDADDR. This study requires participants to provide their current home address so that a technician can visit their home to install light metering equipment. Lack of this information makes you ineligible for this study. Thank you very much for your time.

ENDNAME. This study requires participants to provide the name of the person the technician should ask for when they call to schedule the home visit. Lack of this information makes you ineligible for this study. Thank you very much for your time.

ENDPHONE. This study requires participants to provide a telephone that a technician can call to schedule the home visit. Lack of this information makes you ineligible for this study. Thank you very much for your time.

IF THEY HAVE ANY QUESTION ABOUT THE LEGITIMACY OF THIS STUDY HAVE THEM CONTACT;
David Nichols
Principal Marketing Analyst
ComEd Energy Efficiency Services
Phone: 630.437.2418
david.nichols@comed.com

IF THEY HAVE ANY QUESTION ABOUT WHO WILL BE INSTALLING THE LOGGERS YOU CAN TELL THEM;
Michaels Energy
http://www.michaelsenergy.com/
Phone: 608.785.1900 – Ask for Ryan Kroll

5.2 Scheduling Script

INTRO: Hello, this is _____ from Michaels Energy calling on behalf of ComEd. Is [RECRUIT NAME] available? We are not selling anything. Our records show that within the last few weeks you/[RECRUIT NAME] received a telephone call asking you some questions regarding your use and recent purchases of compact fluorescent light bulbs.

During this call you/[RECRUIT NAME] were informed of a on-site lighting study that is being conducted to gather information about residential lighting operation. This information helps ComEd understand how their program is working to better help their customers save energy and is entirely confidential.

You/[RECRUIT NAME] indicated that your household would be interested in participating in this study and would be paid $100 for your household's participation.

R1. Do you have 5 minutes to talk right now?

1. Yes [Skip to R3]
2. No [Skip to R2]
3. (Don't know) [Skip to R2]

[IF R1 = 2 THEN ASK R2]

R2. Would another time work well for me to call you back?

1. [Enter time and date for call-back] [Skip to END3]
2. No [Skip to END1]
3. (Don't know) [Skip to END4]

For the on-site visit, we will be sending a trained technician to conduct a survey of all the lighting in your home. Also during this visit, we will be installing a few devices on some of your lights that record when your lights are turned on and when they are off. These devices are small and you will probably not even notice them. None of these devices will interfere with how your lights work; they will simply record information each time the light is turned on or off. You will be given a check card for $50 following the completion of this first visit. This visit will last about one hour.

We will then contact you in approximately 6 months to come back and remove the metering devices. You will be given a check card for the final $50 payment following the completion of this second and final visit. This visit will take less than 10 minutes.

The information that is collected from the site visits is used to develop an evaluation report for ComEd. This report will not reference any of your personal information. All information will be presented anonymously.

R3. Are you still interested in participating in this on-site survey?

1. Yes [Skip to R5]
2. No [Skip to END1]
3. (Don't know) [Skip to R4]

R4. If you would like, I can give you some time to think about it. Does another time work well for me to call you back?

1. [RECORD DATE AND TIME] [Skip to END3]
2. No [Skip to END1]
3. (Don't know) [Skip to END1]

R5. We are currently setting up times for on-site visits from [Starting Date] to [Ending Date]. Do you have any specific dates or times that work best for your schedule?

1. Yes [ENTER DATE AND TIME] [Skip to R7]
2. No [Skip to R6]
3. (Don't know) [Skip to R6]
4. (Refused) [Skip to R6]

R6. I currently have an opening at [TIME] on [DATE]. Does this time work for you?

1. Yes-[ENTER DATE AND TIME]
2. No –[REPEAT R6 WITH NEW DATE AND TIME]
3. (Don't know)
4. (Refused)

R7. Is [ADDRESS] in [CITY] still your correct address?

1. Yes
2. No [Skip to R8]
3. (Don't know)
4. (Refused)

R8. Can you please give me your correct address and city?

1. [ENTER ADDRESS AND CITY]
2. (Don't know)
3. (Refused)

R9. Is this the best number to reach you?

1. Yes
2. No [Skip to R10]
3. (Don't know)
4. (Refused)

R10. What would be a better number?

1. [ENTER BEST NUMBER TO REACH PERSON AT]
2. (Don't know)
3. (Refused)

If Appointment scheduled read END5, else if read END4;

END1. That is all of the questions I have for you today. Thank you very much for your time.

END3. That is all of the questions I have for you today. I will plan on calling you back at _____ on _____. Thank you very much for your time.

END4. That is all of the questions I have for you today. I will plan on calling you back at a later date. Thank you very much for your time.

END5. That is all of the questions I have for you today. I will plan on our technician visiting you at [ADDRESS] on [WEEKDAY], [DATE] at [TIME]. The technician will be wearing a ComEd contractor badge and will provide you will a letter of association with contact information for the ComEd representative, who you can call if you have any questions during or about the site visit. The technician will call you the day before to confirm the appointment. If for any reason this date and time will no longer work for you please feel free to call me at [PHONE NUMBER] to reschedule. My name again is [NAME]. Thank you very much for your time and your participation.

IF THEY HAVE ANY QUESTION ABOUT THE LEGITIMACY OF THIS STUDY HAVE THEM CONTACT;
David Nichols
Principal Marketing Analyst
ComEd Energy Efficiency Services
Phone: 630.437.2418
david.nichols@comed.com

5.3 ComEd Letter of Association

<DATE>

<Mr/Ms> <First> <Last>
<Street Address>
<City>, IL <ZIP>

Dear <Mr/Ms> <Last>:

Thank you for agreeing to participate in a ComEd's *Smart Ideas for Your Home*[SM] lighting study that will examine the household usage of compact fluorescent lights (CFLs) and LEDs in your home.

ComEd has contracted with Michaels Energy, an independent consultant, to conduct this study to help ComEd and Illinois state regulators better understand the real-world performance and cost-effectiveness of CFLs and LEDs.

This letter is being provided to confirm that a technical field specialist from Michaels Energy will arrive at your home on <Insert Date & Time> to install light metering equipment for the study. This technician will have a copy of this letter and a ComEd contractor badge as proof of identification.

What to Expect
Upon arrival, the Michaels Energy representative will conduct an inventory of the light bulbs in your home (both installed and in storage) and will install light metering equipment on a portion of your light fixtures. This metering equipment will allow us to measure the electricity consumption of some of the lighting in your home. You need not do anything special and should continue using your lights as you normally would.

The meters will be removed at the end of the study (approximately six months after installation). You will be paid $100 for participating in the study (a $50 gift card on the day the light metering equipment is installed and a $50 gift card at the conclusion of the study when the metering equipment has been removed).

The Michaels Energy representative **will not** request any personal information and will be in proper uniform and display a ComEd contractor identification badge at all times.

If you have questions or concerns about this study or about the Michaels Energy representative who will be performing this work, please contact me by phone or email.

Thank you for participating in this important study. We are committed to providing our customers with energy efficiency incentives, tools and tips to help them take control of their energy usage and save money.

Sincerely,

David Nichols
Principal Marketing Analyst
ComEd Energy Efficiency Services
Phone: 630.437.2418
david.nichols@comed.com

5.4 Lighting Data Collection Forms

5.4.1 Site Information Cover Sheet

Site ID:			
Site details:			
Customer Name:			
Phone Numbers:	Main ( ) Type: Home ☐ Cell ☐	Alternate ( ) Type: Home ☐ Cell ☐	
Site Address:			
Site City:		Zip code:	
Field Tech:			
Appointment Date:		Appointment Time:	
Actual Arrival:		Actual Departure:	
Type of Heating:		Type of AC:	
List of Rooms with no AC/Heat:			
Estimated # of Pgm Bulbs purchased by HH:			
Special Instructions:			
Additional Notes:			

	Date Completed	**Performed by (Initials)**
Field Survey Performed:	__ / __ /__	__ __ __
Quality Control Check:	__ / __ /__	__ __ __
Data Entry Complete:	__ / __ /__	__ __ __
Copy Filed:	__ / __ /__	__ __ __

5.4.2 Data Entry Forms

The Lighting Inventory Data Entry Forms will be used to record information about each and every fixture at the site – both inside and outside the home, installed and in storage. For all lamps, including lamps in storage, we will record the watts, the primary lamp-type (incandescent, CFL, LED, etc.), the lamp-shape/secondary type (A-line, spiral, globe, etc.), the base type, any special features (i.e. three-way). For lamps installed in fixtures, additional information will include their room-type location and the fixture type they are installed in. The record will be by fixture group. A fixture group will be a group of fixtures all operated on the same switch[5]. Most fixture groups will only have one member. However for fixtures like track lighting and recessed cans, there is often more than one identical fixture controlled by the same switch. In this case we only need to make one record and note the number of fixtures. If the fixtures are identical and controlled by the same switch but have lamps of different lamp types, shapes, or wattage, you should denote the fixture group as 1A and 1B etc for each type of lamp installed in the fixture group.

Following are examples of the data entry forms used for this study.

At the start of each onsite visit the technician will ask the household occupant to answer the first set of questions below. The second set of questions below should be answered by Tech based on observation.

[5] If a fixture group contains two types of fixtures (say a table lamp and a hard-wired fixture) that are on the same circuit, they can be considered part of the same fixture group but the specifics about the fixture types should be included on two separate line items on the data entry form and the technician should point out in the notes that these two different types of fixtures are on one circuit.

NAVIGANT

Site Visit Survey

To Be completed by Tech PRIOR to start of survey		
Question		**Customer Response**
1	Own vs. Rent:	
2	Size of home in sq/ft:	
3	# of bedrooms in house:	
4	# of bathrooms in house:	
5	Highest level of education achieved by Head of Household:	
6	Household income level:	
7	# of Year Round Occupants:	
8	Are any lights left on all day long?	
	Location:	
9	Are any lights left on all night long?	
	Location:	
10	Are any lights controlled by motion or daylight sensor?	
	Location:	
11	Are any lights used regularly on **weekday** afternoons between 1-5 pm?	
	Location:	
To Be completed AFTER Tech has left residence - based on observation		
Question		**Observation Estimate**
A1	Age of Head of Household:	
A2	Type of Dwelling (circle one): SFD SFA MF (2 Apts) MF (3-4 Apts) MF(5+ Apts) MoblineHome Don't Know	

Installed Lighting Inventory Data Entry Form

Room Type	Room #	All Bulbs								CFL/LED Bulbs Only						Notes
		Fixture Group #	Fixture Type	Control Type	#Bulbs/ Fixture	Bulb Wattage	Bulb Type	Bulb Shape	Socket Type	Year Obtained	Purchase Location?	Program Bulb?	Pgm Fixture Group	NonPgm Fixture Group	Lighting Logger Installed?	
(See code list)	#		C L W R Tr CF (See Code List for Others)	S D 3 M P T O (See Code List)	#		I C F H L D (See Code List for Others)	A S G R D (See Code List for Others)	M S C G P O			Yes / No			Yes / No	REF=Homeowner refusal to access

NAVIGANT

Stored Lighting Inventory Data Entry Form

Location	All Bulbs						CFL and LED Bulbs Only			Notes
	Package Size	# Bulbs Stored	Bulb Wattage	Bulb Type	Bulb Shape	Socket Type	Year Obtained	Purchase Location?	Program Bulb?	
	# or DK	#		I C F H L D (See Code List for Others)	A S G R D (See Code List for Others)	MS C G P O			Yes / No	
Storage										
Storage										
Storage										
Storage										
Storage										
Storage										
Storage										
Storage										
Storage										
Storage										
Storage										
Storage										
Storage										

Data Entry Code Sheet

Room Type
K=Kitchen
KE=Kitchen w/ eat-in
LR=Living room
DR=Dining room
Bed=Bedroom (provide #)
Ba=Bathroom (provide #)
H=Hall/Entry
OF= Office
BS=Basement
LN=Laundry/Utility Rm
OL= Other Living Room
(Family Rm/RecRm/Den)
G=Garage
C=Closet
O=Other room (describe)
XP=Outside porch/ patio
XE=Outdoor entry
XO=Other outdoor

Fixture Type
C=Ceiling-mounted
L=Floor/table lamp
W=Wall–mounted
R=Recessed
Tr=Track lighting
CF=Ceiling fan
T=Torchiere
S=Suspended
HW=Other hardwired
PI=Other plug-in
G= Garage door
U= Under Counter
O=Other (describe)

Control Type
S=Switch (on/off)
D=Dimmer
3= 3-way
M=Motion sensor
P=Photocell
T=Timer
O=Other

Bulb Type
I=Incandescent
C=CFL
F=Fluorescent
H=Halogen
L=LED
D=High Density
E=Empty
BO= Burned Out

Bulb Shape
A= A-type (I C H)
S=Spiral (C)
G=Globe (I, C, L)
R=Reflector (I, C, H, L)
D=Decorative (I, C, L)
U=U-bend (C, F)
CIR=Circline
T= Linear tube (F, L, H)
MR= MR-16 pin based
V= Low Voltage (H)
O=Other (describe)

Socket Type
MS=Standard MS
C = Canelabra
G = GU
P=Pin based
O=Other (describe)

Year Obtained
Record Year if known
DK = Don't Know

Purchase Location
Record Store/Store Type
DK = Don't Know

Pgm Fixture Group
Program Fixture P1 - PX
If not program bulb leave blank

NonPgm Fixture Group
NonProgram Fixture NP1 - NPX
If program bulb or not CFL/LED leave blank

5.5 *Lighting Inventory Protocol*

This Lighting Inventory Protocol is taken directly from a metering study document prepared by KEMA for the 06-08 California Residential Metering Study[6].

When entering information about each fixture group on the Lighting Inventory Forms, surveyors will be trained to start inventorying/counting the fixture groups in a clock-wise direction from the entrance where they first walk into the room. Overhead lights will be counted by the location of their switch. In the example living room below:

Fixture group "1" is the ceiling mounted fixture because in this room, the light switch is to the left when you enter the room.

Fixture group "2" is the table lamp in the far left corner of the room between the sofa and the window. It is a plug-in lamp that is not controlled by a switch.

Fixture group "3" is the table lamp in the far right corner of the room between the window and the bookcase. It is a plug-in lamp that is not controlled by a switch.

Fixture group "4" contains two wall fixtures that are controlled by the same switch.

Fixture group "5" is the table lamp in the near right corner of the room between the bookcase and the arm chair. Although it is identical to the table lamp in the far right corner near the window and the bookcase (fixture group 3), it is a recorded as a different fixture group because it is controlled by its own switch.

1 Switch for overhead light

[6] Residential Lighting Metering Study. Prepared by KEMA for the California Public Utilities Commission (2006-2008 EM&V).

5.6 Lighting Metering Protocol

This Lighting Metering Protocol is similar to the one used in the 2006-2008 California Residential Metering Study[7].

Based on the lighting inventory, if 12 or fewer Program CFL/LED fixture groups are present in the home, all of these Program CFL/LED fixture groups will be metered. If fewer than 12 Program CFL/LED fixture groups are metered, additional non-Program CFL/LED fixture groups will be selected (based on the random selection process detailed below) up to a total of 12 CFL/LED fixture groups. For homes with fewer than 12 CFL/LED fixture groups total, all CFL/LED fixture groups will be metered (where feasible).

Below is an example table of randomized variables that will be found on the site information sheet and an example completed Lighting Inventory form. We will use this form to illustrate the protocols for installing lighting meters in cases where there are more than 12 fixture groups in the home.

Table 5-1: Randomized Start Variables for Unique Site Id XXX

CFL Fixture Groups	Program CFLs		Non-Program CFLs	
	Random Start Number	Meter Every	Random Start Number	Meter Every
1-12	N/A	N/A	2	3rd
13-20	4	5th	3	5th
21-30	2	8th	1	8th
31-40	6	10th	5	10th
41-50	11	13th	8	13th
More than 50	9	17th	9	17th

First we check the inventory sheet below to get the total number of CFL fixture groups in the home. This inventory shows this home has a total of 22 fixture groups (8 Program CFL/LEDs, 5 non-Program CFL/LEDs, 8 incandescent and one halogen) of which 13 are CFL/LED fixture groups (program and non-program). Based on the table above the randomized start number for Program CFL/LEDs is 4 and Non-Program CFL/LEDs is 3. This randomized start number provides the fixture group with which to begin counting from on the inventory sheets. In this example, there were 8 Program CFL/LED fixture groups and 5 non-Program CFL/LED fixture groups. To select a total of 12 CFL fixture groups for metering, all 8 Program CFL/LED fixture groups will be metered, and 4 of the 5 non-Program CFL/LED fixture groups will be selected at random.

First meters will be installed[8] on all 8 of the Program CFL/LEDs fixture groups (see blue circles in inventory sheets below) and then the random selection protocol will be used to select 4 of the

[7] Residential Lighting Metering Study. Prepared by KEMA for the California Public Utilities Commission (2006-2008 EM&V).
[8] Whenever possible.

remaining 5 non-Program CFL/LEDs to meter. Based on the number of CFL/LED fixtures (13), the randomized start number and the meter selection protocol (from table above) metering will start with the third non-Program CFL/LED and then select the 5th non-Program CFL/LED past this third (in some cases selecting the 5th non-Program CFL/LED fixture group past the third will mean the counting will wrap around and go through the fixtures again removing any previously selected fixture groups).

5.7 Meter Information Tracking Protocol

For each home we need to keep track of the meters we install. We also want more detailed information about the CFL/LEDs that we meter. For each meter installed, a row in the following form will be filled out. First, record the fixture group (from the lighting inventory form) and the serial number of the logger that you are installing. Then, record the room type, fixture type, bulb type and bulb shape in the next series of boxes. You can use the same codes from the Inventory Forms for this. In the next box, write a description of where the logger and specific fixture that you are installing the logger on are located. This information will help the next technician find the logger, so the information written here needs to be very descriptive. You need to write the manufacturer and model number of the CFL/LED and record whether or not this was a ComEd Program bulb (if known). If the logger is being installed on a dimmable fixture, ask the homeowner about how they use the dimming capability and note the response. For dimmable and 3-way bulbs, loggers should be calibrated for use at lowest possible light settings. This may be more difficult for dimmable circuits, as a setting that is too low may be affected by ambient lighting. Surveyor should be extra careful to ensure accurate logger installation in these settings and use light pipes when needed. If the technician believes ambient light in this location might be an issue that should also be noted on the form. Ask the homeowner and record on the form the approximate number of hours the light is used per day (don't worry if it is 0), and ask if it is used during the peak weekday hours of 1-5 p.m.

When the logger is installed and calibrated appropriately for the fixture, a "pre-test" is to be conducted. This involves turning the light switch on and off a few times, and confirming that the lighting logger is indeed logging accurately. By confirming that this logger is recording accurately, it ensures that if the logger shows no activity for the duration of the time installed, yet it passes the "pre-test", and a similar "post-test[9]", that the lamp is truly not used, and it is not just due to a faulty logger installation, or a faulty bulb. Once this has been performed, the surveyor should note the time installed and hit the reset button. Do this for all lights that you are installing loggers on.

[9] Section 5.9.4 provides more details on the "post-test" process.

Logger Tracking Information

					Customer Site ID# _____				
Fixture Group #	_____	_____	_____	_____	_____	_____	_____	_____	_____
Logger Serial Number/Type									
Room Type									
Fixture Type									
Bulb Type									
Bulb Shape									
Logger Attachment and Fixture Description									
Bulb Manufacturer and Model #									
Program Bulb?									
If Dimmable, how is the light used?									
Possible Ambient Light Issues?									
Customer Estimated hours of use per day									
Used during peak hours?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Confirm Logger Pre-Test has been conducted?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Time installed	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM
Notes									

5.8 Meter Installation Protocol

For this study, Hobo UX90 (Shown in Figure 1 below) loggers will be utilized. The UX90 logger is a light on/off state logger that registers a change in state based on observed light levels and features a self-adjusting sensitivity level.

Each field technician will be familiar with the loggers installed and be fully trained on the operational characteristics and limitations of each logger. The field technicians will install Hobo UX90 loggers in locations that are expected to have minimal variances in ambient light level conditions. Under these conditions, a state logger with the sensitivity adjusted to capture the observed lighting level is expected to effectively capture the operating hours.

Figure 5-1: HOBO UX09's Lighting Logger

Each logger must be installed in a manner to minimize the effects of other light sources. This would include ensuring that the light sensor is aimed toward the light source to be metered, secured as firmly as possible in that position, and positioned so that it will not be affected by any ambient or stray light sources such as other lamps and windows. In situations where ambient lighting cannot be avoided and the logger cannot be adjusted to see only the targeted lamp, then a "light pipes" attachment must be used. Often this will include installing the logger inside the light fixture. If this is the case, care must be taken to ensure that the maximum temperature rating of the logger (140° F) is not exceeded. For fluorescent lamps, this typically does not need to be considered. No incandescent fixtures will be loggered as part of this study.

Installation of these loggers on recessed can fixtures will require one of two approaches. Either preassembled brackets which fit inside the cans will be used or the loggers will be ziptied to the bulb (so

they do not fall out of the can) and secured in the appropriate position within the can using double sided sticky tape.

5.8.1.1 Floor and Table Lamp Logger Installation

Proper installation of loggers on floor and table lamps is critical due to the increased contact customers have with these types of fixtures. Ensuring that the loggers are securely fastened to the lighting fixture so that they don't fall off or lose their orientation toward the light bulb following customer contact with the light fixture will increase the likelihood of collecting quality data from these fixture types.

5.8.1.2 Outside Lighting Logger Installation

For this study obtaining quality data for CFLs and LEDS installed in exterior locations is a high priority in order to come up with reliable hours of use and peak coincidence factors for exterior residential lighting. Exterior lighting is typically used in a manner significantly different from interior lighting and many of these fixtures are controlled with integrated motion sensors or photocell controls. Installing lighting loggers in outdoor locations can often be problematic due to ambient light issues. In order to maximize the quantity and quality of logger data installed in outdoor locations all outdoor loggers will be installed with light pipes. The light pipes will be directed at the tube of the CFL and wrapped with black tape to minimize interference from other light sources. Additionally, because the loggers are not weatherproof they will be installed inside the light fixture whenever possible (and thus protected from the elements) or placed inside of a plastic bag with a ziplock seal prior to installation. Additionally, ensuring all loggers are properly oriented, secured firmly in place (with wire, zip-ties, double-sided tape, silicone or another secure fastening agent in addition to the integrated magnet that is part of the logger) and calibrated properly will improve the quality of the data received.

5.8.2 Logger Installation Tools and Materials

Materials needed specifically for lighting logger installation include:

- ☐ Multiple copies of the ComEd Letter of Introduction and business cards. These should be left behind at every site so that if something happens with the loggers, the site contact will know who to contact.
- ☐ Extra copies of blank logger installation & verification forms
- ☐ An oversupply of loggers (in case some, despite pre-testing, don't work on-site).
- ☐ Large gallon-size zip-lock plastic bags (for storing retrieved loggers or broken CFL clean-up)
- ☐ Razor blade or sharp pocket knife (for slitting painted-over fixtures to allow access to lamps and ballasts).
- ☐ Plastic zip-ties, variety pack various lengths (4", 8", 14")
- ☐ 3M double-sided tape – 1" squares (3M-4026) and glass scraper (for removal)
- ☐ Hook & loop (i.e. velcro-type) tape
- ☐ Poster putty (removable/reusable). The best way to install a logger with putty is to put two dime to nickel sized pieces in contact with the logger and the surface.
- ☐ Electrical tape and wire nuts
- ☐ Copper wire, to help hold loggers in place where needed
- ☐ Wire cutters (use to cut copper wire or snip zip-ties for logger extraction)

5.8.3 Data Logger Initialization and Programming Procedures

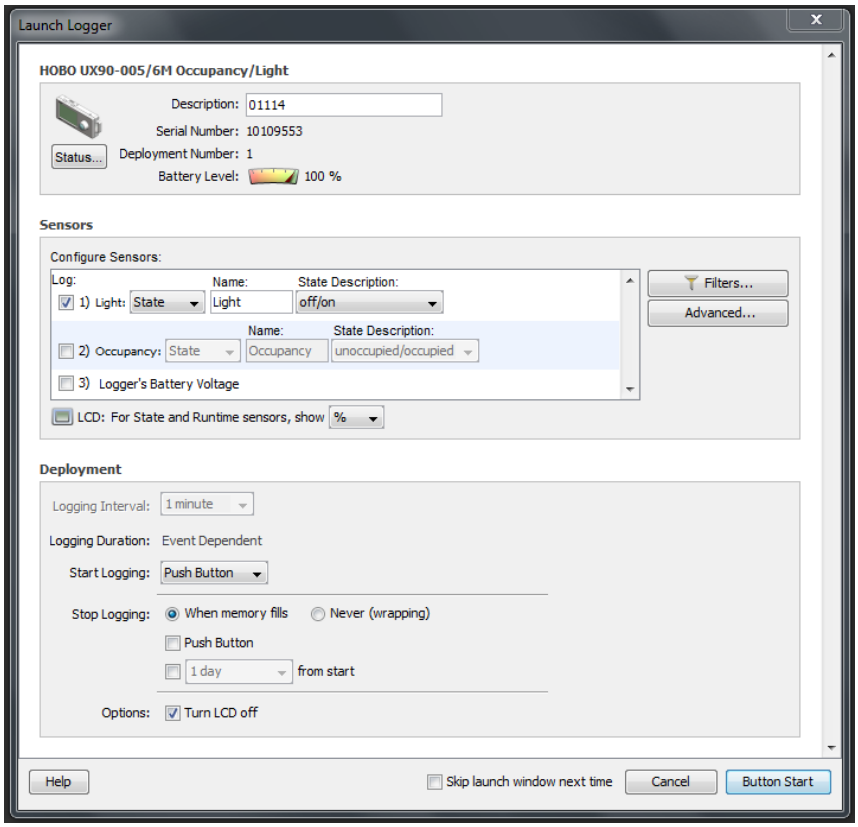
Prior to their use in the field, data loggers need to be initialized and/or programmed. A summary of these procedures for HOBO loggers is provided in this section, but the *data logger user's guides should be reviewed for additional details*. However, one rule that applies regardless of the logger type is: All loggers used for a specific site should be synched to the same computer and this procedure should be performed just prior to visiting the site.

HOBO Data Logger Initialization Procedures

The following steps should be taken when programming the HOBO data loggers:

1. Be sure your computer clock is set to the correct time before beginning.
2. Make sure the software installed on your machine is HOBOware Pro version 3.4.1.
3. Communications cable needed is a USB to Mini-USB Com Cable
4. After opening up the software and plugging in the logger, review the battery status. If the battery status is less than 90%, replace the battery.
5. Launch the logger using the following launch options, as shown in the example screen below:
    A.) Log>Light> State>off/on
    B.) For State and Runtime sensors show > %
    C.) Start Logging > Push Button
    D.) Stop Logging > When memory fills
    E.) Options > Turn LCD off
6. All loggers used for a specific site must be synched to the same computer.

Figure 5-2 HOBO UX90's Launch Screen



HOBO Logger Adjustment & Installation Procedures

Once the fixture locations have been decided, the following procedures should be used to properly set the logger to accurately measure lighting operation:

1. Ensure "Start" appears on the logger display, indicating the logger is awaiting launch.
2. Press and hold the "Start/Stop" button (approximately 3 seconds) on the top of the logger until the word "Logging" appears on the display, then immediately release the button.
3. The logger should be placed at or as close as possible to the location chosen. Install the light pipe on the logger if needed, and position toward the light source.
4. **Adjust the Sensitivity.** The UX90 has an auto-calibration feature. With the logger in place, and the light on, press the "Calibrate" button for 1 second. Ensure the signal strength, indicated on the signal portion of the logger screen (SIGNAL) has a minimum of three bars. If less than three bars are indicated, either relocate the logger or the light pipe to increase the signal.
5. Press the "Calibrate" button for 3 seconds. "HOLD" will appear in the display screen. Take care not to block or shadow the light source during the autocalibration. If successful the display will indicate "PASS" if not the display will indicate "FAIL."

6. Once the sensitivity has been adjusted, place the logger in the location chosen and verify that the  remains on in the display.
7. **Testing.** Now turn OFF the fixture/s being measured and verify that the  symbol has disappeared from the display. This means the logger is no longer sensing light and will accurately measure the lighting source ON/OFF operation. If the light cannot be turned off, an easy way to test it is to face the photocell downward away from the light. Facing downward exposes the photocell to the amount of light it will see when the fixture is off.
8. Physically install logger in final position and test one final time by turning ON the fixture/s and verifying that the lighting symbol appears again.
9. Record the date of install and a detailed location for the logger on the survey form.

5.9 Meter Removal Protocol

These logger extraction procedures are a critical part of the quality control (QC) process for the lighting logger data. Observations about the physical state of the logger, and a short test of the logger *prior to removal* will be used when interpreting the long-term data. This information will help the logger data QC team identify bad loggers (i.e., loggers that are affected by ambient lighting or otherwise not correctly logging the light source), and/or explain long periods of inactivity where the occupants may have been on vacation.

On-Site Survey Data Corrections. The return visit is also a good time to correct any data issues that have been identified with the original on-site survey data. Before returning to the home to extract the loggers, and with a primary focus on the logged fixture information, the on-site survey form should be briefly reviewed for issues including, but not limited to:

- Total # of loggers installed and whether or not the sampling procedures were followed. If the procedure was not followed, at least a general comment should have been provided.
- Logging of a non-CFL lamp/fixture: If the CFL was inaccessible, a proxy circuit with an incandescent lamp may have been used, but this should be explained in comments.
- Be sure that dimmer or 3-way lamp controls are noted correctly on the form, as this can drastically impact logger performance.

Corrections should be made directly on the copy of the installation form with a red or blue (anything but black) ink pen, so the change can be easily seen. Any pages with corrections will be separated from the full copy and returned with the logger extraction forms, and used to update/correct the data in the data entry tables.

5.9.1 Extraction Preparation

For the logger extraction procedure, the surveyor will need the following items:

- A copy of the completed on-site survey form which includes the "Logger Tracking Information" form, and this new "Logger Extraction" form.
- GPS or compass or other method of determining approximate compass orientations (N, S, E, etc.) for each room.
- Digital camera
- Screwdriver
- Wire clippers
- Ziplock or other bag to store loggers in after extraction.
- Pen/pencil and indelible marker
- Ladder

5.9.2 Extraction Procedure Overview

A brief overview of the entire process is provided below:

1) **Photos.** Take a photo of the paperwork that shows the Customer ID, then take photos of every installed logger installation.
2) **Ziplock bag for loggers.** Label a ziplock with the Customer ID in indelible ink. This bag will be used to keep the extracted loggers for a single home together for shipment to Itron.
3) **Set up the "Short-Term Logger Validation Test".** In order to validate and evaluate in-situ logger operation, a short duration test will be conducted before the loggers are extracted. Inform the resident that you will be conducting a short test. You will be turning on the lights where the loggers are installed and leaving them on for a short period of time. Using the on-site survey form as a guide, walk through the house, locate each logger, take a photograph of the installed logger, observe and note whether the logger is still in place and oriented correctly (seeing the lamp), then turn on the light to begin the test. Proceed through the house following the same process until all of the logged lights are turned on.
4) **Record logger observations and extract the loggers.** Return to the first logger and begin filling out the logger extraction form. Note that some observations and tests must be made before removing the logger. When the logger is extracted and tested if needed, turn the sensitivity to the lowest setting and place the logger in the ziplock bag.
5) **Wrap-up.** After the final logger has been extracted, find the resident and ask them the General Questions. Thank the resident for their time and cooperation. If possible, put the completed extraction form and any revised installation forms in the ziplock bag with the loggers.
6) **Downloading the logger data.** Each week data from the loggers that have been removed will be downloaded by Michaels.
7) **Shipment to Itron.** Each week the downloaded logger data (in a .csv format) will be uploaded to a secure website for Itron to access. An email will be sent to let Itron know the file is available and how many loggers to expect. Along with the logger data a file containing the accompanying scanned on-site paperwork will be uploaded to the secure website.

5.9.3 Extraction Procedure Details

The steps of the extraction process include performing the logger validation test, making the observations, doing the tests, and asking the questions necessary to fill out the forms, as explained in detail below.

5.9.4 The Short-Term Logger Validation Test

In order to validate and evaluate in-situ logger operation, a short duration test will be conducted ***before the loggers are extracted***. The field engineer will walk through the house, identify all the loggers, and switch on the light circuit that is being logged and leave it on for the duration of the test. This will be done for every logged fixture, and when the last one has been switched on, the field engineer should return to the first one and start filling out the extraction form and extracting the logger. This short test along with the physical observations made prior to extracting the loggers from their fixture, are critical

for quality checking and assessing the validity of the logger data. The time the light for the first logger is turned on should be recorded as the "Start" time on the extraction form. The time when the light for the last logger is turned off should be recorded as the "End" time. The test should create an extended period of on time data during a confirmed period (the "Start" and "End" times), which will be especially useful for verifying the performance of loggers with low percent on times and sporadic/intermittent operation. A strong signal in the logger data for the test period will help validate those sporadic/intermittent signals.

- If a logger is no longer in or mounted to the lamp-fixture, note the logger as not "intact" and determine from the homeowner what happened to it (removed, fell, etc.) and if possible, the date it fell, as it may be possible to use at least some of the data. Without an approximate removal date, the entire data will likely be suspect and not usable.

- Even if a logger is not completely facing the light source, it should be left in place for the test, and this condition should be described in the extraction comments. For example, if a tie-wrapped logger has twisted partially away from its original position and is "seeing" more than the targeted lamp, it should still be subjected to the test and furthermore, it may need to be tested further for sensitivity to ambient lighting.

- If all of the lamps in a logged fixture are burnt-out, then the logger can be extracted from the fixture, although the logger should be tested before removal for ambient lighting affects if appropriate. The surveyor will also ask host about the timing of the burn-out to compare against the logger data.

Once the logger validation test is complete and the extraction form fields for a logger have also been completed, the logger should be removed from the fixture, the sensitivity turned down to the minimum setting[10], and the logger placed in the ziplock bag.

5.9.5 Filling Out the Logger Extraction Form

This form is used to record information about the loggers installed on site. The first row of the form is used to record the surveyor information, and logger extraction date and times. Logger-specific information is recorded in the remaining fields. The majority of these are on-site extraction observations and comments, and the last few fields are reserved for data downloading. Any fields that are not applicable should be clearly lined-out to indicate that they were not just missed. In addition, a photo should be taken of every logger installation that clearly shows the logger and the lamp it is monitoring.

NOTE: Please do not extract any loggers until the *Section 5.9.4 The Short-Term Logger Validation Test* has been completed!

[10] This is done to confirm the extraction time, and also to ensure that no logging happens after extraction, which has the possibility of overwriting initial records, if extensive flickering occurs between extraction time and download time.

Logger Extraction Fields

The fields for the installation/extraction data block are as follows:

- **Customer ID:** In the upper left of the form, record the Customer ID from the on-site survey installation form.
- **Extractor's Initials:** Record the initials of the person extracting the loggers.
- **Extraction Date:** Record the date the loggers are being extracted.
- **Start / End (Times) AM/PM:** For the "Start" time, enter the time at which you turn on the very first logged fixture for the lighting test. For the "End" time, record the approximate time when the light for the last logger is turned off and the logger extracted.

To populate the next two fields, refer to the on-site installation form. This information describes where the logger is located and what type of fixture it is installed in to facilitate logger extraction:

- **Fixture#/Room (from install):** Copy the Fixture Group # and Room description from the on-site "Logger Tracking Form". These will be used for reference to locate the logger.
- **Fixture Type (from install):** Copy the Fixture Type code from the on-site "Logger Tracking Form". These will be used for reference, primarily to be aware of any dimmer switches and 3-way lamps or fixtures, which require an additional test.

The next three fields will typically be recorded after the Logger Validation Test has been conducted and the logger has been removed from the fixture. However, they are included at the top of the form because they are key fields.

- **Logger Serial Number:** Record the logger serial number after the logger has been removed from the fixture. Use this opportunity to double-check the logger ID recorded on the "Logger Tracking Information" sheet. The logger ID will be used to link to the on-site survey data, so it is very important that the number be recorded correctly. Any errors found on the logger installation forms must also be corrected. In some cases, the Logger ID may not have been recorded during installation, and it is especially important to record this ID on both the installation and extraction forms.
- **Good logger verified?** If the logger was installed correctly and is recording on/off transitions correctly, as observed during the validation test, then circle Y. Correct on/off transition means when the lamp is on, the LIGHT-ON symbol ( ) appears on the logger display, and when the lamp is off the LIGHT-OFF symbol ( ) appears. If the logger is observed/tested and/or for any other reason is determined to *not* be correctly logging the lamp operation, then circle N. Loggers that have either fallen or twisted away from the monitored lamp will also fall into this category. If the logger operation cannot be tested or observed directly, such as in a sealed fixture, then circle "OT" and describe the situation in the Extraction Comments or general comments. Ceiling fixtures, where loggers are "blind installed" (set to maximum sensitivity

and then placed in close proximity to the light source) may fall into this category, since the digital display cannot be directly observed.

- **% On Time:** After the Logger Validation Test has been performed and the logger removed from the fixture, record the % On time indicated on the logger display. Very low % On times (less than 4%) may be an indication of a bad logger installation, unless it is installed in a room that you would expect to be only briefly occupied, like a closet or storage area. For reference and also a sanity check, a few % On times versus hours per day of operation are given below:

Table 5-2: Equivalent Hours Per Day for % On Time

% OnTime	HoursPerDay
1.0%	0.25
2.1%	0.5
4.2%	1
8.3%	2
12.5%	3
33.3%	8

The information collected in the next fields will be used to correlate flickering and variations in seasonal lighting use:

- **Windows/skylights or outside?** Indicate if there are windows or skylights in the room in which the logger and lighting fixture are located. This information may be used to diagnose any "flickering"[11] in the logger data, and also to correlate seasonal changes in operation of the lights. *If the logger is installed on an outside fixture, then circle "O" for outside*, and draw a line through the next two fields since they are irrelevant.
- **Room Orientation?** For windowed rooms on the periphery of a home, indicate the primary orientation of the room. For interior and/or non-windowed rooms, just draw a line through this field. This information will be used to look for seasonal changes in operation of the lights, as well as lighting usage patterns.
- **Other possible ambient ltg?** If there are sources of ambient lighting other than windows that could be close enough to cause the logger to register a false "ON" reading, describe that source in this field, and try to test it whenever possible. This might be the case for a logger installed in a multi-lamp fixture where each lamp can be separately controlled. This information will be used to diagnose flickering in the logger data. If more room is needed for comments, use the Extraction Comments form.

In the next fields, the physical appearance of the logger and the lamp-fixture it is monitoring. Note that an additional logger test is required for fixtures that are on a dimmer or 3-way switch:

[11] Flickering is exhibited as multiple occurrences of impossibly short on-off transition periods (seconds) that are sometimes observed in logger data.

- **Logger Intact?** On returning to the site, if the logger is still as originally installed and does not appear to have been tampered with, then a "Y" should be recorded. If the logger is present but has fallen, partially detached, been moved, has a dead battery, etc. then an "N" should be circled and the situation should be described in the *Extraction Comments* field or on the *General Comments*. In the unfortunate case where the logger is missing and cannot be located, then an "L" should be recorded to indicate that the logger is "lost", and an explanation provided on the General Comments form about what was done to check for these loggers.
  - **Y = Yes** The logger is functional and installed correctly.
  - **N = No** Any condition where the logger is not installed correctly or is not functional, and one of the other codes does not apply. One example is where the logger is still in-place, but the optical eye is twisted away from the lamp, which should be described in the extraction comments block.
  - **R=Removed/Fell** Logger was removed by the resident or fell prematurely and was not replaced.
  - **D=Damaged** Logger is melted, broken, or otherwise destroyed so that the display is unreadable and it is likely that data cannot be downloaded from the logger.
  - **L=Lost** Circle this option if the logger was removed and misplaced by the resident.
- ***- - Est. Date Rem./Fell*** For loggers that were removed or fell from their fixtures and were not replaced, try to get the date they were removed or fell from the customer.
- **Logger display visible in-place?** Can you see the digital display on the mounted logger well enough to see if the light on indicator  is on or off? If yes, circle Y, if no, circle N and explain in Extraction Comments.
- **Burnt-out or non-CFL lamp?** If the lamp being monitored is burnt-out or not a CFL, then circle the appropriate code. If a non-CFL lamp is in place, then determine why this is not a CFL: Check with the resident to see if the lamp was changed out during the monitoring period, or check the installation form (and/or original installer) to see if a proxy fixture was used, and if so, why.
  - **B=Burnt-out** Circle B is if the lamp(s) being logged is burnt out. This would also apply to multi-lamp fixtures (like covered ceiling-mount fixtures) if the logger is placed between the two lamps, but only one of them is burnt out. The situation should be explained in extraction comments, as well as photographed.
  - **N=Non-CFL Lamp** Circle N if a non-CFL lamp is being logged. Be sure to ask the resident of the if the lamp was changed out during the monitoring period, or check the installation form (and/or original installer) to see if a proxy fixture was used, and if so, why.

- **Dimmer or 3-Way type:** ***Logger On at lowest ltg level?*** For lighting fixtures with these control types, an additional logger test must be conducted to determine whether or not the logger can detect the lamp on at the lowest lighting level (the validation test is done at the full-lumen level). If possible, turn the fixture down to its lowest lumen level and verify if the logger continues to indicate an "ON" event. If it does not, circle "N" and note the approximate minimum level that it was able to monitor in the extraction comments. Example comments are: "Logger only monitored full-lumen state, not dimmed levels" or "Logger indicated On for all levels"

- **Extraction Comments:** In this field, record any additional comments or explanations that are needed to fully describe the state of the logger and/or its lamp-fixture upon extraction from the home. This information will be used along with the other data fields, the photos, the on-site survey data, and the general comments/questions to QC and disposition the lighting logger data.

Logger Data Download Fields

The fields at the bottom of the extraction form are <u>not</u> completed on site, they are filled in when the logger data is downloaded. The internal logger time and date are compared to the computer time, and large discrepancies are noted in "Time Shift" or the "Extraction Comments" fields. The data downloading fields are:

- **Logger Date/Time (HH:MM):** Record the internal logger <u>date</u> and clock <u>time</u> for the logger as observed from the HOBOware software on a 24 hour clock basis. For example, 8 am = 0800, 2 pm = 12+2 = 1400. Regarding the logger's internal date, see the special note below.

- **Computer Date/Time (HH:MM):** Record the date the logger data is downloaded, and the time displayed on the computer clock on a 24 hour clock basis. This value will be compared to the logger time and large discrepancies should be noted.

- **Time Issue: No DST (ND) or Time Shift (TS) or Other (OT)**: These are several possible time issues that can occur.

  - **No DST (ND):** A daylight savings time event occurred on November 7, 2010 during the logger installation period (June 2010 through Dec-Jan 2011). There is also the Time Zone difference between California and Wisconsin (2 hours) that needs to be accounted for. As such, all of the loggers should show a *Logger Time that is roughly three (3) hours ahead of the Computer Time*. For example, if the Logger Time is 11:50 then the Computer Time should be close to 14:50 (2:50 pm). If, however, the loggers were not resynchronized before deployment, then the time as well as the date, may be off. If a DST event is not indicated, then circle **ND**

.

  - **Time Shift (TS):** If the date is OK but there is a significant difference between the Logger and Computer times and/or dates (greater than 5 minutes), then circle **TS**.

- **Other (OT):** Circle OT for issues other than ND and TS, for example if both the date and time are significantly different, like the case where the logger was reset and shows a date of 2001.

5.9.6 General Questions Form

The general questions are intended to capture and global customer or site specific information that was not already captured at the individual logger level. The field engineer will need to ask the customer these questions.

Was the residence vacant for longer than a weekend during the course of the logger installation? If so, indicate the dates and reason (vacation, snow birds, etc.). This information is requested to help with interpreting the logger data, and will be used to explain any periods in time where the logger didn't show any activity, or the logger showed constant on-time. If there are multiple periods, just use the same format as for the first event (Event description and from/to dates).

How well does the customer believe they monitor & manage the lighting in the home i.e., Are lights always turned off when not in use, or not? (Scale from 1-5. 1="Not At All", and 5="Actively Manage"). The customer response to this question may be used to examine the average hours of operation versus the self-reported lighting management rating.

Did the contact remove and/or reinstall any of the loggers for any reason? If yes, why and when. This information will be used in interpreting the logger data, and deciding whether or not to use the data. If for example, a logger fell and was reinstalled quickly and correctly by the resident, then the logger data may still be useable in spite of the temporary interruption. It if was not reinstalled correctly, the data prior to removal may still be useful, if the approximate date can be determined. An extreme example if this is residents who stay out of state for the entire winter may pull all loggers prior to leaving.

Other General Notes and Comments (Issues discovered with on-site installation data, loggers all removed by resident, parting comments about CFLs from customer, etc.) This comment block should be used to record any general, site-level comments related to the on-site installation data, the loggers, the site, or the resident. If comments about a specific logger or lighting inventory item are recorded here, please preface the comment with an appropriate reference, for example:

- LC09040218: This logger fell shortly after install but was replaced by the resident almost immediately…….
- Fixture#/Room: The control type for this item was incorrectly recorded as on/off, but is a dimmer switch.

5.10 Meter Extraction Form

Extractor's Initials		Extraction Date		Start: AM/PM	End: AM/PM
Fixture#/Room (from install)					
Fixture Type (from install)					
Logger Serial					
Good logger verified?	Y N OT	Y N OT	Y N OT	Y N OT	Y N OT
% On Time	_____ %	_____ %	_____ %	_____ %	_____ %
Windows/skylights, or outside?	Y N O(utside)	Y N O	Y N O	Y N O	Y N O
Room Orientation:	NW N NE E SE S SW W	NW N NE E SE S SW W	NW N NE E SE S SW W	NW N NE E SE S SW W	NW N NE E SE S SW W
Other possible ambient ltg?					
Logger Intact? R=Removed/Fell D=Damaged -- *Est. Date Rem./Fell*	Y N R D L __/__/__	Y N R D L __/__/__	Y N R D L __/__/__	Y N R D L __/__/__	Y N R D L __/__/__
Logger display visible in-place?	Y N	Y N	Y N	Y N	Y N
Burnt-out or non-CFL lamp? B=Burnt-out N=Non-CFL	B N	B N	B N	B N	B N
Dimmer or 3-Way type: *Logger On at lowest ltg level?*	☐ Y N	☐ Y N	☐ Y N	☐ Y N	☐ Y N
Extraction Comments (Install issue, use of incand. proxy, removal notes, logger not tested, CFL was replaced w/Incand, etc.)					
Logger Date/Time (HH:MM)					
Computer Date/Time (HH:MM)					

General Questions	
Was the residence vacant for longer than a weekend during the course of the logger installation? If so, indicate the dates and reason (*vacation, snow birds, etc.).*	**Event:** From _ _/ _ _ / _ _ through _ _ / _ _ / _ _ **Reason:** _____
How well does the customer believe they monitor & manage the lighting in the home i.e., Are lights always turned off when not in use, or not? (Scale from 1-5. 1="Not At All", and 5="Actively Manage")	**LIGHTING IS: 1 2 3 4 5** NOT Actively Managed — VERY Actively Managed
Did the contact remove and/or reinstall any of the loggers for any reason? If yes, why and approximately when?	
Other General Notes and Comments (Issues discovered with on-site installation data, loggers all removed by resident, parting comments about CFLs from customer, etc.)	

5.11 Field Training on Customer Interactions

5.11.1 Purpose

This document outlines the procedures that must be followed when meeting ComEd customers in their homes for the purposes of data collection. Your interaction with customers will reflect on ComEd and on the Residential ES Lighting program. As a result, all interactions with customers must be courteous and professional. The success of the evaluation effort will greatly depend on establishing credibility with the customer from the first telephone contact and continuing through the first meeting and subsequent site visits.

5.11.2 Before you arrive

Recruiting

Site contact information will be provided with the sample. If any difficulties are encountered contacting the customer, the project manager should be informed and will provide assistance. Sample data may contain outdated or inaccurate contact information.

When contacting the customer, it is important to identify yourself as a consultant acting on behalf of ComEd, explain the purpose of the project to the customer, and inform them that you would like to schedule a site visit. The customer should be informed that the evaluation report will not reference any of their contact information and that they are participating anonymously.

Inform the customer that we will **not** be providing them with the results of our research on their home but will aggregate all our research together before providing results at the program level (not at the customer level) to the utility.

Cooperation with our field work is voluntary. It is appropriate to be persistent and flexible in trying to set up the field work but do not pressure customers to cooperate. If the customer is firm in not wanting to cooperate, do not pressure them to change their mind. Report all refusals to your project manager. The project manager should report all refusals to the client unless it has been determined ahead of time that this reporting is not necessary.

Verify Appointment

Reminder calls the day prior to a given appointment help ensure that no conflicts have arisen that would affect the site visit or data collection activities. Confirm address, major cross-streets, and a secondary phone number.

Attire

Clean and appropriate for the type of work including appropriate protective equipment.

- Khaki pants or jeans without holes, no shorts or sweat pants
- Shirts with collars preferred. No logo T-shirts
- Shoes with no-slip soles

- Wear the utility badge on the outside of any clothing or outerwear so that it is easily visible
- Carry a letter of introduction with contact information

5.11.3 On-Site

Introduction

Make sure badge is visible.

Introduce yourself, your company, and "I am here on behalf of ComEd". (Do not represent yourself as an employee of ComEd.)

Explain the purpose of the visit is to help ComEd understand how their program is working and helping customers save energy. They will use these insights to improve programs to help customers use energy wisely and save money for everyone.

Present letter of introduction with contact information.

Verify that this is a good time for the customer.

Where appropriate, offer to remove shoes or slip on shoe covers in house to minimize messes.

Safety

The goal of the onsite auditing work is to obtain a profile of lighting use that is representative of residences in ComEd service territory. The sample of homes for auditing has been selected with this is mind. While the ideal is to audit every home in the sample, as an onsite auditor you have the right to not enter a residence if for any reason you feel your safety could be compromised. Please report to your supervisor any incidences in which you did not enter a house on your list, and document the reason or reasons you did not enter the house.
Ensure that the loggers are installed in a manner that does not pose a hazard to the installer or the customer. This would include installing loggers in an out-of-the-way location and not in a location with excessive heat buildup or electrical potential.

How to Handle Common Questions:

How will the data collected be used?
The purpose of the visit is to help ComEd understand how their program is working and help customers save energy. They will use these insights to improve programs to help customers use energy wisely and save money for everyone. We will aggregate all our research together before providing results at the program level (not at the customer level) to the utility.

Why are you here?
Describe the work you will do on-site and, if appropriate, provide the answer to the "How will the data collected be used?" question.

What did you learn?

The data I collected will be analyzed once it is aggregated with similar sites. If in the process we find any important information that you should know, we will work with the utility to get that information to you.

If it is true, you may say "everything seems to be in order." If that is NOT true, do NOT tell that to the customer. Instead report your findings to the project manager as soon as reasonably possible.

Under no circumstance should you say anything negative about the bulbs that were purchased through the program.

If pressed for your findings state that you are operating under strict instructions not to provide the results of your research directly to the customer. If the customer wishes to have the results, you will pass them on to the utility and they will choose the appropriate course of action.

If you find a situation that represents a potential hazard, report that information to the project manager immediately.

You broke my...

If this is true: assure the customer that you will report the problem and someone will be in contact with them soon to discuss the next steps.

If it is not true: If the customer will discuss the situation calmly, explain how you are not at fault. If the customer resists this explanation or is otherwise uncooperative, explain that you will report the situation to your manager and someone will be in contact with them soon to resolve the issue.

Regardless of the outcome of this conversation, take detailed notes on the situation and report it to your manager as soon as reasonably possible.

Other

If the schedule is running late and you will be more than 10 minutes late for the next appointment, notify them by phone.

All contact with the customer must be recorded in a file that includes the date, time, name of parties, and outline of the discussion or message.