

# Residential ENERGY STAR® Lighting PY6 Evaluation Report

Final

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

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## 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).<sup>1</sup> 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).<sup>2</sup>

### 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).<sup>3</sup> 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 <sup>4</sup>	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

<sup>1</sup> PY6 began June 1, 2013, and ended May 31, 2014.

<sup>2</sup> 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.

<sup>3</sup> 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).

<sup>4</sup> 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<sup>5</sup>**

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<sup>6</sup>**

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 <sup>7</sup>	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

<sup>5</sup> PY6 carryover savings are all attributable to the EEPS portfolio. This table is included as a placeholder for future program years.

<sup>6</sup> These tables do not include PY6 carryover savings.

<sup>7</sup> 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	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	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 <sup>8</sup>
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

<sup>8</sup> 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
1 <sup>st</sup> Year Installation Rate	72.6% Standard CFL	3-year rolling average (PY4-PY6) of Evaluation Research Findings
	88.0% Specialty CFL	
	95.0% LEDs <sup>9</sup>	PY7 Evaluation Research Findings
NTGR	0.59 Standard CFL	PY6 Evaluation Research Findings
	0.54 Specialty CFL	
	0.56 Standard CFL	3-year rolling average (PY4-PY6) of Evaluation Research Findings
	0.50 Specialty CFL	
	0.73 LEDs	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 1 <sup>st</sup> Year Installed Bulbs	6,231,054	1,681,017
PY4 Carryover Bulbs – Installed in PY6 <sup>10</sup>	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

<sup>9</sup> 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.

<sup>10</sup> 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) <sup>11</sup>	%	76%	85%	n/a	n/a
Installed Savings Realization Rate (MW)	%	70%	79%	n/a	n/a
Installed Savings Realization Rate (Peak MW)	%	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 <sup>12</sup>	n/a
Specialty CFLs incentivized	#	0	2,125,179	229,557	n/a
Other Bulbs incentivized <sup>13</sup>	#	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

<sup>11</sup> 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.

<sup>12</sup> Carryover bulbs were incentivized in PY4 and PY5.

<sup>13</sup> Includes LED bulbs, and CFL and LED fixtures.

findings and recommendations.<sup>14</sup> 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.<sup>15</sup> Despite this decline in delta watts for Standard CFLs, and thus the drop

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<sup>14</sup> 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.

<sup>15</sup> 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). 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<sup>16</sup> 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

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<sup>16</sup> 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 <sup>17</sup>	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

<sup>17</sup> 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<sup>18</sup>

$$\text{Verified Gross Annual kWh Savings} = \text{Program Bulbs} \times \text{Delta Watts} \div 1000 \times \text{HOU} \times \text{IEe} \times \text{ISR}$$

$$\text{Verified Gross Annual kW Savings} = \text{Program Bulbs} \times \text{Delta Watts} \div 1000 \times \text{ISR}$$

$$\text{Verified Gross Annual Peak kW Savings} = \text{Gross Annual kW Savings} \times \text{Peak Load CF} \times \text{IEd} \times \text{ISR}$$

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

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<sup>18</sup> 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); <sup>19</sup> Evaluation Research (IPA) <sup>20</sup>	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.

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,

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

<sup>20</sup> 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<sup>21</sup> program bulbs sold in PY6.

As in prior years, in PY6 the evaluation team was also provided a spreadsheet created by the implementation contractor<sup>22</sup> 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.<sup>23</sup> For all 109 unmatched tracking records,

<sup>21</sup> This matched the Goals Tracker data exactly.

<sup>22</sup> As of August 2014, the implementation contractor is CLEAResult.

<sup>23</sup> 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 1 <sup>st</sup> Year Installed Bulbs	6,231,054	1,681,017
PY4 Carryover Bulbs – Installed in PY6	1,660,241 <sup>24</sup>	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*

### 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:

$$\text{Verified Gross Annual kWh Savings} = \text{Program Bulbs} \times \text{Delta Watts} \div 1000 \times \text{HOU} \times \text{IEe} \times \text{ISR}$$

$$\text{Verified Gross Annual kW Savings} = \text{Program Bulbs} \times \text{Delta Watts} \div 1000 \times \text{ISR}$$

$$\text{Verified Gross Annual Peak kW Savings} = \text{Gross Annual kW Savings} \times \text{Peak Load CF} \times \text{IEd}$$

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.

<sup>24</sup> 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 <sup>25</sup> Savings
Program Bulb Sales <sup>26</sup>	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
1 <sup>st</sup> Year Installation Rate	Standard CFLs		69.5%
	Specialty CFLs		79.5% <sup>27</sup>
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 <sup>28</sup>	0.095
	Res CF - Spec	NR	0.105
	NonRes HOU	8.76 (3198 hrs)	10.19 <sup>29</sup> (3721 hrs)
	NonRes CF	NR	0.677
	Leakage	All Bulbs	
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>

<sup>25</sup> 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.

<sup>26</sup> LEDs and Fixtures were not incentivized through the Residential ES Lighting program in PY6.

<sup>27</sup> 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.

<sup>28</sup> Not Reported.

<sup>29</sup> 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).

<sup>30</sup> 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
<b>Residential</b>			
Verified Gross MWh Savings	287,782	68,880	356,661
Installed Savings Gross MWh Realization Rate	74%	84%	76%
<b>Non-Residential</b>			
Verified Gross MWh Savings	52,993	11,378	64,371
Installed Savings Gross MWh Realization Rate	88%	88%	88%
<b>Total</b>			
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
<b>Residential</b>			
Verified Gross MW Savings	271.5	66.7	338.2
Installed Savings Gross MW Realization Rate	70%	80%	71%
<b>Non-Residential</b>			
Verified Gross MW Savings	11.3	2.4	13.7
Installed Savings Gross MW Realization Rate	70%	70%	70%
<b>Total</b>			
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
<b>Residential</b>			
Verified Gross Peak MW Savings	28.6	7.8	36.4
Installed Savings Gross Peak MW Realization Rate	77%	88%	79%
<b>Non-Residential</b>			
Verified Gross Peak MW Savings	11.3	2.4	13.8
Installed Savings Gross Peak MW Realization Rate	103%	103%	103%
<b>Total</b>			
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
<b>PY6 Verified Gross Carryover Savings</b>				
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.

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

Source: Evaluation team analysis

<sup>31</sup> The installed savings realization rate for the Residential ES Lighting program includes the program bulb first year installation rate and interactive effects.

<sup>32</sup> 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
<b>Residential</b>			
Verified Gross MW Savings	271.5	66.7	338.2
Verified Net MW Savings	146.6	34.0	180.6
<b>Non-Residential</b>			
Verified Gross MW Savings	11.3	2.4	13.7
Verified Net MW Savings	6.1	1.2	7.3
<b>Total</b>			
Ex Ante Gross MW Savings	n/a	n/a	n/a
Installed Savings Gross MW Realization Rate <sup>33</sup>	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

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

	Standard CFLs	Specialty CFLs	Total
<b>Residential</b>			
Verified Gross Peak MW Savings	28.6	7.8	36.4
Verified Net Peak MW Savings	15.5	4.0	19.4
<b>Non-Residential</b>			
Verified Gross Peak MW Savings	11.3	2.4	13.8
Verified Net Peak MW Savings	6.1	1.2	7.4
<b>Total</b>			
Ex Ante Gross Peak MW Savings	n/a	n/a	n/a
Installed Savings Gross Peak MW Realization Rate	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

<sup>33</sup> The installed savings realization rate for the Residential ES Lighting program includes the program bulb first year installation rate and interactive effects.

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
<b>PY6 Verified Net Carryover Savings</b>				
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<sup>34</sup>, 53 percent in PY4 and 35 percent in PY3. Respondents who reported being aware of the EISA standards were more likely to purchase 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).

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<sup>34</sup> 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<sup>35</sup>

- **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.

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<sup>35</sup> 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 the 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.<sup>36</sup> 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

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<sup>36</sup> 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,<sup>37</sup> 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.

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<sup>37</sup> 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),<sup>38</sup> 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

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<sup>38</sup> 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
<b>HOU</b>					
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%
<b>Peak CF</b>					
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
<b>HOU</b>			
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%
<b>Peak CF</b>			
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:

$$\text{Verified Gross Annual kWh Savings} = \text{Program Bulbs} \times \text{Delta Watts} \div 1000 \times \text{HOU} \times \text{IEe} \times \text{ISR}$$

$$\text{Verified Gross Annual kW Savings} = \text{Program Bulbs} \times \text{Delta Watts} \div 1000 \times \text{ISR}$$

$$\text{Verified Gross Annual Peak kW Savings} = \text{Gross Annual kW Savings} \times \text{Peak Load CF} \times \text{IEd} \times \text{ISR}$$

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.<sup>39</sup> 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.

<sup>39</sup> 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 <sup>40</sup>	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

<sup>40</sup> 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.<sup>41</sup> 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.<sup>42</sup> 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).<sup>43</sup> Standard CFLs represent 81 percent of program bulb sales in PY6, so despite the high Specialty CFL installation rate, the overall PY6

<sup>41</sup> The Energy Independence and Security Act 2007 (EISA) and the Energy Policy and Conservation Act of 2012 (EPACT).

<sup>42</sup> This is a retailer sales-weighted estimate.

<sup>43</sup> 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% <sup>44</sup>	74%
	Retailer Sales Weighted	<b>72.6%</b>	<b>92.4%</b>	<b>76.1%</b>
Total CFLs Purchased	1	100%	100%	-
	2-4	81%	95%	-
	5-10	72%	91%	-
	11+	64%	67% <sup>45</sup>	-

*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.<sup>46</sup> This relationship helps explain 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.

<sup>44</sup> 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.

<sup>45</sup> 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.

<sup>46</sup> 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.<sup>47</sup> 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<sup>48</sup> 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,<sup>49</sup> 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<sup>50</sup> 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.<sup>51</sup>

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<sup>47</sup> 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.

<sup>48</sup> These three packs were all 4-packs of Standard CFLs manufactured by TCP and received a higher than average program incentive.

<sup>49</sup> 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.

<sup>50</sup> This analysis excluded program bulbs that were reportedly installed in locations outside of ComEd service territory.

<sup>51</sup> 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 <sup>52</sup>	Daily HOU	Peak CF	Bulbs <sup>53</sup>	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.

<sup>52</sup> Representative of the deemed 96 percent of PY6 bulb sales estimated to have been installed in Residential locations.

<sup>53</sup> 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 <sup>54</sup>	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.

<sup>54</sup> 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.<sup>55</sup> The estimate of the number of PY5 program bulbs installed in PY6 was calculated based on the Illinois TRM v1.0<sup>56</sup> 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

<sup>55</sup> 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.

<sup>56</sup> The Illinois TRM v1.0 (effective in PY5) was in place at the time the program bulbs 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<sup>57</sup> that are associated with these impact estimates.

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

	EEPS Portfolio	IPA Portfolio	Total
<b>PY6 Evaluation Research Gross Savings</b>			
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
<b>PY6 Evaluation Research Gross Savings Realization Rates</b>			
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).

### 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 <sup>58</sup>	0.55	0.64
Specialty CFLs	0.47	0.01	0.54	0.40	0.67

Source: Evaluation team analysis

<sup>57</sup> The evaluation research gross realization rates are equal to the evaluation research gross savings/verified savings gross estimate.

<sup>58</sup> These results include additional significant digits not shown in this table.

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

### 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:

$$\text{NTGR} = 1 - \text{Free-ridership} + \text{Spillover (participant and nonparticipant)}$$

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:

$$\text{Free-Ridership} = 1 - (\text{PI Score} + \text{NP Score}) \div 20$$

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 <sup>59</sup>
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

<sup>59</sup> Letters in this column represent paired results that are statistically significant from one another.

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 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
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.

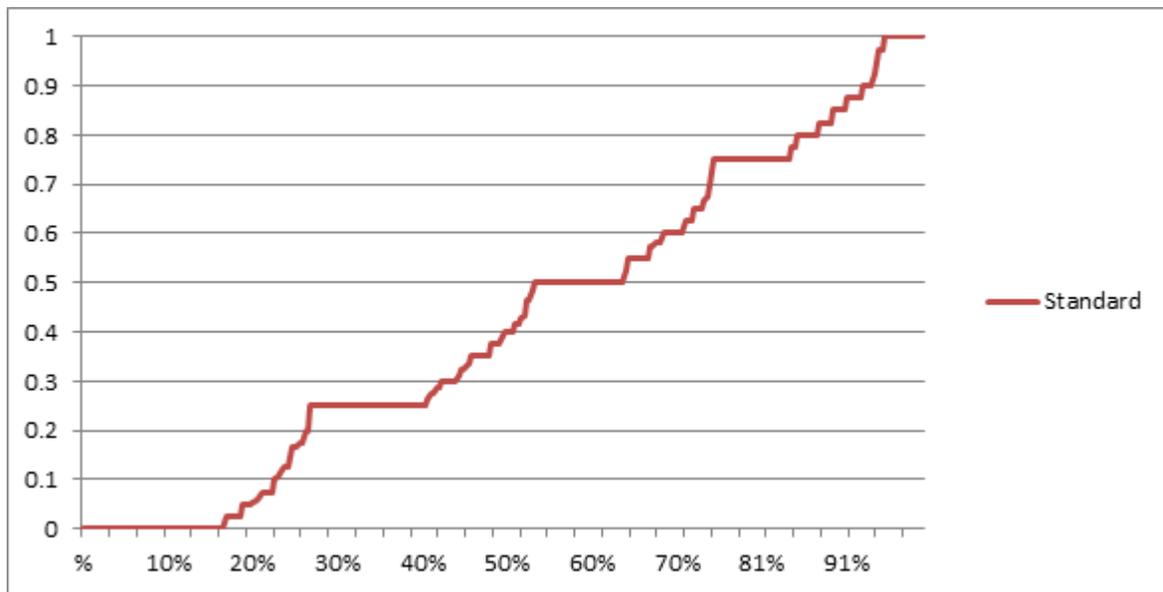
**Table 7-18. Standard and Specialty Weighted Free-Ridership Estimates**

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

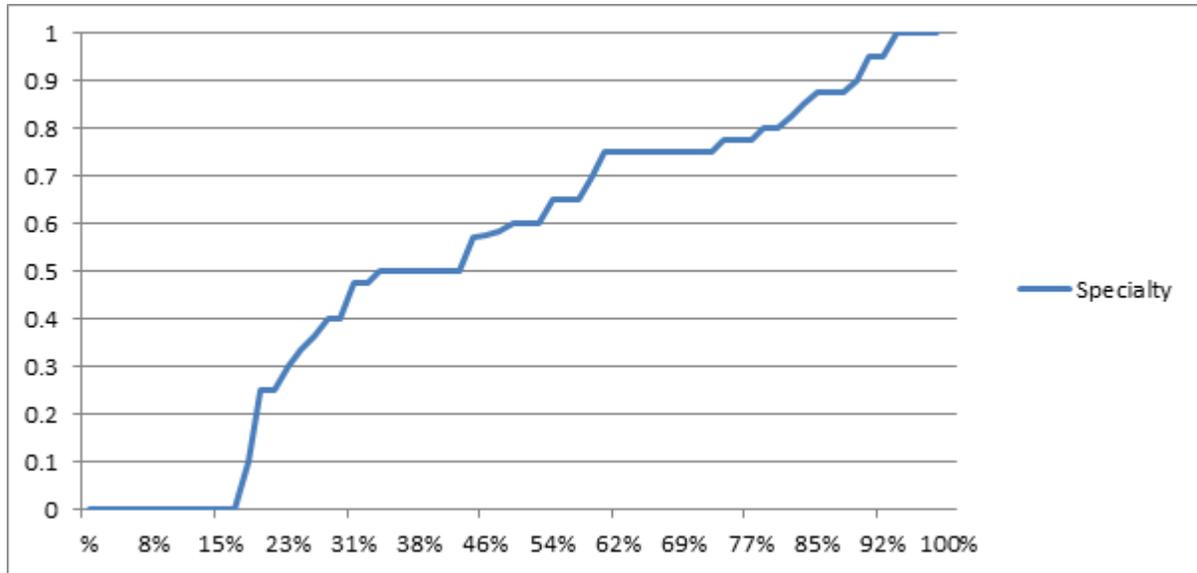
Figure 7-1 and Figure 7-2 show the distribution of standard CFL and Specialty CFL free-ridership scores across the in-store intercept analysis population.

**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.<sup>60</sup> 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

<sup>60</sup> This portion is based on the number of non-program bulbs they purchased as well as the influence level they provided for the program.

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. 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<sup>61</sup> 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).

<sup>61</sup> The evaluation research net realization rates are equal to the evaluation research net savings/verified savings net estimate.

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

	EEPS Portfolio	IPA Portfolio	Total
<b>PY6 Evaluation Research Net Savings</b>			
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
<b>PY6 Evaluation Research Net Savings Realization Rates</b>			
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)<sup>62</sup>, 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.

<sup>62</sup> 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	%						
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<sup>63</sup> 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

<sup>63</sup> As of August 2014 APT is now CLEAResult.

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%	
<b>Residential ES Lighting Program</b>		<b>100%</b>	<b>100%</b>

*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).<sup>64</sup>

<sup>64</sup> 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 them 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).

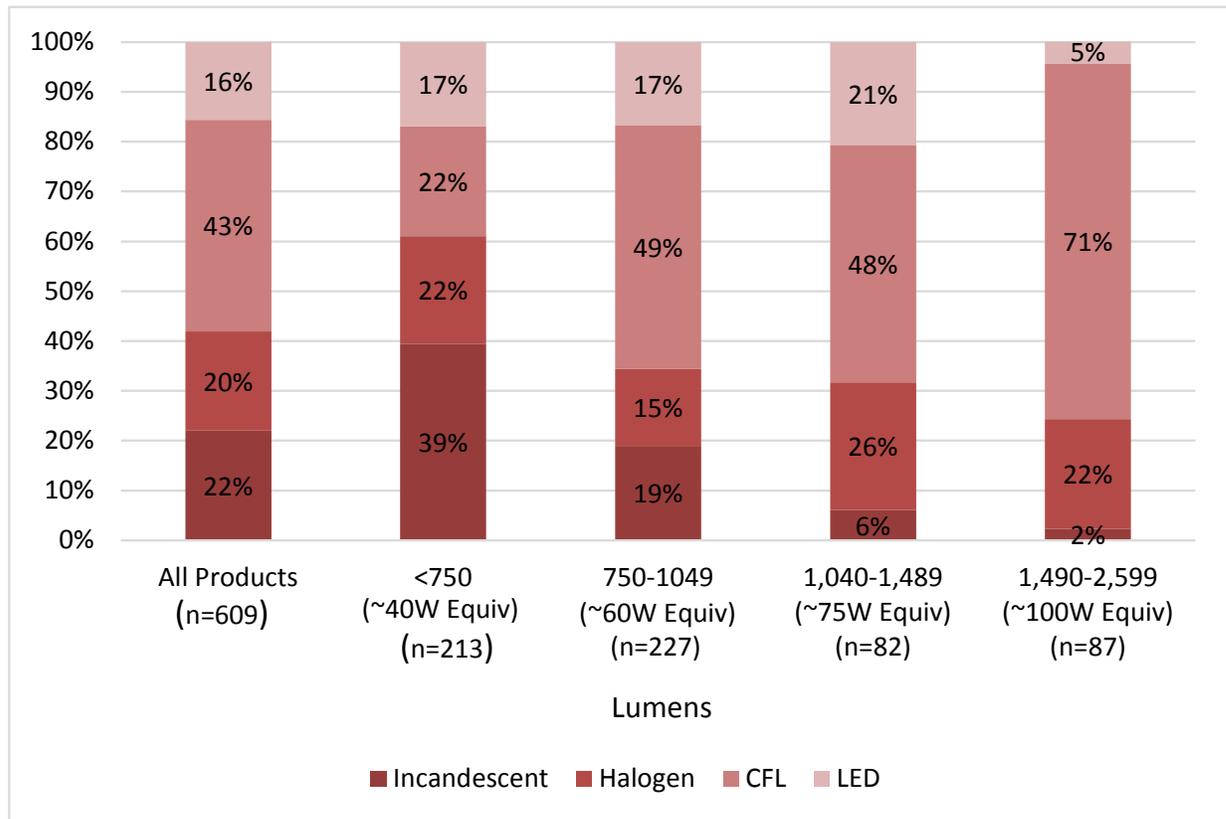
### 7.2.8 Lighting Product Stocking

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)**

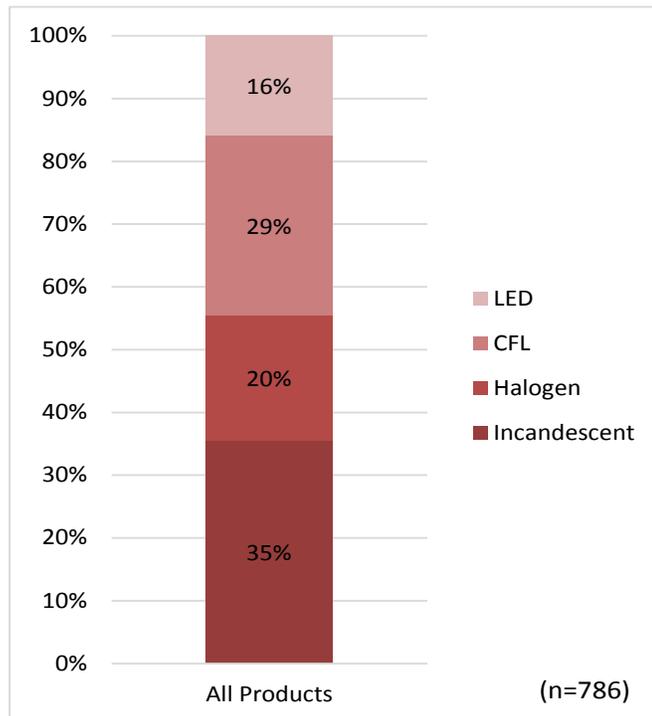


Note: The numbers (“n”) in this figure represent the number of different types of products, not bulb counts.  
Source: PY6 Shelf Stocking Survey

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<sup>65</sup>  
(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-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.<sup>66</sup> One-third of the sales staff said they had 100-watt incandescent bulbs in stock

<sup>65</sup> 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.

<sup>66</sup> 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,

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.<sup>67</sup> 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.

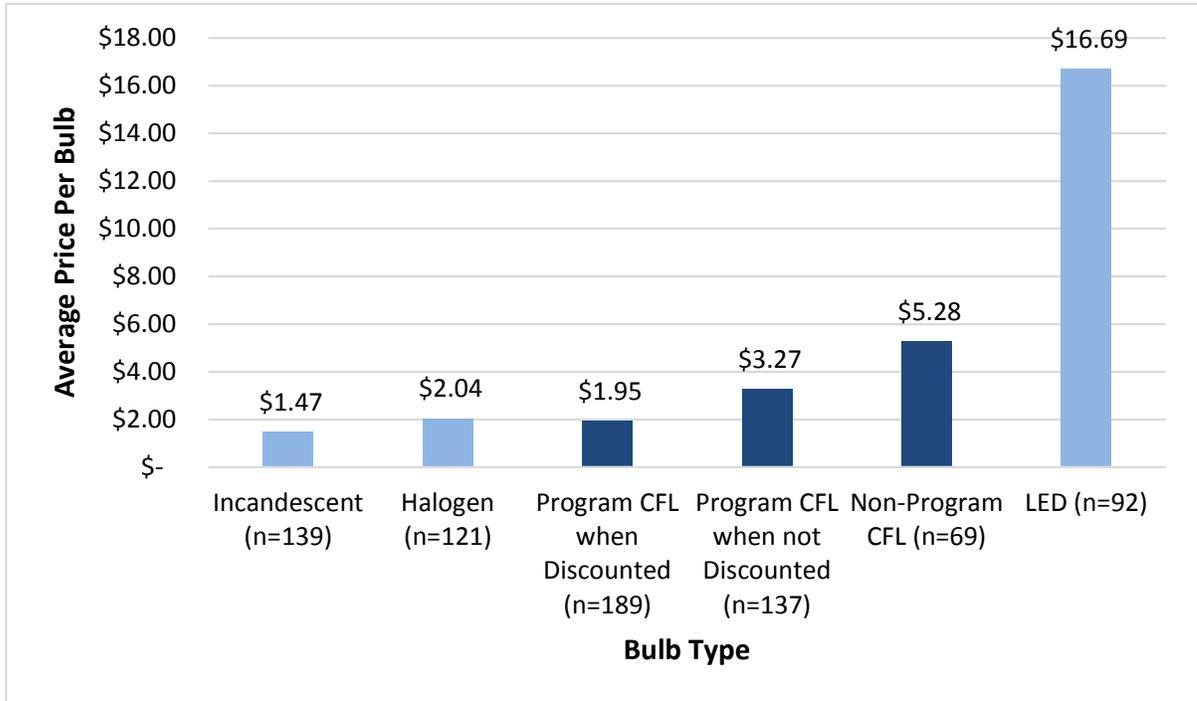
The Standard CFLs that are incentivized by ComEd cost about \$0.50 more per bulb on average than an equivalent incandescent bulbs and cost slightly less per bulb than an equivalent halogen. Without the ComEd discount, the average price of program Standard CFLs per bulb would be more than double the average 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.

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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.

<sup>67</sup> 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**

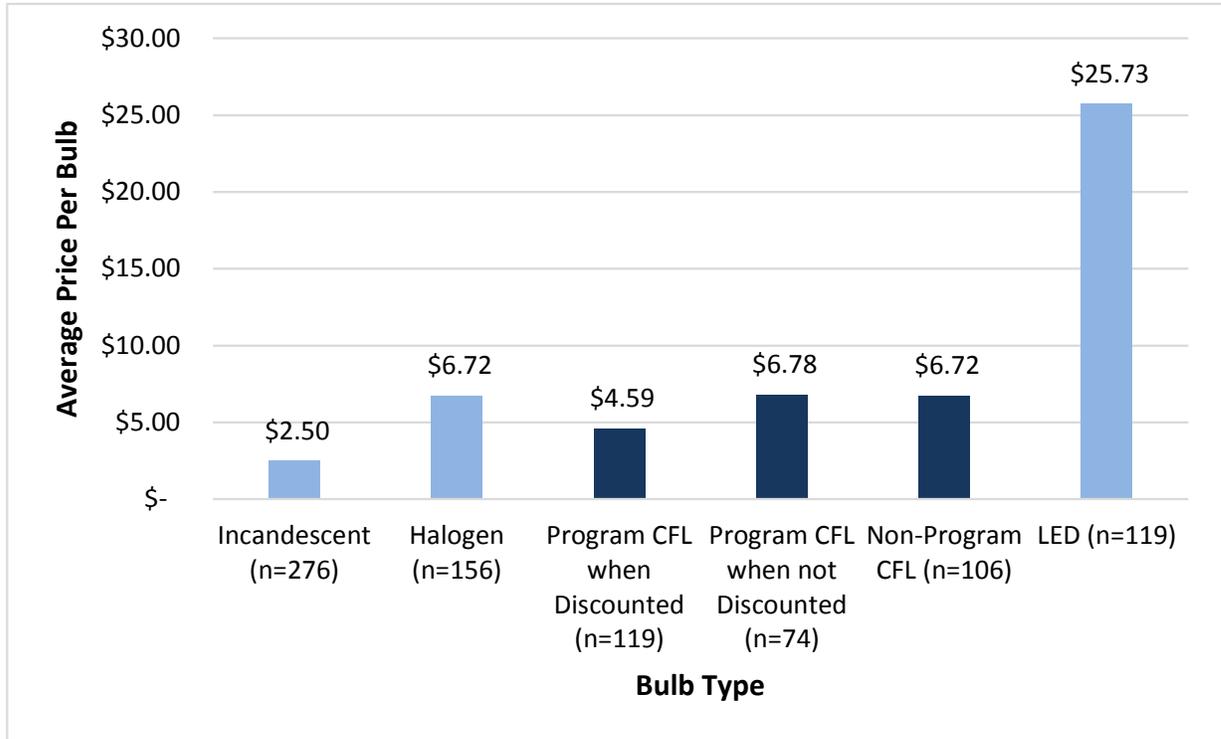


Note: The non-discounted price for program CFLs was not available for all products in stores, so the number of products used to estimate the discounted price is higher than number of products used to estimate the non-discounted price.

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 <sup>68</sup>	96% / 4%	3-year rolling average (PY4-PY6) of Evaluation Research Findings
1st Year Installation Rate	72.6% Standard CFL	3-year rolling average (PY4-PY6) of Evaluation Research Findings
	88.0% Specialty CFL	
	95% LEDs <sup>69</sup>	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 split is deemed at 97 percent/3 percent “based on a weighted (by sales volume) average of ComEd PY3,

<sup>68</sup> Residential/Nonresidential (Res/NonRes).

<sup>69</sup> 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 1<sup>st</sup> year installation rate for LEDs.

PY4, and PY5 and Ameren PY5 in-store intercept survey results.”<sup>70</sup> 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.

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

Program Year	Standard CFLs		Specialty CFLs		LEDs	
	Bulbs	1 <sup>st</sup> Year ISR	Bulbs	1 <sup>st</sup> Year ISR	Bulbs	1 <sup>st</sup> 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 <sup>71</sup>	95%
3-year Weighted Average	-	72.6%	-	88.0%		95% <sup>72</sup>

Source: Evaluation team analysis

<sup>70</sup> Illinois TRM v3.0 at p. 576

<sup>71</sup> Projected PY7 LED sales based on the PY7 Goals Tracker spreadsheet (week ending 0706).

<sup>72</sup> Only a single year of results is available and thus this result is not a 3-year weighted average.

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.

## **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	PY6 Evaluation Research Findings
	0.54 Specialty CFL	
	0.56 Standard CFL	3-year rolling average (PY4-PY6) of Evaluation Research Findings
	0.50 Specialty CFL	
	0.73 LEDs <sup>73</sup>	PY7 Evaluation Research Findings

Source: Evaluation team analysis

## 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

<sup>73</sup> 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.

## **7.6 *Data Collection Instruments***

### **7.6.1 PY6 In-Store Intercept Survey Instrument**



Microsoft Word 97  
- 2003 Document

### **7.6.2 PY6 Shelf Survey Instrument**



Microsoft Word 97  
- 2003 Document

### **7.6.3 PY6 Mystery Shopper Instrument**



Microsoft Word 97  
- 2003 Document

## **7.7 *PY5/PY6 Lighting Logger Memo***



ComEd PY5-PY6 Res  
Lighting Logger Study