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Residential Lighting Discounts Program Evaluation Report

FINAL

Energy Efficiency / Demand Response Plan:
Plan Year 8 (PY8)
(6/1/2015-5/31/2016)

Presented to

Commonwealth Edison Company

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E. EXECUTIVE SUMMARY

This report presents a summary of the findings, results, and recommendations from the impact and process evaluation of the PY8[1] Residential Lighting Discounts (Residential Lighting) program. The main goal of this 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 through the distribution of educational materials. In PY8, the Residential Lighting program offered incentives for the purchase of standard compact fluorescent lamps (CFLs), standard and specialty LEDs, and LED fixtures. The savings from bulbs sold in PY8 were counted under the Illinois Power Agency (IPA) portfolio. Some carryover bulbs from previous years were counted under the Energy Efficiency Portfolio Standard (EEPS).

E.1. Program Savings

Table E-1 summarizes the gross and net electricity savings from the PY8 Residential Lighting program, including the carryover savings resulting from bulbs sold in PY6 and PY7 that are installed in PY8. As this table shows, the total verified net energy savings including carryover and bulbs attributable to both the EEPS and the IPA portfolios is 313,360 megawatt-hours (MWh).[2] Table E-2 and Table E-3 separate the overall PY8 Residential Lighting program savings into the portions attributable to the EEPS and IPA portfolios (including carryover).

Table E-1. PY8 Total Program Electric Savings

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Ex-Ante Gross Savings[3]	326,151	NR[4]	NR	NR
Verified Gross Program Savings[5]	381,167	359.3	46.3	58.0
Verified Gross Carryover Savings	95,652	94.2*	10.9	12.7
Verified Gross PY8 Savings	476,819	453.5*	57.2	70.7
Verified Net Program Savings	254,854	240.0	31.0	38.8
Verified Net Carryover Savings	58,506	57.1*	6.8	7.7*
Verified Total PY8 Net Savings	313,360	297.1*	37.8	46.5*

NR = Not Reported
*Numbers do not sum exactly due to rounding.
Source: ComEd tracking data and Navigant team analysis

[1] The PY8 program year began June 1, 2015 and ended May 31, 2016.
[2] Net savings attributable to the EEPS portfolio are 54,272 MWh and net savings attributable to the IPA portfolio are 259,088 MWh. All EEPS savings are from PY8 carryover.
[3] PY8 Bulb Sales only, excludes carryover.
[4] Estimates of demand and summer and winter peak demand are not reported in the tracking database provided to the evaluation team. Additionally, tracking data only reports gross savings.
[5] PY8 Bulb Sales only, excludes carryover.

Table E-2. PY8 Total Program EEPS Electric Savings (Carryover only)

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Verified Gross Carryover Savings	87,810	87.2	9.9	11.5
Verified Net Carryover Savings	54,272	53.3	6.3	7.1

Source: ComEd tracking data and Navigant team analysis.

Table E-3. PY8 Total Program IPA Electric Savings

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Ex-Ante Gross Savings	326,151	NR	NR	NR
Verified Gross Program Savings	381,167	359.3	46.3	58.0
Verified Gross Carryover Savings	7,842	6.9	1.0	1.2
Verified Net Program Savings	254,854	240.0	31.0	38.8
Verified Net Carryover Savings	4,234	3.7	0.5	0.7
Verified Total PY8 Net Savings	259,088	243.7	31.5	39.5

NR = Not Reported

Source: ComEd tracking data and Navigant team analysis.

E.2. Program Savings by Bulb Type

Table E-4 summarizes the electricity and demand savings (MWh and MW) from the ComEd PY8 Residential Lighting program by bulb type. As this table shows, LEDs (including omni-directional, directional, and fixtures) now comprise 61 percent of the total verified net savings, and standard CFLs comprise the remaining 39 percent of the savings.

Table E-4. PY8 Program Results by Measure[6]

Savings Category	Standard CFL	Omni-Directional LED	Directional/ Other LED	LED Fixtures	Total
Ex-Ante Gross Energy Savings (MWh)	157,023	96,317	60,679	12,132	326,151
Verified Gross Energy Savings (MWh)	167,132	122,231	79,621	12,183	381,167
Verified Gross Demand Savings (MW)	159.6	116.2	70.7	12.9	359.3*
Verified Net Energy Savings (MWh)	98,608	89,228	58,124	8,893	254,854*
Verified Net Demand Savings (MW)	94.2	84.8	51.6	9.4	240.0
Gross Verified / Ex-Ante Realization Rates	106%	127%	131%	100%	117%

Source: ComEd tracking data and Navigant team analysis.

*Numbers do not sum exactly due to rounding.

[6] These tables do not include PY8 carryover savings.

E.3. Impact Estimate Parameters for Future Use

In the course of our PY8 evaluation, the evaluation team conducted research on parameters used in impact calculations including those in the Illinois TRM. Some of those parameters are eligible for deeming for future program years or for inclusion in future versions of the TRM. The evaluation team's parameters recommended for future use are shown in the following table.

Table E-5. Impact Estimate Parameters for Future Use[7]

Parameter	Value	Data Source
Res/Non-Res Split	95%/5% Standard CFLs	3-year rolling average (PY6-PY8) of Evaluation Research Findings
	98%/2% Omni-Directional LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings
	92%/8% Directional LED	
1st Year Installation Rate	76.6% Standard CFL	3-year rolling average (PY6-PY8) of Evaluation Research Findings
	89.9% Omni-Directional LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings
	93.5% Directional/Other LEDs	
Leakage	2.2% Standard CFL	3-year rolling average (PY6-PY8) of Evaluation Research Findings
	1.4% Omni-Directional LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings
	2.2% Directional/Other LEDs	
NTGR	0.54 Standard CFLs	PY8 Evaluation Research Findings
	0.58 Omni-Directional LEDs	
	0.58 Directional/Other LEDs	

Source: Evaluation Analysis

E.4. Program Volumetric Detail

The PY8 program incentivized 7,205,656 standard CFLs, 3,896,077 omni-directional LEDs, 1,578,687 directional LEDs, and 302,241 LED fixtures as shown in the following table.

[7] The evaluation research parameter estimates differ from those reported in the PY8 In-store Intercepts Memo and the PY8 NTG Results Memo because the estimates were reweighted using final PY8 bulb sales (allocated sales were used to weight the results reported in the In-Store Intercepts Results Memo).

Table E-6. PY8 Volumetric Findings Detail

Participation	Total	Standard CFLs	Specialty CFLs	Omni-Directional LEDs	Directional/ Other LEDs	LED Fixtures
PY8 Incentivized Bulbs	12,982,661	7,205,656	0	3,896,077	1,578,687	302,241
PY8 1st Year Installed Bulbs	10,773,575	5,268,776	0	3,702,364	1,500,195	302,241
PY6 Carryover–PY8 Installs	1,359,037	1,174,487	184,551	0	0	0
PY7 Carryover– PY8 Installs	1,539,885	1,432,726	85,219	15,095	6,845	0
Total Installed Bulbs in PY8	13,672,497	7,875,988	269,770	3,717,459	1,507,040	302,241

Source: ComEd tracking data and Navigant team analysis.

The verified net MWh savings associated with bulbs installed in PY8 (by bulb type) are provided in the table below.

Table E-7. PY8 Verified Net MWh Savings Summary Detail

Net Verified Savings from Population	Total	Standard CFLs	Specialty CFLs	Omni-Directional LEDs	Directional/ Other LEDs	LED Fixtures
PY8 1st Year Installed Bulbs	254,854	98,608	0	89,228	58,124	8,893
PY6 Carryover–PY8 Installs	27,598	23,364	4,234	0	0	0
PY7 Carryover– PY8 Installs	30,908	28,935	1,357	362	255	0
Total Installed Bulbs in PY8	313,360	150,907	5,591	89,590	58,378	8,893

Source: ComEd tracking data and Navigant team analysis.

E.5. Results Summary

The following table summarizes the key verified savings metrics from PY8.

Table E-8. PY8 Results Summary

Key Metrics	Units	EEPS Portfolio	IPA Portfolio	EEPS Carryover	IPA Carryover
Verified Gross Savings	MWh	n/a	381,167	87,810	7,842
Verified Gross Demand Reduction	MW	n/a	359.3	87.2	6.9
Verified Gross Summer Peak Demand Reduction	MW	n/a	46.3	9.9	1
Verified Gross Winter Peak Demand Reduction	MW	n/a	58.0	11.5	1.2
NTGR	#	n/a	0.67[8]	0.62	0.54
Verified Net Savings	MWh	n/a	254,854	54,272	4,234
Verified Net Demand Reduction	MW	n/a	240.0	53.3	3.7
Verified Net Summer Peak Demand Reduction	MW	n/a	31.0	6.3	0.5
Verified Net Winter Peak Demand Reduction	MW	n/a	38.8	7.1	0.7
Standard CFLs incentivized	#	n/a	7,205,656	n/a	n/a
Omni-directional LEDs incentivized	#	n/a	3,896,077	n/a	n/a
Directional LEDs incentivized	#	n/a	1,578,687	n/a	n/a
LED Fixtures incentivized	#	n/a	302,241	n/a	n/a

Source: ComEd tracking data and Navigant team analysis.
† A deemed value. Source: ComEd_NTG_History_and_PY8_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html

E.6. Findings and Recommendations

Overall, the PY8 Residential Lighting program successfully met its goals and objectives. The program exceeded its planning target by over 155,000 bulbs (one percent increase over the program's target volume) and exceeded its gross energy savings target by 27 percent (gross savings target was 299,013 MWh, versus the program achieved verified gross savings of 381,167 MWh). In addition, the program's net savings exceeded the PY8 target by 24 percent (the net savings target was 252,729 kWh (which was comprised of 205,529 kWh from IPA PY8 installs and 47,200 kWh from EEPS carryover) and the verified PY8 net savings was 313,360 kWh (which included carryover savings)).

The key evaluation findings and recommendations are presented below. Numbered findings and recommendations in this section are the same as those found in Section 6 of the evaluation report for ease of reference between each section.

Program Volumetric Findings

Finding 1. The total number of bulbs sold during the PY8 Residential Lighting program was estimated to be 12,982,661, which is a six percent increase from the quantity of bulbs sold in PY7. Fifty-six percent of the bulbs sold in PY8 were standard CFLs, 30 percent were omni-directional LEDs, 12 percent were directional LEDs, and two percent were LED fixtures. No specialty CFLs were incentivized through the program

[8] The NTG estimates in this row represent an average NTGR across standard CFLs, directional and omni-directional LEDs, and LED fixtures.

in PY8. This significant decrease in standard CFL sales was planned as it is likely that standard CFLs will be eliminated from the program during PY9.

Finding 2. Analysis of PY8 program bulb sales found the average incentive per MWh of energy saved for omni-directional LEDs and directional LEDs is higher than it is for standard CFLs (roughly $77/net MWh for a standard CFL, $150/net MWh for an omni-directional LED, $120/net MWh for a directional LED). The cost per kWh saved will continue to be lower for standard CFLs than for LEDs as these bulbs continue to require greater incentives to encourage market uptake due to their higher non-incentivized market prices. Energy Star 2.0 (ES 2.0) bulbs which are scheduled to hit the market in July 2018 should help decrease the cost per MWh of savings as their retail prices are projected to be significantly lower than existing LEDs and thus will require lower incentive levels.[9]

Recommendation 1. ComEd should consider adding the ES 2.0 bulbs to the program to retain a large volume of LED savings while minimizing program spending.

Barriers to CFL and LED Purchase

Finding 3. Customers' primary barriers to purchasing CFLs are aesthetic—their look and fit in fixtures or their light color—and as a result customers reported a low likelihood of purchasing CFLs even if their prices were equal to or lower than the price of other bulb types. Barriers to LED purchases are related to their cost and a lack of awareness or knowledge of this newer technology. The top factors that customers reported had influenced their decision to purchase efficient bulbs were the energy saved by the bulbs, the longevity of the bulbs, and the quality of light they produce.

Recommendation 2. Both of the primary LED barriers will be reduced over time, however ComEd's lighting program is currently well positioned to effectively increase the rate at which these barriers are diminished by expanding their program LED offerings and re-examining their educational materials to ensure they are focused on the top influential factors, such as the longevity of the bulb and its impact on the ultimate cost and energy savings of the LED.

State of the Lighting Market

Finding 4. The shelf surveys conducted as part of this evaluation found that the ComEd program incentives are having a significant effect on the retail price of CFLs and LEDs within ComEd service territory. Specifically, these shelf surveys found:

- Program LEDs (omni-directional and directional) are around two-thirds the price of non-program LEDs.
- Over the last two years, the price of a standard LED has decreased by around $10 and the price of a specialty LED has decreased by $13 a bulb. In addition, LEDs also comprise a larger proportion of stocked bulbs, however they seem to be replacing space previously occupied by CFLs.
- Program standard CFLs are approximately half the price of non-program standard CFLs and cost less per bulb, on average, than similar incandescent and halogen bulbs.

[9] Further information on Energy Star 2.0 LEDs can be found at: https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Lamps%20V2%20Cover%20Letter%2012-4-15.pdf

- The shelf space dedicated to standard incandescent bulbs lamps has been cut in half (22 percent to 11 percent) in the past two years, mostly driven by EISA, but all of this reduction has been met with an increase in halogen bulbs.
- The availability of specialty incandescent bulbs, which are generally not covered by the EISA standards, has increased—specialty incandescent bulbs represent 54 percent of the stocked product (up from 35 percent in the last two years ago). Stocking of halogen specialty bulbs has remained fairly steady (around 20 percent).

Recommendation 3. Availability and acceptance of high efficiency specialty bulbs still significantly lag behind standard bulbs (resulting from their exclusion from the EISA standards, their high up-front cost, and customers lack of satisfaction with previous products, primarily CFLs, they have installed). ComEd should review their specialty LED offerings to ensure they are effectively targeting the bulb shapes with the highest potential (based on price differential between efficient and in-efficient bulbs and the estimated quantity of sockets containing inefficient specialty products).

Awareness of ComEd's Residential Lighting Program Incentives and Marketing Materials

Finding 5. Customer awareness that the bulbs were discounted by ComEd continued to be low (66 percent of PY8 program bulb purchasers surveyed were not aware they were purchasing bulbs discounted by ComEd, in PY7 this rate was 69 percent). However, while participants may be unaware of the ComEd discount, they are noticing the lower CFL and LED prices that the program provides (60 percent of respondents were aware they were buying discounted bulbs (but not necessarily ComEd discounted) and an additional 60 percent of respondents who didn't know the LEDs were discounted reported that they thought the prices in the store were low for LEDs).

Finding 6. Despite paying a higher upfront cost for LEDs, LED purchasers seem to be aware that the longevity and efficiency of LEDs will save them money over the lifetime of the bulb, compared to other bulb types.

Recommendation 4. ComEd should re-examine marketing material to see if it can enhance the information on lifetime cost savings to encourage more of non-LED purchasers to make the higher initial investment in LEDs.

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's impact and process evaluation of the Residential Lighting Discounts (Residential Lighting) program's eighth program year (PY8[10]). The PY8 Residential Lighting program provides incentives to increase the market share of ES-qualified compact fluorescent lamps (CFLs) and light emitting diodes (LEDs) sold through retail sales channels. The program distributes educational materials designed to increase customer awareness and acceptance of energy-efficient lighting technology. The PY8 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 PY8 Residential 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 PY8, 20 retailers participated in the program, which resulted in 1,129 retail outlets selling program bulbs within ComEd's service territory. Across the 20 retailers, nearly 570 unique lighting measures[11] were available to ComEd customers.

1.2 Evaluation Objectives

The evaluation team identified the following key researchable questions for PY8.

1.2.1 Impact Questions

1. What is the level of gross annual energy (kilowatt-hours [kWh]) and peak demand (summer and winter, 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?
4. What is the researched value for net-to-gross (NTG) ratio?
5. What updates are recommended for the Illinois Technical Reference Manual (TRM)?

1.2.2 Process Questions

1. How aware are customers regarding the ComEd-incented CFL and light-emitting diodes (LEDs) bulb discounts? How effective are the in-store displays and marketing materials?

[10] The Residential Lighting program began in PY1, however this program was significantly different in those first two years so this PY8 report makes specific references back to PY3.
[11] Unique by manufacturer, model number, and retailer.

2. How aware are customers regarding changes in available lighting products as a result of EISA 2007 implementation? How have customers lighting purchasing decisions been affected by the changes in the options available for purchase?

3. How has this program changed with regard to rapid market changes for energy efficient lighting and upcoming standards changes?

4. What are the key barriers to CFL and LED purchase and how can they be addressed by the program?

5. What is the current level of LED availability and pricing in ComEd territory for common retail channels? How does this compare to similar regions (with or without lighting programs) and how is this changing over time?

2. EVALUATION APPROACH

For the Residential Lighting program, the upstream retail-level delivery of the program determined the analytical methods for the evaluation. 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 for the PY8 evaluation included in-store intercept surveys and retailer shelf surveys. The full set of data collection activities is shown in the following table.

Table 2-1. Primary Data Collection Activities

What	Who	Target Completes	Completes Achieved	When	Comments
In-store Intercept Survey	Retail Lighting Purchasers	800	832[12]	August – September 2015	Data collection supporting Gross and Net impact assessment and process analysis.
Shelf Surveys	Program Retailers	25	25	October – November 2015	Market Assessment
In Depth Interviews	Program Manager	1	1	April 2016	

Table 2-2. Additional Resources

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

2.2 Verified Savings Parameters

Verified gross and net savings (energy and coincident peak demand) resulting from the PY8 Program were calculated using the following algorithms as defined by the Illinois TRM version 4[13]

Verified Gross Annual ΔkWh = Delta Watts/1000 * ISR * (1-Leakage) * HOU * IEe
Verified Gross Annual ΔkW = Delta Watts/1000 * ISR * (1-Leakage)
Verified Gross Annual Summer Peak ΔkW = Gross Annual ΔkW * Summer Peak CF * IEd
Verified Gross Annual Winter Peak ΔkW = Gross Annual ΔkW * Winter Peak CF * IEd

Where:

- Delta Watts = Difference between Baseline Wattage (incandescent wattage) and CFL Wattage

[12] Fifty-five percent of the surveys completed were conducted with retail customers who were purchasing one or more ComEd incentivized bulb.
[13] Source: http://www.ilsag.info/technical-reference-manual.html

- HOU = Annual Hours of Use
- IEe = Energy Interactive Effects
- Leakage = % of Program Bulbs installed outside of ComEd Service Territory
- Summer Peak CF = Peak load coincidence factor, the percentage of Program Bulbs turned on during summer peak hours (weekdays from 1 to 5 p.m.)
- Winter Peak CF = Peak load coincidence factor, the percentage of Program Bulbs turned on during the PJM Winter Peak hours[14]
- IEd = Demand Interactive Effects (applied to summer Peak kW estimates only[15])

The following table 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	PY8 Program Tracking Data	Evaluated
Delta Watts	Illinois TRM v4	Deemed
Installation Rate	Illinois TRM v4	Deemed
Leakage	PY7 Report	Evaluated
Res / Non-Res Split	Illinois TRM v4	Deemed
Hours of Use (HOU)	Illinois TRM v4	Deemed
Summer Peak Coincidence Factor (CF)	Illinois TRM v4	Deemed
Winter Peak Coincidence Factor (CF)	Memo to ComEd[16]	Evaluated
Energy Interactive Effects	Illinois TRM v4	Deemed
Demand Interactive Effects	Illinois TRM v4	Deemed
NTGR†	IL Stakeholder Advisory Group website	Deemed

† A deemed value. Source: "ComEd_NTG_History_and_PY8_Recommendations.xls", found on the IL SAG web site: http://ilsag.info/net-to-gross-framework.html. Accessed: September 2, 2016.

2.2.1 Verified Gross Program Savings Analysis Approach

The evaluation team calculated verified savings by measure for measures with available data. For PY8, the evaluation team calculated verified savings for standard CFLs, omni-directional LEDs, directional LEDs, and LED fixtures. The data used to estimate the verified gross program

[14] The Winter Peak Period is defined by PJM as the period from 6-8 am and 5-7 pm, Central Time Zone, between January 1 and February 28.
[15] Summer interactive effects represent the increased energy savings due to the cooler operating temperatures at which CFLs and LEDs operate and thus a reduction in cooling electric loads. In the winter the cooler operating temperature of efficient bulbs results in an increase in gas heating loads (often referred to as "heating penalties"). Since ComEd is an electric utility these heating penalties have not included in the winter peak kW savings estimates.
[16] *"Winter Peak Coincidence Factor Recommendation for Residential Lighting"* memo delivered to ComEd on February 2, 2015

savings came from the PY8 program tracking data[17], the Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0 (Illinois TRM v4), and PY8 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). For PY8, the NTGR estimates were 0.59 for standard CFLs and 0.73 for LED bulbs and fixtures. These NTGR estimates were based on past evaluation research and approved through the Illinois Stakeholder Advisory Group (IL SAG) consensus process.

2.3 Process Evaluation

The process evaluation for the PY8 Residential Lighting program focused on the impact of program processes (e.g., the mechanics of how the program was implemented) on consumers who participated in the program, as well as, the current state of the efficient lighting market in ComEd's service territory. In this component of the study, we examined the effectiveness of program marketing, current levels of customer familiarity and use of energy efficient lighting technologies, awareness of ComEd sponsored discounts on high efficiency lighting, key considerations when purchasing household lighting, and remaining barriers to purchasing CFL and LED lighting technologies. The primary data source for the process evaluation was the in-store intercept surveys (n=832).

[17] The Evaluation Team received the tracking data on July 29, 2016: Res_Lighting_PY8_EOY_Evaluation_Data_Rev0_07252016.xlsx.

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 PY8 verified estimates (excluding carryover) are 381,167 MWh for gross energy savings, 359.3 MW for gross demand savings, with 46.3 MW of summer peak demand savings, and 58.0 MW of winter peak demand savings.

3.1 Tracking System Review

The Residential Lighting Project Information Database was the upstream lighting database used for the PY8 evaluation. This database contained a record for all retail program bulb sales invoices (by model number and store) that were sold during PY8. 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, as well as the parameter values used to calculate ex-ante gross energy savings. The database did not include the parameters needed to calculate the ex ante gross demand savings. In previous program years, ComEd provided a cumulative tracking database that included the program's sales since its inception. However, this year's database included only PY8 sales, which avoided the data cleaning steps required in prior years to make sure each year's sales were complementary and non-overlapping. The PY8 analysis dataset was created based on the program tracking database received from ComEd (dated July 25, 2016). This dataset contained 263,900 records, representing 12,982,661 program bulbs sold in PY8.

In prior years, the evaluation team had to match the tracking database with a file created by the implementation contractor called the *Goals Tracker* in order to pick up detailed bulb information not present in the tracking database. This problem was resolved in PY8 as the tracking database has been updated to include all of the necessary program bulb fields.

The Residential Lighting Project Information Database included all of the information needed to calculate and verify the measure-level gross energy savings, but did not include measure-level demand savings or the demand savings calculation parameter input values. The evaluation team recommends continuing to include the energy savings calculation parameter values in the upstream lighting database and adding the measure-level demand savings and the demand savings calculation parameter input values to the database.

The evaluation team also noted that The Residential Lighting Project Information Database included a field called "Lamp_category" that appears to incorrectly classify program bulbs and is not consistent with the "description" field included in the tracking database. The following table details the inconsistencies observed. Therefore, the evaluation team recommends reviewing the bulb description to "Lamp_category" mapping to ensure this field is correctly defined and delete the "Lamp_category" field if it is not being used by ComEd.

Table 3-1. Tracking Database Bulb Description versus "Lamp_category" Field

Tracking Database Bulb Category	Tracking Database Lamp Type	"Lamp_category"	N Records	N Bulbs
LED Omni	A-Lamp	LED MR16 8w (LMRS16)	61	1,108
LED Omni	A-Lamp	LED PAR 20 (LPAR20)	69,770	3,894,969
LED-Directional/Other	7-9 Watt Reflector	LED MR16 20w (LMRL)	2,122	93,385
LED-Directional/Other	Reflector	LED MR16 8w (LMRS16)	48,246	1,110,719
LED Fixture	Retrofit	LED MR16 8w (LMRS16)	87	547

3.2 Program Volumetric Findings

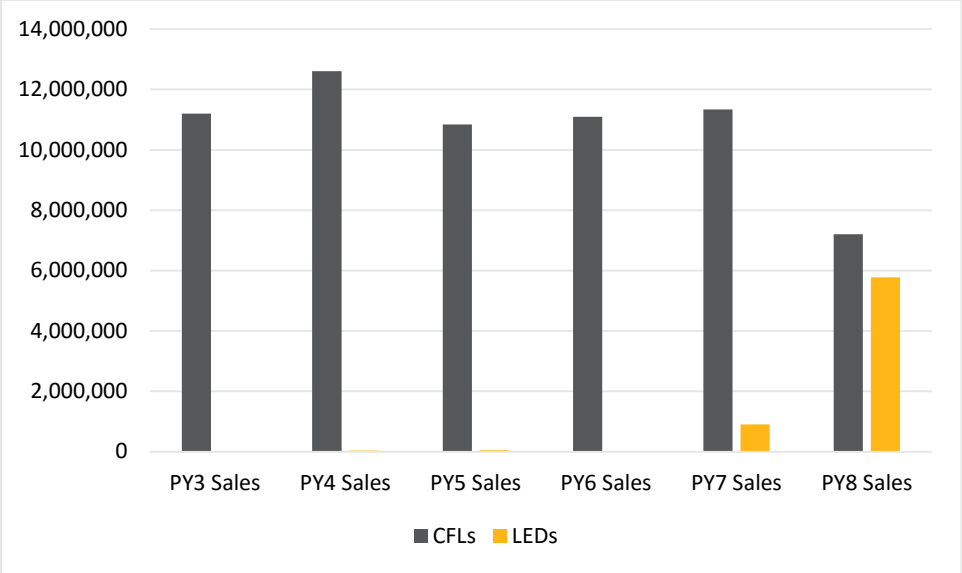
The total number of bulbs sold during the PY8 Residential Lighting program is estimated to be 12,982,661, which is a six percent increase from the bulbs sold in the seventh program year (PY7). There was a dramatic shift in the volumetric sales among the types of bulbs sold through the program from CFLs to LEDs: 56 percent of the bulbs sold in PY8 were standard CFLs compared to 85 percent in PY7, 30 percent were omni-directional LEDs compared to four percent in PY7, 12 percent were directional LEDs compared to three percent in PY7, and two percent were LED fixtures (no fixtures were sold in the program in PY7). Table 3-2 and Figure 3-1 show the volume of bulbs, by bulb type, incentivized through the Residential Lighting program in PY3 through PY8.

Table 3-2. PY3 – PY8 Volumetric Findings Detail

Program Year	Standard CFLs	Specialty CFLs	CFL Fixtures	LED Omni-Dir	LED Dir	LED Fixtures	Coupons	Total
PY8 Sales	7,205,656	0	0	3,896,077	1,578,687	302,241	0	12,982,661
PY7 Sales	10,347,580	989,999	0	471,710	427,824	0	0	12,237,113
PY6 Sales	8,965,546	2,125,179	0	0	0	0	0	11,090,725
PY5 Sales	9,633,227	1,197,896	8,767	9,472	18,758	24,268	5,506	10,897,894
PY4 Sales	11,419,752	1,097,670	84,539	2,592	22,327	16,551	5,599	12,649,030
PY3 Sales	9,893,196	1,217,723	86,943	0	0	0	0	11,197,862

Source: ComEd tracking data and Navigant team analysis.

Figure 3-1. Sales Over Time



Source: ComEd tracking data and Navigant team analysis.

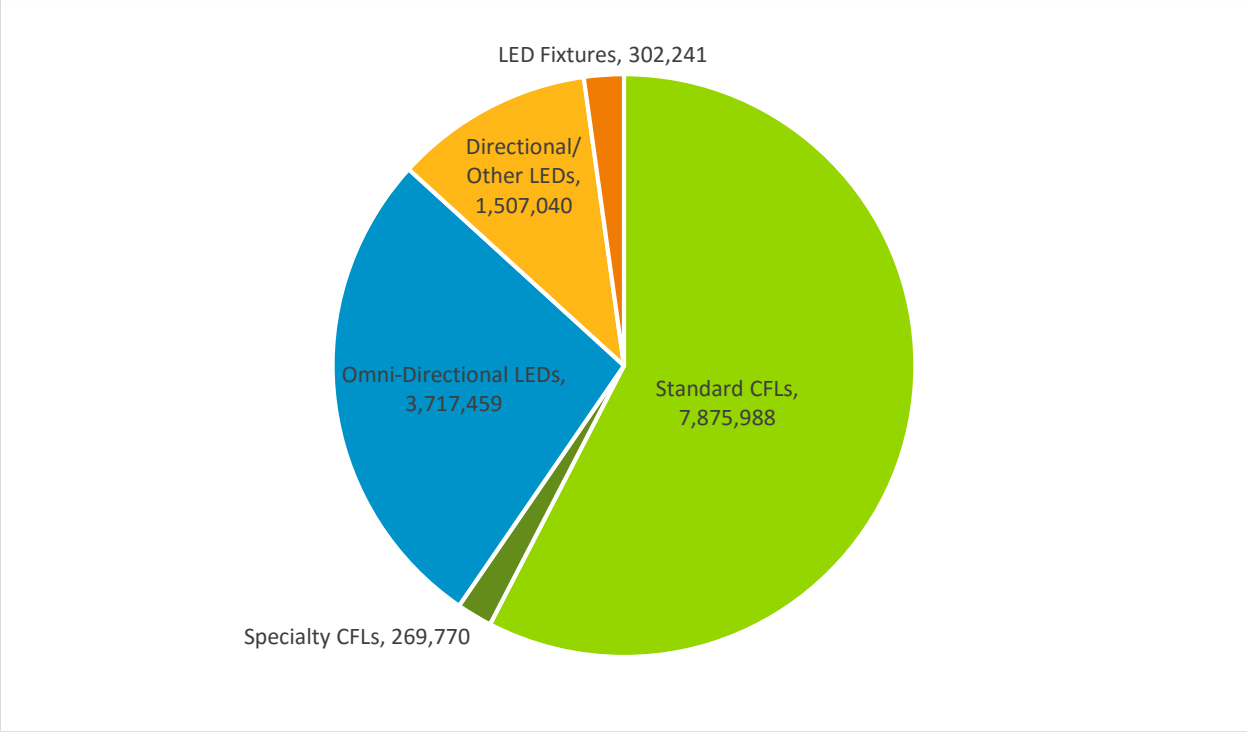
Table 3-3 shows the volume of bulbs incentivized through the Residential Lighting program estimated to have been installed during PY8. This includes bulbs sold in prior program years and installed in PY8 by program bulb type.

Table 3-3. PY8 Volumetric Findings Detail – Bulbs installed in PY8

Participation	Total	Standard CFLs	Specialty CFLs	Omni-Directional LEDs	Directional/ Other LEDs	LED Fixtures
PY8 Incentivized Bulbs	12,982,661	7,205,656	0	3,896,077	1,578,687	302,241
PY8 1st Year Installed Bulbs	10,773,575	5,268,776	0	3,702,364	1,500,195	302,241
PY6 Carryover–PY8 Installs	1,359,037	1,174,487	184,551	0	0	0
PY7 Carryover– PY8 Installs	1,539,885	1,432,726	85,219	15,095	6,845	0
Total Installed Bulbs in PY8	13,672,497	7,875,988	269,770	3,717,459	1,507,040	302,241

Source: ComEd tracking data and Navigant team analysis.

Figure 3-2. Number of Measures Installed by Type



Source: Evaluation Analysis

3.3 Gross Program Impact Parameter Estimates

As described in Section 2, energy and demand savings are estimated using the following formula as specified in the IL TRM v4:

Verified Gross Annual ΔkWh = Delta Watts/1000 * ISR * (1-Leakage) * HOU * IEe
Verified Gross Annual ΔkW = Delta Watts/1000 * ISR * (1-Leakage)
Verified Gross Annual Summer Peak ΔkW = Gross Annual ΔkW * Summer Peak CF * IEd
Verified Gross Annual Winter Peak ΔkW = Gross Annual ΔkW * Winter Peak CF * IEd
The evaluation team conducted research to validate the parameters that were not specified in the TRM. The final list of parameter estimates used to calculate the PY8 verified gross savings are shown in the following table.

Table 3-4. Verified Gross Savings Parameters

Gross Impact Parameters	Measure	PY8 ComEd Reported (Ex-Ante)	PY8 Verified Savings[18]
Program Bulb Sales[19]	Standard CFLs		7,205,656
	Omni-Directional LEDs		3,896,077

[18] All of the verified NonRes parameters in this table are taken from the IL TRM v4, building type = "Unknown".
[19] In PY8, the Residential Lighting program did not incent specialty CFLs and CFL fixtures.

Gross Impact Parameters	Measure	PY8 ComEd Reported (Ex-Ante)	PY8 Verified Savings[18]
	Directional LEDs		1,578,687
	LED Fixtures		302,241
	All Measures		12,982,661
Delta Watts	Standard CFLs		31.2
	Omni-Directional LEDs		32.3
	Directional LEDs	42.4	48.6
	LED Fixtures	43.9	44.0
	All Measures	33.2	34.0
Installation Rate	Res Standard CFLs	0.747[20]	0.732
	Res Omni-Directional LEDs		0.95
	Res Directional LEDs		0.95
	Res LED Fixtures	1.00	1.00
	Non-Res Standard CFLs	NR	0.712
	Non-Res LEDs	NA	0.957
Res/NonRes	Standard CFLs	NR	96%/4%
	Omni-Directional LEDs	100%/0%	96%/4%[21]
	Directional LEDs	100%/0%	96%/4%
	LED Fixtures		100%/0%
Leakage	All Measures	NA	3%
Hours of Use (HOU)	Res Standard CFLs	759[22]	847
	Res Omni-Directional LEDs	759	847
	Res Directional LEDs - Reflector	861	891
	Res Directional LEDs - Globe	639	639
	Res Directional LEDs - Decorative	1,190	1,190
	Res LED Fixtures	861	891
	Non-Res Standard CFLs		3,612
	Non-Res LEDs	NA	3,612

[20] The standard CFL installation rate appears to be the estimated value recommended for future use in the PY7 Final Report. This is not the value that is included in the IL TRM v4 since the IL TRM estimate averages the ComEd and Ameren results for a statewide estimate.
[21] Currently the IL TRM does not include a Res/NonRes split for Omni-Directional LEDs. The evaluation team believes this is an oversight and should be added.
[22] The tracking data uses an HOU estimate of 873 hours which is a weighted average of the Res (759 hours, residential Interior) and NonRes (3,612 hours, nonresidential Unknown) HOU estimates assuming a 96/4 Res/NonRes Split.

Gross Impact Parameters	Measure	PY8 ComEd Reported (Ex-Ante)	PY8 Verified Savings[18]
Interactive Effects (IE)	Energy - Res All Measures		1.06[23]
	Energy - Non-Res Standard CFLs		1.31
	Energy - Non-Res LEDs	NA	1.31
	Demand - Res All Measures	NR	1.11
	Demand - Non-Res Standard CFLs	NR	1.53
	Demand - Non-Res LEDs	NA	1.53
Summer Peak Coincidence Factor (Summer Peak CF)[24]	Res Standard CFLs	NR	0.081
	Res Omni-Directional LEDs	NR	0.081
	Res Directional LEDs - Reflector	NR	0.094
	Res Directional LEDs - Globe	NR	0.075
	Res Directional LEDs - Decorative	NR	0.121
	Res LED Fixtures	NR	0.094
	Non-Res All Measures	NR	0.66
Winter Peak Coincidence Factor (Winter Peak CF)[25]	Res Standard CFLs	NR	0.116
	Res Omni-Directional LEDs	NR	0.116
	Res Directional LEDs - Reflector	NR	0.134
	Res Directional LEDs - Globe	NR	0.107
	Res Directional LEDs - Decorative	NR	0.173
	Res LED Fixtures - Interior	NR	0.134
	Non-Res All Measures	NR	0.55
Carryover Bulbs	All Measures		2,898,922

‡ State of Illinois Technical Reference Manual version 4 from http://www.ilsag.info/technical-reference-manual.html.
NR = Not Reported
NA = Not Applied

3.4 Verified Gross Program Impact Results

The resulting total program verified gross savings is 381,167 MWh for electricity, 359.3 MW for demand, 46.3 MW for summer peak demand, and 58.0 MW for winter peak demand as shown in the following table. These saving estimates are based on deemed parameter estimates from the Illinois TRM v4. 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. These tables do not include carryover. PY8 Carryover savings are presented in Table 3-6.

[23] The tracking data uses an WHFe estimate of 1.07, which is a weighted average of the Res (1.06) and NonRes (1.31) WHFe estimates assuming a 96/4 Res/NonRes Split.
[24] The evaluation team recommends that ComEd use the Summer Peak Coincidence Factors in this table for Residential Lighting, dated 2/2/2015.
[25] The evaluation team recommends that ComEd use the Winter Peak Coincidence Factors in this table for Residential Lighting, dated 2/2/2015.

Table 3-5. PY8 Verified Gross Impact Savings Estimates by Measure Type

Measure	Ex-Ante Gross MWh Savings	Verified Gross Realization Rate	Verified Gross MWh Savings	Verified Gross Summer Peak MW Savings	Verified Gross Winter Peak MW Savings
Standard CFLs	157,023	106%	167,132	20.1	25.0
Omni-Directional LEDs	96,317	127%	122,231	14.7	18.3
Directional LEDs	60,679	131%	79,621	10.2	12.8
LED Fixtures	12,132	100%	12,183	1.3	1.9
Total	326,151	117%	381,167	46.3	58.0

Source: Evaluation Team analysis.

The PY8 Residential Lighting program is able to claim energy and demand savings from program bulbs purchased during PY6 and PY7, but not installed in a customer's home until PY8. Table 3-6 below provides estimates of the verified gross savings for all bulbs installed in PY8 including the savings from the carryover bulbs. PY8 carryover savings from PY6 standard CFLs and all PY7 bulbs were attributed to the EEPS portfolio and savings from PY6 specialty CFLs were attributed to the IPA portfolio.

Table 3-6. PY8 Verified Gross Impact Savings including Carryover

Measure	Ex-Ante Gross MWh Savings	Verified Gross Realization Rate	Verified Gross MWh Savings	Verified Gross Summer Peak MW Savings	Verified Gross Winter Peak MW Savings
PY8 Bulb Sales	326,151	117%	381,167	46.3	58.0
Carryover bulbs	95,652	100%	95,652	10.9	12.7
Total	421,803	113%	476,819	57.2	70.7

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 NTG ratio. In PY8, the NTGR estimates used to calculate the net verified savings for the IPA portfolio were based on past evaluation research and approved through the IL SAG consensus process.[26]

4.1 PY8 Program and Carryover Savings Estimate

In PY8, all program bulbs sales (standard and specialty CFLs and omni-directional and directional LEDs) were attributed to the IPA portfolio. The NTGR estimates applied to calculate verified net savings were based on past evaluation research and approved through the IL SAG consensus process: 0.59 for standard CFLs and 0.73 for LEDs (omni-directional, directional, and fixtures). Using these NTGR values, the evaluation team calculated verified net savings of 313,360 MWh, 297.1 MW for demand, 37.8 summer peak MW, and 46.5 winter peak MW as shown in Table 4-1 and Table 4–2.

Table 4-1. PY8 Verified Net Impact Savings Estimates by Measure Type without Carryover

Measure	Ex-Ante Net MWh Savings[27]	Verified Net Realization Rate	Verified Net MWh Savings	Verified Net Summer Peak MW Savings	Verified Net Winter Peak MW Savings
Standard CFLs	92,644	106%	98,608	11.8	14.7
Omni-Directional LEDs	70,311	127%	89,228	10.8	13.4
Directional LEDs	44,296	131%	58,124	7.4	9.3
LED Fixtures	8,856	100%	8,893	1.0	1.4
Total	216,107	118%	254,854	31.0	38.8

Source: Evaluation team analysis

Table 4-2 provides estimates of the verified net savings for all bulbs installed in PY8 including the savings from the carryover bulbs. PY8 carryover savings from PY6 standard CFLs and all PY7 bulbs were attributed to the EEPS portfolio and savings from PY6 specialty CFLs were attributed to the IPA portfolio.

[26] ComEd_NTG_History_and_PY8_Recommendations.xls, available on the IL SAG website here: http://ilsag.info/net-to-gross-framework.html. Accessed: September 2, 2016.
[27] ComEd did not provide the evaluation team with the ex-ante net savings and thus these estimates were derived by multiplying the ex-ante gross savings estimates by the deemed NTG values found on the IL SAG website.

Table 4-2. PY8 Verified Net Impact Savings including Carryover

Measure	Ex-Ante Net MWh Savings	Verified Net Realization Rate	Verified Net MWh Savings	Verified Net Summer Peak MW Savings	Verified Net Winter Peak MW Savings
PY8 Sales	216,107	118%	254,854	31.0	38.8
Carryover bulbs	58,506	100%	58,506	6.8	7.7
Total	274,613	114%	313,360	37.8	46.5

Source: Evaluation team analysis

4.2 PY9 Carryover Savings Estimate

The evaluation team calculated the PY9 carryover estimate using the Illinois TRM (v4 and v5) and the PY7 and PY8 reports. The energy and demand savings from these PY7 and PY8 late installed bulbs are calculated based on the following parameters:

- Delta Watts – Verified savings estimate from the year of installation (source: Illinois TRM v5)
- Res/Non-Res Split - Evaluation research from the year of purchase (PY7 and PY8 Reports)
- HOU and Peak CF – Verified savings estimate from the year of installation (source: Illinois TRM v5)
- Energy and Demand IE – Verified savings estimate from the year of installation (source: Illinois TRM v5)
- Installation Rate - Verified savings estimate from the year of purchase (source: IL TRM v3 and Illinois TRM v4)
- NTGR – Evaluation research from the year of purchase (source: PY7 and PY8 Reports)

Table 4-3 shows that in PY9 a total of 2,373,351 bulbs (1,317,793 EEPS bulbs and 1,055,558 IPA bulbs) that were purchased during PY7 or PY8, are expected to be installed within ComEd's 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 estimate is 51,464 MWh, 51.3 MW, 5.8 Summer Peak MW, and 6.6 Winter Peak MW which will be counted in PY9 as Residential Lighting Program carryover savings.

Table 4-3. PY9 Carryover Savings Estimates by Portfolio

PY9 Verified Savings Carryover Estimate	EEPS PY7 Bulbs	IPA PY8 Bulbs	Total PY9 Carryover
Carryover Bulbs Installed in PY9	1,317,793	1,055,558	2,373,351
Average Delta Watts	32.2	31.7	n/a
Average Daily Hours of Use	2.5	2.6	n/a
Summer Peak Load Coincidence Factor	0.096	0.102	n/a
Winter Peak Load Coincidence Factor	0.127	0.132	n/a
Installation Rate	10.8%	8.1%	n/a
Energy Interactive Effects	1.06	1.06	n/a
Demand Interactive Effects	1.12	1.12	n/a
Gross kWh Impact per unit	29.9	30.6	n/a
Gross kW Impact per unit	0.032	0.032	n/a
Carryover Gross MWh Savings	48,888	34,397	83,286
Carryover Gross MW Savings	49.6	33.4	83.0
Carryover Gross Peak Summer MW Savings	5.3	4.0	9.3
Carryover Gross Peak Winter MW Savings	6.3	4.4	10.7
Net-to-Gross Ratio	0.63	0.60	n/a
Carryover Net MWh Savings	30,707	20,756	51,464
Carryover Net MW Savings	31.1	20.2	51.3
Carryover Net Summer Peak MW Savings	3.3	2.4	5.8
Carryover Net Winter Peak MW Savings	4.0	2.7	6.6

Source: Evaluation team analysis

5. PROCESS EVALUATION

This section includes a description of the process evaluation and findings from the study.

5.1 Overview of Process Evaluation

The process evaluation of the PY8 Residential Lighting program assessed the impact of program processes (e.g., the mechanics of how the program was implemented) on select consumers who participated in the program and the current state of the efficient lighting market in ComEd's service territory. In this component of the study, we examined the effectiveness of program marketing, current levels of familiarity and usage of energy efficient lighting technologies, awareness of ComEd sponsored discounts on high efficiency lighting, key considerations when purchasing household lighting, remaining barriers to purchasing CFL and LED lighting technologies, and the current retailer (program and non-program) efficient lighting stocking levels to assess the effect ComEd's program is having the on the price of efficient lighting at program stores. The primary data source for the process evaluation were the in-store intercept surveys (n=832) and the shelf surveys (n=25). Memos presenting the complete analysis details and key findings for each of these process related efforts were delivered to ComEd in May and June of 2016. These process memos have been included as attachments to this report (Sections 7.6.3 and 7.6.4). The remainder of this section presents the key process findings from these memos. The reader is encouraged to review the attached memos if further detail is desired.

5.2 High-Level Process Findings

Customer Bulb Type Preference. From PY7 to PY8 there was a dramatic shift in the purchasing behavior among intercept respondents towards LEDs and away from CFLs and incandescent bulbs. This shift to LEDs is likely closely tied to the high level of LED awareness (85 percent in PY8), the significant increase in program LED offerings[28] and the rapidly declining LED prices.[29] Despite all of this LED activity, only half of customers who were aware of LEDs went on to purchase LEDs primarily due to their cost (price continues to be reported as the largest barrier to LED purchase).

Prior Usage of High Efficiency Bulbs by Program Participants. The majority of program participants had prior experience with high efficiency bulbs. Ninety-four percent of program CFL purchasers reported they had previously installed CFLs in their home or business and 73 percent of program LED purchasers reported they had also previously installed LEDs in their home or business.

Installation of LEDs. LEDs are most frequently being purchased to replace incandescent bulbs. Over half (56 percent) of survey respondents reported the LEDs would replace incandescent bulbs, 30 percent reported they would replace CFLs, 5 percent reported they would replace other LEDs, and 4 percent reported they would replace Halogen bulbs. Nine percent were unsure what type of bulb they would replace.

[28] In PY8, more than 200 LED models were incentivized through the program across the four program retailers where intercepts were conducted, compared to 50 LED models in PY7.
[29] *LED Incremental Cost Study Overall FINAL Report*. Prepared by Cadmus for the Electric and Gas Program Administrators of Massachusetts. February 2016. Figure 15, page 44.

Replacement of Working Bulbs. The majority of respondents purchasing CFLs and LEDs reported they planned to install these efficient bulbs to replace less efficient bulbs that were still in working order (70 percent of LED purchasers and 50 percent of CFL purchasers reported that some or all of the bulbs they were purchasing would replace bulbs that were still in working order).

Awareness of ComEd's Residential Lighting Program Incentives. Customer awareness that the bulbs were discounted by ComEd was low (66 percent of program bulb purchasers were not aware they were purchasing bulbs discounted by ComEd).

Price Differential. While roughly a third of program participants did not know they were buying ComEd discounted bulbs, 60 percent of participants did know that the bulbs were discounted. The majority of customers who did not know the bulbs were discounted did think that the CFL and LED in-store prices were low (84 percent reported the CFL prices were low and 60 percent reported the LED prices were low). This indicates that while the participants may be unaware of the ComEd program or discount, they are noticing the low prices (that the program provides) for these efficient bulb types.

Influence of Incentives. The ComEd program incentives are having a significant effect on the retail price of CFLs and LEDs within ComEd service territory. On average, program standard CFLs are approximately half the price of non-program standard CFLs and program LEDs (both omni-directional and directional) are around two-thirds the price of non-program LEDs. Additionally, ComEd discounted standard CFLs cost less per bulb, on average, than similar incandescent and halogen bulbs.

Awareness and Influence of Program Marketing Materials. The majority of customers surveyed were unaware of in-store efficient lighting information provided by ComEd (63 percent), however customers who had seen this information reported they were highly influential in their decision to purchase efficient lighting. During demonstration events customers reported greater awareness of marketing materials and more frequent interactions with store employees who could offer information on energy efficiency lighting.

Purchasing Intentions. The majority of respondents planned to purchase lighting when they entered the store (81 percent) and most of these respondents (93 percent) purchased at least one bulb of the type they reportedly had planned to buy. Lighting purchasers who had not planned to purchase bulbs upon entering the store, primarily purchased LEDs and CFLs (48 percent purchased LEDs only, 34 percent purchased CFLs only, and 19 percent purchased a mix of efficient and non-efficient bulbs). The program appeared to have a rather significant influence on what these customers purchased as program influence was relatively high amongst those who ended up purchase a program bulb (87 percent reported an influence of 6 or higher to either the program bulb price, in-store information, or the bulb placement). Awareness of the discount was also higher amongst those who ended up buying a program bulb (61 percent of those who ended up buying a program bulb were aware of the discount versus only 12 percent who did not end up buying a program bulb).

Purchasing Influences. Customers purchasing CFLs and LEDs both reported two of the top three factors influencing their purchase were: the energy used by the bulbs and the longevity of

bulbs. The other top factor reported for CFL purchasers was the price of the CFLs, while for LED purchasers it was the light quality that LEDs produce.

Barriers to CFL and LED Purchase. Customers purchasing incandescent or halogen bulbs reported their primary barriers to purchasing CFLs were aesthetic – including their look and fit in fixtures, light color and quality, and flicker (47 percent) or that they needed another kind of bulb (24 percent). Because customers largely disliked CFLs for aesthetic reasons they also reported a low likelihood of purchasing CFLs if their prices were equal to or lower than other bulb types available for purchase. The primary barriers reported to LED purchase included their cost and a lack of awareness or knowledge of LEDs, both are factors that can be overcome through continued program incentives, marketing, and education.

State of the LED Market: The cost of a medium screw-based LED has come down substantially in recent years (the average cost of a non-incentivized standard LED in PY6 was nearly $17 a bulb and is now less than $7 and the price of a non-incentivized specialty LED has come down from around $26 a bulb to $13). LED bulbs are also comprising a larger proportion of the medium-screw based bulbs stocked on program retailer shelves (21 percent in PY8 versus 16 percent in PY6), although they appear to be replacing shelf space previously filled by CFLs, as opposed to reducing the share of incandescent and halogen bulbs.

State of the CFL Market: The shelf space program retailers dedicate to CFLs has decreased significantly as LEDs drop in price and awareness of LEDs continues to rise quickly. Since LEDs last longer, generate greater energy savings than CFLs, and are often preferred to CFLs in terms of light quality, they will likely continue to cannibalize the CFL market as the preferred energy efficient bulb technology. Specialty CFL shelf space has declined at a faster rate than standard CFL space, dropping from 29 percent in PY6 to 6 percent in PY9 (standard CFL space dropped from 43 percent to 34 percent during that same period).

Incandescent Lamp Availability: The availability of standard incandescent medium screw-based lamps has continued to decrease due to the implementation of EISA 2007. Overall, the share of standard incandescent bulbs has decreased from 22 percent in PY6 to 11 percent in PY8, with the greatest decline being in the 40-watt replacement category where incandescent bulbs fell from 39 percent to 26 percent of the market. At the same time the availability of specialty incandescent bulbs, which are generally not covered by the EISA standards, has increased with specialty incandescent bulbs making up 54 percent of the stocked product (up from 35 percent in PY6).

Halogen Lamp Availability: The volume of standard halogen bulbs found on the shelves of program retailers has risen as incandescent bulbs have gone away. Between PY6 and PY8, standard halogens increased from 20 percent of the stocked standard bulbs to 35 percent. The stocking of specialty halogen bulbs in that same time period has remained fairly steady (20 percent compared to 18 percent).

Specialty Bulb Market: Availability of high efficiency (CFL and LED) specialty bulbs still significantly lags behind standard bulbs – in part due to the fact that many specialty bulbs are exempt from the EISA standards, their prices are still about double the cost of a standard bulb of the same technology, and customers lack of satisfaction with the products that are available (primarily for CFLs).

6. FINDINGS AND RECOMMENDATIONS

This section summarizes the key impact and process findings and recommendations.
The PY8 Residential Lighting program planning target was to sell 12,827,609 incentivized CFL and LED bulbs to Residential customers within ComEd's service territory. The program exceeded this goal by selling a total of 12,982,661 CFLs, LEDs, and LED fixtures. These CFL and LED sales led to the program achieving 127 percent of its targeted gross energy savings. Retailer participation in the Residential Lighting program remained stable between PY7 and PY8. In total, there were 20 retail chains participating in the PY8 program, resulting in a total of just over 1,129 individual retail locations where program bulbs could be purchased. As in previous program years, big box, do-it-yourself (DIY), and warehouse stores remained the dominant retail categories (responsible for selling 84 percent of PY8 program bulbs).

Program Volumetric Findings

Finding 1. The total number of bulbs sold during the PY8 Residential Lighting program was estimated to be 12,982,661, which is a six percent increase from the quantity of bulbs sold in PY7. Fifty-six percent of the bulbs sold in PY8 were standard CFLs, 30 percent were omni-directional LEDs, 12 percent were directional LEDs, and two percent were LED fixtures. No specialty CFLs were incentivized through the program in PY8. This significant decrease in standard CFL sales was planned as it is likely that standard CFLs will be eliminated from the program during PY9.

Finding 2. Analysis of PY8 program bulb sales found the average incentive per MWh of energy saved for omni-directional LEDs and directional LEDs is higher than it is for standard CFLs (roughly $77/net MWh for a standard CFL, $150/net MWh for an omni-directional LED, $120/net MWh for a directional LED). The cost per kWh saved will continue to be lower for standard CFLs than for LEDs as these bulbs continue to require greater incentives to encourage market uptake due to their higher non-incentivized market prices. Energy Star 2.0 (ES 2.0) bulbs which are scheduled to hit the market in July 2018 should help decrease the cost per MWh of savings as their retail prices are projected to be significantly lower than existing LEDs and thus will require lower incentive levels.[30]

Recommendation 1. ComEd should consider adding the ES 2.0 bulbs to the program to retain a large volume of LED savings while minimizing program spending.

Barriers to CFL and LED Purchase

Finding 3. Customers' primary barriers to purchasing CFLs are aesthetic—their look and fit in fixtures or their light color—and as a result customers reported a low likelihood of purchasing CFLs even if their prices were equal to or lower than the price of other bulb types. Barriers to LED purchases are related to their cost and a lack of awareness or knowledge of this newer technology. The top factors that customers reported had influenced their decision to purchase efficient bulbs were the energy saved by the bulbs, the longevity of the bulbs, and the quality of light they produce.

[30] Further information on Energy Star 2.0 LEDs can be found at: https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Lamps%20V2%20Cover%20Letter%2012-4-15.pdf

Recommendation 2. Both of the primary LED barriers will be reduced over time, however ComEd's lighting program is currently well positioned to effectively increase the rate at which these barriers are diminished by expanding their program LED offerings and re-examining their educational materials to ensure they are focused on the top influential factors, such as the longevity of the bulb and its impact on the ultimate cost and energy savings of the LED.

State of the Lighting Market

Finding 4. The shelf surveys conducted as part of this evaluation found that the ComEd program incentives are having a significant effect on the retail price of CFLs and LEDs within ComEd service territory. Specifically, these shelf surveys found:

- Program LEDs (omni-directional and directional) are around two-thirds the price of non-program LEDs.
- Over the last two years, the price of a standard LED has decreased by around $10 and the price of a specialty LED has decreased by $13 a bulb. In addition, LEDs also comprise a larger proportion of stocked bulbs, however they seem to be replacing space previously occupied by CFLs.
- Program standard CFLs are approximately half the price of non-program standard CFLs and cost less per bulb, on average, than similar incandescent and halogen bulbs.
- The shelf space dedicated to standard incandescent bulbs lamps has been cut in half (22 percent to 11 percent) in the past two years, mostly driven by EISA, but all of this reduction has been met with an increase in halogen bulbs.
- The availability of specialty incandescent bulbs, which are generally not covered by the EISA standards, has increased—specialty incandescent bulbs represent 54 percent of the stocked product (up from 35 percent in the last two years ago). Stocking of halogen specialty bulbs has remained fairly steady (around 20 percent).

Recommendation 3. Availability and acceptance of high efficiency specialty bulbs still significantly lag behind standard bulbs (resulting from their exclusion from the EISA standards, their high up-front cost, and customers lack of satisfaction with previous products, primarily CFLs, they have installed). ComEd should review their specialty LED offerings to ensure they are effectively targeting the bulb shapes with the highest potential (based on price differential between efficient and in-efficient bulbs and the estimated quantity of sockets containing inefficient specialty products).

Awareness of ComEd's Residential Lighting Program Incentives and Marketing Materials

Finding 5. Customer awareness that the bulbs were discounted by ComEd continued to be low (66 percent of PY8 program bulb purchasers surveyed were not aware they were purchasing bulbs discounted by ComEd, in PY7 this rate was 69 percent). However, while participants may be unaware of the ComEd discount, they are noticing the lower CFL and LED prices that the program provides (60 percent of respondents were aware they were buying discounted bulbs (but not necessarily ComEd discounted) and an additional 60 percent of respondents who didn't know the LEDs were discounted reported that they thought the prices in the store were low for LEDs).

Finding 6. Despite paying a higher upfront cost for LEDs, LED purchasers seem to be aware that the longevity and efficiency of LEDs will save them money over the lifetime of the bulb, compared to other bulb types.

Recommendation 4. ComEd should re-examine marketing material to see if it can enhance the information on lifetime cost savings to encourage more of non-LED purchasers to make the higher initial investment in LEDs.

Finding 7. The majority of customers surveyed in PY8 were unaware of in-store efficient lighting materials provided by ComEd (63 percent), however customers who had seen these materials reported they were highly influential in their decision to purchase efficient lighting. During demonstration events customers reported greater awareness of marketing materials and more frequent interaction with store employees who could offer information on energy efficiency lighting.

Recommendation 5. ComEd should re-examine their in-store materials to look for ways to increase customer awareness of in-store program marketing and educational materials.

Program Tracking Data

Finding 8. In PY8, the Residential Lighting program tracking database was updated so that it includes all program bulb information required to calculate program impacts. This makes it no long necessary to merge the tracking data and the goals tracker spreadsheet, which had been necessary in past program years. This change has reduced the need for manual matches on the part of the evaluation team representing significant time savings. However, the database did not include measure-level demand savings or the demand savings calculation parameter input values.

Recommendation 6. Continue to include the energy savings calculation parameter values in the upstream lighting database as well as add the measure-level demand savings and the demand savings calculation parameter input values to the database.

Finding 9. The Residential Lighting Project Information Database included a field called “Lamp_category” that appears to incorrectly classify program bulbs and is not consistent with the “description” field included in the tracking database.

Recommendation 7. Review the bulb description for “Lamp_category” mapping to ensure this field is correctly defined and delete the “Lamp_category” field if it is not being used by ComEd.

Verified Gross Impacts

Finding 10. The PY8 gross verified energy savings were estimated to be 381,167 MWh (excluding carryover), the entirety of which was attributable to the IPA portfolio. The PY8 gross verified carryover savings were 95,652 kWh, of which the majority (92 percent) were attributable to the EEPS portfolio and the remaining 8 percent were attributable to the IPA portfolio.

Installation of CFLs and LEDs

Finding 11. The lighting market is currently undergoing a dramatic shift from CFLs and incandescent bulbs to LEDs. This shift to LEDs is closely tied to the high level of LED

awareness (85 percent in PY8), the significant increase in program LED offerings,[31] rapidly declining LED prices,[32] and prior experience with LEDs (73 percent of program LED purchasers had an LED installed in their home or business).

Finding 12. While LEDs are most frequently being purchased to replace incandescent bulbs (56 percent), nearly a third are replacing CFLs (five percent are replacing LEDs, four percent Halogens, and nine percent an unknown bulb type).

Finding 13. The majority of high efficiency bulbs will replace less efficient bulbs that are still in working order (70 percent of LED purchasers and 50 percent of CFL purchasers reported that some or all of the bulbs they were purchasing would replace bulbs that were still in working order).

PY9 Carryover Savings Estimate

Finding 14. In PY9, the savings from nearly 2.4 million high efficiency bulbs, purchased during PY7 or PY8, are expected to be installed within ComEd service territory. These bulbs are estimated to yield total net savings of 51,464 MWh, 51.3 MW, 5.8 Summer Peak MW, and 6.6 Winter Peak MW. Estimated net carryover savings for PY9 is 88 percent of PY8 net carryover savings. Approximately 60 percent of the PY9 carryover savings are attributable to the EEPS portfolio (30,707 MWh) and the remaining 40 percent of carryover savings are attributable to the IPA portfolio (20,756 MWh). All EEPS savings come from bulbs purchased in PY7 and all IPA savings come from bulbs purchased in PY8.

Impact Estimates for Future Use

Finding 15. During the course of the PY8 study, the evaluation team estimated key parameters used to estimate lighting program impacts. These parameters can be included in future versions of the Illinois Statewide Technical Reference Manual for Energy Efficiency (Illinois TRM) or within the IL net-to-gross ratio (NTGR) framework.

[31] In PY8, more than 200 LED models were incentivized through the program across the four program retailers where intercepts were conducted, compared to 50 LED models in PY7.
[32] *LED Incremental Cost Study Overall FINAL Report*. Prepared by Cadmus for the Electric and Gas Program Administrators of Massachusetts. February 2016. Figure 15, page 44.

Table 6-1. Impact Estimate Parameters for Future Use[33]

Parameter	Value	Data Source
Res/Non-Res Split	95%/5% Standard CFLs	3-year rolling average (PY6-PY8) of Evaluation Research Findings
	98%/2% Omni-Directional LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings
	92%/8% Directional LEDs	
1st Year Installation Rate	76.6% Standard CFL	3-year rolling average (PY6-PY8) of Evaluation Research Findings
	89.9% Omni-Directional LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings
	93.5% Directional/Other LEDs	
Leakage	2.2% Standard CFL	3-year rolling average (PY6-PY8) of Evaluation Research Findings
	1.4% Omni-Directional LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings
	2.2% Directional/Other LEDs	
NTGR	0.54 Standard CFLs	PY8 Evaluation Research Findings
	0.58 Omni-Directional LEDs	
	0.58 Directional/Other LEDs	

[33] The evaluation research parameter estimates differ from those reported in the PY8 In-store Intercepts Memo and the PY8 NTG Results Memo because the estimates were reweighted using final PY8 bulb sales (allocated sales were used to weight the results reported in the In-Store Intercepts Results Memo).

7. APPENDIX

7.1 Evaluation Research Impact Approaches and Findings

7.1.1 Evaluation Research Gross Impact Findings

The PY8 evaluation research gross savings were calculated using the gross energy and demand savings algorithms shown below. These are the same algorithms used to estimate the evaluation verified estimates (provided in Section 2) and specified within the Illinois TRM v4.[34]

Verified Gross Annual ΔkWh = Delta Watts/1000 * ISR * (1-Leakage) * HOU * IEe
Verified Gross Annual ΔkW = Delta Watts/1000 * ISR * (1-Leakage)
Verified Gross Annual Summer Peak ΔkW = Gross Annual ΔkW * Summer Peak CF * IEd
Verified Gross Annual Winter Peak ΔkW = Gross Annual ΔkW * Winter Peak CF * IEd

Where:

- Delta Watts = Difference between Baseline Wattage (incandescent wattage) and CFL Wattage
- HOU = Annual Hours of Use
- IEe = Energy Interactive Effects
- Leakage = % of Program Bulbs installed outside of ComEd Service Territory
- Summer Peak CF = Peak load coincidence factor, the percentage of Program Bulbs turned on during summer peak hours (weekdays from 1 to 5 p.m.)
- Winter Peak CF = Peak load coincidence factor, the percentage of Program Bulbs turned on during the PJM Winter Peak hours[35]
- IEd = Demand Interactive Effects (applied to summer Peak kW estimates only[36])

Table 7-1 contains the evaluation research gross savings parameter estimates. As shown in the table below, many of the evaluation research parameters, such as installation rate, res/nonres split, and leakage, were based on analysis of customer self-report data collected during the PY8 in-store intercept surveys. The evaluation research estimates of installation rate, res/nonres split, and leakage differ from those reported in the In-store Intercepts Memo delivered on March 19, 2016 because the estimates were reweighted using final PY8 bulb sales (allocated sales were used to weight the results reported in the In-Store Intercepts Results Memo).

A number of these estimates differ from the deemed verified parameter estimates and thus account for the discrepancy between the verified savings and evaluation research savings estimates. The differences include the following:

- The evaluation research installation rates for standard CFLs were 14 percent higher than the deemed estimates included in Illinois TRM v4. For omni-directional and directional

[34] Source: http://www.ilsag.info/technical-reference-manual.html
[35] The Winter Peak Period is defined by PJM as the period from 6-8 am and 5-7 pm, Central Time Zone, between January 1 and February 28.
[36] Summer interactive effects represent the increased energy savings due to the cooler operating temperatures at which CFLs and LEDs operate and thus a reduction in cooling electric loads. In the winter the cooler operating temperature of efficient bulbs results in an increase in gas heating loads (often referred to as “heating penalties”). Since ComEd is an electric utility these heating penalties have not included in the winter peak kW savings estimates.

LEDs, the installation rates were found to be six percent and two percent lower, respectively.

- The evaluation research Res/NonRes split found the percent of residential installs was two percent higher than the deemed estimate from the Illinois TRM v4 for standard CFLs and omni-directional LEDs. For directional LEDs the residential installations rate was six percent lower.
- The evaluation research found no leakage for CFLs while the deemed estimate in Illinois TRM v4 was three percent. For omni-directional and directional LEDs the evaluation research estimated leakage was slightly lower than the deemed estimate in the TRM.

Table 7-1. Evaluation Research Gross Savings Parameters

Gross Impact Parameters	Population	PY8 Evaluation Research	Source
Program Bulb Sales	Standard CFLs	7,205,656	PY8 Program Tracking data
	Omni-directional LEDs	3,896,077	
	Directional/Other LEDs	1,578,687	
	LED Fixtures	302,241	
	All Bulbs	12,982,661	
Delta Watts	Standard CFLs	31.2	Base Watts: IL TRM v4; Efficient Watts: Tracking Data
	Omni-directional LEDs	32.3	
	Directional/Other LEDs	48.6	
	LED Fixtures	44.0	
	All Bulbs	34.0	
Installation Rate	Res Standard CFLs	83.6%	PY8 In-Store Intercepts
	Res Omni-Directional LEDs	89.3%	
	Res Directional LEDs	93.1%	
	Res LED Fixtures	100.0%	Illinois TRM v4
	Non-Res Standard CFLs	71.2%	
	Non-Res LEDs	95.7%	
Res/Non-Res	Standard CFLs	98%/2%	PY8 In-Store Intercepts
	Omni-directional LEDs	98%/2%	
	Directional/Other LEDs	90%/10%	
	LED Fixtures	100%/0%	Illinois TRM v4
Hours of Use	Res Standard CFLs	847	Illinois TRM v4
	Res Omni-Directional LEDs	847	
	Res Directional LEDs - Reflector	891	
	Res Directional LEDs - Globe	639	
	Res Directional LEDs - Decorative	1190	
	Res LED Fixtures	891	

Gross Impact Parameters	Population	PY8 Evaluation Research	Source
	Non-Res All Measures	3,612	
Summer Peak CF	Res Standard CFLs	0.081	Illinois TRM v4
	Res Omni-Directional LEDs	0.081	
	Res Directional LEDs - Reflector	0.094	
	Res Directional LEDs - Globe	0.075	
	Res Directional LEDs - Decorative	0.121	
	Res LED Fixtures	0.094	
	Non-Res All Measures	0.66	
Winter Peak CF	Res Standard CFLs	0.116	Memo to ComEd[37]
	Res Omni-Directional LEDs	0.116	
	Res Directional LEDs - Reflector	0.134	
	Res Directional LEDs - Globe	0.107	
	Res Directional LEDs - Decorative	0.173	
	Res LED Fixtures - Interior	0.134	
	Non-Res All Measures	0.55	
Leakage	Standard CFLs	0.0%	PY8 In-Store Intercepts
	Omni-directional LEDs	1.6%	
	Directional/Other LEDs	2.8%	
	LED Fixtures	3.0%	PY7 Report
Interactive Effects	Energy - Res	1.06	Illinois TRM v4.0
	Demand - Res	1.11	
	Energy – Non-Res	1.31	
	Demand – Non-Res	1.53	
Carryover Bulbs	All Measures	2,898,922	PY7 Report

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 PY8 Bulb Sales Estimates

Verified savings and evaluation research program bulb sales estimates were derived from the PY8 tracking databases provided by ComEd. The total number of bulbs sold during the PY8 Residential Lighting program is estimated to be 12,982,661, which is a six percent increase from the bulbs sold in PY7. Fifty-six percent of these were standard CFLs, 30 percent were omni-directional LEDs, 12 percent were directional LEDs, and two percent were LED fixtures. Table 7-2 shows that nearly all standard CFLs were sold in multi-packs (99.9 percent), while LEDs were more likely to be sold in single packs (74.9 percent of omni-directional LEDs and 52.2

[37] Winter Peak Coincidence Factor Recommendation for Commercial Lighting to ComEd from evaluation team, dated 2/10/2015.

percent of directional LEDs were sold in multi-packs). LED fixtures are primarily sold in single units, 24% of LED fixtures were multi-unit packages.

Table 7-2. PY8 Bulb Sales by Pack Size

Single vs. Multi-Pack	Standard CFL	Omni-directional LED	Directional LED	LED Fixtures	Total
Single Pack	5,557	976,503	755,366	228,427	1,965,853
Multi-Pack	7,200,099	2,919,574	823,321	73,814	11,016,808
PY8 Total Bulb Sales	7,205,656	3,896,077	1,578,687	302,241	12,982,661
% Multi-Pack	99.9	74.9	52.2	24.4	84.9

Source: Evaluation team analysis

Table 7-3 shows bulb sales by retailer type. Across all bulb types, 89 percent of PY8 bulbs and fixtures were sold at DIY, warehouse or big box stores. DIY stores alone were responsible for half of the overall program bulb sales, selling approximately 50 percent of program CFLs and LEDs and 74 percent of the program LED fixtures.

Table 7-3. PY8 Bulb Sales by Type of Retailer

Retailer Type	Standard CFL	Omni-directional LED	Directional LED	LED Fixtures		Total
DIY	3,615,067	1,938,908	733,206	225,163	6,512,344	50%
Warehouse	1,026,196	1,390,769	573,463	74,980	3,065,408	24%
Big Box	1,458,066	382,564	148,844	336	1,989,810	15%
Dollar Store	725,422	4,851	0	0	730,273	6%
Small Hardware	148,545	123,569	110,687	836	383,637	3%
Other[38]	232,360	55,416	12,487	926	301,189	2%
PY8 Total Bulb Sales	7,205,656	3,896,077	1,578,687	302,241	12,982,661	100%

Source: Evaluation team analysis

7.1.1.2 PY8 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 upstream lighting database. Appropriate baseline wattages are more difficult to establish as this metric depends on various factors including bulb type / shape, directionality, and federal standards.[39] The verified savings delta watts values 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, and decorative). This delta watts approach is technology neutral, meaning that lumen ranges for specific bulb types are consistent across technologies.

[38] Includes electronics, discount, and grocery stores.
[39] The Energy Independence and Security Act 2007 (EISA) and the Energy Policy and Conservation Act of 2012 (EPACT).

Using the baseline wattages methods established in the Illinois TRM v4, 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	Omni-directional LED	Directional LED	LED Fixtures	All PY8 Bulbs
Bulbs Sold	7,205,656	3,896,077	1,578,687	302,241	12,982,661
Average Bulb Wattage	16.5	10.4	8.8	10.6	12.2
Average Delta Watts	31.2	32.3	48.6	44.0	34.0

Source: Evaluation team analysis

7.1.1.3 PY8 CFL Installation Rates

Table 7-5 shows the standard CFL, specialty CFL, and LED installation rates broken down by the retailer types where in-store intercepts took place. For additional information about the methods and results of the PY8 installation rate calculations see the In-store Intercepts Memo in Section 7.6.5.

Table 7-5. Installation Rate Estimates by Bulb Type and Retailer

Retailer Type	Standard CFLs	Omni-directional LEDs	Directional LEDs	All Bulbs
Big Box	81%	88%	95%	85%
DIY	84%	86%	94%	86%
Warehouse	87%	94%[40]	92%	90%
Retailer Sales Weighted	84%	89%	93%	87%

Source: Evaluation team analysis

7.1.1.4 PY8 Program Bulb Leakage Rate

In PY8, the overall leakage rate across bulb types and retailer types was estimated to be 0.8 percent, which has decreased from the PY7 value of three percent. The decline in leakage was primarily driven by program standard CFL purchasers who reported that they planned to install all of their bulbs within the ComEd service territory, and only six program LED bulb purchasers reported they planned to install the program LED bulbs that they were purchasing outside of ComEd service territory.[41] For additional details about the leakage purchases see the In-store Intercepts Memo in Section 7.6.5.

7.1.1.5 PY8 Residential/Non-residential Installation Location Split

The percentage of program bulbs being installed in residential versus non-residential locations in PY8 was estimated to be 98/2 for Standard CFLs, 98/2 for omni-directional LEDs, and 90/10

[40] It should be noted that this result is based on a small sample of six intercept survey respondents who purchased Specialty CFLs at a Warehouse store.
[41] The six LED purchasers who reported leakage included three omni-directional LED purchasers who bought 13 bulbs and three directional LED purchasers who bought 7 bulbs.

for directional LEDs[42] based on data collected during the in-store intercept surveys. 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 PY8 Hours of Use and Peak Coincidence Factor

Residential Evaluation Research Estimates

Table 7-6 shows the residential HOU and Peak CF estimates used to calculate the evaluation research impact estimates. These values were taken from IL TRM v4 and are the same as those used to calculate the verified energy and demand savings. The deemed TRM HOU and CF estimates are the results of the PY5/PY6 ComEd Lighting Logger Study.[43]

Table 7-6. Residential HOU and Peak CF Estimates

Bulb Type		Evaluation Research				
		Bulb Sales	Annual HOU	Daily HOU	Summer Peak CF	Winter Peak CF
CFL	Standard	7,205,656	847	2.32	0.081	0.116
LED	Omni-directional	3,896,077	847	2.32	0.081	0.116
	Candelabra	288,526	891	2.44	0.094	0.134
	Reflector	1,204,104	639	1.75	0.075	0.107
	Globe	86,057	1190	3.26	0.121	0.173
LED Fixture		302,241	891	2.44	0.094	0.134
Bulb Weighted Average		12,982,661	832	2.28	0.08	0.12

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 were taken from the commercial lighting portion of the Illinois TRM v4.0 (Unknown" building type).

7.1.1.7 Interactive Effects

The IE estimates (both energy and demand) used to estimate the verified savings and evaluation research impacts were taken from the Residential and C&I sections of the Illinois TRM v4. 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 7-7 presents these Illinois TRM based IE estimates.

[42] This analysis excluded program bulbs that were reportedly installed in locations outside of ComEd service territory.
[43] The complete PY5/PY6 Lighting Logger Study was included as an Appendix to the PY6 report.

Table 7-7. PY8 Energy and Demand Interactive Effects

Sector	Evaluation Research	
	Energy IE	Demand IE
Residential	1.06	1.11
Non-residential	1.31	1.53

Source: Evaluation team analysis

7.1.1.8 Carryover Bulb Savings Estimation

The PY8 residential CFL energy and demand savings estimates include savings resulting from bulbs purchased during PY6 and PY7, 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 PY8, but not installed in PY8, can be counted in future program years. This section presents the verified savings estimates for the carryover bulbs installed in PY8.

PY8 Carryover Savings Estimation

The source for the parameter estimates that go into the energy and demand impact calculations for the PY8 carryover bulbs are provided in Table 7-8.

Table 7-8. PY8 Carryover Parameter Sources

Parameter Estimate	Parameter Timing	PY6 Sales	PY7 Sales
Installation Rate	Year of Bulb Purchase	Illinois TRM v2	Illinois TRM v3
Delta Watts	Year of Bulb Installation	Illinois TRM v4	Illinois TRM v4
Res/Non-Res Split	Year of Bulb Purchase	Illinois TRM v2	Illinois TRM v3
HOU and Peak CF	Year of Bulb Installation	Illinois TRM v4	Illinois TRM v4
Energy/Demand IE	Year of Bulb Installation	Illinois TRM v4	Illinois TRM v4
NTGR	Year of Bulb Purchase	PY6 Report	PY7 Report

Source: Evaluation team analysis

Table 7-9 shows that 2,898,922 bulbs sold through the program in PY6 or PY7 were estimated to have been installed in PY8. The number of PY6 bulbs installed in PY8 was calculated based on the third-year installation rate deemed in v2 of the Illinois TRM[44] and the number of PY7 bulbs installed in PY8 was calculated based on the second-year installation rate deemed in v3 of the Illinois TRM.[45]

[44] The Illinois TRM v2 (effective in PY6) was in place at the time the PY6 program bubs were sold and govern the estimated installation rates for PY6 bulb sales.
[45] The Illinois TRM v3 (effective in PY7) was in place at the time the PY7 program bubs were sold and govern the estimated installation rates for PY7 bulb sales.

Table 7-9. PY8 Carryover Bulb Estimates

Carryover Bulbs	Bulbs Sold in PY6	PY7 Bulbs Sold in PY7
Total Bulbs Sold	11,090,725	12,237,113
Installed During PY6	7,912,071	n/a
Installed During PY7	1,597,802	9,134,352
Installed During PY8	1,359,037	1,539,885
Installed During PY9	n/a	1,317,793
Total Installed	10,868,911	11,992,031
Lifetime Installation Rate	98%	98%

Source: Evaluation team analysis

Table 7-10 provides estimates of energy and demand savings in PY8 resulting from the delayed installation of PY6 and PY7 program bulbs.

Table 7-10. PY8 Verified Savings Estimate for Carryover Bulbs

PY8 Verified Savings Carryover Estimate	PY6 Program Bulbs	PY7 Program Bulbs	Total PY8 Carryover
Program Bulbs Installed During PY8	1,359,037	1,539,885	2,898,922
PY8 Carryover Gross Energy Savings (MWh)	46,442	49,210	95,652
PY8 Carryover Gross Demand Savings (MW)	44.6	49.6	94.2
PY8 Carryover Gross Summer Peak Demand Savings (MW)	5.4	5.5	10.9
PY8 Carryover Gross Winter Peak Demand Savings (MW)	6.2	6.5	12.7
Net-to-Gross Ratio	0.59	0.63	0.61
PY8 Carryover Net Energy Savings (MWh)	27,598	30,908	58,506
PY8 Carryover Net Demand Savings (MW)	26.0	31.1	57.1
PY8 Carryover Net Summer Peak Demand Savings (MW)	3.4	3.4	6.8
PY8 Carryover Net Winter Peak Demand Savings (MW)	3.6	4.1	7.7

Source: Evaluation team analysis

7.1.1 Evaluation Research Gross Program Impact Results

The total PY8 Residential Lighting program evaluation research gross savings is estimated to be 396,182 MWh, 380.9 MW, 47.2 summer peak MW and 49.9 winter peak MW. Table 7-11 shows evaluation research gross savings by portfolio (EEPS and IPA[46]) and overall, and presents the evaluation research gross realization rates[47] that are associated with these impact estimates.

[46] All PY7 program bulb sales are included in the EEPS portfolio.
[47] The evaluation research gross realization rates are equal to the evaluation research gross savings/verified savings gross estimate.

Table 7-11. PY8 Evaluation Research Gross Impact Savings Estimates

	IPA Portfolio	EEPS Portfolio	Total
PY8 Evaluation Research Gross Savings			
Gross MWh Savings	396,182	n/a	396,182
Gross MW Savings	380.9	n/a	380.9
Gross Summer Peak MW Savings	47.2	n/a	47.2
Gross Winter Peak MW Savings	59.9	n/a	59.9
PY8 Evaluation Research Gross Savings Realization Rates			
Gross MWh Savings	121%	n/a	121%
Gross MW Savings	106%	n/a	106%
Gross Summer Peak MW Savings	102%	n/a	102%
Gross Winter Peak MW Savings	103%	n/a	103%

Source: Evaluation team analysis

7.1.2 Evaluation Research Net Impact Findings

As shown in Table 7-12, the evaluation research NTGR in PY8 was 0.54 for standard CFLs, 0.58 for omni-directional LEDs, and 0.58 for directional LEDs. The final free ridership, spillover, and NTGR estimates differ from those reported in the PY8 NTG Results Memo delivered on January 29, 2016 because the estimates were reweighted using final PY8 bulb sales (allocated sales were used to weight the results reported in the NTG Results Memo).

Table 7-12. NTGR by Bulb Type

Bulb Type	Wt'd Free-Ridership	Spillover Part/Nonpart	Wt'd NTGR
Standard CFLs	0.47	0.004/0.010	0.54
Omni-Directional LEDs	0.49	0.009/0.058	0.58
Directional LEDs	0.45	0.009/0.026	0.58

Source: Evaluation team analysis

Table 7-13, compares the free-ridership, spillover and NTGR estimates for PY8 to those from the previous program years.

Table 7-13. PY8 FR, Spillover, and NTGR Estimates Compared to Prior Program Years

Net Impact Parameters	Population	PY2	PY3	PY4	PY5	PY6	PY7	PY8
Free-ridership	Standard CFLs	n/a	n/a	0.47	0.47	0.41	0.38	0.47
	Omni-directional LEDs	n/a	n/a	n/a	n/a	n/a	0.44	0.49
	Directional LEDs	n/a	n/a	n/a	n/a	n/a		0.45
Spillover	Standard CFLs	n/a	n/a	0.02	0.02	0.01	0.02	0.01
	Omni-directional LEDs	n/a	n/a	n/a	n/a	n/a	0.17	0.07
	Directional LEDs	n/a	n/a	n/a	n/a	n/a		0.03
NTGR	Standard CFLs	n/a	n/a	0.55	0.55	0.59	0.64	0.54
	Omni-directional LEDs	n/a	n/a	n/a	n/a	n/a	0.73	0.58
	Directional LEDs	n/a	n/a	n/a	n/a	n/a		0.58

Source: Evaluation team analysis

7.2 Detailed Process Findings

Details about the process evaluation methods, results, and findings are provided in the Process Evaluation memo which can be found in Section 7.6.4.

7.3 IL TRM Recommendations

As noted in previous evaluation reports, the evaluation team recommends updating a number of parameters in the Illinois TRM annually based on three-year rolling averages of the evaluation primary research based parameter estimates. It should be noted that including a three-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 Lighting program that would render the three-year rolling average inappropriate and justifiably warrants a change to the parameter estimate away from a three-year rolling average, this should be considered. The evaluation team's recommended parameters for the IL TRM are shown in Table 7-14.

Table 7-14. Impact Estimate Parameters for Future Use

Parameter	Value	Data Source
Res/Non-Res Split	95%/5% Standard CFLs	3-year rolling average (PY6-PY8) of Evaluation Research Findings
	98%/2% Omni-Directional LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings
	92%/8% Directional LED	
1st Year Installation Rate	76.6% Standard CFL	3-year rolling average (PY6-PY8) of Evaluation Research Findings
	89.9% Omni-Directional LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings
	93.5% Directional/Other LEDs	
Leakage	2.2% Standard CFL	3-year rolling average (PY6-PY8) of Evaluation Research Findings
	1.4% Omni-Directional LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings
	2.2% Directional/Other LEDs	2-year rolling average (PY7-PY8) of Evaluation Research Findings

Source: Evaluation team analysis

In Illinois TRM v4.0, the res/non-res split is deemed at 96 percent/4 percent for standard CFLs "based on a weighted (by sales volume) average of ComEd PY4, PY5, and PY6 and Ameren PY5 and PY6 in-store intercept survey results."[48] The TRM also recommends that if the installation location of an LED bulb is unknown then it should be classified as a residential bulb, which is guidance that results in all ComEd PY8 LEDs being classified as residential installs. The evaluation team recommends updating the deemed res/non-res split annually based on a rolling three-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/non-res split would be for Illinois TRM v5.0 (effective June 1, 2016 to correspond to ComEd PY9) 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. PY7 is the first year the evaluation team had enough data to estimate the res/non-res split by LED bulb type. This is shown in Table 7-15.

Table 7-15. 3-Year Average Res/Non-Res Split for ComEd

Program Year	Standard CFLs		Omni-directional LEDs		Directional LEDs	
	Bulbs	Res/NonRes	Bulbs	Res/NonRes	Bulbs	Res/NonRes
PY6	8,965,546	95% / 5%				
PY7	10,347,580	94% / 6%	471,710	98% / 2%	427,824	98% / 2%
PY8	7,205,656	98% / 2%	3,896,077	98% / 2%	1,578,687	90% / 10%
3-year Wtd Average	-	95% / 5%	-	98% / 2%		98% / 2%

Source: Evaluation team analysis

[48] Illinois TRM v3 at p. 576

The evaluation team recommends updating the deemed installation rates for CFLs annually based on a rolling three-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 7-16 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.

Table 7-16. 3-Year Average Installation Rates for ComEd

Program Year	Standard CFLs		Omni-directional LEDs		Directional LEDs	
	Bulbs	1st Year ISR	Bulbs	1st Year ISR	Bulbs	1st Year ISR
PY6	8,965,546	72.6%	--	--	--	--
PY7	10,347,580	75.2%	471,710	95.0%	427,824	95.0%
PY8	7,205,656	83.6%	3,896,077	89.3%	1,578,687	93.1%
3-year Wtd Average	-	76.6%	-	89.9%		93.5%

Source: Evaluation team analysis

7.4 NTGR Recommendations

The NTGR for PY8 was deemed for bulbs sold through the IPA portfolio based on past evaluation research and approved through the IL SAG consensus process. Table 7-17 provides up to three years of evaluation research NTGR estimates (PY6-PY8) for standard CFLs and omni-directional and directional LEDs, as well as the two- or three-year weighted NTGR estimates which are available for future use.

Table 7-17. Multi-Year Average NTGR Available for Future Use

Program Year	Standard CFLs		Omni-Directional LEDs		Directional LEDs	
	Bulbs	NTGR	Bulbs	NTGR	Bulbs	NTGR
PY6	8,965,546	0.59	--	--	--	--
PY7	10,347,580	0.64	471,710	0.73	427,824	0.73
PY8	7,205,656	0.54	3,896,077	0.58	1,578,687	0.58
3-year Wtd Average		0.60		0.60		0.61[49]

Source: Evaluation team analysis

Table 7-18 provides the NTGR Parameters available for deeming for future use, based on previous evaluation research.

[49] Only two years of results is available and thus this result is not a 3-year weighted average.

Table 7-18. NTGR Parameters Available for Future Use

Value	Data Source
0.54 Standard CFL	
0.58 Omni-directional LEDs	PY8 Evaluation Research Findings
0.58 Directional LEDs	

Source: Evaluation team analysis

7.5 PJM Data and Findings

ComEd Residential Lighting Program
Program Year 8 – June 2015 – May 2016
(In a separate memo)

7.6 Attachments

7.6.1 PY8 In-Store Intercept Survey Instrument

COMED PY8 LIGHTING INTERCEPT SURVEY

Customer Bulb Inventory

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

Q0. Enter Retailer

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

Q1. Record Bulb Type

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

Q2. Record number of bulbs in the package

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

Q3. Record Bulb Shape

Bulb Type	**Package 1**	**Package 2**	**Package 3**	**Package 4**
1. Spiral				
2. A-lamp				
3. Reflector				
4. Globe				
5. Candelabra				
6. Post				
7. Torpedo				
8. Retrofit Fixture				

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

	Package 1	**Package 2**	**Package 3**	**Package 4**
1. Dimmable				
2. 3-way				
3. G24 Base				
4. Ceiling Fan Bulb				
5. Candelabra Base				

6. QuickStart				
7. Silicone				
8. None of the above				

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

	Package 1	**Package 2**	**Package 3**	**Package 4**
Bulb Wattage				

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

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

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

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

Q7. Did you find this package of bulbs on the shelf in the lighting aisle or on a separate display?

	Package 1	**Package 2**	**Package 3**	**Package 4**
Shelf in Lighting Aisle				
Separate Display (Endcap, Pallet. Etc.)				
Other				
Don't Know				

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

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

If Q1(i) = CFL and Q3 = Spiral and Q3a = None then BULBGROUP(i) = STANDARD
If Q1(i) = CFL and (Q3 = Spiral and Q3a ne None) or (Q3 ne Spiral) then BULBGROUP (i)= SPECIALTY
If Q1(i) = LED and Q3 in (A-lamp. Slim LED) then BULBGROUP(i) = OMNI
If Q1(i) = LED and Q3 = Reflector then BULBGROUP (i)= DIRECT

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

PLED = sum of (Q2(i)*Q6(i)) where BULBGROUP(i) in (OMNI, DIRECT) and PGMBULB(i) = YES
PLEDOMNI = sum of (Q2(i)*Q6(i)) where BULBGROUP(i) = OMNI and PGMBULB(i) = YES
PLEDDIR = sum of (Q2(i)*Q6(i)) where BULBGROUP(i) = DIRECT and PGMBULB(i) = YES

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

"Going forward we are going to be asking you a number of questions about the light bulbs you are purchasing today."

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

IF BUYING <u>OMNI-DIRECTIONAL LEDs</u> (OMNI >0) READ:
"When I refer to Omni-Directional LEDs I am talking about LEDs that can be used to replace standard incandescent or CFL bulbs"?

IF BUYING <u>DIRECTIONAL LEDS</u> (DIRECT >0) READ:
"When I refer to Directional LEDs I am talking about LED flood lights or reflectors that focus light in a directional beam."

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

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

(IF PURCHASING PROGRAM OMNI-DIRECTIONAL LEDs *(PLEDOMNI >0)*)
Q15led. Where are you planning to install the **Omni-directional <u>LEDs</u>** you are buying today - in your home, a business, or both?

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

(IF PURCHASING PROGRAM DIRECTIONAL LEDs *(PLEDDIR >0)*)
Q15led2. Where are you planning to install the D**irectional <u>LEDs</u>** you are buying today - in your home, a business, or both?

1. Home
2. Business

3. Both
8. Don't know

(IF ANY BULBS WILL BE INSTALLED IN A BUSINESS, if Q15stan or Q15led in (2, 3) or Q15led2 in (2, 3))

Q16. What type of business is it?

1. Apartment Building/Multi-Family Dwelling
2. Office
3. Restaurant
4. Grocery
5. Retail/Service
6. Warehouse
7. Garage
8. Hospital
9. Health care clinic
10. Elementary School
11. High School/Middle School
12. College/University
13. Hotel/Motel
14. Public assembly, e.g. church/theater/conference
15. Heavy Industry
16. Light Industry

00. Other _____

17. Don't Know

(IF THE BULBS IN Q16 ARE FOR A HOTEL, MOTEL, OR APARTMENT, if Q16 = 1 or 12)

Q17. Will you install the bulbs you are buying today in common spaces such as hallways, or inside the individual units?

9. Common spaces
10. Within individual apartment units or hotel/motel rooms
11. Both
8. Don't know

<u>Customer Intentions and History</u>

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

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

(IF Q9 = 2)

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

1. Low price
2. Saw them and was reminded I needed them
3. Lighting Demo / Information in the store

4. These bulbs are hard to find – limited availability
0. Other – Record Verbatim
8. Don't Know

(IF Q9b not in (2,3, .))
Q9c. Did you see any CFL or LED light bulbs in stand-alone displays or in locations outside of the primary lighting aisle while you were in the store today?

1. Yes (SKIP TO Q9d)
2. No (SKIP TO Q10)
8. Don't know (SKIP TO Q10)

(IF Q9c = 1)
Q9d. Do you think you would have still purchased light bulbs today if you had not seen this display?

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

(IF Q9 =1)
Q10. What type (or types) of bulbs were you planning to buy? (Do not read, select all that apply)

1. CFLs
2. Incandescent
3. Halogen
4. LED
0. Other_____
8. Don't know

(IF PURCHASING LEDs, LEDs > 0)
Q13. Have you ever purchased or been given any LEDs before today?

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

(IF ANY OF THE CFLs WILL BE INSTALLED IN A BUSINESS- Q15stan in (2,3))
Q18. Do you have any CFLs installed right now in your business?

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

(IF ANY OF THE LEDs WILL BE INSTALLED IN A BUSINESS- Q15led in (2,3) or Q15led2 in (2,3))
Q18led. Do you have any LEDs installed right now in your business?

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

(IF ANY BULBS WILL BE INSTALLED IN A BUSINESS- Q15stan in (2,3)or Q15led in (2, 3) or Q15led2 in (2, 3))
Q19. Does ComEd deliver electricity to your business?

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

(If Q19 = 2 or 3)
Q19b. Does your business receive a bill from ComEd for your electricity usage**? (IF NEEDED, READ: "Some businesses in this region purchase their electricity from a Retail Electric Supplier but ComEd still handles the billing of these customers.")**

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

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

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

(IF THE PROGRAM LEDs ARE FOR A HOME- Q15led in (1,3) or Q15led2 in (1,3))
Q20led. Do you have any LEDs installed right now in your home?

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

(IF THE PROGRAM BULBS ARE FOR A HOME- Q15stan in (1,3) or Q15led in (1, 3))
Q21. Does ComEd deliver electricity to your home?

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

(IF Q21 = 2 or 3)
Q21b. Do you receive a bill from ComEd for your electricity usage? **(IF NEEDED, READ: "Some customers in this region purchase their electricity from a Retail Electric Supplier but ComEd still bills these customers.")**

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

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

Q11. We are interested in learning more about how people use different types of light bulbs. I see that you are purchasing multiple types of bulbs including (<READ IN IF BUYING CFLs> "CFLs", <READ IN IF BUYING LEDs> "LEDs" <READ IN IF BUYING INCANDESCENT> "incandescent bulbs" <READ IN IF

BUYING HALOGEN> "halogen bulbs". Why are you buying a mix of bulb types? **(DO NOT READ; SELECT ALL THAT APPLY. NOTE: IF NONE OF THE ANSWERS FIT, PLEASE USE THE OPTION TO WRITE IN RESPONDENTS ANSWERS)**

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

00. Other_____
98. Don't Know

(IF PURCHASING CFLS BULBS)

Q22a-b. Next I'm going to read you six different factors that some people consider when deciding which light bulbs to buy. Thinking **JUST** about the **CFLs** that you are purchasing **TODAY**, I'd like you to tell me which was the **MOST IMPORTANT** factor and which was the **LEAST IMPORTANT factor. [PROGRAMMING WILL AUTOMATICALLY ROTATE ORDER IN WHICH ITEMS ARE READ, READ LIST TWICE, ONCE FOR MOST IMPORTANT FACTOR AND ONCE FOR LEAST IMPORTANT FACTOR]**

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

(IF PURCHASING LEDs BULBS)

Q22c-d. Next I'm going to read you six different factors that some people consider when deciding which light bulbs to buy. Thinking **JUST** about the **LEDs** that you are purchasing **TODAY**, I'd like you to tell me which was the **MOST IMPORTANT** factor and which was the **LEAST IMPORTANT factor. [PROGRAMMING WILL AUTOMATICALLY ROTATE ORDER IN WHICH ITEMS ARE READ, READ LIST TWICE, ONCE FOR MOST IMPORTANT FACTOR AND ONCE FOR LEAST IMPORTANT FACTOR]**

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

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

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

Q29cfl. Of the <STANCFL > CFLs you are purchasing today, how many will you use to replace incandescent or halogen bulbs that still work?

1. Record Number _____ [1 through (STANCFL)]
2. None of Them
3. All of Them
8. Don't Know

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

1. Record Number _____ [1 – OMNI]

998. Don't Know

Q29type. What bulb type will these Omni-Directional LEDs replace? (Accept Multiple)

1. Incandescent
2. CFL
3. Halogen
4. LED
8. Don't Know

(IF PURCHASING DIRECTIONAL LEDs, DIRECT > 0 ASK Q25led2 and Q29type2)
Q25led2. Of the **Directional LEDs** you are purchasing today, how many do you expect to install in the next 6 months?

1. Record Number _____ [1 – DIRECT]

998. Don't Know

Q29type2. What bulb type will these Directional LEDs replace? (Accept Multiple)

1. Incandescent
2. CFL
3. Halogen
4. LED
8. Don't Know

Q29led. Of the <LED> LEDs you are purchasing today, how many will replace bulbs that still work?

1. Record Number _____ [Can take value 1 through LED]
2. None of Them
3. All of Them

8. Don't Know

Program Purchase Decision

(IF CUSTOMER IS PURCHASING 1 OR MORE PROGRAM BULB (PSTANCFL + PLED > 0), OTHERWISE, SKIP TO Q30)

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

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

(IF CUSTOMER IS PURCHASING 1 OR MORE PROGRAM CFLS (PSTANCFL > 0), ASK Q33b

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

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

(IF CUSTOMER IS PURCHASING 1 OR MORE PROGRAM LED (PLED > 0), ASK Q33bled

Q33bled. (If Q33 = 2,3 and PLED > 0 then read: "Although you may not have noticed the LEDs were discounted,) do you think the listed price for the LEDs you are purchasing today is a low price for LED bulbs?

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

(IF Q33 = 1)

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

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

(IF Q34 = 1)

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

1. ComEd sticker on the shelf
2. Saw marketing materials in the store
3. Read about it in my bill from ComEd
4. Discount was advertised in newspaper/tv/radio
5. Store employee made me aware of the discount
6. Saw a retail lighting demonstration
7. Friend

00. Other_____

8. Don't know

(IF Q34 = 1)
Q36. Did you come into the store today specifically to buy light bulbs discounted by ComEd?

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

PROGRAM CFL NTG BATTERY
IF BUYING PROGRAM CFLS (PSTANCFL > 0) READ:
*"The discount ComEd offers on select CFLs is around $1.00 per bulb for Standard CFLs. The < PSTANCFL > CFLs you are purchasing today that have been discounted by ComEd would have cost a total of $<PSTANCFL*1.00 > more without the ComEd incentive."*

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

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

(IF PURCHSING STANDARD CFLS DISCOUNTED BY COMED, PSTANCFL > 0)
Q37stan. If the ComEd discount had not been offered, and the <PSTANCFL> discounted standard CFL(s) you are purchasing had instead cost approximately $1.00 more per bulb, or a total of <$**1.00*PSTANCFL>** more, would you still have purchased all of these CFLs, some of them, or none of them?

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

(ASK IF Q37stan=2)
Q37stan2. How many of the <PSTANCFL> standard CFLs would you have purchased if they had cost $1.00 more per bulb?

___ [NUMERIC OPEN END, 1 – <PSTANCFL>]
98. Don't know

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

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

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

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

PROGRAM LED NTG BATTERY

IF BUYING PROGRAM OMNI-DIRECTIONAL LEDs (PLEDOMNI> 0) READ:

"The discount ComEd offers on select Omni-Directional LEDs is typically around $3 to $4 per bulb for Omni-Directional LEDs. The < PLEDOMNI> ***OMNI-DIRECTIONAL*** *LEDs you are purchasing today that have been discounted by ComEd would have cost a total of $<PLEDOMNI*4 > more without the ComEd incentive."*

(IF PURCHASING PROGRAM *OMNI-DIRECTIONAL* LEDs, PLEDOMNI > 0)

Q23led. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the (<IF Q33 = 1 READ> **discounted)** (<IF Q33Bled = 1 READ> **low)** price in your decision to purchase ***OMNI-DIRECTIONAL*** **LEDs** today?

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

(IF PURCHASING ONE PROGRAM OMNILED, PLEDOMNI = 1)

Q37ledSO. If the ComEd discount had not been offered, and the discounted ***OMNI-DIRECTIONAL*** **LED** you are purchasing had instead cost $4 more, would you still have purchased this ***OMNI-DIRECTIONAL*** **LED?** [If needed: " ***OMNI-DIRECTIONAL*** LEDs are LEDs that can be used to replace a basic incandescent bulb."]

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

(IF PURCHASING MORE THAN ONE PROGRAM OMNILEDs, PLEDOMNI > 1)

Q37ledMO. If the ComEd discount had not been offered, and the <PLEDOMNI> discounted ***OMNI-DIRECTIONAL*** **LEDs** you are purchasing had instead cost a total of <4***PLEDOMNI>** more, would you still have purchased all of these ***OMNI-DIRECTIONAL*** **LEDs**, some of them, or none of them? [If needed: " ***OMNI-DIRECTIONAL*** LEDs are LEDs that can be used to replace a basic incandescent bulb."]

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

(ASK IF Q37ledMO=2 and PLEDOMNI > 1)

Q37led3. How many of the <PLEDOMNI> ***OMNI-DIRECTIONAL*** **LEDs** would you have purchased if they had cost $4.00 more per bulb?

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

IF BUYING PROGRAM DIRECTIONAL LEDs (PLEDDIR> 0) READ:

"The discount ComEd offers on select Directional LEDs is typically around $4 to $5 per bulb for Directional LEDs. The < PLEDDIR> ***DIRECTIONAL*** *LEDs you are purchasing today that have been discounted by ComEd would have cost a total of $<4* PLEDDIR> more without the ComEd incentive."*

(IF PURCHASING PROGRAM *DIRECTIONAL* LEDs, PLEDDIR > 0)

Q23ledD. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the (<IF Q33 = 1 READ> **discounted)** (<IF Q33Bled = 1 READ> **low)** price in your decision to purchase ***DIRECTIONAL*** **LEDs** today?

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

(IF PURCHASING ONE PROGRAM DIRLED, PLEDDIR = 1)
Q37ledSD. If the ComEd discount had not been offered, and the discounted ***DIRECTIONAL*** **LED** you are purchasing had instead cost $5 more, would you still have purchased this ***DIRECTIONAL*** **LED?** [If needed: " ***DIRECTIONAL*** LEDs are LEDs that can be used to replace a floodlight or spot light bulb."]

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

(IF PURCHASING MORE THAN ONE PROGRAM DIRLEDs, PLEDDIR > 1)
Q37ledMD. If the ComEd discount had not been offered, and the <PLEDDIR> discounted ***DIRECTIONAL*** **LEDs** you are purchasing had instead cost a total of <5***PLEDDIR>** more, would you still have purchased all of these ***DIRECTIONAL*** **LEDs**, some of them, or none of them? [If needed: " ***DIRECTIONAL*** LEDs are LEDs that can be used to replace a floodlight or spot light bulb."]

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

(ASK IF Q37ledMD=2 and PLEDDIR > 1)
Q37led4. How many of the <PLEDDIR> ***DIRECTIONAL*** **LEDs** would you have purchased if they had cost $5 more per bulb?

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

(ASK IF Q37ledMD=2, 3 or Q37ledMO=2, 3 or Q37ledSD=2 or Q37ledSO=2)
Q38led. Would you have purchased a different type of light bulb instead of the LEDs?

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

[ASK IF Q38led=1]
Q38led2. What type of light bulbs would you have purchased instead of the LEDs? Would you have purchased… (**ALLOW MULTIPLE RESPONSES)**

1. Incandescent light bulbs
2. Halogen light bulbs
3. CFL light bulbs
8. Don't know

Q39. Did you see information or displays about Energy Efficiency Lighting in this store?

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

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

1. ComEd
2. The store
0. Other_____
8. Don't know

Staff. Did you receive any information about Energy Efficiency Lighting from [RETAILER] personnel in this store?

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

(ASK IF staff = 1 and Q35 ne 5)
STAFF2. Did the [RETAILER] personnel tell you about the discounts ComEd was offering on Energy Efficiency Lighting?

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

(IF PURCHASING STANDARD CFLS DISCOUNTED BY COMED (PSTANCFL > 0) AND SAW INFO OR DISPLAYS (Q39 = 1) OR received information from sales reps that informed them of ComEd program (STAFF2 = 1 OR (STAFF = 1 and Q35 = 5)))
Q41stan. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the in-store information regarding Energy Efficient Lighting that you saw or heard about from [RETAILER] personnel in your decision to buy **Standard** CFLs?

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

(IF PURCHASING PROGRAM LEDs (PLED > 0) AND SAW INFO OR DISPLAYS (Q39 = 1) or received information from sales reps that informed them of ComEd program (STAFF2 = 1 OR (STAFF = 1 and Q35 = 5)))
Q41led. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the in-store information regarding Energy Efficient Lighting that you saw or heard about from [RETAILER] personnel in your decision to buy LEDs?

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

(IF PURCHASING PROGRAM BULBS (PSTANCFL + PLED > 0) AND EITHER ONE OR MORE PACKAGE WAS LOCATED ON A PROGRAM DISPLAY (Q7_X in (2,3) OR THE CUSTOMER SAW EE BULBS OUTSIDE OF THE PRIMARY LIGHTING AISLE (Q9c = 1))

Q9c**)**
PLACE. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the location of the program bulbs within the store on your decision to buy these program bulbs today?

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

Non-Program CFL Purchases

(IF CUSTOMER IS NOT PURCHASING ANY PROGRAM BULBS, (PSTANCFL + PLED = 0) ASK Q30, ELSE SKIP TO Q32)

Q30. Do you know that THIS STORE is selling light bulbs that are discounted by ComEd?

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

(IF Q30 = 1)

Q31. How did you first find out about ComEd's discounts on light bulbs?

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

(IF CUSTOMER IS PURCHASING SOME NON-DISCOUNTED CFLS, IF (STANCFL) > (PSTANCFL) AND THEY DIDN'T ALREADY REPORT THAT THEY DID NOT KNOW THE STORE WAS SELLING PROGRAM BULBS (Q30 ne 2))

Q32. (IF PSTANCFL > 0 then read "Some of") The CFLs you are buying are NOT discounted by ComEd. Why did you choose these CFLs instead of the discounted ones? **(DO NOT READ, CIRCLE ALL MENTIONED)**

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

(IF CUSTOMER IS PURCHASING NON-DISCOUNTED CFLS (STANCFL) > (PSTANCFL) AND KNEW ABOUT THE COMED DISCOUNT (Q30 = 1 OR Q33=1 OR q9b = 3 OR Q39 = 1 OR Staff = 1))

Q32a. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was [if Q30=1 or Q33=1 "ComEd's discount lighting program", ELSE "the in-store information"] in your decision to purchase the **non-discounted** CFLs you are purchasing today?

1. Record Influence Level: 0 (not influential) – 10 (extremely influential) _____

98. Don't know

(IF CUSTOMER IS PURCHASING SOME NON-DISCOUNTED LEDs, IF (LED) > (PLED) AND THEY DIDN'T ALREADY REPORT THAT THEY DID NOT KNOW THE STORE WAS SELLING PROGRAM BULBS (Q30 ne 2)))

Q32led. (IF PLED > 0 then read "Some of) The LEDs you are buying are NOT discounted by ComEd. Why did you choose these LEDs instead of the discounted ones? **(DO NOT READ, CIRCLE ALL MENTIONED)**

1. Prefer this brand/manufacturer
2. Prior experience with this model
3. No discounted LEDs in this bulb category
4. Didn't know about the discount
5. Thought these bulbs were discounted
0. Other_____
8. Don't Know

(IF CUSTOMER IS PURCHASING NON-DISCOUNTED LEDs (LED) > (PLED) AND KNEW ABOUT THE COMED DISCOUNT (Q30 = 1 OR Q33=1 OR q9b = 3 OR Q39 = 1 OR Staff = 1))

Q32aled. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was [if Q30=1 or Q33=1, "ComEd's discount lighting program" ELSE "the in-store information"] in your decision to purchase the **non-discounted** LEDs you are purchasing today?

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

Incandescent or Halogen Purchaser Section

Q42. Did you consider purchasing any CFLs today?

1. Yes
2. No
8. Don't Know **(SKIP TO Q42led)**

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

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

00. Other _____
98. Don't Know

(IF NOT PURCHASING LEDs, LED =0)
Q42led. Did you consider purchasing any LEDs today?

1. Yes
2. No
8. Don't Know **(SKIP TO QPRICE2)**

Q43led. Why aren't you purchasing LEDs? **(DO NOT READ. SELECT ALL THAT ARE STATED)**

1. Not aware of LEDs before today
2. LEDs are too expensive
3. Don't know enough about LEDs
4. Don't like the way LEDs fit or look in fixtures
5. Dislike the light quality/color of LEDs
6. Need 3-way bulbs
7. Need other specialty bulb
8. Accustomed to other bulb types
9. LEDs are not bright enough
10. Other _____
98. Don't Know

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

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

(IF NOT PURCHASING LEDs (LED = 0))
QPRICE2led. Using a scale of 0 to 10 where 0 means not at all likely and 10 means extremely likely, if the price of LEDs were the same as, or less than, the price of an incandescent, halogen or CFL bulb, how likely would you be to purchase a LED instead of the bulbs you are purchasing today?

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

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

1. Yes
2. No
8. Don't Know

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

1. Yes
2. No
8. Don't Know

(IF LED2 = 2 or 3)

LED3. What has kept you from purchasing LED bulbs for your home (or business)?

1. Price of LEDs too high
2. Do not like look of LEDs
3. Unfamiliar with LED technology
4. Waiting for LED technology to become more mainstream

0. Other_____

8. Don't Know

READ TO CUSTOMER:

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

AFTER CUSTOMER HAS LEFT, PLEASE FILL OUT INFORMATION:

QA1. Field Staff Name: _____

QA2. Date: _____

QA3. Store location: _____

1. WE CAN PROVIDE LIST
2. Other (Note store name and city)

QA4. Demo Period at Store

1. Yes
2. No

QA6. Where in store interview was completed:

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

7.6.2 PY8 NTG Memo

Itron
230 Horizon Drive
Suite 101B
Verona, WI 53593

NAVIGANT

Memorandum

To: **All Interested Parties in Illinois**

CC: **Vincent Gutierrez, ComEd**

From: **Amy Buege and Vanessa Arent, Navigant Evaluation Team**

Date: **January 29, 2016**

Re: ***PY8 ComEd Residential Lighting NTGR Estimation***

This memorandum presents the *Evaluation Research*[1] PY8 net-to-gross ratio (NTGR) estimates for Standard CFLs and Omnidirectional and Directional LEDs sold through ComEd's Residential Lighting program in PY8.

Results Summary

The table below presents the PY8 Evaluation Research NTGR estimates for program Standard CFLs, Omni-directional LEDs, and Directional LEDs. These results were estimated using a participant self-report method that was similar to the method used in previous evaluation years. The NTGR results in Table 1 are inclusive of both participant and non-participant spillover.

As shown in Table 1, the NTGR estimates for LEDs purchased during demonstration events[2] were higher than the NTGR estimates for bulbs purchased during non-demonstration event periods for Omni-directional and Directional LEDs. Omni-directional LEDs had the highest NTGR differential (NTGR of 1.02 for bulbs sold during demo events versus 0.56 for bulbs sold outside of the demo event periods). Due to the increased program sales which occurred during demo events, and the fact that our in-store data collection methodology resulted in an over-sampling of demonstration period data,[3] the final results were estimated separately for demonstration and non-demonstration event periods and then weighted by the estimated percentage of bulbs sold during demonstration events. The recommended NTGR results below are based on a 5%/95% demonstration event/non-demonstration event period split which represents an upper bound on the likely percentage of

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1 It should be noted that the NTGR estimates presented here are the evaluation verified estimates (based on the PY8 in-store intercept surveys) and weighted by PY8 forecasted bulb sales as documented in the PY8 Goals Tracker spreadsheet provided to the evaluation team by ComEd.

2 Demonstration events are events put on by CLEAResult, the program implementer, and involve CLEAResult personnel setting up an efficient lighting informational display within the retailers lighting aisle. These personnel actively work with retail shoppers within the aisle answering questions and providing information about the benefits of CFLs and LEDs and the ComEd lighting program.

3 Each three-day data collection period at a program retailer commenced with a half day demonstration event so that the program implementation staff were on hand to introduce the intercept surveyor to retail staff and secure approval for the in-store data collection activities. Demonstration events occurred on 12 of the 36 days when intercepts were being conducted (17% of the data collection period), which is a significantly higher percentage of time than throughout the remainder of the program year.

program bulbs sold annually during demonstration events. Sensitivity analyses were performed on the demonstration/non-demonstration event split (ranging from a 1%/99% demo/nondemo split to a 10%/90% split) and the results showed little difference in the NTGR estimates for all of the program bulb types.

Table 1 – PY8 Evaluation Research NTGR Results

Bulb Type	Segmentation	Free-Ridership	Part Spillover	Nonpart Spillover	NTGR
Standard CFLs	**Non-Demo Periods**	0.45	0.004	0.009	0.56
	Demo Periods	0.37	0.032	0.000	0.66
	Recommended PY8 Estimate (5/95 Demo/Non-Demo split)	0.45	0.005	0.008	0.57
Omni-Directional LEDs	Non-Demo Periods	0.50	0.008	0.054	0.56
	Demo Periods	0.27	0.011	0.274	1.02
	Recommended PY8 Estimate (5/95 Demo/Non-Demo split)	0.49	0.009	0.065	0.58
Directional LEDs	Non-Demo Periods	0.43	0.008	0.014	0.59
	Demo Periods	0.31	0.011	0.020	0.72
	Recommended PY8 Estimate (5/95 Demo/Non-Demo split)	0.42	0.009	0.014	0.60

PY8 NTGR Methodology

The Evaluation Research NTGR estimates included in this memo are based on a total of 828 in-store intercept surveys conducted as part of the PY8 evaluation. Table 2 below shows (by retailer type and overall) the number of retail store locations where intercept surveys were conducted in PY8, the number of days of interviewing that took place, the distribution of completed intercept surveys, as well as the forecasted[4] PY8 program bulb sales used for NTGR analysis retailer weighting. As this table shows, a total of 69 person days were spent in retail stores conducting intercept surveys and a total of 23 different program retail stores were visited across the three program retailers included in the sample. This table also shows that the greatest proportion of PY8 intercept surveys were conducted with lighting purchasers (program and non-program) in DIY stores (68%). DIY stores account for 41% of PY8 forecasted program bulb sales. The average number of intercept surveys completed per day varied by retailer type, ranging from a high of 15.5 in DIY stores, to a low of 4.8 in Warehouse stores. The NTGR results presented in this memo are weighted by the forecasted PY8 Retailer Type program bulb sales in order to make the results representative of the expected distribution of PY8 Residential Lighting program bulb sales. Once the PY8 program year is complete, the results shown here will be reweighted using the final PY8 program bulb sales.

[4] Based on the PY8 program bulbs sales forecast in the PY8 Goals Tracking spreadsheet.

Table 2 – PY8 Intercept Surveys and Forecasted Program Bulb Sales by Retailer Type

Retailer Type	Stores	Days	PY8 Intercepts		Avg Intercepts /Day	PY8 Bulb Sales[5]	
			#	%		#	%
Big Box	6	18	197	24%	10.9	2,047,353	14%
Do-It Yourself	12	36	559	68%	15.5	5,893,255	41%
Warehouse	5	15	72	9%	4.8	3,505,765	24%
Other	0	0	n/a	n/a	n/a	3,039,081	21%
Total	23	69	828	100%	12	14,485,454	100%

Table 3 below shows the distribution of PY8 intercept survey respondents by retailer and bulb type purchased. As this table shows, 55% of intercept survey respondents purchased one or more program bulb (the majority of the bulbs being purchased were standard CFLs or Omni-directional LEDs) and 49% of purchased one or more non-program bulb (the majority of these being incandescent bulbs).

Table 3 –Distribution of PY8 Intercept Survey Respondents by Bulb Type Purchased

Retailer Type	Program Bulbs				NonProgram Bulbs						All Intercepts
	Stan CFL	Omni LED	Dir LED	Pgm[6]	Stan CFL	Spec CFL	LED	Hal	Inc	Non Pgm[7]	
Big Box	64	33	16	110	3	4	10	33	44	91	197
DIY	100	139	48	283	12	27	72	76	133	304	559
Warehouse	24	18	25	65	0	0	5	2	0	7	72
Total	188	190	89	458	15	31	87	111	177	402	828
% Surveyed[8]	23%	23%	11%	55%	2%	4%	11%	13%	21%	49%	100%

Table 3 above shows that in PY8, 93% of intercept respondents purchasing Standard CFL were buying program CFLs, which similar to the PY7 findings (95% were buying program CFLs). The results for LEDs, however, changed significantly between PY7 and PY8 (the percentage of LED purchasers buying program LEDs increased from 50% in PY7 to 76% in PY8). This significant increase is likely attributable to ComEd's increased program LED offerings in PY8 which allowed more LED purchasers to participate in the program. Based on the Goals Tracker, in PY8 ComEd is incentivizing a total of 216 LED models across the three program retailers where intercepts were performed. This is

[5] Forecasted savings based on the PY8 Goals Tracker spreadsheet.

[6] Some respondents purchased more than one type of program bulb, so the sum of the percentages of respondents surveyed for the three different program bulbs types is greater than the program percentage.

[7] Some respondents purchased more than one type of non-program bulb, so the sum of the percentages of respondents surveyed for the five different non-program bulbs types is greater than the program percentage.

[8] Bulb Type percentages sum to more than 100% since some customers purchased more than one type of bulb.

a significant increase over PY7 during which only 59 LEDs were included in the program. Table 4 shows the difference in Omni-directional and Directional LED offerings between PY7 and PY8. Both Big Box and DIY stores increased their offerings by over 300%, while Warehouse intercept stores offered one model number in 2015. In PY7, intercept retailers primarily offered three LED bulb types: A-lamp, slim lamps, and reflectors. In PY8, the types of LEDs offered expanded to include globes, candelabras, a larger variety of reflectors, and a wider range of replacement wattages.

Table 4 – Number of Unique Model Numbers of Incentivized LEDs Sold by Intercept Retailers[9]

Type	PY8			PY7			YOY Increase
	Omni-directional LED	Directional LED	Total	Omni-directional LED	Directional LED	Total	
Big Box	21	64	85	7	13	20	325%
DIY	49	72	121	13	14	27	348%
Warehouse	4	7	11	5	7	12	-8%
Total	74	142	216	25	34	59	266%

Table 5 below is similar to Table 3 except that it shows the distribution of bulbs purchased by PY8 intercept survey respondents. As this table shows, 55% of the bulbs being purchased by intercept respondents were program bulbs (55% of which were standard CFLs) and the remaining 45% of the bulbs being purchased were non-program bulbs (52% of which were incandescent bulbs and 25% of which were halogen bulbs). In total, of the 4,576 bulbs purchased by intercept respondents, 34% were purchasing CFLs, 32% were purchasing LEDs, 11% were purchasing Halogen bulbs, and 23% were purchasing Incandescent bulbs.[10] This represents nearly a 400% increase in LED purchasers, a 36% increase in halogen purchasers, a 39% drops in CFL purchasers, and a 23% drop in Incandescent purchasers in PY8.

Table 5 – Distribution of PY8 Bulb Purchases by Intercept Respondents

Retailer Type	Program Bulbs				NonProgram Bulbs						All Intercepts
	Stand CFL	Omni LED	Dir LED	Pgm	Stand CFL	Spec CFL	LED	Hal	Inc	Non Pgm	
Big Box	452	142	62	656	13	10	21	157	188	389	1,045
DIY	648	600	183	1,431	42	82	296	337	868	1,625	3,056
Warehouse	292	62	97	451	0	0	12	12	0	24	475
Total	1,392	804	342	2,538	55	92	329	506	1,056	2,038	4,576
% Surveyed	30%	18%	7%	55%	1%	2%	7%	11%	23%	45%	100%

Table 6 below shows the average number of bulbs purchased by intercept respondents by Retailer and Bulb Type. As this table shows, the average survey respondent at Warehouse stores purchased more bulbs that respondents at Big Box or DIY stores.

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[9] Some retailers carried the same model numbers, so the total number of unique Omni-direciotnal model numbers in PY8 and the overall total number of unique model numbers in PY8 sum to less than the segmented values for these categories

[10] In PY7, of the 4,193 bulbs purchased by intercept respondents, 56% were purchasing CFLs, 6% were purchasing LEDs, 8% were purchasing Halogen bulbs, and 30% were purchasing Incandescent bulbs.

Table 6 – Average Number of Bulbs Purchased by PY8 Intercept Respondents

Retailer Type	Program Bulbs				NonProgram Bulbs					All Intercepts
	Stan CFL	Omni LED	Dir LED	Pgm	CFL	LED	Hal	Inc	Non Pgm	
Big Box	7.1	4.3	3.9	6.0	3.3	2.1	4.8	4.3	4.3	5.3
DIY	6.5	4.3	3.8	5.1	3.2	4.1	4.4	6.5	5.3	5.5
Warehouse	12.2	3.4	3.9	6.9	0.0	2.4	6.0	0.0	3.4	6.6
Total	7.4	4.2	3.8	5.5	3.2	3.8	4.6	6.0	5.1	5.5

Table 7 below shows the number of intercepts conducted and the volume of program versus nonprogram bulbs purchased during ComEd sponsored in-store demonstration events (versus non-demonstration event periods). In-store interviewers accompanied program implementation staff into program retail stores during demonstration events to familiarize themselves with the program offerings and be introduced to program retail staff. As this table shows, demonstration events were taking place during approximately 17% of the time interviewers were in the stores and 24% of the completed surveys were conducted during a demonstration event. Demonstration events, which promote the benefits of high efficiency lighting, led to increased rates of LED purchases (31% of survey respondents program LED sales occurred while a demonstration events was being held). Typically 20 to 40 ComEd-sponsored demonstration events occur each month across all program retailers, and thus intercepts occurring during a demonstration event are over-represented in our sample.[11] To account for the demonstration event bias, the NTGR results were segmented by the demonstration event status (Demo or NonDemo) at the time the in-store intercept survey took place.

Table 7 – PY8 Intercept Surveys and Forecasted Program Bulb Sales by Retailer Type

Retailer Type	Days[12]		Intercepts		Bulb Sales					
	#	%	#	%	Pgm LEDs	%	Pgm CFLs	%	NonPgm Bulbs	%
NonDemo Event	57.5	83%	626	76%	795	69%	1,100	79%	1,549	76%
Demo Event	11.5	17%	202	24%	351	31%	292	21%	489	24%
Total	69	100%	828	100%	1,146	100%	1,392	100%	2,038	100%

PY8 NTGR Estimation Methodology

In PY8, NTGR estimates for CFLs and LEDs were calculated using the customer self-report method based on data collected during the in-store intercept surveys.

Once these parameters were estimated NTGR was calculated as follows:

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11 The evaluation team estimates that between 1% and 5% of all annual program sales occur during a demonstration event period. This assumption is based on roughly 40 demonstration events occurring monthly, roughly 800 participating retail store fronts and a four-fold increase in the rate of sale during a demonstration events.

12 Demonstration events lasted approximately 4 hours and so were considered 0.5 of a day.

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

Free-ridership was estimated by first calculating the following two scores:

1) *Program Influence Score* (PI Score) - The degree of influence the program[13] had on the customers' decision to install CFLs or LEDs, 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 scores were calculated for all program bulb purchasers, free-ridership was calculated as:

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

PY8 Evaluation Verified Free-ridership Results

Table 8 through Table 10, below, present the ***unweighted*** free-ridership estimates for Standard CFLs, Omni-directional LEDs, and Directional LEDs, respectively. The tables below also presents the unweighted free-ridership results segmented by Demo Event (whether the intercept survey occurred during a demonstration event) and Retailer Type (Big Box, Do-It-Yourself, or Warehouse).

Table 8 – Unweighted PY8 Standard CFL Free-Ridership Segmentation Analysis

Standard CFL Free-Ridership		N	Free-Ridership	Lower 90%CL	Upper 90%CL
All Standard CFLs		155	0.42	0.38	0.46
Demo Event	Yes	36	0.40	0.31	0.49
	No	119	0.43	0.38	0.47
Retailer Type	Big Box	53	0.36	0.29	0.43
	DIY	79	0.50	0.45	0.56
	Warehouse	23	0.36	0.25	0.48
Demo Event and Retailer Type	Big Box – No Demo	39	0.40	0.32	0.48
	Big Box – Demo	14	0.24	0.10	0.38
	DIY – No Demo	59	0.53	0.46	0.59
	DIY –Demo	20	0.44	0.35	0.54
	WH – No Demo	21	0.33	0.22	0.44
	WH –Demo	2	0.80[14]	0.43	1.00

[13] Program influence could be attributable to the program incentive, in-store information materials, placement of incentivized bulbs, or information from retail store personnel who call out the ComEd program.

[14] Due to the small sample size (n=2) associated with this result and its non-intuitiveness, the free-ridership estimate for Warehouse Demo Events was set equal to the Warehouse Nondemo Events estimate (which can be considered an upper bound on the Demo Event result).

Table 9 – Unweighted PY8 Omni-Directional LED Free-Ridership Segmentation Analysis

Omni-Directional LED Free-Ridership		N	Free-Ridership	Lower 90%CL	Upper 90%CL
All Omni-Directional LEDs		187	0.37	0.33	0.41
Demo Event	Yes	63	0.31	0.25	0.37
	No	124	0.40	0.35	0.45
Retailer Type	Big Box	33	0.36	0.27	0.45
	DIY	136	0.36	0.31	0.40
	Warehouse	18	0.54	0.38	0.69
Demo Event and Retailer Type	Big Box – No Demo	24	0.40	0.28	0.52
	Big Box – Demo	9	0.28	0.16	0.39
	DIY – No Demo	88	0.37	0.31	0.43
	DIY –Demo	48	0.33	0.25	0.41
	WH – No Demo	12	0.68	0.50	0.85
	WH –Demo	6	0.19	0.04	0.34

Table 10 – Unweighted PY8 Directional LED Free-Ridership Segmentation Analysis

Directional LED Free-Ridership		N	Free-Ridership	Lower 90%CL	Upper 90%CL
All Directional LEDs		59	0.42	0.36	0.48
Demo Event	Yes	20	0.35	0.24	0.46
	No	39	0.44	0.37	0.51
Retailer Type	Big Box	11	0.29	0.15	0.42
	DIY	38	0.46	0.39	0.54
	Warehouse	10	0.39	0.27	0.51
Demo Event and Retailer Type	Big Box – No Demo	9	0.30	0.14	0.45
	Big Box – Demo	2	0.18	0.0	0.40
	DIY – No Demo	22	0.50	0.41	0.59
	DIY –Demo	16	0.37	0.24	0.51
	WH – No Demo	8	0.41	0.26	0.55
	WH –Demo	2	0.29	0.28	0.31

As shown in the tables above, all three Bulb Types had lower free-ridership scores during demonstration events than during non-demonstration event periods.

Weights

Due to the differences in results related to demonstration event status and retailer type, the evaluation team developed case weights that were applied to the demo event and retailer-type free-ridership estimates in order to derive bulb type free-ridership estimates that were representative of

the anticipated[15] distribution of PY8 bulb sales. Table 11 below shows the distribution of PY8 Standard CFLs and Omni-directional and Directional LEDs forecasted by retailer-type and intercept-store status based on the preliminary Goals Tracker spreadsheet provided to the evaluation team. Applying the Retailer Type case weights makes the free-ridership estimates representative of 67% of the forecasted PY8 Standard CFL sales, 97% of the forecasted PY8 Omnidirectional LED sales and 94% of forecasted PY8 Directional LEDs sales.

Table 11 – Forecasted PY8 Sales used for Analysis Weights

Intercept Store?	Retailer Type	Standard CFL	%	Omni LED	%	LED Directional/Other	%
Yes	Big Box	1,068,390	13%	275,586	8%	480,264	18%
	DIY	1,713,506	21%	1,350,128	38%	630,114	24%
	Warehouse	768,002	9%	155,986	4%	384,994	15%
	Intercept Stores	3,549,898	43%	1,781,700	50%	1,495,372	57%
No	Big Box	129,904	2%	53,726	1%	39,483	2%
	DIY	1,298,022	16%	346,338	10%	555,147	21%
	Discount	460,000	6%	0	0%	0	0%
	Dollar Store	1,950,000	24%	0	0%	0	0%
	Electronic	51,942	1%	37,216	1%	23,216	1%
	Grocery	98,400	1%	11,555	0%	9,555	0%
	Hardware	201,616	2%	74,510	2%	121,071	5%
	Warehouse	530,500	6%	1,286,270	36%	380,013	14%
	Non-Intercept Stores	4,720,384	57%	1,809,615	50%	1,128,485	43%
Total		8,270,282	57%	3,591,315	25%	2,623,857	18%

As mentioned previously, the distribution of program bulbs sales by demonstration event status is unknown, but believed to be 5% or less. The final results will be calculated assuming three different demo/non-demo sales ratios (1/99, 5/95, 10/90) in order to test the sensitivity of this parameter.

Weighted Free-ridership Results

Tables 12 through 14 below present the weighted free-ridership estimates for Standard CFLs, Omni-directional LEDs, and Directional LEDs by Demo Event and Retailer Type segmentations.

As shown in these tables, all bulb types had lower free-rider scores during demonstration events, when the program was able to have its maximum influence due to implementation staff being present in the aisles to educate customers the various high efficiency bulb types.

Table 12 provides the Retailer Type weighted free-ridership estimate for program Standard CFL sales by demonstration event period (0.45 NonDemo period vs. 0.37 during Demo period). The last three rows of this table present the Standard CFL weighted free-ridership scores assuming 1%, 5%, and 10% of Standard CFL program bulb sales occur during a demonstration event. As this table shows, Standard CFL free-ridership is not very sensitive to a +/-5% shift in the percentage of program bulb sales occurring during demonstration events.

[15] Based on the PY8 Goals Tracker spreadsheet.

Table 12 –Weighted CFL Free-Ridership Estimates

Demo Event	Retailer Type	PY8 Bulb Sales Weighted Free-Ridership	
		Retailer Type Wt.	Free-ridership
No	Big Box	14%	0.40
No	DIY	36%	0.53
No	Warehouse	16%	0.33
No Demo Retailer Type Weighted		n/a	0.45
Yes	Big Box	14%	0.24
Yes	DIY	36%	0.44
Yes	Warehouse	16%	0.33[16]
Demo Retailer Type Weighted		n/a	0.37
Weighted 1/99 demo/non-demo		n/a	0.45
Weighted 5/95 demo/non-demo		n/a	0.45
Weighted 10/90 demo/non-demo		n/a	0.44

Table 13 shows that the Retailer Type weighted free-ridership estimate for program Omni-directional LED sales by demonstration event period (0.50 NonDemo period vs. 0.27 during Demo period). Similar to the table above, the analysis results indicate that the weighted Omni-directional LED free-ridership estimates are fairly insensitive to a +/- 5% shift in the percentage of program sales that occur during a demonstration event.

Table 13 –Weighted Omni-directional LED Free-Ridership Estimates

Demo Event	Retailer Type	PY8 Bulb Sales Weighted Free-Ridership	
		Retailer Type Wt.	Free-ridership
No	Big Box	9%	0.40
No	DIY	47%	0.37
No	Warehouse	40%	0.68
No Demo Retailer Type Weighted		n/a	0.50
Yes	Big Box	9%	0.28
Yes	DIY	47%	0.33
No	Warehouse	40%	0.19
Demo Retailer Type Weighted		n/a	0.27
Weighted 1/99 demo/non-demo		n/a	0.50
Weighted 5/95 demo/non-demo		n/a	0.49
Weighted 10/90 demo/non-demo		n/a	0.48

[16] The free-ridership estimate for Warehouse Demo Event was set equal to the Warehouse Nondemo Event estimate due to an extremely low sample size within the Demo Event Warehouse store category (n=2). The Nondemo result can be thought of as an upper bound on the true Demo Event result.

Table 14 shows that the Retailer Type weighted free-ridership estimate for program Directional LED sales by demonstration event period (0.43 NonDemo period vs. 0.31 during Demo period). Again, the results show that weighted Directional LED free-ridership estimates are fairly insensitive to a +/- 5% shift in the percentage of annual bulbs sold during demonstration events.

Table 14 –Weighted Directional LED Free-Ridership Estimates

Demo Event	Retailer Type	PY8 Bulb Sales Weighted Free-Ridership	
		Retailer Type Weighting	Free-ridership
No	Big Box	20%	0.30
No	DIY	45%	0.50
No	Warehouse	29%	0.41
No Demo Retailer Type Weighted		n/a	0.43
Yes	Big Box	20%	0.18
Yes	DIY	45%	0.37
No	Warehouse	29%	0.29
Demo Retailer Type Weighted		n/a	0.31
Weighted 1/99 demo/non-demo		n/a	0.43
Weighted 5/95 demo/non-demo		n/a	0.42
Weighted 10/90 demo/non-demo		n/a	0.42

Spillover

In PY8, participant and non-participant CFL and LED spillover were estimated based on data collected during the in-store intercept surveys. Similar to the free-ridership results presented above, these results are broken down by intercepts occurring during demo and non-demo event due to the increased program influence which is likely to occur during demonstration events. The participant and non-participant spillover results are presented below.

Participant Spillover

Participant spillover occurs when a customer who is purchasing a program CFL or LED is influenced by the program to also purchase a non-program non-discounted CFL or LED bulb. Participant spillover was estimated separately for CFLs and LEDs.[17] Table 15 and Table 16 below present the results of the Standard CFL and LED participant spillover analysis, segmented by demonstration and non-demonstration event period.

As shown in Table 15 below, a total of three respondents who purchased a program bulb also purchased non-discounted Standard CFLs. All three respondents reported that the program influenced their decision to purchase the non-program Standard CFLs. Two of these three surveys occurred during a demonstration event. Based on this data, the Standard CFL participant spillover rate was calculated as the ratio of the spillover Standard CFL bulb purchases to the program Standard CFL purchases (segmented by demonstration event status). As the table below shows, this yielded a participant Standard CFL spillover rate of 3.2% for bulbs purchased during a demo event

[17] Participant spillover for Omni-directional and Directional LEDs was estimated together.

and a 0.4% participant Standard CFL spillover rate for bulbs purchased outside of a demo event period.

Table 15 – PY8 Participant CFL Spillover Results – Self-Report Method

Demo Event	Participant CFL Spillover	n	Bulb/Purchase	Bulbs
No	NonPgm CFL Purchases By Participants	1	4.00	4
	Spillover Purchases	1	4.00	4
	Program Purchases	142	7.75	1,100
	Participant CFL Spillover Rate			0.4%
Yes	NonPgm CFL Purchases By Participants	2	5.00	10
	Spillover Purchases	2	4.70	9
	Program Purchases	46	6.35	292
	Participant CFL Spillover Rate			3.2%

Similarly for LEDs, Table 16 shows that a total of nine respondents who purchased a program bulb also purchased a non-discounted LED. Of these nine respondents, seven respondents reported that the ComEd program was influential[18] in their decision to purchase non-program bulbs. Two of these seven surveys occurred during a demonstration event. Based on this data, the LED participant spillover rate was calculated as the ratio of the spillover LED bulb purchases to the program LED purchases (segmented by demo event status). As the table below shows, this yielded a participant LED spillover rate of 1.1% for bulbs purchased during a demo event and a 0.8% participant LED spillover rate for bulbs purchased outside of a demo event period.

Table 16 – PY8 Participant LED Spillover Results – Self-Report Method

Demo Event	Participant LED Spillover	n	Bulb/Purchase	Bulbs
No	NonPgm LED Purchases By Participants	6	3.17	19
	Spillover Purchases	5	1.34	7
	Program Purchases	184	4.32	795
	Participant LED Spillover Rate			0.8%
Yes	NonPgm LED Purchases By Participants	3	3.33	10
	Spillover Purchases	2	1.90	4
	Program Purchases	91	3.86	351
	Participant LED Spillover Rate			1.1%

[18] The portion of non-program bulbs counted as spillover is determined based upon the level of influence they attribute to the program for this non-program efficient lighting purchase.

The level of participant spillover found for LEDs purchased during a demonstration event was notably higher in PY7 than in PY8 (6.1% versus 1.1%). The decline in participant spillover during a demonstration event is likely due to the greater quantity and variety of LEDs offered through the program in PY8. The level of participant spillover found for LEDs sold outside of a demonstration event was slightly lower in PY7 than in PY8 (0.3% versus 0.8%).

Nonparticipant Spillover

Nonparticipant spillover occurs when a survey respondent who is not purchasing a program CFL or LED reports that the program in some way influenced them to purchase a non-program non-discounted CFL or LED bulb. Nonparticipant spillover was estimated separately for Standard CFLs, Omni-directional LEDs, and Directional LEDs.[19] Table 17 through Table 19 present the results for the Standard CFL and LED nonparticipant spillover analysis, segmented by demonstration event status. Survey respondents were included in this analysis if they did not purchase any program bulbs, butpurchased one or more Standard CFL or LED.

As shown in Table 17, four customers who were not purchasing program bulbs reported they were influenced by ComEd's programto purchase non-program Standard CFLs. Based on this data, and their stated purchase intentions when they entered the store, the nonparticipant spillover rate was extrapolated to the population of ComEd customers to yield an estimated 69,227non-program Standard CFLs being purchased by program nonparticipants. All four of the customers who were included in this non-participant spillover analysis were surveyed during non-demo event periods, so dividing the extrapolated spillover purchases by the total number of program CFLs projected to be sold in PY8 resulted in an estimated nonparticipant spillover rate of 0.9% for bulbs purchased not during a demo event.

Table 17 – PY8 Nonparticipant Standard CFL Spillover Results

Demo Event	Nonparticipant CFL Spillover	n	Bulbs / Purchase	Total Bulbs
No	Nonparticipant CFL Spillover Purchases	4	3.6	15
	Population Extrapolated Spillover Purchases	19,097	3.6	69,227
	PY8 Program CFL Sales			7,856,768
	Nonparticipant CFL Spillover Rate			0.9%

As shown in Table 18, 27 customers who were not purchasing program bulbs reported that influence from the ComEd residential lighting program led them to purchase non-program Omni-directional LEDs. Fifteen respondents purchased non-program Omni-directional LEDs during a non-demonstration event period, while twelve respondents purchased non-program Omni-directional LEDs during a demonstration event. Based on this data, and their stated purchase intentions when they entered the store, the nonparticipant spillover rate was extrapolated to the population of ComEd customers to yield an estimated 183,444 non-program Omni-directional LEDs being purchased by program nonparticipants during a non-demonstration event period and 49,209non-program Omni-directional LEDs being purchased during a demonstration event period. Dividing the extrapolated spillover purchases by the total number of program Omni-directional LEDs projected to be sold in PY8, resulted in an estimated nonparticipant spillover rate of 5.4% for bulbs purchased during a non-demo event period and 27.4% for bulbs purchased during a demo event period.

[19] Participant spillover for Omni-directional and Directional LEDs was estimated together.

Table 18 – PY8 Nonparticipant Omni-directional LED Spillover Results

Demo Event	Nonparticipant Omni-directional LED Spillover	n	Bulbs / Purchase	Total Bulbs
No	Nonparticipant Omni-dir LED Spillover Purchases	15	2.4	36.40
	Population Extrapolated Spillover Purchases	75,595	2.4	183,444
	PY8 Program Omni-directional LED Sales			3,411,749
	Nonparticipant Omni-directional LED Spillover Rate			5.4%
Yes	Nonparticipant Omni-dir LED Spillover Purchases	12	4.3	51.10
	Population Extrapolated Spillover Purchases	11,556	4.3	49,209
	PY8 Program Omni-directional LED Sales			179,566
	Nonparticipant Omni-directional LED Spillover Rate			27.4%

As shown in Table 19, 10 customers who were not purchasing program bulbs reported that influence from the ComEd residential lighting program led them to purchase non-program Directional LEDs. Six respondents purchased non-program Directional LEDs during a non-demonstration event period, while four respondents purchased non-program Directional LEDs during a demonstration event. Based on this data, and their stated purchase intentions when they entered the store, the nonparticipant spillover rate was extrapolated to the population of ComEd customers to yield an estimated 34,490non-program Directional LEDs being purchased by program nonparticipants during a non-demonstration event period and 2,671purchased during a demonstration event period. Dividing the extrapolated spillover purchases by the total number of program Directional LEDs projected to be sold in PY8, resulted in an estimated nonparticipant spillover rate of 1.4% for bulbs purchased during a non-demo event period and 2.0% for bulbs purchased during a demo event.

Table 19 – PY8 Nonparticipant Directional LED Spillover Results

Demo Event	Nonparticipant Directional LED Spillover	n	Bulbs / Purchase	Total Bulbs
No	Nonparticipant Directional LED Spillover Purchases	6	1.2	7.10
	Population Extrapolated Spillover Purchases	29,147	1.2	34,490
	PY8 Program Directional LED Sales			2,492,664
	Nonparticipant Directional LED Spillover Rate			1.4%
Yes	Nonparticipant Directional LED Spillover Purchases	4	0.9	3.60
	Population Extrapolated Spillover Purchases	2,967	0.9	2,671
	PY8 Program Directional LED Sales			131,193
	Nonparticipant Directional LED Spillover Rate			2.0%

Nonparticipant LED spillover outside of a demonstration event decreased from PY7 to PY8 (16.8% versus 5.4% Omni/1.4% Dir), but increased for Omni-directional LEDs during demonstration events from PY7 to PY8 (6.4% versus 27.4% Omni/2.0% Dir). Overall, the combined Omni-directional and Directional PY8 LED nonparticipant spillover rate decreased slightly compared to PY7 (16% in PY7

and 15% in PY8), which is likely due to the increase in the quantity and variety of LEDs sold through the program.

NTGR

Table 20 through Table 22 below, present the overall self-reported PY8 bulb-weighted NTGR estimates for Standard CFLs, Omni-directional LEDs, and Directional LEDs, respectively.

Table 20 shows the NTGR for Standard CFLs purchased during demo events was 0.66 and the NTGR for Standard CFL purchased outside demo events was 0.56. The sensitivity analysis performed on the demo/nondemo rate showed little change on the NTGR estimate when the demo rate was dropped to 1% or increased to 10%. The evaluation recommended NTGR estimate for Standard CFLs based on the PY8 analysis is 0.57.

Table 20 – PY8 Standard CFL NTGR

Segmentation	Free-Ridership	Part Spillover	Nonpart Spillover	NTGR
Non-Demo Event Periods	0.45	0.004	0.009	0.56
Demo Event Periods	0.37	0.032	0.000	0.66
Recommended PY8 Estimate (5/95 Demo/NonDemo)	**0.45**	**0.005**	**0.008**	**0.57**
Demo Event Sensitivity (1/99 Demo/NonDemo)	0.47	0.004	0.008	0.56
Demo Event Sensitivity (10/90 Demo/NonDemo)	0.46	0.006	0.008	0.57

Table 21 shows the NTGR for Omni-directional LEDs purchased during demo events was 1.02 and the NTGR for Omni-directional LEDs purchased not during demo events was 0.56. The sensitivity analysis performed on the demo/nondemo rate showed a moderate fluctuation in the NTGR estimate when the demo rate was increased to 10%, however the evaluation team estimates that 10% is an overestimate of the percentage of program bulbs sold during demonstration event periods. As a result, the evaluation recommended NTGR estimate for Omni-directional LEDs based on the PY8 analysis is 0.58.

Table 21 – PY8 Omni-directional LED NTGR

Segmentation	Free-Ridership	Part Spillover	Nonpart Spillover	NTGR
Non-Demo Event Periods	0.50	0.008	0.054	0.56
Demo Event Periods	0.27	0.011	0.274	1.02
Recommended PY8 Estimate (5/95 Demo/NonDemo)	**0.49**	**0.009**	**0.065**	**0.58**
Demo Event Sensitivity (1/99 Demo/NonDemo)	0.50	0.008	0.056	0.57
Demo Event Sensitivity (10/90 Demo/NonDemo)	0.48	0.009	0.076	0.61

Table 22 shows the NTGR for Directional LED purchased during demo events was 0.72 and the NTGR for Directional LED purchased not during a demo event was 0.59. The sensitivity analysis performed on the demo/nondemo rate showed a only a small fluctuation in the NTGR estimate when the demo rate was dropped to 1% or increased to 10%. The evaluation recommended NTGR estimate for LEDs based on the PY8 in-store data collection is 0.60.

Table 22 – PY8 Directional LED NTGR

Segmentation	Free-Ridership	Part Spillover	Nonpart Spillover	NTGR
Non-Demo Event Periods	0.43	0.008	0.014	0.59
Demo Event Periods	0.31	0.011	0.020	0.72
Recommended PY8 Estimate (5/95 Demo/NonDemo)	**0.42**	**0.009**	**0.014**	**0.60**
Demo Event Sensitivity (1/99 Demo/NonDemo)	0.43	0.008	0.014	0.60
Demo Event Sensitivity (10/90 Demo/NonDemo)	0.42	0.009	0.014	0.61

7.6.3 PY8 Shelf Survey Memo

Memorandum

Date: May 27, 2016

To: All Interested Parties in Illinois

CC: Vince Gutierrez, ComEd;

Jennifer Hinman Morris, ICC Staff,

Jeff Erickson, Randy Gunn, Josh Arnold and Rob Neumann; Navigant

From: Amy Buege and Ben Cheah; Navigant Evaluation Team

RE: ComEd PY8 Residential Lighting Discounts Program Shelf Survey Findings

This memo presents findings from the retailer shelf surveys conducted as part the ComEd PY8 Residential Lighting Discounts program evaluation. In total 25 shelf surveys were conducted across 15 unique program retailers. The primary objective of the retailer shelf surveys was to collect data (via in-store lighting inventories) to assess current retailer (program and non-program) efficient lighting stocking levels within ComEd's service territory and to examine the effect ComEd's Residential Lighting Discounts program is having on the price of CFLs and LEDs at program stores. These shelf surveys were conducted in October and November of 2015 and included only medium-screw based bulbs.

To weight the findings from the sample of shelf surveys completed to be representative of the population of bulbs sold through the major residential lighting retailers within ComEd service territory, a final weighting factor was created. To determine this weighting factor, the first step was to calculate a *package adjustment factor*. For each unique package identified, the surveyor recorded an estimate of the number of units of that package on the retailer's shelves which served as the *package adjustment factor*.

The second factor that went into the weighting factor was the *store weight*. The *store weight* was calculated by taking the number of storefronts each retailer had participating in the ComEd program, divided by the number of storefronts for that same retailer that were surveyed. For example, there were 173 Family Dollar stores, and the evaluation team conducted shelf surveys at two of them, and thus the *store weight* was calculated to be 86.5.

The final weighting factor, noted as the Bulb Weight, was calculated by the following equation:

$$Bulb\ Weight = PkgAdj \times NumBulbs \times StoreWt$$

Where:

PkgAdj	=	*The package adjustment factor*
NumBulbs	=	*The number of bulbs in the package*
StoreWt	=	*The store weight*

Key Findings

- **Influence of Incentives:** The ComEd program incentives are having a significant effect on the retail price of CFLs and LEDs within ComEd service territory. On average, program standard CFLs are approximately half the price of non-program standard CFLs and program LEDs (both omni-directional and directional) are around two-thirds the price of non-program LEDs. Additionally, ComEd discounted standard CFLs cost less per bulb, on average, than similar incandescent and halogen bulbs.

- **State of the LED Market:** The cost of a medium screw-based LED has come down substantially in recent years (the average cost of a non-incentivized standard LED in PY6[1] was nearly $17 a bulb and is now less than $7 and the price of a non-incentivized specialty LED has come down from around $26 a bulb to $13). LED bulbs are also comprising a larger proportion of the medium-screw based bulbs stocked on program retailer shelves (21 percent in PY8 versus 16 percent in PY6), although they appear to be replacing shelf space previously filled by CFLs, as opposed to reducing the share of incandescent and halogen bulbs.
- **State of the CFL Market:** The shelf space program retailers dedicate to CFLs has decreased significantly as LEDs drop in price and awareness of LEDs continues to rise quickly. Since LEDs last longer, generate greater energy savings than CFLs, and are often preferred to CFLs in terms of light quality, they will likely continue to cannibalize the CFL market as the preferred energy efficient bulb technology. Specialty CFL shelf space has declined at a faster rate than standard CFL space, dropping from 29 percent in PY6 to 6 percent in PY9 (standard CFL space dropped from 43 percent to 34 percent during that same period).
- **Incandescent Lamp Availability:** The availability of standard incandescent medium screw-based lamps has continued to decrease due to the implementation of EISA 2007. Overall, the share of standard incandescent bulbs has decreased from 22 percent in PY6 to 11 percent in PY8, with the greatest decline being in the 40-watt replacement category where incandescent bulbs fell from 39 percent to 26 percent of the market[2]. At the same time the availability of specialty incandescent bulbs, which are generally not covered by the EISA standards, has increased with specialty incandescent bulbs making up 54 percent of the stocked product (up from 35 percent in PY6).
- **Halogen Lamp Availability:** The volume of standard halogen bulbs found on the shelves of program retailers has risen as incandescent bulbs have gone away. Between PY6 and PY8, standard halogens increased from 20 percent of the stocked standard bulbs to 35 percent. The stocking of specialty halogen bulbs in that same time period has remained fairly steady (20 percent compared to 18 percent).
- **Specialty Bulb Market:** Availability of high efficiency (CFL and LED) specialty bulbs still significantly lag behind standard bulbs – due to the fact that many specialty bulbs are exempt from the EISA standards,[3] their prices are still about double the cost of a standard bulb of the same technology, and customers lack of satisfaction with the products that are available (primarily for CFLs).

Recommendations

- **Continue Incentivizing CFLs and LEDs:** ComEd should continue to incentivize standard CFLs and LEDs as these incentives are making these energy efficient alternatives price competitive with the non-efficient alternatives, reducing the primary barrier to efficient lighting purchase.
- **Increase Educational Messaging on the Reduced Efficiency of Halogen Bulbs compared to CFLs and LEDs:** Halogen bulbs are often promoted as "moderately high efficiency", although their efficiency pales to that of CFLs and LEDs. ComEd should work to increase customers understanding of the relative efficiencies of Halogen bulbs versus CFLs and LEDs so that customers better understand the lifetime savings potential - both in terms of

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[1] Residential ENERGY STAR® Lighting PY6 Evaluation Report. Presented to Commonwealth Edison Company. February 16th, 2015. Figure 7-4 and Figure 7-5. LEDs were not incentivized in PY6 and no shelf surveys were conducted during the PY7 evaluation.

[2] A larger proportion of these 40-watt incandescent bulbs labeled as "standard" are appliance or ceiling fan bulbs which are exempt from EISA.

[3] Specialty bulb exemptions: All reflector bulbs, Globes <= 749 lumens or >= 5 inches in diameter, and Candelabra base bulbs that are ≤ 1049 lumens.

energy usage (kWh and $$) and bulb replacement costs, and are better able to make informed purchasing decisions.

Incandescent Lamp Availability

The Energy Independence Security Act of 2007 (EISA 2007) stipulated a three-year phase-in of lighting efficiency standards impacting general use medium screw-based light bulbs (lamps). As of January 2014, the EISA standards for 40-watt through 100-watt incandescent bulbs were fully in effect. Table 1 summarizes the phase-in of the EISA standards.

Table 1: EISA 2007 Lighting Standards

Effective Date	Typical Current Lamp Wattage	Rated Lumen Ranges	Maximum Rate Wattage
1/1/2012	100	1490-2600	72
1/1/2013	75	1050-1489	53
1/1/2014	60	750-1049	43
1/1/2014	40	310-749	29

Source: http://lightingfacts.com/Library/Content/EISA

The shelf surveys conducted for this evaluation found very few non-EISA compliant standard incandescent bulbs were only available in a very small proportion of program stores. Nearly all of the 40-, 60-, 75- and 100-watt incandescent bulbs found on store shelves had a quality (such as rough service or appliance) that made them except from the EISA standards.

Efficiency Product Availability

Table 2 below shows the distribution of the bulbs inventoried (weighted by the approximate quantity of bulbs present on the shelves and the number of retail storefronts participating in the ComEd program) across the four bulb types (CFLs, LEDs, halogen and incandescent) by bulb shape (A-lamp/twist, globe, reflector and other[4]) and overall.

Looking across all lighting products inventoried, analysis of the shelf survey data found that energy-efficient bulb types—CFLs and LEDs— now make up 43percent[5] of the medium screw-based bulbs on program retailer shelves. These efficient bulb types made up a higher percentage of standard bulbs (53 percent of A-lamp or twist bulbs), but fewer specialty bulbs (30 percent of globes, 32 percent of reflectors and 20 percent of other specialty bulb types). Halogen bulbs were the most common standard bulb type (35 percent) and incandescent bulbs were the least common standard bulb type (11 percent). CFLs continue to make up a higher percentage of standard bulbs than LEDs (34 percent vs 20 percent), but LEDs are rapidly cutting into CFLs market share and will likely surpass them in the next year or two.

Incandescent bulbs still make up the overwhelming majority of specialty bulbs inventoried (54 percent across all specialty bulb types), but LEDs now are the second most prevalent technology (23 percent in PY8 vs 16 percent in PY6). CFLs, which never really gained widespread acceptance within the specialty market make up only 6 percent of specialty bulbs inventoried in PY8, and thus it was not

[4] Other is comprised of candelabra bulbs, 3 way bulbs and Edison bulbs.

[5] Differences from table and the text in this paragraph reflects rounding.

surprising to find the majority of CFLs found within program retailers (90 percent) were standard bulbs (spiral or a-lamp).

Table 2: Distribution of Bulb Types across Bulb Shapes (weighted)[6]

Bulb Type	All	Standard	Specialty		
		Spiral / A-lamp[7]	Globe	Reflector	Other
CFL	23%	34%	5%	7%	3%
LED	21%	20%	24%	25%	17%
Halogen	29%	35%	13%	26%	4%
Incandescent	28%	11%	57%	42%	77%

Source: Evaluation Team Analysis
* This analysis has been weighted using the bulb weights.
** This analysis represents approximately 45,000 Standard bulbs, 4,500 Globe bulbs, 18,000 Reflector bulbs, and 7,500 bulbs classified as "Other".

The shelf survey data was also analyzed to determine what percentage of stores had each of the four bulb technologies (LED, CFL, halogen and incandescent) on their shelves and how many unique models of each bulb type were available.[8] In some cases there may be slightly more unique model numbers than indicated as model number were missing for approximately 16 percent (unweighted) of the data collected. The results from this analysis are shown in Table 4 below.

Analysis of the shelf survey data indicated that across standard bulbs, CFLs were both the most widely available (84 percent of the stores surveyed had one or more standard CFL on their shelves) and also had the highest number of unique models available (269). LEDs followed closely behind with 79 percent availability across the 25 stores visited and 246 unique models. Incandescent standard bulbs, while close behind in availability had roughly half the selection of models to choose from.

The specialty bulb shape categories are still dominated by incandescent models and the availability of incandescent specialty bulbs is over 85 percent across the stores inventoried for all specialty lamp types.

The analysis results presented in Table 4 suggests that CFL and LED availability and lamp selection is no longer a barrier for standard bulbs, is becoming less of a barrier for reflectors, however is still a barrier for other specialty bulb types where the availability is sparse and the package selection is minimal.

[6] Numbers do not always add to 100% due to rounding within cells.

[7] Spiral and A-lamp bulbs were combined into a single category, as spiral lamps are only found as CFLs.

[8] Unique by program retailer, not necessarily unique to the program.

Table 3: Availability of Bulb Types across Retail Stores and Number of Unique Models Identified

Bulb Type	Standard		Globe		Reflector		Other	
	% Stores	Models	% Stores	Models	% Stores	Models	% Stores	Models
CFL	84%	269	23%	12	52%	59	19%	19
LED	79%	246	39%	53	61%	220	60%	64
Halogen	67%	172	31%	26	50%	181	23%	20
Incandescent	79%	128	86%	97	85%	143	91%	168

Source: Evaluation Team Analysis
* The percent of stores has been weighted by the store weight. The number of unique models identified is unweighted.

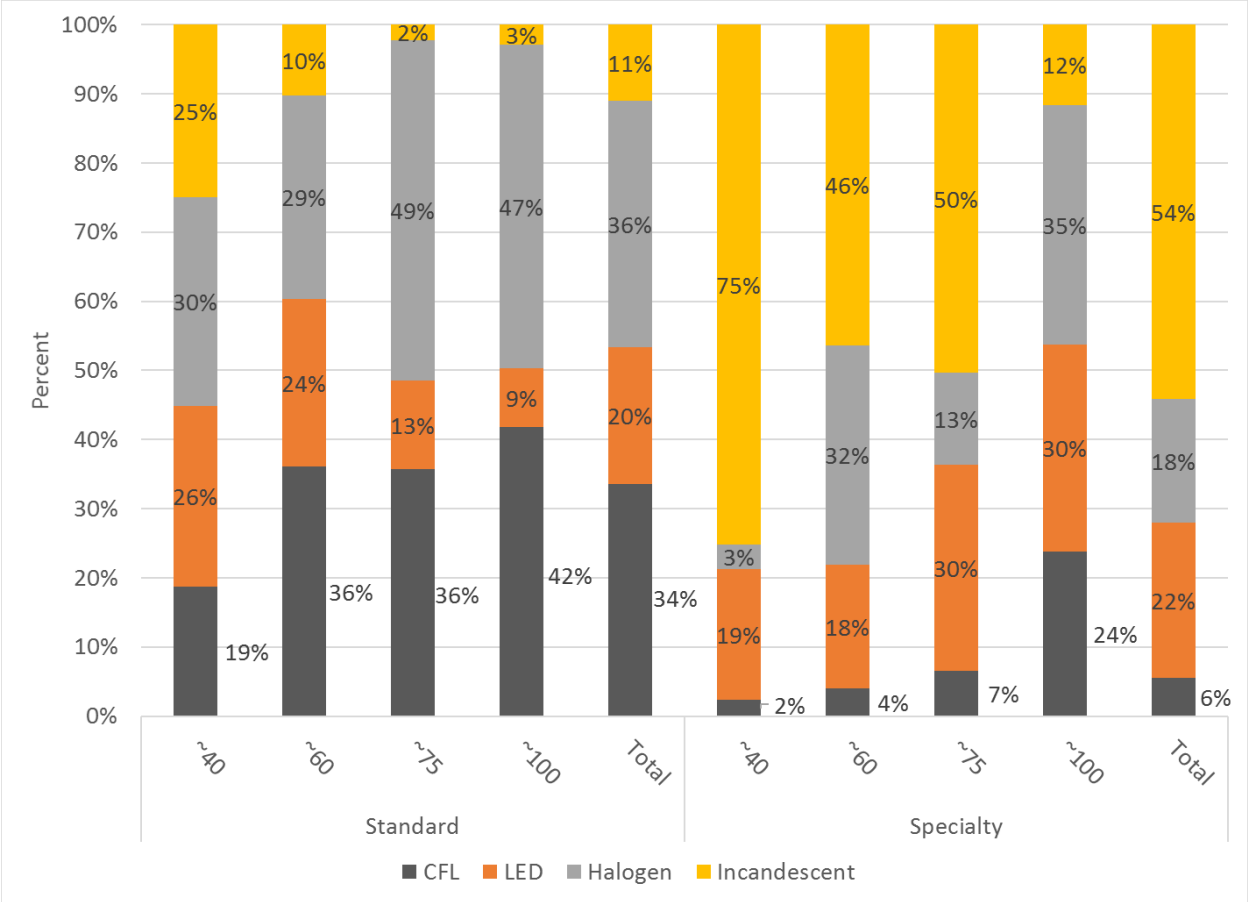
Figure 1 displays the share of standard and specialty bulbs stocked at retailer stores within the ComEd service territory, split out by lamp technology type and replacement wattage.[9] Across all wattage categories, standard energy efficient bulbs (CFLs and LEDs) made up 54 percent of the bulbs identified, while for specialty bulbs this share of efficient bulbs dropped to less than 30 percent. Sixty-watt replacement bulbs had the highest share of efficient standard bulbs (60 percent), while specialty bulbs were the most efficient in the higher wattage ranges (55 percent of specialty bulbs in the > 75-watt replacement bin were CFLs or LEDs).

The EISA legislation first prohibited the manufacture of 100-watt and 75-watt standard bulbs in January 2012 and January 2013, respectively, while the 40-watt and 60-watt standard bulbs were not restricted until January 2014. This explains the very low share (2-3 percent) of standard incandescent bulbs in the 75 and 100-watt replacement bins (and most of these are rough service bulbs), as well as the slightly higher share of incandescent bulbs in the 60-watt (10 percent) and 40-watt (25 percent) replacement bins (many of these are also EISA except due to being appliance or ceiling fan bulbs).

Comparing the share of standard efficient versus standard non-efficient bulbs in Figure 1 shows that the market share is rather consistent between the two technology groups, indicating that as incandescent bulbs have been phased out, halogen bulbs have been replacing them in the same manner that LED bulbs are replacing CFLs. This dynamic emphasizes the importance of ComEd's program to continue to bring down the cost of LEDs so that customers don't revert to halogen bulbs as CFLs become less available. The ComEd program provides important educational information to customers concerning the benefits of LED lighting over less efficient types such as halogen.

[9] Bulbs greater than 100-watts were not included in this analysis, as only 23 bulbs with wattages greater than 100-watts were identified during the shelf-surveys.

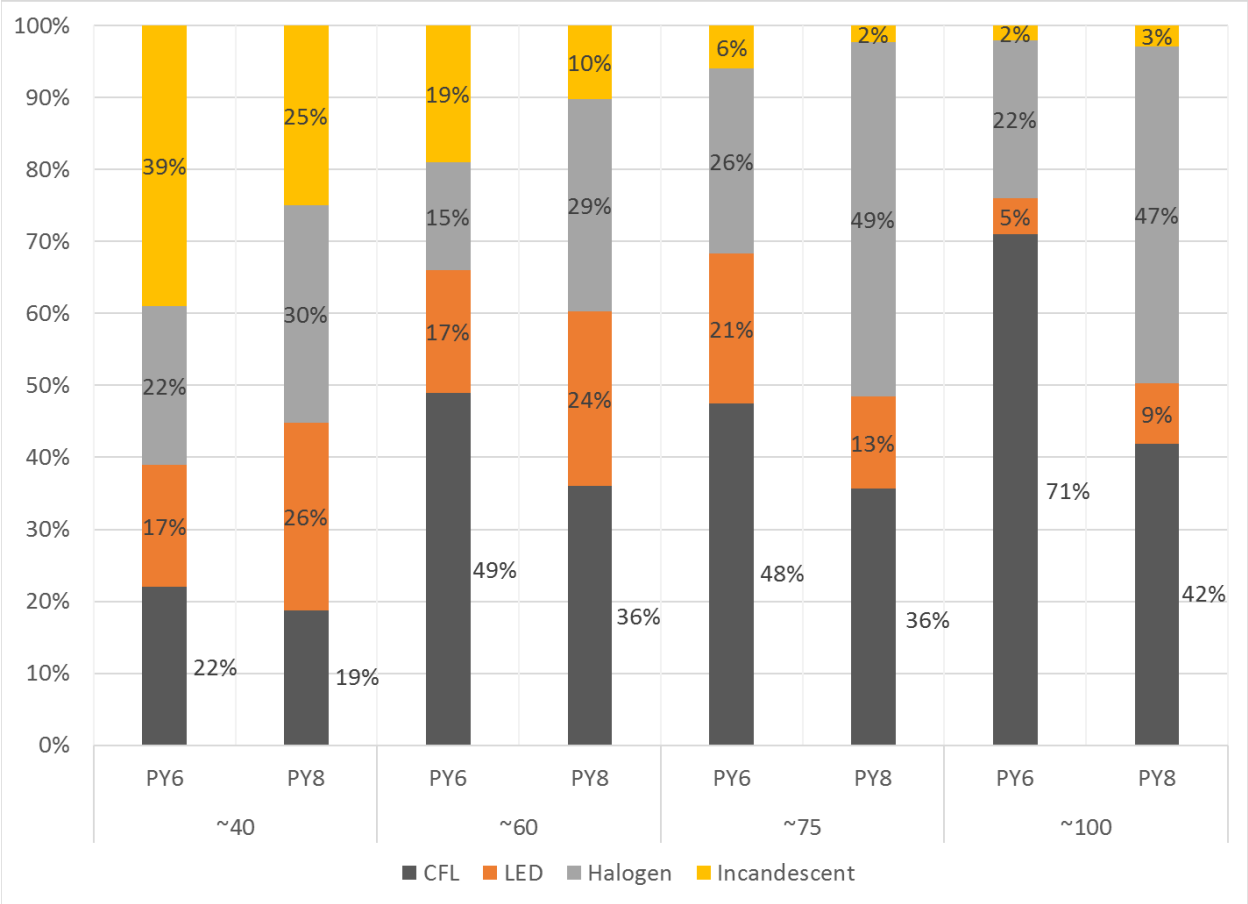
Figure 1: Availability of Bulbs Types by Replacement Wattage Bin



Source: Evaluation Team Analysis
* This analysis has been weighted by the bulb weight.

Comparing the PY6 and PY8 shelf survey data for standard bulbs shows a clear reduction in incandescent bulbs across every wattage category, paired with an increase in the volume of halogen bulbs. The higher wattage bins show larger increases in the volume of halogen bulbs available and a reduction in the availability of high efficiency bulbs (CFLs and LEDs). In the lower wattage bins, a decrease in CFL share was also seen accompanied by a similar increase in LEDs, however the overall distribution of efficient versus non-efficient lighting has not changed that much in the past 2 years.

Figure 2: Comparison of Shelf Survey Results for Standard Bulbs of PY6 and PY8[10]

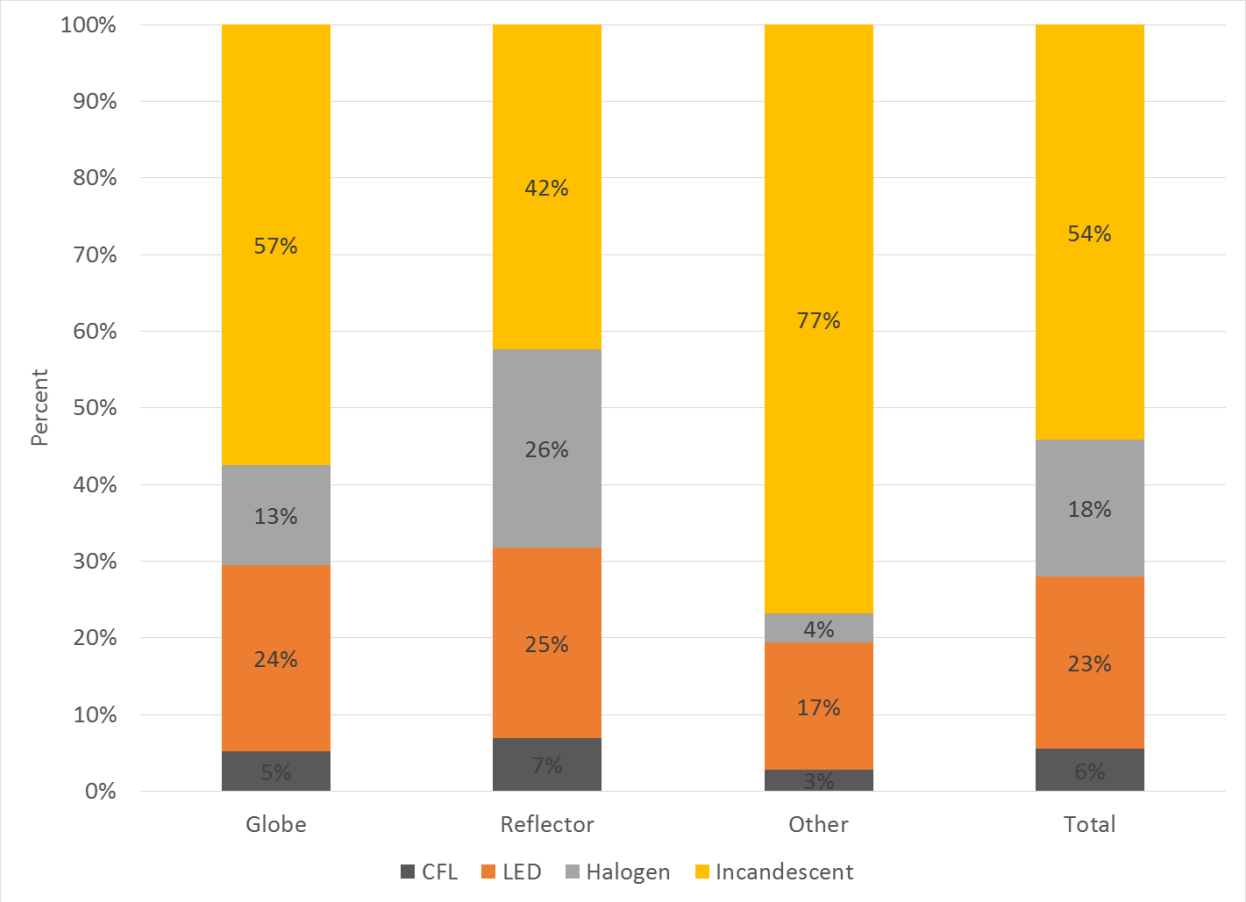


Source: Evaluation Team Analysis
* This analysis has been weighted by the bulb weight.

The stocking of specialty bulbs, many of which are not impacted by EISA, is different than that of standard products. Incandescent bulbs comprised the majority of specialty bulb products stocked in stores within ComEd's service territory (54 percent). As Figure 3 below shows, efficient bulb technologies (LEDs and CFLs) make up less than 35 percent of the available bulbs across all specialty bulb categories, and overall. When developing future year program plans, ComEd should consider expanding the specialty LED program offerings, if it can be done in a cost-effective manner.

[10] The PY6 data came from "Residential ENERGY STAR® Lighting PY6 Evaluation Report. Presented to Commonwealth Edison Company. February 16th, 2015. Figure 7-3."

Figure 3: Availability of Specialty Bulbs by Bulb Type



Source: Evaluation Team Analysis
* This analysis has been weighted by bulb weight.

The evaluation team analyzed the number of unique model numbers found by bulb type across each of the different store types (the results are presented in Table 5). Across the standard bulb types, efficient bulbs generally tended to have a higher number of unique models available to customers than the non-efficient types. DIY stores had the highest number of unique made and models for efficient standard bulbs. As expected, specialty incandescent bulbs still had the highest number of unique options available.

The analysis also reviewed what percentage of bulbs sold at each stores were ComEd program bulbs. Big Box stores had the highest percentage of program bulbs, with 85 percent of their standard CFLs, 38 percent of their standard LEDs, and 41 percent of their specialty LEDs being program bulbs. At DIY stores, program bulbs comprised only 14 percent of all available CFLs and LEDs.

Table 4: Number of Unique Model Available and the Percentage of Program Bulbs

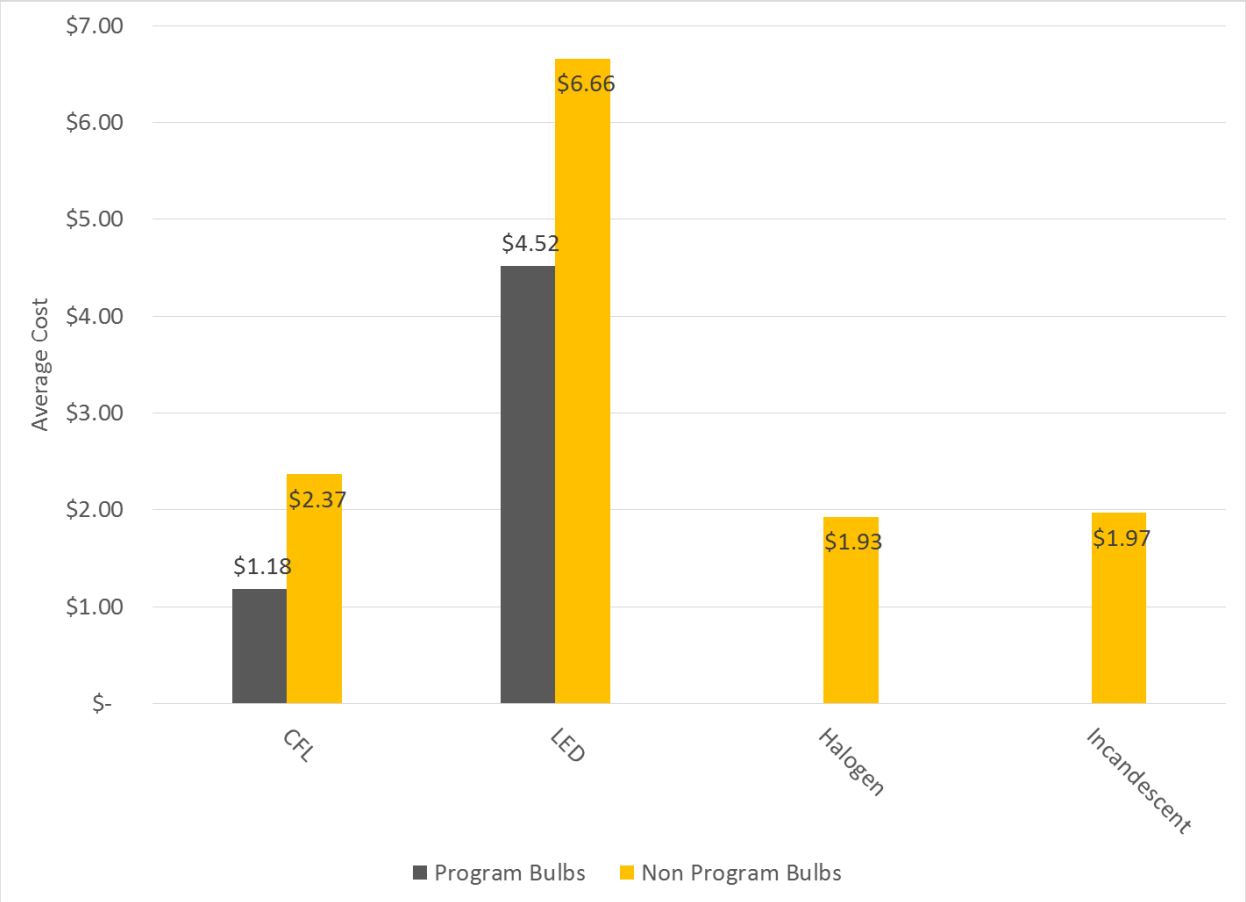
Store Type	Standard				Specialty			
	CFL	LED	Halogen	Incan.	CFL	LED	Halogen	Incan.
Big Box	45 *(85%)*	82 *(38%)*	56	29	11	81 *(41%)*	44	77
DIY	133 *(14%)*	87 *(14%)*	59	50	29	135 *(14%)*	119	141
Discount	4 *(62%)*	1 *(0%)*	3	4	0	4 *(0%)*	1	16
Grocery	14 *(49%)*	9 *(20%)*	16	6	2	3 *(33%)*	0	22
Small Hardware	45 *(29%)*	39 *(0%)*	35	37	21	54 *(4%)*	40	113
Warehouse	41 *(11%)*	54 *(19%)*	41	23	29	84 *(29%)*	35	74

Source: Evaluation Team Analysis
* The percent of program bulbs has been weighted by the bulb weight. The number of unique models identified is unweighted.

Lighting Product Pricing

As part of the shelf stocking study, pricing information was also collected for all products found on retailer store shelves for the program retailers included in the sample. For discounted products, both the regular retail price and discounted price (where available) were recorded, and the provider of the discount (ComEd or the retailer/manufacturer) was also noted. Figure 4 below compares the average price of a standard bulb across the four bulb technology (incandescent, halogen, CFL, and LED). As this figure shows, standard CFL bulbs that are incentivized by ComEd cost less per bulb on average than similar incandescent and halogen bulbs. Without the ComEd discount, the average price of a non-program standard CFL is about 50 cents more than the price of an incandescent or halogen bulb. LED bulbs that are incentivized by ComEd were still found to be nearly 1.5 times more expensive than incandescent or halogen bulbs. Non-incentivized standard LEDs continue to cost significantly more than all bulb types with an average price of nearly $7 per bulb.

Figure 4: Average Price of Standard Bulbs[11]



Source: Evaluation Team Analysis
* This analysis has been weighted by the bulb weight.
** This analysis represents approximately 7,000 Program Bulbs and 39,000 Non-Program Bulbs. There were a total of 17,000 CFLs, 9,000 LEDs, 15,000 Halogens, and 5,000 Incandescent bulbs.

Figure 5 makes similar pricing comparisons for specialty bulbs (reflector, globe, "other", and all specialty) across the four lighting technologies. PY8 was the first year when specialty CFLs were no longer incentivized through the program. As this table shows, incandescent reflector bulbs are still significantly less expensive than halogen, CFL or LED reflector bulbs. Even with the ComEd incentive, LED reflectors are nearly four times more expensive than an incandescent reflector and approximately 1.5 times the cost of their CFL and halogen counterparts. For globe shaped bulbs, the ComEd discount brings the average LED bulb cost down below that of CFLs, but still about 1.5-2 times more costly than halogen or incandescent globes. When comparing the overall specialty bulb pricing of program versus non-program bulbs, program LEDs are about a third more expensive than CFLs, 60 percent more than halogen bulbs, and almost four times higher than the average cost of incandescent bulbs.

[11] This is a per bulb price, not per package.

Figure 5: Average Price of Specialty Bulbs

Source: Evaluation Team Analysis
* This analysis has been weighted by the bulb weight.
** This analysis includes the following approximate number of bulbs: Reflector - 1,200 Program, 17,000 Non-Program, Globe - 160 Program and 4,300 Non-Program, Other - 430 Program and 7,000 Non-Program. There were a total of approximately 2,000 CFLs, 6,500 LEDs, 5,700 Halogens, and 16,000 Incandescent Specialty bulb packages.

Materials Present in Stores

During the shelf survey, the evaluation team also recorded the types of lighting informational materials present in the program stores, along with the source of those materials. As shown in Table 6, 16 of the stores visited had information about the CFL incentives, provided by either ComEd, the retailer, or the manufacturer, and 14 had information about LED incentives. Ten stores were found to have general information about LED or CFL bulbs, while only seven stores had materials explaining lumens, four had information on proper CFL disposal, and only three had information on the EISA regulations. ComEd material was the most commonly available material across the majority of categories.

Table 5. In-Store Informational Materials Present

Informational Materials Present	ComEd Materials	Retailer Materials	Manufacturer Materials	Total
Information on CFL Discounts	16	7	2	16
Information on LED Discounts	13	7	3	14
Information on CFL Bulbs	6	5	8	10
Information on LED Bulbs	7	5	6	10
Information on Proper CFL Disposal	3	2	0	4
Explanation of Lumens	6	4	6	7
Information on EISA Regulations	3	2	2	3

Source: PY8 Shelf Survey

End Cap Product Selection

Across the 25 stores where shelf surveys were conducted we found 110 end caps displaying light bulbs. Endcaps were much more likely to contain energy efficient bulbs, with 45 percent of endcap bulbs being LEDs and 40 percent being CFLs. Roughly one-third of the LEDs found in end-caps were discounted by ComEd (ComEd discounted bulbs made up 16 percent of all bulbs found in endcaps). Of these 110 endcaps inventoried, 75 (68 percent) contained standard bulbs, followed by 26 that were reflectors (24 percent), and the remaining 9 percent were other types of specialty bulbs (including globes).

Average Package Size

The evaluation team also reviewed the average number of bulbs per package across the various bulb types, as well as program versus non-program bulbs. The results, shown in Table 7 below, illustrate that as one might expect program and non-program LEDs (both standard and specialty) were more frequently sold in smaller pack sizes (average bulbs per package was between 1.2 and 1.6) likely due to their higher price points and thus the cost of a multi-packs potentially being off-putting.

Table 6: Average Number of Bulbs per Package[12]

Bulb Type	Standard	Globe	Reflector	Other
CFL	3.6	1.7	1.8	1.8
Program CFLs	3.9	-	-	-
Non-Program CFLs	3.4	1.7	1.8	1.8
LED	1.6	1.2	1.3	1.3
Program LEDs	1.5	1.5	1.2	1.3
Non-Program LEDs	1.7	1.2	1.3	1.3
Halogen	3.6	2.2	2.0	1.9
Incandescent	2.3	2.0	3.5	2.4

Source: PY8 Shelf Survey

[12] Weight used for this analysis does not include the package adjustment factor as we are looking at the quantity of bulbs per pack.

7.6.4 PY8 Process Memo

NAVIGANT

Itron

230 Horizon Drive
Suite 101B
Verona, WI 53593

Memorandum

Date: June 6, 2016

To: Vince Gutierrez, ComEd

CC: Jennifer Morris, ICC Staff

From: Amy Buege and Vanessa Arent, Itron; Navigant Evaluation Team

RE: ComEd PY8 Residential Lighting Discounts In-Store Intercepts Process Results

This memo presents the process findings from the analysis of the PY8 in-store intercepts survey. The overall goal of the process evaluation of the PY8 Residential Lighting Discounts program was to assess the impact of program processes (e.g., the mechanics of how the program was implemented) on ComEd's residential customers who participated in the program and to examine the state of the retail lighting market in ComEd service territory. In this component of the study, we examined the effectiveness of program marketing with respect to the current levels of familiarity with, and usage of, efficient lighting technologies, and awareness of ComEd sponsored lighting discounts. We also examined key consumer considerations when purchasing household lighting and barriers keeping customers from purchasing CFL and LED lighting technologies.

Summary of Key Process Findings

Finding 1. Customer bulb type preference. From PY7 to PY8 there has been a dramatic shift in the purchasing behavior among intercept respondents towards LEDs and away from CFLs and incandescent bulbs. This shift to LEDs is likely closely tied to the high level of LED awareness (85 percent in PY8, the significant increase in program LED offerings1 and the rapidly declining LED prices. Despite all of this LED progress, only half of customers who were aware of LEDs went on to purchase LEDs primarily due to their cost (price continues to be reported as the largest barrier to LED purchase).

Finding 2. Prior Usage of High Efficiency Bulbs by Program Participants. The majority of program participants had prior experience with high efficiency bulbs. Ninety-four percent of program CFL purchasers reported they had previously installed CFLs in their home or business and 73 percent of program LED purchasers reported they had installed LEDs in their home or business.

Finding 3. Installation of LEDs. LEDs are most frequently being purchased to replace incandescent or CFL bulbs (56 percent of survey respondents reported the LEDs would replace incandescent bulbs and 30 percent reported they would replace CFLs) and many customers are increasing their immediate energy and bill savings by using these LEDs to replace less efficient bulbs that are still in working order.

Finding 4. Awareness of ComEd's Residential Lighting Discounts Program Incentives. While the majority of customers thought the CFL and LED in-store prices were low, customer awareness that the bulbs were discounted by ComEd was low (only 34 percent of program bulb purchasers were aware they were purchasing bulbs discounted by ComEd).

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[1] In PY8, more than 200 LED models were incentivized through the program across the four program retailers where intercepts were conducted, compared to 50 LED models in PY7.

Finding 5. Awareness and influence of program marketing materials. The majority of customers surveyed were unaware of in-store efficient lighting materials provided by ComEd (63 percent), however customers who had seen these materials reported they were highly influential in their decision to purchase efficient lighting. During demonstration events customers reported greater awareness of marketing materials and more frequent interaction with store employees who could offer information on energy efficiency lighting.

Finding 6. Purchasing Intentions. The majority of respondents planned to purchase lighting when they entered the store (81 percent) and most of these respondents purchased the type of bulbs they had originally planned to buy. Customers who had not planned to purchase bulbs upon entering the store, primarily purchased LEDs and CFLs.

Finding 7. Purchasing Influences. Customers purchasing CFLs and LEDs both reported two of the top three factors influencing their purchase were: the energy used by the bulbs and the longevity of bulbs. The other top factor reported for CFL purchasers was the price of the CFLs, while for LED purchasers it was the light quality that LEDs produce.

Finding 8. Barriers to CFL purchase. Customers purchasing incandescent or halogen bulbs reported their primarily barriers to purchasing CFLs were aesthetic reasons – including their look and fit in fixtures, light color and quality, and flicker –as well as a preference for LEDs. Because customers largely disliked CFLs for aesthetic reasons they also reported a low likelihood of purchasing CFLs if their prices were equal to or lower than other bulb types available for purchase.

Finding 9. Barriers to LED purchase. The primary barriers reported to LED purchase included their cost and a lack of awareness or knowledge of LEDs, both are factors that can be overcome through continued program incentives, marketing, and education.

Recommendations

Recommendation 1. The evaluation team recommends that ComEd continue to promote and expand program LED offerings, while shrinking CFL offerings. Customers have reported cost and lack of familiarity with LEDs are their greatest barriers to purchasing LEDs, which are both barriers that can be diminished by expanding program LED offerings and marketing. While the primarily barriers to CFL purchasing are aesthetic reasons which cannot be diminished by the program or overcome by increasing incentives.

Recommendation 2. Work to increase customer awareness of in-store program marketing and educational materials. Although customer awareness of program materials was low, those who were aware of the materials reported that they were highly influential in their decision to purchase efficient lighting. Respondents who were aware of the materials reported that they saw them most often on shelves in the lighting aisle and during demonstration events.

Recommendation 3. Increase customer awareness of the potential lifetime cost savings from using LEDs compared to other less efficient bulb types. Despite paying a higher upfront cost for LEDs, LED purchasers seem to be aware that the longevity and efficiency of LEDs will save them money over the lifetime of the bulb, compared to other bulb types. Educating non-LED purchasers of the potential lifetime cost savings may encourage more of them to make the higher initial investment in LEDs.

In-Store Intercept Surveys

The process findings presented in this memo are based on the data collected during 828 in-store intercept surveys completed as part of the PY8 Residential Lighting Discounts program evaluation.

These surveys were conducted within the aisles of program retailers with customers who had selected one or more package of medium-screw based bulbs for purchase and who agreed to participate in the survey. Key bulb characteristics (such as bulb type, bulb shape and program or non-program bulb) were recorded at the start of the survey and were used to determine which batteries of survey questions would be asked of the respondent. In the majority of instances, the bulb characteristics were recorded accurately, however there were a number of instances where a standard bulb was misclassified as a specialty bulb or a program bulb was misclassified as a non-program bulb. Prior to our analysis of the survey data these misclassifications were corrected, however because respondents were asked questions based on their bulb type, a number of survey questions were skipped for misclassified customers.

Table 1 shows the distribution of in-store intercept respondent's bulb purchases by retailer type. This table is at a bulb level so all respondents' bulb purchases, both program and non-program, are included. This table is not weighted and so represents the distribution of customers surveyed. Since non-program bulb sales are not available to the evaluation team, this data represents the best approximation available for the types of bulbs (program and non-program) being purchased at the largest program retailers.

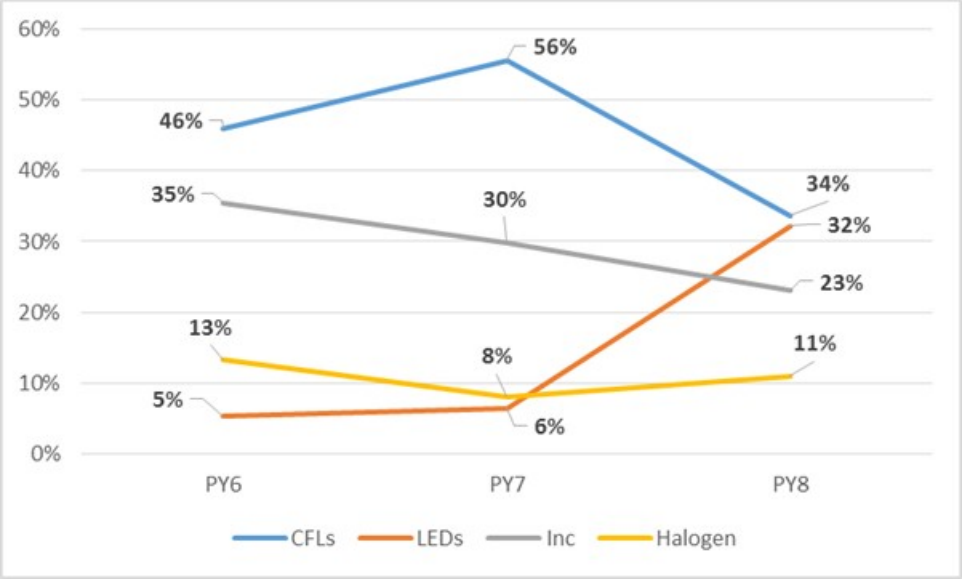
Table 1. Distribution of PY8 In-Store Intercept Respondent Bulb Purchases by Retailer Type

Program vs. Non-Program	Bulb Type	Big Box		DIY		Warehouse		Total	
		Bulbs Sold	%	Bulbs Sold	%	Bulbs Sold	%	Bulbs Sold	%
Program Bulbs	Standard CFLs	452	43%	656	21%	292	61%	1,400	31%
	Omni Directional LEDs	142	14%	600	20%	62	13%	804	18%
	Directional LEDs	62	6%	183	6%	97	20%	342	7%
	Total	656	63%	1,439	47%	451	95%	2,546	56%
Non-Program Bulbs	Incandescent	188	18%	868	28%	0	0%	1,056	23%
	Halogen	157	15%	337	11%	12	3%	506	11%
	Non-program CFLs	23	2%	116	4%	0	0%	139	3%
	Non-Program LEDs	21	2%	296	10%	12	3%	329	7%
	Total	389	37%	1,617	53%	24	5%	2,030	44%

Source: Evaluation Team Analysis

In PY8, the type of bulbs purchased by intercept respondents shifted dramatically. As Figure 1 below shows, PY8 intercept respondents purchased significantly more LEDs and fewer CFLs than in PY7, meanwhile the trajectory for incandescent purchases continued to decline and halogen bulb purchases remained fairly steady.

Figure 1. Distribution of In-store Intercept Purchases by Bulb Type



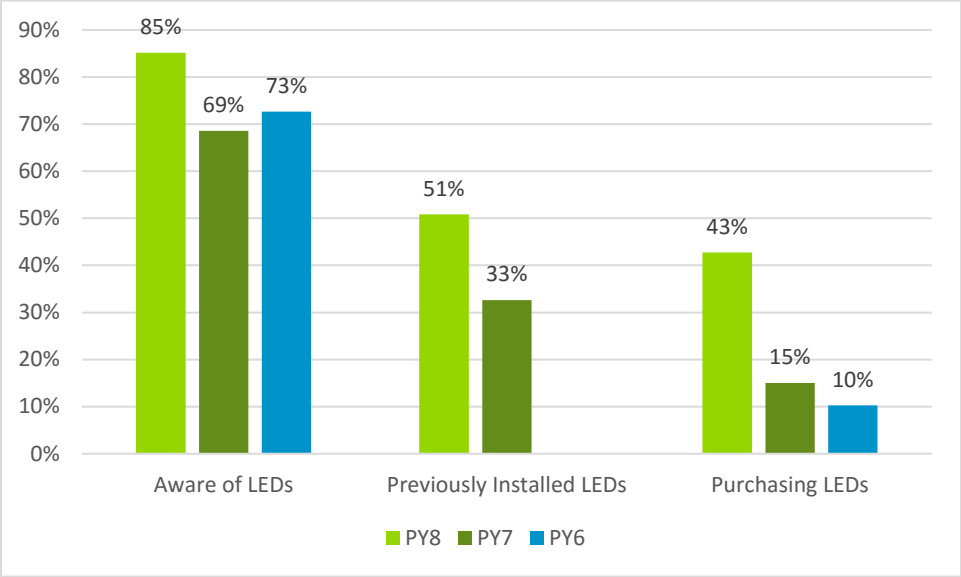
Source: Evaluation Team Analysis

Prior Usage and Familiarity with High Efficiency Bulbs

As customers have reported greater awareness and prior experience with LEDs year after year, the portion of respondents choosing to purchase LEDs has also grown. The greatest growth in PY8 is seen in the percentage of customers purchasing LEDs, minimizing the portion of customers who were aware of LEDs but not purchasing them. The growth in LED purchases is likely attributable to ComEd's increased LED offerings and the significant decline in LED prices in PY8 (due to both incentives and a general reduction in market prices for LEDs). Based on the PY8 Goals Tracker, ComEd is incentivizing more than 200 LED models across the four program retailers where intercepts were conducted, compared to PY7 when ComEd incentivized approximately only 50 LEDs models. From PY6 to PY8 LED prices also declined significantly, with the average price of a non-incentivized standard LED dropping from nearly $17 a bulb to now less than $7 a bulb and the average price of a non-incentivized specialty LED dropping from $26 to $13. Despite the increased incentives and declining prices for LEDs, PY8 intercept respondents continued to report that the greatest barrier to purchasing LEDs continues to be cost, which will be discussed in more detail in the barriers section below.

Figure 2 below shows the percentage of customers who are aware, have prior experience, and were purchasing LEDs in PY6 through PY8.

Figure 2. Distribution of Respondents Who Were Aware of LEDs, Had Previously Installed LEDs, and were Purchasing LEDs[2]



Source: PY8 In-Store Intercept Survey

During the intercept surveys program bulb purchasers were asked if they had any CFLs or LEDs installed in their homes or businesses at the time of the survey. As shown in Table 2, nearly all program CFL purchasers reported they had CFLs installed in their homes (93%) and roughly three-quarters of the program LED purchasers reportedly had LEDs installed in their homes.

Table 2. Current Installation of CFLs and LEDs in Homes and Businesses

Current Installation?	CFL		LED	
	Home	Business	Home	Business
Yes	93%	100%	74%	60%
No	7%	0%	25%	40%
Don't Know	0%	0%	1%	0%
N	152	5	241	10

Source: PY8 In-Store Intercept Survey

LED purchasers were asked what type of bulb would be replaced with the LEDs they were purchasing, and as shown in
Table 3, over half reported that the LEDs would replace an incandescent bulb. The second most frequently reported bulb being replaced was a CFL.

[2] PY6 is not included in this table as previous installation of LEDs was only asked of customers not purchasing LEDs. The PY7 and PY8 responses reflect non-LED and program LED purchasers.

Table 3. Bulb Type Replaced by LED Being Purchased

Bulb Type Replaced by LED	Omni-directional LED	Directional LED
Incandescent	57%	52%
CFL	34%	18%
LED	5%	6%
Halogen	1%	15%
Don't Know	7%	14%
N	205	65

Source: PY8 In-Store Intercept Survey

In an effort to maximize immediate energy and bill savings, the majority of respondents purchasing CFLs and LEDs reported they planned to install the bulbs to replace less efficient bulbs that were still in working order (70 percent of LED purchasers and 50 percent of CFL purchasers reported that some or all of the bulbs they were purchasing would replace bulbs that were still in working order).

Effectiveness of Program Marketing

In-store intercept respondents who were purchasing program bulbs were asked if they knew that they were purchasing incentivized bulbs and if so, if they knew the incentive was provided by ComEd. Similar to previous program years, the responses showed that awareness of both the lighting discounts and that ComEd was the provider of the discounts continues to be moderate among both CFL and LED program bulb purchasers. As shown in Table 4, 60 percent of PY8 respondents reported knowing they were purchasing incentivized bulbs, which is close to the percentage reported in PY7 (57 percent). The level of discount awareness was highest at Big Box stores, and as one might expect, awareness of the discount was marginally higher for surveys conducting during demonstration events (64 percent) than it was for surveys conducted during non-demonstration event periods (58 percent).

Table 4. Program Participants' Self-Reported Awareness of Lighting Discounts[3]

Aware of program discount	Overall	CFL Purchasers	LED Purchasers	Big Box	DIY	Warehouse
Yes	60%	57%	61%	72%	58%	44%
No	39%	43%	37%	28%	41%	52%
Don't know	1%	0%	2%	0%	1%	4%
N	403	158	251	94	257	52

Source: PY8 In-Store Intercept Survey

Fifty-seven percent of the respondents who were aware of the discount knew that the incentive was provided by ComEd. Therefore, only 34 percent (57% * 60% = 34%) of PY8 program participants were aware they were purchasing ComEd discounted bulbs. Program participants who were not aware of the discount were asked if they thought the bulb prices were low and the majority thought they were (84 percent reported the prices were low for CFLs, 60 percent reported they were low for LEDs).

[3] This table shows the percentage of purchasers who knew bulbs were discounted, but not necessarily that the discount was provided by ComEd.

As shown in Table 5, both program and non-program bulb purchasers primarily learned about the ComEd discount from a ComEd sticker on the shelf (48 percent) or through other program marketing materials in the store (21 percent).

Table 5. Respondents Top 5 Reported Source of ComEd Discount Awareness

Source of ComEd Discount Awareness	Purchasing Program Bulbs	Not Purchasing Program Bulbs	Overall
ComEd sticker on the shelf	52%	39%	48%
Saw marketing materials in the store	19%	23%	21%
Saw a retail lighting demonstration	14%	22%	16%
Read about it in ComEd Bill	5%	10%	7%
Store employee	5%	4%	5%
N	145	69	214

Source: PY8 In-Store Intercept Survey

All intercept respondents who were purchasing program bulbs were asked whether they had seen any information or displays about efficient lighting in the store. Table 6 shows that the majority of respondents (61 percent) reported they had not seen any in-store information, with Big Box and Warehouse store program bulb purchasers reporting the lowest levels of awareness.

Table 6. Program Purchaser Self-Reported Awareness of In-Store Efficient Lighting Materials

Awareness of In-store Efficient Lighting Materials	Overall	CFL	LED	Big Box	DIY	Warehouse
Yes	37%	31%	45%	25%	42%	28%
No	61%	67%	53%	72%	56%	71%
Don't know	2%	2%	2%	3%	1%	1%
N	828	231	354	197	559	72

Source: PY8 In-Store Intercept Survey

Demonstration events have been effective in increasing customer awareness of in-store marketing materials — 75 percent of customers shopping during a demonstration event reported seeing in-store energy efficiency information compared to 19 percent of respondents shopping during a non-demonstration period. Customers shopping during a demonstration event were also more aware that the information was provided by ComEd (72 percent versus 32 percent).

Demonstration events also have been effective in increasing customer interaction with store employees who may provide information about efficient lighting and the ComEd program offerings.[4] During demonstration events, 43 percent of program bulb purchasers reported they received information from a store employee about efficient lighting, compared to only 5 percent during a non-demonstration period.

As shown in Table 7, over half of the program bulb purchasers who received in-store efficient lighting information reported the materials were extremely influential. Overall, the LED purchasers rated the

[4] Customers who reported that they received information from a store employee likely spoke with a CLEAResult representative, who are often confused for a store employee by intercept respondents.

influence of the materials higher than CFL purchasers, and respondents shopping in Big Box stores reported they were more influential than those shopping at DIY or Warehouse stores.

Table 7. Self-Reported Influence of In-store Efficient Lighting Materials

Level of Influence	Overall	CFL	LED	Warehouse	Big Box	DIY
Not Very Influential (0 to 3)	23%	27%	21%	8%	3%	28%
Moderately Influential (4 to 6)	19%	19%	18%	15%	10%	21%
Extremely Influential (7 to 10)	58%	52%	61%	77%	87%	50%
Average Score	6.5	6.0	6.7	7.5	8.7	5.9
N[5]	176	47	130	13	30	133

Source: PY8 In-Store Intercept Survey

Customer Purchasing Decisions

The influence of in-store materials (including marketing materials, bulb prices, demo events, etc.) on customers' bulb selections can be seen by comparing customers' purchasing plans against their eventual purchases. Table 8 shows that the majority (81 percent) of respondents planned to purchase bulbs prior to entering the store and these customers rarely selected a bulb type different from their plan. Among these customers who planned to purchase bulbs prior to entering the store (n=673), 31 percent reported they planned to buy LEDs exclusively; 20 percent planned to buy CFLs exclusively; 33 percent planned to buy bulbs other than CFLs and LEDs; and 16 percent were not sure what type of bulb they would buy or reported they would buy a mix of bulb types. As shown in the table below, customers who planned on purchasing at least one non-efficient bulb followed through with their plan less frequently than those who planned on purchasing at least one efficient bulb, and often choose CFLs or LEDs when they strayed from their plan. The majority of customers who did not plan to purchase bulbs when they entered the store eventually purchased CFLs or LEDs.

[5] Includes one respondent who responded "Don't Know" to this question about the level of influence of the in-store materials.

Table 8. Purchase Intentions versus Actual Purchases

Purchasing Intentions	(n = 828)
Planned on purchasing light bulbs prior to entering the store	81%[6]
Customers who planned on purchasing at least one LED bulb, eventually purchased…	**(n = 229)**
LEDs Only	90%
CFLs Only	3%
A mix of LEDs, CFLs and/or Other Non-Efficient Bulbs	6%
Non-Efficient Bulbs Only	1%
Customers who planned on purchasing at least one CFL bulb, eventually purchased…	**(n = 155)**
CFLs Only	87%
LEDs Only	4%
A mix of LEDs, CFLs and/or Other Non-Efficient Bulbs	7%
Non-Efficient Bulbs Only	1%
Customers who planned on purchasing at least one non-efficient bulb eventually purchased…	**(n = 225)**
Non-Efficient Bulbs Only	82%
LEDs and/or CFLs Only	12%
A mix of Efficient and Non-Efficient Bulbs	6%
Customers who did not plan on purchasing bulbs when they entered the store…	**(n = 155)**
LEDs Only	48%
CFLs Only	34%
Mix of Efficient + Non-Efficient Bulbs	19%

Source: PY8 In-Store Intercept Survey

Respondents who purchased efficient bulbs were asked about the most and least important factors that influenced their decision to purchase CFLs and LEDs and the distribution of their responses are shown in Table 9 and Table 10 below. In PY8, the three most influential factors in a customer's decision to purchase CFLs were the price, the energy usage, and the longevity of the CFL.

[6] When the customers who reported that they planned on purchasing a lightbulb when they entered the store were asked what type of bulb they planned to buy, 13% (n=89) said "Don't know" or "Other" and did not specify the bulb type.

Table 9. Factors Influencing CFL Purchase Decisions

Influence Factor	Most Important	Least Important
The purchase price of CFLs	23%	18%
The energy used by CFLs	23%	9%
How long the CFLs will last	19%	30%
The light quality that CFLs produce	16%	11%
The monthly bill savings resulting from using CFLs	15%	9%
The environmental impact of using CFLs	3%	15%

Source: PY8 In-Store Intercept Survey

The three most influential factors customers reported for their decision to purchase LEDs were the energy usage, the longevity, and the light quality that LEDs produce. Although the percentage of respondents purchasing LEDs has increased each year as LED prices have decreased, price was only the fourth most important factor in their purchase decision. Upon further investigation we found that price was significantly more important to those who had not planned to purchase LEDs when they entered the store, than to those who had planned to purchase LEDs (27% of customers who did not plan to purchase LEDs when they entered the store ranked price as the most important factor, compared to only 12% of customers who planned to purchase LEDs when they entered the store).

Table 10. Factors Influencing LED Purchase Decisions

Influence Factor	Most Important	Least Important
The energy used by LEDs	28%	5%
How long the LEDs will last	23%	25%
The light quality that LEDs produce	19%	9%
The purchase price of LEDs	18%	22%
The monthly bill savings from using LEDs	11%	12%
The environmental impact of using LEDs	2%	27%

Source: PY8 In-Store Intercept Survey

Barriers to CFL and LED Use

Seventy-two percent of the customers completing the in-store intercept survey (all of whom were purchasing light bulbs) did not purchase CFL bulbs and chose to purchase incandescent or halogen bulbs instead. Nearly all of these customers reported that they did not consider purchasing CFLs when they entered the store primarily because they do not like the quality or aesthetics of CFLs (46 percent) or preferred or needed another bulb type (33 percent).[7] Price was not reported as a primary barrier to CFL use, and customers purchasing incandescent or halogen bulbs reported a low likelihood (likelihood score of 3 on a scale of zero to 10 where zero is not at all likely and 10 is extremely likely) of purchasing CFLs if their price was equal to or less than the price of incandescent or halogen bulbs. This indicates that continuing to incentivize or further reduce the price of CFLs would not encourage the majority of incandescent and halogen bulb purchasers to switch to CFLs because the primary barriers reported cannot be diminished by the program.

[7] Ninety percent of customers who did not purchase CFLs (n=597) did not consider purchasing CFLs when they entered the store.

Fifty-seven percent of the respondents who completed the in-store intercept survey did not purchase any LED bulbs. Customers who purchased only non-efficient bulbs were also asked if they considered purchasing LED bulbs when they entered the store and 86 percent said had not. The top reasons these respondents provided for not purchasing LEDs, as shown in Table 11, were that LEDs are too expensive (30 percent), they did not know enough about LEDs or were not aware of them prior to the survey (23 percent), or another specialty bulb type was needed (18 percent). Although price was a primary barrier to LED purchase, respondents who reported LEDs were too expensive reported only a moderate likelihood (a 6 on a scale of 0 to 10) of purchasing an LED if it was the same price or lower than the price of the incandescent, halogen, or CFL bulb. This indicates that the other reasons the customers reported for not purchasing LEDs, including lack of information or awareness of LEDs and the need for other bulb types, are also important barriers to LED use that need to be addressed and can be impacted through increased LED marketing and education and a continued focus on a wide variety of program offerings.

Table 11. Top Barriers to LED Purchase

Reasons for not buying LEDs	Overall	DIY	Big Box	Warehouse[8]
LEDs are too expensive	30%	33%	25%	50%
Lacking knowledge/Awareness of LEDs	23%	17%	38%	0%
Needed other specialty bulb (dimmable, 3-way, etc.)	18%	14%	28%	0%
Accustomed to other bulb types	11%	13%	6%	50%
Don't like the way LEDs fit or look in fixtures	9%	9%	11%	0%
Dislike the light quality/color of LEDs	8%	9%	7%	0%
N	246	172	72	2

Source: PY8 In-Store Intercept Survey

Summary

The lighting market is in a state of flux and with the assistance of programs such as ComEd's is rapidly shifting towards LEDs and away from CFLs and non-efficient bulbs. The program has helped increase efficient bulb offerings in retail stores, reduce CFL and LED prices, and educate the market place on the benefits of installing CFLs and LEDs in their homes and businesses for immediate energy usage and bill savings. Cost is still the greatest barrier to LED purchase among incandescent and halogen purchasers, along with lack of knowledge and the need for other bulb types, all of which are barriers the program can influence via incentives, increased offerings, and marketing. Conversely, the primary barriers to CFL use were primarily aesthetic reasons that cannot be overcome by the program. Similar to past program years, customer awareness of ComEd's Residential Discounts Lighting program continues to be moderate with only roughly one-third of program participants reporting they were aware they were purchasing ComEd discounted bulbs. Demonstration events have been successful in building customer awareness of the program, providing them with efficient lighting materials, and influencing them to purchase program bulbs.

[8] Few warehouse store respondents are included in the barriers to purchase analysis because the majority of Warehouse store respondents purchased LED bulbs.

7.6.5 PY8 In-Store Intercepts Memo

NAVIGANT

Itron

230 Horizon Drive
Suite 101B
Verona, WI 53593

Memorandum

Date: March 19, 2016

To: All Interested Parties in Illinois

CC: Vince Gutierrez, ComEd;
Jennifer Hinman Morris, ICC Staff,
Jeff Erickson, Randy Gunn, Josh Arnold and Rob Neumann; Navigant Consulting

From: Amy Buege and Vanessa Arent; Navigant Evaluation Team

RE: PY8 ComEd Residential Lighting Program In-store Intercepts Results Memo

This memo presents the PY8 ComEd Residential Lighting Program evaluation research impact parameter estimates resulting from analysis of the PY8 in-store intercepts survey. This memo is intended to provide ComEd with a preliminary review of the in-store intercept data analysis and the resulting parameter estimates that will eventually be used to calculate the PY8 evaluation research savings estimates, as well as update the deemed parameter estimates included in future versions of the IL TRM.

The preliminary[1] evaluation research impact parameter estimates presented in this memo include:

- Installation Rates
- Leakage Rate
- Residential/Non-residential Installation Location Split

The PY8 Residential Lighting net-to-gross (NTG) results were presented in a memo delivered to ComEd on February 9th, 2016.

When the PY8 program ends (on May 31, 2016) and the PY8 program tracking data is finalized, the evaluation team will use the PY8 tracking data to estimate the final PY8 bulb sales, the associated delta watt estimates, and to reweight the parameters included in this memo, as well as the NTG estimates, to make them reflective of the distribution of bulbs sold through ComEd's PY8 Residential Lighting program. These parameters, along with the deemed parameters found in the IL TRM v4.0,[2] will be used to calculate the PY8 verified savings and evaluation research impacts.

Preliminary PY8 Parameter Estimates

Table 1 below presents the preliminary impact parameter findings from the analysis of the PY8 in-store intercept surveys. This table includes the PY8 evaluation research impact parameter estimates by bulb type alongside confidence/relative precision levels (one-tailed) around the gross parameter

[1] These parameter estimates are labeled as "preliminary" since all weighting done to estimate these parameters is based upon the most recent goals tracker spreadsheets which have forecasted and program year-to-date bulb sales. When the final PY8 tracking data is available (in July 2016), these parameter estimates will be updated based on actual PY8 sales.

[2] Hours of Use, Peak CF, and Energy and Demand Interactive Effects will also be weighted based upon the final program tracking data and the deemed or evaluated Res/Nonres split.

estimates based on the PY8 intercept surveys completed. The derivation of the PY8 parameter estimates is provided in the sections below. The installation rates provided in the following table are weighted by program retailer type based on the forecasted PY8 bulb sales data in the goals tracker document provided by the implementation contractor. The final PY8 report will include updated PY8 installation rates that are weighted based on the final PY8 bulb sales data. The final PY8 report will also include the final 3-year rolling average program leakage, installation, and Res/Nonres split estimates that are eligible for future updates to the IL TRM and are derived based on the parameter estimates shown in the table below.

Table 1. PY8 Gross Impact Parameter Estimates

Parameter Estimate	Bulb Type	PY8 n	Preliminary PY8 Estimate	Relative Precision @ 90% one-tailed CI
Installation Rate	Standard CFL	167	84%	6%
	Omni LED	228	90%	4%
	Directional LED	100	93%	4%
Leakage (% installed in ComEd Service Territory)	Standard CFL	158	0.0%	0%
	Omni LED	190	1.6%	2%
	Directional LED	62	2.8%	4%
Res/NR Split	Standard CFL	158	98%/2%	5%
	Omni LED	187	98%/2%	2%
	Directional LED	59	90%/10%	9%

Source: Evaluation Team Analysis

In-store Intercept Surveys

The PY8 the evaluation team completed 832 in-store intercept surveys, 32 more than planned, with customers purchasing program and non-program medium screw-based (MSB) light bulbs from program retailers. The targeted sample size of 800 was determined to allow for a large enough sample of completed surveys with customers who were purchasing each program bulb type -- standard CFLs, and omni-directional and directional LEDs -- to allow for the estimation of program impact parameters by bulb type. In PY8, specialty CFLs were no longer incentivized through the program.

In total, 828 of the 832 in-store intercept surveys were included in the analysis dataset. Four surveys were dropped since the customer was not purchasing a MSB bulb. Out of the 828 surveys, 459 (55%) were completed with customers purchasing one or more program bulbs, and 400 (48%) were completed with customers purchasing one or more non-program bulbs.[3] In total, 4,576 MSB bulbs were purchased by the customers included in the analysis. Table 2 below provides the distribution of the number of program and non-program bulbs purchased by survey respondents.

In PY8, intercept survey respondents purchased higher percentages of LED bulbs than in PY7 (LED bulbs made up 32% of bulb sales in PY8 but only 6% in PY7) and lower percentages of CFL and incandescent bulbs (CFL purchases dropped from 55% in PY7 to 34% in PY8, and incandescent bulb purchases dropped from 30% in PY7 to 23% in PY8). Halogen bulb purchases among intercept respondents increased slightly, from 8% of bulb sales in PY7 to 11% in PY8.

[3] Thirty-one surveys were completed with customers purchasing both program and non-program bulbs.

Figure 1. Distribution of Intercept Respondents Bulb Purchases by Bulb Type

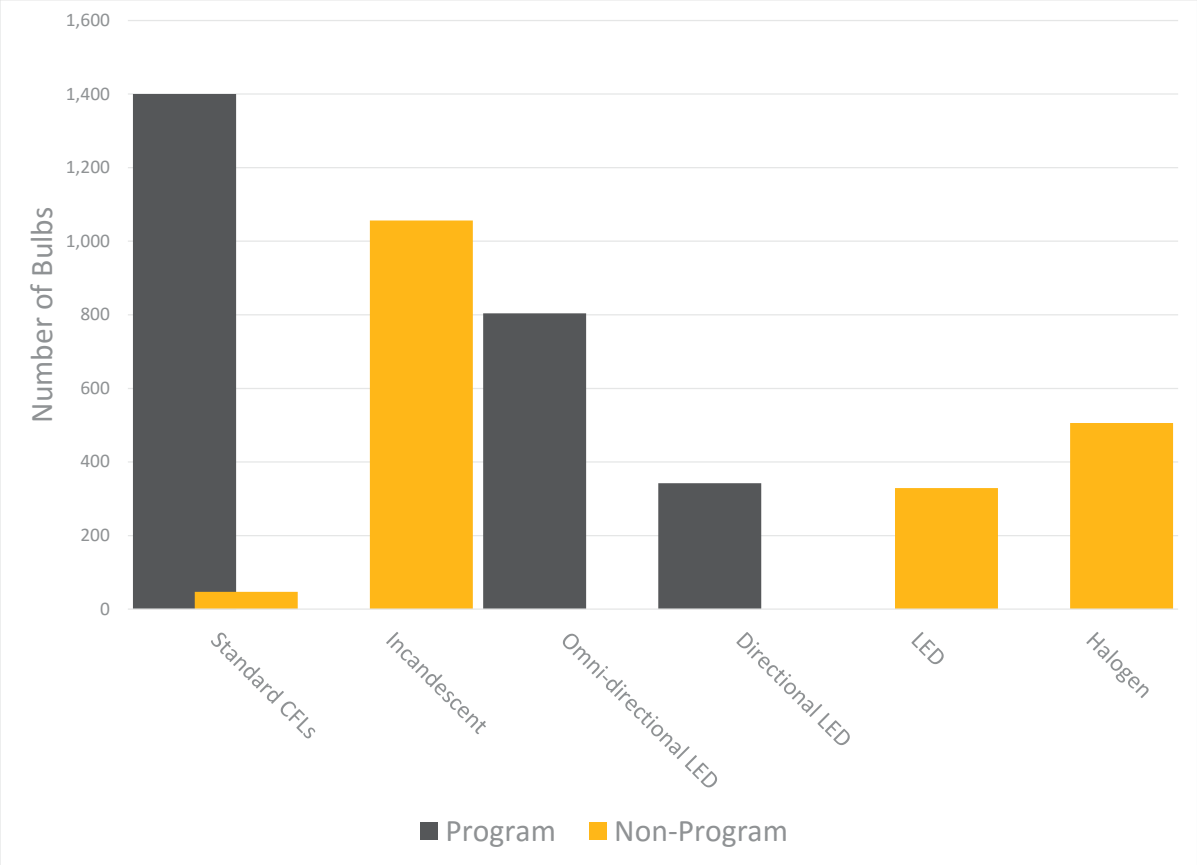


Table 2. Distribution of Intercept Respondents Bulb Purchases by Bulb Type

Program vs. Non Program	Bulb Type	Number of Bulbs Sold	% of Bulbs Sold
Program Bulbs	Standard CFLs	1,400	31%
	Omni-directional LED	804	18%
	Directional LED	342	7%
	Total	2,546	56%
Non-Program Bulbs	Incandescent	1,056	23%
	Halogen	506	11%
	Standard CFL	47	1%
	Specialty CFL	92	2%
	LED	329	7%
	Total	2,030	44%

Source: Evaluation Team Analysis

Table 3 below shows the distribution of PY8 intercept survey respondents by retailer and bulb type purchased. As this table shows, the majority (559, 68%) of intercept respondents were purchasing bulbs at a DIY store[4], and 55% of intercept survey respondents purchased one or more program bulb (the majority being standard CFLs and omni-directional LEDs). The majority of non-program bulb sales continued to be incandescent bulbs. The percent of respondents' purchasing program and non-program bulbs sums to more than 100% since some customers purchased more than one type of bulb.

Table 3. Distribution of PY8 Intercept Respondents by Bulb Type Purchased[5]

Retailer Type	Program Bulbs				Non-Program Bulbs						Total
	Stan CFL	Omni LED	Dir LED	Prog	Stan CFL	Spec CFL	LED	Hal	Inc	Non Prog	
Big Box	64	33	16	110	3	4	10	33	44	91	197
DIY	102	139	48	284	11	27	72	76	133	302	559
Warehouse	24	18	25	65	0	0	5	2	0	7	72
Total	190	190	89	459	14	31	87	111	177	400	828
% Surveyed	23%	23%	11%	55%	2%	4%	11%	13%	21%	48%	100%

Source: Evaluation Team Analysis

In PY8 the majority (93%) of intercept respondents purchasing standard CFLs continued to buy program bulbs. The percentage of LED purchasers buying program bulbs increased from 50% in PY7 to 76% in PY8. This significant increase is most likely attributable to ComEd's increased LED offerings in PY8. Based on the goals tracker, in PY8 ComEd is incentivizing more than 200 LED models across the three program retailers where intercepts were conducted, compared to approximately 50 LEDs models in PY7. Both Big Box and DIY stores increased their offerings by over 300%. In PY7, intercept retailers primarily offered three LED bulb types: A-lamp, slim lamps, and reflectors. In PY8, the types of LEDs offered expanded to include globes, candelabras, a larger variety of reflectors, as well as a much wider range of replacement wattages.

Table 4 below is similar to Table 3 except that it shows the distribution of the quantity of bulbs purchased by PY8 intercept survey respondents. As shown in Table 4, nearly all of the bulbs purchased by Warehouse respondents were program bulbs, while 63% and 47% of the bulbs purchased by Big Box and DIY respondents were program bulbs. The most frequently purchased bulb type among Warehouse and Big Box respondents was CFLs, while LEDs were the most frequently purchased bulb type among DIY respondents.

[4] DIY stores were oversampled for this intercept surveying effort as they made up 41% of the projected PY8 bulb sales (based on the Goals Tracker). Warehouse stores made up 24% of projected PY8 sales (however only one of the Warehouse stores would allow intercepts to occur within their stores) and Big Box Stores made up 16%.

[5] Eighty-four intercept respondents purchased more than one package of bulbs, so some of the 828 respondents are counted in more than one category.

Table 4. Distribution of Bulbs Purchased by PY8 Intercepts Respondents

Retailer Type	Program Bulbs				Non-Program Bulbs						Total
	Stan CFL	Omni LED	Dir LED	Prog	Stan CFL	Spec CFL	LED	Hal	Inc	Non Prog	
Big Box	452	142	62	656	13	10	21	157	188	389	1,045
DIY	656	600	183	1,439	34	82	296	337	868	1,617	3,056
Warehouse	292	62	97	451	0	0	12	12	0	24	475
Total	1,400	804	342	2,546	47	92	329	506	1,056	2,030	4,576
% Surveyed	31%	18%	7%	56%	1%	2%	7%	11%	23%	44%	100%

Source: Evaluation Team Analysis

Table 5 below shows the average number of bulbs purchased by retailer type and bulb type. As this table shows, the average survey respondent at Warehouse stores purchased one bulb more than the average survey respondent at Big Box or DIY stores. On average, standard program CFLs were purchased in the largest quantities.

Table 5. Average Number of Bulbs Purchased by PY8 Intercepts Respondents

Retailer Type	Program Bulbs				Non-Program Bulbs					All Intercepts
	Stan CFL	Omni LED	Dir LED	Pgm	CFL	LED	Hal	Inc	Non Pgm	
Big Box	7.1	4.3	3.9	6.0	3.3	2.1	4.8	4.3	4.3	5.3
DIY	6.4	4.3	3.8	5.1	3.1	4.1	4.4	6.5	5.4	5.5
Warehouse	12.2	3.4	3.9	6.9	0.0	2.4	6.0	0.0	3.4	6.6
Total	7.4	4.2	3.8	5.5	3.2	3.8	4.6	6.0	5.1	5.5

Source: Evaluation Team Analysis

Installation Rates

First year installation rates for ComEd's Residential Lighting program have historically been calculated based on intercept survey respondents' estimates of how many of the bulbs they are purchasing they expected to install within the next six months (this question is asked separately for each bulb type the respondent is purchasing). Analysis of the PY8 intercept data revealed an inconsistency between the responses to the standard CFL installation question and the omni-directional and directional LED installation questions. The wording of the questions differed slightly which we believe may have led to some misunderstanding amongst LED purchasers.[6] As a result, more than 12% of LED purchasers reported they did not expected to install any of the LEDs they were purchasing within the next six months (compared to only 2% of standard CFLs respondents who said they did not plan to install any in this time period). The evaluation team was very skeptical that such a large proportion of LED purchasers would wait more than six months to install the LEDs they

[6] The evaluation team will revise the wording of these question for LED purchasers in the future and will also ask a follow-up question regarding why they are purchasing bulbs in the store on that day if they do not intend to install them for over half a year.

were purchasing, given the cost of LEDs and the low relatively low household LED saturation levels. A careful review of individual respondent's answers to a number of other survey questions supported this hypothesis and therefore the evaluation team recommends revising the IR calculation in PY8 to reflect the assumption that any bulb reported to be installed within a "early replacement" situation (as opposed to "replace on burnout") will be installed within 6 months of purchase.[7] For consistency, we made this revision to estimate the first year installation rate for all three bulb types. This revision led to a slight increase in the IR estimates for standard CFLs and larger increases in IR estimates for omni-directional and directional LEDs (much of which is likely attributable to the misunderstanding discussed above).

The installation rates shown in Table 6 below reflect the revision to the algorithm discussed above. Again in PY8, 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.[8] Respondents purchasing standard CFLs during a demonstration event reported slightly higher installation rates than during non-demo events, however the opposite was true for omni-directional and directional LED purchasers. The table below also shows that again in PY8 installation rates varied by bulb type across all three retailer types. The highest installation rates for standard CFLs and omni-directional LEDs were reported at Warehouse stores and highest installation rates for directional LEDs were reported at Big Box stores. The correlation between the installation rate and the number of bulbs continues to be evident in PY8, however is non-linear in a few cases likely due to small sample sizes. The PY8 recommended IR estimates for each program bulb type are the retailer sales-weighted[9] estimates shown in bold below.

[7] The evaluation team does not believe there is any logical explanation why a customer who states that the efficient bulbs they are purchasing will be used to replace less efficient bulbs that are still in working order would wait more than 6 months to make this retrofit.

[8] 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.

[9] Retailer sales weights are based on the forecasted PY8 sales from the Goals Tracker.

Table 6. Installation Rate Estimates by Bulb Type and Respondent Characteristic

Population		In-store Intercept Installation Rate		
		Standard CFL	**Omni LED**	**Dir LED**
Total – Non-Weighted		84%	87%	94%
Demo vs. Non-Demo	**Demo**	86%	83%	87%
	Non-Demo	83%	89%	96%
Retailer Type	**Big Box**	81%	88%	95%
	DIY	84%	86%	94%
	Warehouse	87%	94%	92%
	Retailer Sales Wt'd	**84%**	**90%**	**93%**
Total Bulbs Purchased	**1**	100%[10]	98%	95%
	2-4	83%	89%	90%
	5-10	76%	85%	92%
	11+	90%[11]	83%	100%[12]

Source: Evaluation Team Analysis

The evaluation research estimated installation rate (IR) for standard CFLs increased from PY7 to PY8 (75% to 84%).[13] For LEDs, the IR declined slightly from an overall average of 99% in PY7 to 90% for omni-directional bulbs and 93% for directional LEDs in PY8.[14] The slight decline in IRs for LEDs is not entirely unexpected as the price of LEDs continues to come down and customers' usage of LEDs (and house-hold saturation) increases. Additionally, the average pack-size of LEDs purchased by survey respondents also increased in PY8 (average omni-directional LED pack-size purchased increased from 1.1 bulbs in PY7 to 2.0 bulbs in PY8 and average directional LED pack size increased from 1.0 in PY7 to 1.4 in PY8),[15] which may also have contributed to the decline in the IRs among omni-directional and directional LED purchasers.

The evaluation team recommends updating the deemed installation rates for CFL and LEDs 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. Table 7 provides three years of CFL evaluation research results and two years of LED evaluation research results for the ComEd program which can be used to as input for future IL TRM updates.

Table 7. 3-Year Average Installation Rate Estimates for ComEd

[10] This result is based on three intercept survey respondents who purchased a single standard CFL bulb.

[11] This rate is driven up by one customer who purchased 96 CFLs and reported all 96 would be installed within the first program year.

[12] This result is based on a sample size of six intercept survey respondents.

[13] The standard CFL IR excluding the "early replacement" bulbs was 78%.

[14] The omni-directional LED IR excluding the "early replacement" bulbs was 77% and the directional LED IR excluding the "early replacement" bulbs was 89%.

[15] In PY7 the majority of program LEDs were sold in single packs.

Program Year	Standard CFLs		Omni-directional LEDs		Directional LEDs	
	Bulbs	1st Year ISR	Bulbs	1st Year ISR	Bulbs	1st Year ISR
PY6	8,965,546	72.6%				
PY7	10,347,580	75.2%	471,710	95.0%	427,824	95.0%
PY8	8,218,282	84.2%	3,585,315	89.7%	2,619,857	93.5%
3-year Weighted Average	-	77.0%	-	90.3%[16]		93.7%[17]

Source: Evaluation team analysis

Program Bulb Leakage Rate

In PY8, the overall leakage rate across bulb types and retailer types was estimated to be 0.9%,[18] which is lower than the leakage rates in previous years (shown in Table 8). In total, only six program LED bulb purchasers reported they planned to install the program LED bulbs that they were purchasing outside of ComEd service territory, and none of the respondents purchasing program standard CFLs reported that they would be installed outside of ComEd's service territory.
Table 8 below, provides additional details about the six respondents who reported the program bulbs would be installed outside of the ComEd territory. As this table shows, four of these six respondents were purchasing program bulbs at retail stores close to the edge ("Outer") of ComEd service territory. When final program tracking data is available, analysis will be conducted to evaluate the percentage of program bulbs sold through stores in these outlying areas to determine if any adjustment to the leakage rate is appropriate.

Table 8. Bulb Type, Quantity, and Location of Leakage Purchases and Reason for Leakage

#	Bulb Type	Bulbs	Retailer Type	Retailer City	Location Type	Leakage Reason
1	Dir LED	2	WH	Matteson, IL	Outer	Does not live in the area
2	Dir LED	2	WH	Rockford, IL	Outer	Does not received ComEd Bill
3	Dir LED	3	DIY	Machesney Park, IL	Outer	Does not received ComEd Bill
4	Omnidir LED	1	DIY	Chicago, IL	Urban	Does not live in the area
5	Omnidir LED	4	DIY	Machesney Park, IL	Outer	Does not live in the area
6	Omnidir LED	8	DIY	Broadview, IL	Suburban	Does not live in the area

Source: PY8 In-store Intercept Surveys

Table 9 below shows the results of the evaluation team's leakage research from PY3 though PY8, as well as 3- and 5-year rolling average leakage rates.

[16] Only two years of results are available and thus this result is not a 3-year weighted average.
[17] Only two years of results are available and thus this result is not a 3-year weighted average.
[18] The 90/10 confidence interval on the leakage estimate based on the intercept surveys is a lower bound of 0.1% and an upper bound of 1.7%.

Table 9. Leakage Rates for PY3 through PY8[19]

Program Year	Standard CFLs		Specialty CFLs		LEDs		Total	
	Bulbs	Leak-age	Bulbs	Leak age	Bulbs	Leak age	Bulbs	Leak-age
PY3	**9,893,196**	0.7%	1,217,723	0.7%	0	n/a	11,110,919	0.7%
PY4	**11,419,752**	3.7%	1,097,670	3.7%	24,919	3.7%	12,517,422	3.7%
PY5	**9,633,227**	2.3%	1,197,896	2.3%	28,230	2.3%	10,831,123	2.3%
PY6	**8,965,546**	2.6%	2,125,179	2.6%	0	n/a	11,090,725	2.6%
PY7	**10,347,580**	3.3%	989,999	2.3%	899,534	0.0%	11,337,579	3.0%
PY8	**6,275,846**	0.0%	0	--	5,938,049	1.9%	12,213,895	0.9%
3-year Average[20]	**-**	2.2%	-	2.5%	-	1.7%	-	2.1%
5-year Average[21]	-	2.6%	-	2.7%	-	1.7%	-	2.5%

Source: Evaluation team analysis

As this table shows, the results over time have been relatively stable over time. In PY8 leakage has declined, driven primarily by fewer program standard CFL respondents reporting they were planning to install their bulbs outside of ComEd service territory.

Residential/Non-residential Installation Location Split

In PY8, respondents reported that 98% of the standard CFLs that they purchased through the program would be installed in residential locations, which is up from 94% in PY7. PY8 respondents also reported that 98% of the omni-directional LEDs and 90% of the directional LEDs purchased through the program would be installed in residential locations.

Respondents who indicated they planned to install the program bulbs they were purchasing in 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. Respondents who reported the program bulbs would be installed within an individual unit/room were classified as residential installations, whereas bulbs going into common areas were classified as nonresidential installations. Table 10 shows the percentage of program bulbs (by bulb type) reportedly being installed in residential versus non-residential locations, along with the type of non-residential locations reported.

Table 10. Program Bulb Installation Location[22]

[19] The PY8 bulb counts are based on the forecasted bulb sales from the Goals Tracker. These bulb sales values will be updated with the final values in the final report.

[20] Three-year weighted average of the final installation rates for PY6 through PY8, weighted by the total number of bulbs sold each year.

[21] Five-year weighted average of the final installation rates for PY4 through PY8, weighted by the total number of bulbs sold each year.

[22] This analysis excludes respondents who were purchasing more than the program's limit of 16 incentivized bulbs in a single purchase. Within the analysis dataset were two respondents who planned to purchase large quantities of program bulbs (30 and 96) to install in non-residential locations. The program limits the number

Installation Location	CFLs			Omni Directional LEDs			Directional LEDs		
	n	Bulbs	%	n	Bulbs	%	n	Bulbs	%
Residential Installs	**152**	**932**	**98.1%**	**183**	**774**	**97.9%**	**53**	**158**	**90.3%**
Non-Res Installs	**2**	**18**	**1.9%**	**5**	**17**	**2.1%**	**4**	**17**	**9.7%**
Apartment / MF Common	--	--	--	2	5	0.6%	1	3	1.7%
Offices	1	6	0.6%	--	--	--	1	3	1.7%
Retail/Services	1	12	1.3%	1	1	0.1%	1	2	1.1%
Middle / High School	--	--	--	--	--	--	1	9	5.1%
Public Assembly	--	--	--	1	4	0.5%	--	--	--
Other	--	--	--	1	7	0.9%	--	--	--

Source: Evaluation team analysis

The evaluation team also recommends updating the deemed Res/Non-res splits for CFL and LEDs annually based on a rolling 3-year average from the most recent evaluation research findings. This insures the deemed Res/Non-res splits are reflective of the most recent data available. Table 11 provides three years of CFL evaluation research results and two years of LED evaluation research results for the ComEd program which can be used to as input for future IL TRM updates.

Table 11. 3-Year Average Res/Non-Res Split Estimates

Program Year	Standard CFLs		Omni-directional LEDs		Directional LEDs	
	Bulbs	Res/ Nonres	Bulbs	Res/ Nonres	Bulbs	Res/ Nonres
PY6	8,965,546	95% / 5%				
PY7	10,347,580	94% / 6%	471,710	98% / 2%	427,824	98% / 2%
PY8	8,218,282	98% / 2%	3,585,315	98% / 2%	2,619,857	90% / 10%
3-year Weighted Average	-	96% / 4%	-	98% / 2%[23]		91% / 9%[24]

Source: Evaluation team analysis

of program bulb which can be purchased in part to reduce the likelihood that customers will buy Residential Lighting program bulbs to install in non-residential locations. Including large purchases volumes (which exceed the program limit) likely inaccurately inflate the proportion of program bulbs going into nonresidential locations. It should be noted that because these surveys take place within the lighting aisle we are unsure whether these customers were actually allowed to make these planned purchases at checkout due to exceeding the program limit (store personnel may have either directed them to the pro-desk or declined to make the entire sale).

[23] Only two years of results are available and thus this result is not a 3-year weighted average.

[24] Only two years of results are available and thus this result is not a 3-year weighted average.

7.6.6 PY8 Preliminary Impacts Memo

NAVIGANT

30 S Wacker Street
Chicago, IL 60647
www.navigant.com

To: Vincent Gutierrez, ComEd

CC: Jennifer Morris, ICC Staff

Patricia Plympton, Josh Arnold, Jeff Erickson, Randy Gunn, Rob Neumann, Navigant

From: Amy Buege, Vanessa Arent, Navigant Team

Date: October 4, 2016 (revised from the September 28th version)

Re: ComEd PY8 Residential Lighting Discounts Program Preliminary Impacts Memo

This memo presents the preliminary impact estimates for the PY8 ComEd Residential Lighting Discounts program evaluation. This memo provides ComEd with a preliminary review of program impacts and parameters used to calculate the PY8 verified savings estimates prior to the draft evaluation report.

Findings Summary

Navigant's preliminary review of the ex-ante calculations for the ComEd PY8 Residential Lighting Discounts program, including the carryover savings from bulbs sold in PY6 and PY7 and installed in PY8, resulted in verified gross energy savings of 476,819 MWh, and verified gross demand savings of 453.5 MW, including 57.2 Summer Peak MW, and 70.7 Winter Peak MW. The preliminary verified gross kWh realization rate for bulbs sold in PY8[1] is 117%. The evaluation team applied the measure-level net-to-gross ratio (NTGR) to the verified gross savings to calculate total verified net savings of 313,360 MWh, and verified gross demand savings of 297.1 MW, including 37.8 Summer Peak MW, and 46.5 Winter Peak MW.[2] Table 1 presents a summary of the overall findings; Table 2 and Table 3 present the preliminary savings estimates by portfolio (EEPS vs IPA) and Table 4 presents the preliminary energy and demand savings by bulb type.

[1] Excluding carryover as the evaluation team does not currently have an ex ante estimate of PY8 carryover from ComEd.
[2] Includes carryover.

Table 1. ComEd PY8 Verified Savings Preliminary Review

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Ex Ante Gross Savings[3]	326,151	NR[4]	NR	NR
Verified Gross Program Savings[5]	381,167	359.3	46.3	57.9
Verified Gross Carryover Savings	95,652	94.2	10.9	12.7
Verified Gross PY8 Savings	476,819	453.5	57.2	70.7
Verified Net Program Savings	254,854	240.0	31.0	38.8
Verified Net Carryover Savings	58,506	57.1*	6.8	7.7*
Verified Total PY8 Net Savings	313,360	297.1	37.8	46.5

NR = Not Reported
* = Numbers do not sum exactly from Tables 2 and 3 due to rounding.

Table 2. ComEd PY8 Verified Savings Preliminary Review - IPA

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Ex Ante Gross Savings	326,151	NR	NR	NR
Verified Gross Program Savings	381,167	359.3	46.3	57.9
Verified Gross Carryover Savings	7,842	6.9	1.0	1.2
Verified Net Program Savings	254,854	240.0	31.0	38.8
Verified Net Carryover Savings	4,234	3.7	0.5	0.7
Verified Total PY8 Net Savings	259,088	243.7	31.5	39.5

NR = Not Reported

Table 3. ComEd PY8 Verified Savings Preliminary Review – EEPS (Carryover Only)

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Verified Gross EEPS Carryover Savings	87,810	87.2	9.9	11.5
Verified Net EEPS Carryover Savings	54,272	53.3	6.3	7.1

[3] PY8 Bulb Sales only, excludes carryover.
[4] Estimates of demand and summer and winter peak demand are not reported in the tracking database provided to the evaluation team. Additionally, tracking data only reports gross savings.
[5] PY8 Bulb Sales only, excludes carryover.

Table 4. ComEd PY8 Verified Savings Preliminary Review by Lamp Type (excluding Carryover)

Savings Category	Standard CFL	Omni-Directional LED	Directional LED	LED Fixtures	Total
Ex-Ante Gross Energy Savings (MWh)	157,023	96,317	60,679	12,132	326,151
Verified Gross Energy Savings (MWh)	167,132	122,231	79,621	12,183	381,167
Verified Gross Demand Savings (MW)	159.6	116.2	70.7	12.9	359.3
Verified Net Energy Savings (MWh)	98,608	89,228	58,124	8,893	254,854
Verified Net Demand Savings (MW)	94.2	84.8	51.6	9.4	240.0
Gross Verified / Ex-Ante Realization Rates	106%	127%	131%	100%	117%

Lamp Type Detail

There were no misclassifications of lamp types within the tracking data; therefore, there were no differences in unit sales for any lamp type category between ex-ante and verified savings. The evaluation team identified inconsistencies between the "Lamp_category" field and the bulb description field. As an example, 3,896,077 Omni-directional A-lamp LEDs are categorized as either "LED PAR 20" or "LED MR16 8w" in the "Lamp_category" field. Although the lamp category field was not used by the evaluation team in our analysis, it should be corrected in the event it is being used by ComEd personnel.

Tables 5 – 8 present the ex-ante and Navigant verified savings parameters for each of the lamp type categories. ComEd's PY8 tracking data for Residential Lighting did not include demand savings, demand savings parameters, net savings, or net-to-gross ratios. As a result, these ex-ante parameters are marked as "not reported" (NR) in the ex-ante columns of the tables.

ComEd and the evaluation team used slightly different methods (in terms of the order of operations) to calculate the total program savings. The evaluation team calculated savings for the residential and non-residential bulbs separately and then added them together to calculate total program savings. This calculation method produces slightly different (typically higher) results than ComEd's method of calculating a Res/NonRes weighted average for each parameter and using that estimate to calculate program savings.

Standard CFLs

Table 5 compares the parameters used to calculate the ex-ante and Navigant verified gross and net savings estimates for Standard CFLs. As shown in Table 4, the realization rate for Standard CFLs was 106%, indicating the evaluation team has estimated the savings from program Standard CFLs in PY8 as 6% higher than reported by ComEd. An explanation of the comparison for each of the parameters is provided below.

Delta Watts

There were no differences between the record-level ex-ante and verified "WattsBase" or "WattsEE" values for Standard CFLs, and therefore the resulting Delta Watts estimates were also the same.

Residential/Non-residential Installation Location Split

While the Res/NonRes split was not explicitly stated in the tracking data, it appears that the ex-ante energy savings for Standard CFLs were calculated using weighted averages of the residential and non-residential hours of use (HOU), waste heat factor (WHFe), and installation rate values, using a 96/4 Res/NonRes split as a weight, which is correct per IL TRM v4. As mentioned earlier, the order of operations applied by ComEd was different from what was applied by the evaluation team, however in both cases (ex-ante and verified) a Res/NonRes split of 96/4 was applied.

Hours of Use

One factor contributing to the high realization rate for Standard CFLs was the higher HOU parameter used to estimate verified savings. The ex-ante HOU parameter was lower than the verified savings parameter due to the ex-ante assumption the residential HOU parameter pertaining to "Residential and in-unit Multi Family" locations (759 hours) being applied for all residential installations. To estimate verified savings, the evaluation team utilized the "Unknown" residential HOU parameter (847 hours) which corresponds to bulbs installed in interior or exterior locations.[6]

Installation Rate

The weighted average of the Res/NonRes installation rates (ISR) used to calculate the verified energy savings differs from the ex-ante estimate included in the tracking data. The discrepancy has a marginal impact on the savings (-2%). The source of the ex-ante ISR (0.747) is unknown. The evaluation team utilized the residential and nonresidential ISR for Standard CFLs found in IL TRM v4. The result is a Res/NonRes weighted ISR equal to 96%*0.732+4%*0.71 = 0.731.

Waste Heat Factor

There were no differences between the ex-ante and verified residential or nonresidential WHFe parameters applied to estimate program savings.

Leakage

The verified savings estimate assumes a leakage rate of 3% based on findings from the PY7 residential lighting evaluation, while the ex-ante savings did not incorporate a leakage factor. Including this parameter in the verified saving calculation contributed to the overall realization rate.

[6] Standard CFLs installed in residential locations could be installed in either indoor or outdoor locations and therefore the "unknown" installation location HOU parameter was applied by the evaluation team to estimate the verified savings. The bulb location description in the TRM HOU table should be clarified (to "Residential Interior and in-unit Multi Family) so that the 759 HOU estimate is for interior residential installations, the 2,475 HOU estimate is for exterior residential installations, and the 847 HOU is for unknown (interior or exterior) residential installation locations (per the PY5/PY6 logger study report, Table 5: Average Daily Hours of Use by Room Type).

Table 5. Standard CFL PY8 Parameter Comparison, Ex-Ante vs. Navigant Verified

Value, Navigant	Value, Ex-Ante	Parameter	Source	Deemed / Other	Discrepancy
46	46	WattsBase	IL TRM v4, 5.5.1	Deemed	-
14	14	WattsEE	Tracking Data	Other	-
0.96	NR	% Res	IL TRM v4, 5.5.1	Deemed	-
0.04	NR	% NonRes	IL TRM v4, 5.5.1	Deemed	-
0.03	NA	Leakage	PY7 Report	Other	Yes
847	873[7]	Hours - Res	IL TRM v4, 5.5.1	Deemed	Yes
3,612[8]		Hours - NonRes	IL TRM v4, 4.5	Deemed	
1.06	1.07[9]	WHFe - Res	IL TRM v4, 5.5.1	Deemed	-
1.31		WHFe – NonRes	IL TRM v4, 4.5	Deemed	-
0.732	0.747[10]	ISR - YR1 - Res	IL TRM v4, 5.5.1	Deemed	Yes
0.71		ISR - YR1 - NonRes	IL TRM v4, 4.5	Deemed	
1.11	NR	WHFd - Res	IL TRM v4, 5.5.1	Deemed	-
1.53	NR	WHFd - NonRes	IL TRM v4, 4.5	Deemed	-
0.081	NR	Summer CF - Res	IL TRM v4, 5.5.1	Deemed	-
0.66	NR	Summer CF - NonRes	IL TRM v4, 4.5	Deemed	-
0.116	NR	Winter CF - Res	Memo to ComEd[11]	Other	-
0.55	NR	Winter CF - NonRes	Memo to ComEd[12]	Other	-
0.59	NR	NTGR†	Il SAG website	Deemed	-

NR = Not Reported
NA = Not Applied
† A deemed value. Source: "ComEd_NTG_History_and_PY8_Recommendations.xls", found on the IL SAG web site: http://ilsag.info/net-to-gross-framework.html. Accessed: September 2, 2016.

Omni-Directional LEDs

Table 6 compares the parameters used to calculate the ex-ante and Navigant verified gross and net savings estimates for Omni-directional LEDs. As shown in Table 4, the realization rate for Omni-directional LEDs was 127%, indicating the evaluation team has estimated the savings from program Omni-directional LEDs in PY8 as 27% higher than reported by ComEd. An explanation of the comparison for each of the parameters is provided below.

Delta Watts

There were no differences between the record-level ex-ante and verified "WattsBase" or "WattsEE" values for Omni-directional LEDs, and therefore the resulting Delta Watts estimates were also the same.

[7] The tracking data uses an HOU estimate of 873 hours which is a weighted average of the Res (759 hours, residential Interior) and NonRes (3,612 hours, nonresidential Unknown) HOU estimates assuming a 96/4 Res/NonRes Split. Applying the 96/4 split to the verified savings HOU parameters yields a weighted average value of 958 hours.
[8] All of the Navigant verified NonRes parameters in this table are taken from the IL TRM v4, building type = "Unknown".
[9] The tracking data uses an WHFe estimate of 1.07, which is a weighted average of the Res (1.06) and NonRes (1.31) WHFe estimates assuming a 96/4 Res/NonRes Split.
[10] The tracking data uses an ISR estimate of 0.747 which has an unknown source.
[11] Winter Peak Coincidence Factor Recommendation for Residential Lighting to ComEd from evaluation team, dated 2/2/2015.
[12] Winter Peak Coincidence Factor Recommendation for Commercial Lighting to ComEd from evaluation team, dated 2/10/2015.

Residential/Non-residential Installation Location Split

Neither the IL TRM v4 nor the PY8 tracking data explicitly reported a Res/NonRes split for Omni-directional LEDs. However, based upon the ex-ante HOU estimates reported in the tracking data, it appears that ComEd assumed 100% of the Omni-directional LEDs were installed in residential locations. The evaluation team sees no reason to assume that all Omni-directional LEDs will be installed in residential locations. Therefore, to estimate the verified savings the Navigant team applied the 96/4 Res/NonRes split, which is consistent with all of the other PY8 lamp types.

Hours of Use

The high realization rate for Omni-directional LEDs was primarily driven by the higher HOU parameter used to estimate verified savings. The ex-ante HOU parameter was significantly lower than the verified savings parameter due to the ex-ante assumption that 100% of Omni-directional LEDs were being installed in residential locations and the residential HOU parameter pertaining to "Residential and in-unit Multi Family" locations (759 hours) being applied to all residential installations. To estimate verified savings, the evaluation team applied the 96/4 Res/NonRes split and utilized the "Unknown" residential HOU parameter (847 hours) which corresponds to bulbs installed in interior or exterior locations.[13]

Installation Rate

The ex-ante savings were calculated using an ISR of 95% for Omni-directional LEDs sold through the program. The verified ISR applied an ISR of 95% for all bulbs installed in residential locations (96% of sales) and an ISR[14] of 95.7% for all bulbs installed in non-residential locations (4% of sales). This difference led to a very small increase in the overall ISR for Omni-directional LEDs (~0.03%).

Waste Heat Factor

As previously noted, the evaluation team assumed that the Omni-directional program LEDs were installed in both residential and non-residential locations, whereas ComEd assumed that 100% of the Omni-directional LEDs were installed in residential locations. The evaluation team applied the deemed residential WHFe value of 1.06 to 96% of program bulbs and the deemed non-residential WHFe parameter value of 1.31 to the remaining 4% of program bulbs, which resulted in an increase in the verified savings estimate as compared to the ex-ante savings.

Leakage

The verified savings estimate assumes a leakage rate of 3% based on findings from the PY7 residential lighting evaluation, while the ex-ante savings did not incorporate a leakage factor. The inclusion of this parameter in the verified saving calculation contributed to the overall realization rate.

[13] Omni-directional LEDs installed in residential locations could be installed in either indoor or outdoor locations and therefore the "unknown" installation location HOU parameter was applied to estimate the verified savings. The bulb location description in the TRM HOU table should be clarified so that the 759 HOU estimate is for interior residential installations, the 2475 HOU estimate is for exterior residential installations, and the 847 HOU is for unknown residential installation locations (per the PY5/PY6 logger study report, Table 5: Average Daily Hours of Use by Room Type).

[14] Per IL TRM v4. Section 4.5.4 – Nonresidential LED Bulbs and Fixtures.

Table 6. Omni-Directional PY8 Parameter Comparison, Ex-Ante vs. Navigant Verified

Value, Navigant	Value, Ex-Ante	Parameter	Source	Deemed/ Other	Discrepancy
42	42	WattsBase	IL TRM v4, 5.5.8	Deemed	-
10	10	WattsEE	Tracking Data	Other	-
0.96[15]	1.00	% Res	IL TRM v4, 5.5.8	Deemed	Yes
0.04	0.00	% NonRes	IL TRM v4, 5.5.8	Deemed	Yes
0.03	NA	Leakage	PY7 Report	Other	-
847	759	Hours - Res	IL TRM v4, 5.5.8	Deemed	Yes
3,612[16]	NA	Hours - NonRes	IL TRM v4, 4.5	Deemed	Yes
1.06	1.06	WHFe - Res	IL TRM v4, 5.5.8	Deemed	-
1.31	NA	WHFe – NonRes	IL TRM v4, 4.5	Deemed	Yes
0.95	0.95	ISR - YR1 - Res	IL TRM v4, 5.5.8	Deemed	-
0.957		ISR - YR1 - NonRes	IL TRM v4, 4.5	Deemed	Yes
1.11	NR	WHFd - Res	IL TRM v4, 5.5.8	Deemed	-
1.53	NA	WHFd - NonRes	IL TRM v4, 4.5	Deemed	-
0.081	NR	Summer CF - Res	IL TRM v4, 5.5.8	Deemed	-
0.66	NR	Summer CF - NonRes	IL TRM v4, 4.5	Deemed	-
0.116	NR	Winter CF - Res	Memo to ComEd[17]	Other	-
0.55	NR	Winter CF - NonRes	Memo to ComEd[18]	Other	-
0.73	NR	NTGR†	Il SAG website	Deemed	-

NR = Not Reported
NA = Not Applied
† A deemed value. Source: ComEd_NTG_History_and_PY8_Recommendations.xls, found on the IL SAG web site: http://ilsag.info/net-to-gross-framework.html. Accessed: September 2, 2016.

Directional/Other LEDs

Table 7 compares the parameters used to calculate the ex-ante and Navigant verified gross and net savings estimates for Directional/Other LEDs. As shown in Table 4 above, the realization rate for Directional/Other LEDs was 131%, indicating the evaluation team has estimated the savings from program Directional/Other LEDs in PY8 as 31% higher than reported by ComEd. An explanation of the comparison for each of the parameters is provided below.

Delta Watts

One of the primary drivers in the high realization rates for Directional/Other LEDs was related to the assignment of WattsBase in the tracking data for Directional LEDs. The evaluation team used the lumen mapping method to determine the base watts for each bulb in the tracking data based on lumen bins defined in the IL TRM v4. The TRM states that BR30, BR40, and R20 reflector bulbs are exceptions to the general lumen bins defined for reflectors. It appears that the ex-ante savings estimates did not apply this exception and instead mapped the BR30, BR40, and R20 bulbs according to the general reflector

[15] Currently the IL TRM does not include a Res/NonRes split for Omni-Directional LEDs. The evaluation team believes this is an oversight and should be added.
[16] All of the Navigant verified NonRes parameters in this table are taken from the IL TRM v4, building type = “Unknown”.
[17] Winter Peak Coincidence Factor Recommendation for Residential Lighting to ComEd from evaluation team, dated 2/2/2015
[18] Winter Peak Coincidence Factor Recommendation for Commercial Lighting to ComEd from evaluation team, dated 2/10/2015

lumen bins. This resulted in an overall average increase in base wattage values of approximately 6 watts, therefore increasing the resulting average delta watt estimate by a similar magnitude.

Residential/Non-residential Installation Location Split

As previously noted for Directional/Other LEDs, neither the IL TRM v4 nor the PY8 tracking data explicitly reported a Res/NonRes split for Directional/Other LEDs. However, based upon the ex-ante HOU estimates reported in the tracking data, it appears that ComEd also assumed 100% of the Directional/Other LEDs were installed in residential locations. To maintain consistency across the PY8 measures, the evaluation team applied the 96/4 Res/NonRes split to Directional/Other LEDs.

Hours of Use

HOU was another source of the high realization rate for Directional/Other LEDs. The ex-ante HOU parameter was significantly lower than the verified savings parameter due to the ex-ante assumption that 100% of Directional/Other LEDs were being installed in residential locations and the residential HOU parameter pertaining to "Residential Interior and in-unit Multi Family" locations (861 hours) being applied for Directional LEDs. To estimate verified savings, the evaluation team applied the 96/4 Res/NonRes split and utilized the residential HOU parameter for Directional LED (891 hours) which corresponds to bulbs installed in unknown (interior or exterior) locations.[19]

Installation Rate

The ex-ante savings were calculated using an ISR of 95% for Directional/Other LEDs sold through the program. The verified ISR applied an ISR of 95% for all bulbs installed in residential locations (96% of sales) and an ISR of 95.7% for all bulbs installed in non-residential locations (4% of sales). This difference led to a very small increase in the overall ISR for Directional/Other LEDs (~0.03%).

Waste Heat Factor

Similar to Omni-directional LEDs, the evaluation team assumed Directional/Other LEDs were installed in both residential and non-residential locations, whereas ComEd assumed that 100% of the Directional/Other LEDs were installed in residential locations. The evaluation team applied the deemed residential WHFe value of 1.06 to 96% of program bulbs and the deemed non-residential WHFe parameter value of 1.31 to the remaining 4% of program bulbs, which resulted in an increase in the verified savings estimate as compared to the ex-ante savings.

Leakage

The verified savings estimate assumes a leakage rate of 3% based on findings from the PY7 residential lighting evaluation, while the ex-ante savings did not incorporate a leakage factor. The inclusion of this parameter in the verified saving calculation contributed to the overall realization rate.

[19] Directional LEDs installed in residential locations could be installed in either indoor or outdoor locations and therefore the "unknown" installation location HOU parameter was applied to estimate the verified savings. The bulb location description in the TRM HOU table should be clarified so that the 861 HOU estimate is for interior residential installations, the 2475 HOU estimate is for exterior residential installations, and the 891 HOU is for unknown residential installation locations (per the PY5/PY6 logger study report, Table 5: Average Daily Hours of Use by Room Type).

Table 7. Directional/Other PY8 Parameter Comparison, Ex-Ante vs. Navigant Verified

Value, Navigant	Value, Ex-Ante	Parameter	Source	Deemed/ Other	Discrepancy
58	52	WattsBase	IL TRM v4, 5.5.6	Deemed	Yes
9	9	WattsEE	Tracking Data	Other	-
0.96	NR[20]	% Res	IL TRM v4, 5.5.6	Deemed	Yes
0.04	NR	% NonRes	IL TRM v4, 5.5.6	Deemed	Yes
0.03	NA	Leakage	PY7 Report	Other	Yes
891	861	Hours – Reflector	IL TRM v4, 5.5.6	Deemed	Yes
639	639	Hours – Globe[21]	IL TRM v4, 5.5.2	Deemed	-
1190	1190	Hours - Decorative	IL TRM v4, 5.5.2	Deemed	-
3,612[22]	NA	Hours - NonRes	IL TRM v4, 4.5	Deemed	Yes
1.06	1.06	WHFe - Res	IL TRM v4, 5.5.6	Deemed	-
1.31	NA	WHFe - NonRes	IL TRM v4, 4.5	Deemed	Yes
0.95	0.95	ISR - YR1 - Res	IL TRM v4, 5.5.6	Deemed	-
0.957		ISR - YR1 - NonRes	IL TRM v4, 4.5	Deemed	Yes
1.11	NR	WHFd - Res	IL TRM v4, 5.5.6	Deemed	-
1.53	NR	WHFd - NonRes	IL TRM v4, 4.5	Deemed	-
0.094	NR	Summer CF – Reflector	IL TRM v4, 5.5.6	Deemed	-
0.075	NR	Summer CF – Globe	IL TRM v4, 5.5.2	Deemed	-
0.121	NR	Summer CF - Decor	IL TRM v4, 5.5.2	Deemed	-
0.66	NR	Summer CF - NonRes	IL TRM v4, 4.5	Deemed	-
0.134	NR	Winter CF – Reflector	Memo to ComEd[23]	Other	-
0.107	NR	Winter CF – Globe	Memo to ComEd	Other	-
0.173	NR	Winter CF - Decor	Memo to ComEd	Other	-
0.55	NR	Winter CF - NonRes	Memo to ComEd[24]	Other	-
0.73	NR	NTGR†	Il SAG website	Deemed	-

NR = Not Reported
NA = Not Applied
† A deemed value. Source: ComEd_NTG_History_and_PY8_Recommendations.xls, found on the IL SAG web site: http://ilsag.info/net-to-gross-framework.html. Accessed: September 2, 2016.

LED Fixtures

Table 8 below compares the parameters used to calculate the ex-ante and Navigant verified gross and net savings estimates for LED Fixtures. As shown in Table 4, the realization rate for LED Fixtures was 100%, indicating the evaluation team has estimated that the savings from program LED Fixtures in PY8 are approximately the same as the saving reported by ComEd. An explanation of the comparison for each

[20] This parameter was not included in the PY8 tracking data but it appears that the ex-ante estimates were derived assuming 100% of bulbs went into residential locations.
[21] IL TRM v4 does not include HOU or Peak CF estimates for LED globes or directional bulbs therefore CFL specialty bulbs parameters were used in place of them.
[22] All of the verified NonRes parameters in this table are taken from the IL TRM v4, building type = “Unknown”.
[23] Winter Peak Coincidence Factor were estimated using a 43% lift based upon the recommendation for Residential Lighting to ComEd from evaluation team, dated 2/2/2015.
[24] Winter Peak Coincidence Factor Recommendation for Commercial Lighting to ComEd from evaluation team, dated 2/10/2015.

of the parameters is provided below. IL TRM v4 section 5.5.6 is being applied for LED fixtures per the TRM "This measure describes savings from a variety of LED downlight lamp types. This characterization assumes that the LED lamp or **fixture** is installed in a residential location."

Delta Watts

There were no differences between the ex-ante and verified delta watts estimates for LED Fixtures.

Hours of Use

HOU differed between the ex-ante and verified parameter estimates for LED Fixtures. The HOU parameter for the ex-ante savings was the estimate pertaining to "Residential Interior and in-unit Multi Family" locations (861 hours) whereas the verified savings estimate applied an HOU value of 891 hours which corresponds to bulbs installed in unknown (interior or exterior) locations.[25]

Installation Rate

There were no differences between the ex-ante and verified ISR parameter applied to estimate program savings.

Waste Heat Factor

There were no differences between the ex-ante and verified WHFe parameter applied to estimate program savings.

Leakage

The verified savings estimate assumes a leakage rate of 3% based on findings from the PY7 residential lighting evaluation, while the ex-ante savings did not incorporate a leakage factor. The inclusion of this parameter in the verified saving calculation contributed to the overall realization rate.

[25] LED Fixtures installed in residential locations could be installed in either indoor or outdoor locations and therefore the "unknown" installation location HOU parameter was applied to estimate the verified savings. The bulb location description in the TRM HOU table should be clarified so that the 861 HOU estimate is for interior residential installations, the 2475 HOU estimate is for exterior residential installations, and the 891 HOU is for unknown residential installation locations (per the PY5/PY6 logger study report, Table 5: Average Daily Hours of Use by Room Type).

Table 8. LED Fixtures PY8 Parameter Comparison, Ex-Ante vs. Navigant Verified

Value, Navigant	Value, Ex-Ante	Parameter	Source	Deemed/ Other	Discrepancy
57	57	WattsBase	IL TRM v4, 5.5.6	Deemed	-
13	13	WattsEE	Tracking Data	Other	-
0.03	NA	Leakage	PY7 Report	Other	Yes
891	861	Hours	IL TRM v4, 5.5.6	Deemed	Yes
1.06	1.06	WHFe	IL TRM v4, 5.5.6	Deemed	-
1.0	1.0	ISR - YR1	IL TRM v4, 5.5.6	Deemed	-
1.11	NR	WHFd	IL TRM v4, 5.5.6	Deemed	-
0.094	NR	Summer CF	IL TRM v4, 5.5.6	Deemed	-
0.134[26]	NR	Winter CF - Interior	Memo to ComEd	Other	-
0.73	NR	NTGR†	Il SAG website	Deemed	-

NR = Not Reported
NA = Not Applied
† A deemed value. Source: ComEd_NTG_History_and_PY8_Recommendations.xls, found on the IL SAG web site: http://ilsag.info/net-to-gross-framework.html. Accessed: September 2, 2016.

[26] There is no Winter Peak CF for LED fixtures, therefore the Summer Peak CF were applied. These may be conservative estimates as the Winter Peak CF for residential CFLs and LEDs are approximately 43% higher than the Summer Peak CF estimates.