

# Residential ENERGY STAR® Lighting PY7 Evaluation Report

Final

Energy Efficiency/Demand Response Plan:  
Plan Year 7  
(6/1/2014-5/31/2015)

Presented to  
Commonwealth Edison Company

February 13, 2016

Prepared by:

Amy Buege  
Itron, Consulting and Analysis

Vanessa Arent  
Itron, Consulting and Analysis



[www.navigant.com](http://www.navigant.com)



**Submitted to:**

Commonwealth Edison Company  
Three Lincoln Centre  
Oakbrook Terrace, IL 60181

**Submitted by:**

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

**Contact:**

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

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

Disclaimer: This report was prepared by Navigant Consulting, Inc. (Navigant) for Commonwealth Edison Company (ComEd) based upon information provided by ComEd and from other sources. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Navigant nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

## Table of Contents

<b>E.</b>	<b>Executive Summary .....</b>	<b>1</b>
E.1	Program Savings .....	1
E.2	Program Savings by Bulb Type .....	3
E.3	Impact Estimate Parameters for Future Use .....	6
E.4	Program Volumetric Detail .....	6
E.5	Results Summary .....	7
E.6	Findings and Recommendations .....	7
<b>1</b>	<b>Introduction .....</b>	<b>10</b>
1.1	Program Description .....	10
1.2	Evaluation Objectives .....	10
1.2.1	Impact Questions .....	10
1.2.2	Process Questions .....	11
<b>2</b>	<b>Evaluation Approach .....</b>	<b>12</b>
2.1	Overview of Data Collection Activities .....	12
2.2	Verified Savings Parameters .....	12
2.2.1	Verified Gross Program Savings Analysis Approach .....	13
2.2.2	Verified Net Program Savings Analysis Approach .....	13
2.3	Process Evaluation .....	14
<b>3</b>	<b>Gross Impact Evaluation .....</b>	<b>15</b>
3.1	Tracking System Review .....	15
3.2	Program Volumetric Findings .....	16
3.3	Gross Program Impact Parameter Estimates .....	17
3.4	Verified Gross Program Impact Results .....	18
<b>4</b>	<b>Net Impact Evaluation .....</b>	<b>23</b>
4.1	PY7 Program and Carryover Savings Estimate .....	23
4.2	PY8 Carryover Savings Estimate .....	26
<b>5</b>	<b>Process Evaluation .....</b>	<b>28</b>
5.1	Overview of Process Evaluation .....	28
5.2	High-Level Process Findings .....	28
<b>6</b>	<b>Findings and Recommendations .....</b>	<b>30</b>
<b>7</b>	<b>Appendix .....</b>	<b>34</b>
7.1	Evaluation Research Impact Approaches and Findings .....	34

7.1.1	Evaluation Research Gross Impact Parameter Estimates .....	34
7.1.2	Evaluation Research Gross Program Impact Results .....	43
7.1.1	Evaluation Research Net Impact Parameter Estimates.....	43
7.1.2	Evaluation Research Net Impact Results.....	49
7.2	Detailed Process Findings .....	50
7.2.1	Program Bulbs .....	51
7.2.2	Prior Usage of High Efficiency Bulbs by Program Participants .....	52
7.2.3	Effectiveness of Program Marketing .....	53
7.2.4	Customer Purchasing Decisions .....	55
7.2.5	Barriers to CFL and LED Use .....	58
7.2.6	General LED Usage and Familiarity.....	59
7.3	Illinois TRM Recommendations.....	59
7.3.1	Recommendations for Updates to the Illinois TRM.....	60
7.4	NTGR Recommendations .....	61
7.4.1	NTGR Estimate for Future Use .....	61
7.5	PJM Data and Findings.....	62
7.6	Attachments .....	63
7.6.1	PY7 In-Store Intercept Survey Instrument .....	63
7.6.2	PY7 LED NTG Memo .....	85
7.6.3	Winter Peak Coincidence Factor Memo.....	98

## List of Figures and Tables

### Tables:

Table E-1. PY7 Residential ES Lighting Program Electric Savings – Total PY7 Incentivized.....	1
Table E-2. PY7 Residential ES Lighting Program Electric Savings - EEPS.....	2
Table E-3. PY7 Residential ES Lighting Program Electric Savings – IPA.....	2
Table E-4. PY7 Residential ES Lighting Program Electric Savings from Carryover.....	2
Table E-5. PY7 Residential ES Lighting Program Electric Savings from Carryover - EEPS.....	2
Table E-6. PY7 Residential ES Lighting Program Electric Savings from Carryover - IPA.....	3
Table E-7. PY7 Program MWh Results by Measure.....	3
Table E-8. PY7 Program MW Results by Measure.....	4
Table E-9. PY7 Program Summer Peak MW Results by Measure.....	4
Table E-10. PY7 Program Winter Peak MW Results by Measure.....	4
Table E-11. PY7 Carryover MWh Savings Results by Measure.....	5
Table E-12. PY7 Carryover MW Savings Results by Measure.....	5
Table E-13. PY7 Carryover Summer Peak MW Savings Results by Measure.....	5
Table E-14. PY7 Carryover Winter Peak MW Savings Results by Measure.....	5
Table E-15. Impact Estimate Parameters for Future Use.....	6
Table E-16. PY7 Volumetric Findings Detail.....	6
Table E-17. PY7 Verified Savings Results Summary.....	7
Table 2-1. Primary Data Collection Activities.....	12
Table 2-2. Additional Resources.....	12
Table 2-3. Verified Savings Parameter Data Sources.....	14
Table 3-1. Incentivized Program Bulbs by Year, PY3 to PY7.....	16
Table 3-2. PY7 Volumetric Findings Detail.....	17
Table 3-3. PY7 Verified Gross Savings Parameters (continued on next page).....	17
Table 3-4. PY7 Verified Gross Impact Savings Estimates by Measure Type - MWh.....	19
Table 3-5. PY7 Verified Gross Impact Savings Estimates by Measure Type – MW.....	20
Table 3-6. PY7 Verified Gross Impact Savings Estimates by Measure Type – Summer Peak MW.....	20
Table 3-7. PY7 Verified Gross Impact Savings Estimates by Measure Type – Winter Peak MW.....	21
Table 3-8. PY7 Verified Gross Impact Savings from PY5 and PY6 Carryover Bulbs.....	21
Table 3-9. PY7 Total Verified Gross Impact Savings from PY7 Sales and Carryover Bulbs.....	22
Table 4-1. PY7 Verified Net Impact Savings Estimates by Measure Type – MWh.....	23
Table 4-2. PY7 Verified Net Impact Savings Estimates by Measure Type –MW.....	24
Table 4-3. PY7 Verified Net Impact Savings Estimates by Measure Type – Summer Peak MW.....	24
Table 4-4. PY7 Verified Net Impact Savings Estimates by Measure Type – Winter Peak MW.....	25
Table 4-5. PY7 Verified Net Impact Savings from PY5 and PY6 Carryover Bulbs.....	25
Table 4-6. PY7 Total Verified Net Impact Savings from PY7 Sales and Carryover Bulbs.....	26
Table 4-7. PY8 Carryover Savings Estimates by Portfolio.....	27
Table 6-1. Impact Estimate Parameters for Future Use.....	33
Table 7-1. Evaluation Research Gross Savings Parameters (continued on next page).....	35
Table 7-2. PY7 Bulb Sales by Pack Size.....	36

Table 7-3. PY7 Bulb Sales by Type of Retailer.....	37
Table 7-4. Average Delta Watts Value across All Bulbs .....	38
Table 7-5. Installation Rate Estimates by Bulb Type and Retailer.....	38
Table 7-6. Residential HOU and Peak CF Estimates.....	40
Table 7-7. Non-Residential HOU and Peak CF Estimates.....	41
Table 7-8. PY7 Energy and Demand Interactive Effects .....	41
Table 7-9. PY7 Carryover Parameter Sources .....	42
Table 7-10. PY7 Carryover Bulb Estimates.....	42
Table 7-11. PY7 Verified Savings Estimate for Carryover Bulbs .....	43
Table 7-12. PY7 Evaluation Research Gross Impact Savings Estimates .....	44
Table 7-13. NTGR by Bulb Type .....	44
Table 7-14. PY7 FR, Spillover, and NTGR Estimates Compared to Prior Program Years .....	45
Table 7-15. Unweighted Standard CFL Free-Ridership Segmentation Analysis .....	46
Table 7-16. Unweighted Specialty CFL Free-Ridership Segmentation Analysis .....	47
Table 7-17. Standard and Specialty PY7 Bulb Sales used for Analysis Weights .....	48
Table 7-18. Standard and Specialty Weighted Free-Ridership Estimates .....	48
Table 7-19. PY7 Participant Spillover Results – Self-Report Method.....	49
Table 7-20. PY7 Nonparticipant Spillover Results – Self-Report Method.....	49
Table 7-21. PY5 Evaluation Research Net Impact Savings Estimates.....	50
Table 7-22. Distribution of In-Store Intercept Respondent Bulb Purchases by Retailer Type.....	51
Table 7-23. Average Number of Bulbs Purchased per Intercept Respondent by Retailer Type.....	51
Table 7-24. Distribution of PY7 Residential ES Lighting Program Sales across Bulb Types .....	52
Table 7-25. Prior Installation of CFLs and LEDs in Homes and Businesses .....	52
Table 7-26. Program Participants’ Self-Reported Awareness of Lighting Discounts .....	53
Table 7-27. Respondents Self-Reported Method of Learning about ComEd Discounts .....	54
Table 7-28. Program Purchaser Self-Reported Awareness of CFL In-Store Materials .....	54
Table 7-29. Influence of Energy Efficient Lighting In-Store Materials .....	55
Table 7-30. Purchase Intentions versus Actual Purchases .....	56
Table 7-31. Factors Influencing CFL Purchase Decisions .....	57
Table 7-32. Factors Influencing LED Purchase Decisions .....	57
Table 7-33. Barriers to CFL Purchase .....	58
Table 7-34. Barriers to LED Purchase.....	59
Table 7-35. Impact Estimate Parameters for Future Use .....	60
Table 7-36. 3-Year Average Res/Non-Res Split for ComEd .....	61
Table 7-37. 3-Year Average Standard and Specialty Installation Rates for ComEd .....	61
Table 7-38. 3-Year Average Standard and Specialty NTGR Available for Future Use .....	62
Table 7-39. NTGR Parameters Available for Future Use.....	62

## E. Executive Summary

This report presents a summary of the findings and results from Navigant Consulting, Inc.'s (Navigant's) impact and process evaluation of the Residential ENERGY STAR® (ES) Lighting program's seventh program year (PY7).<sup>1</sup> The main goal of this Residential lighting program is to increase the market penetration of energy-efficient lighting within the Commonwealth Edison Company's (ComEd's) service territory by offering incentives for bulbs purchased through various retail channels. The program also seeks to increase customer awareness and acceptance of energy-efficient lighting technologies, as well as proper bulb disposal, through the distribution of educational materials. In PY7, the Residential ES Lighting program offered incentives for the purchase of standard and specialty compact fluorescent lamps (CFLs) and LEDs.

### E.1 Program Savings

Table E-1 summarizes the gross and net electricity savings from the ComEd PY7 Residential ES Lighting program, including the carryover savings resulting from bulbs sold in PY5 and PY6 that are installed in PY7. As this table shows, the total verified net energy savings including carryover and bulbs attributable to both the Energy Efficiency Portfolio Standard (EEPS) and the Illinois Power Agency (IPA) portfolios, is 276,521 megawatt-hours (MWh).<sup>2</sup> Table E-2 and Table E-3 separate the overall PY7 Residential ES Lighting program savings into the portions attributable to the EEPS and IPA portfolios. These two tables do not include PY7 carryover savings (savings from bulbs purchased during PY5 and PY6 that are installed in PY7). PY7 carryover savings are presented in Table E-4, Table E-5, and Table E-6.

**Table E-1. PY7 Residential ES Lighting Program Electric Savings – Total PY7 Incentivized**

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Ex Ante Gross Program Savings <sup>3</sup>	349,611	n/a	n/a	n/a
Verified Gross Program Savings	350,816	303.3	40.4	40.7
Verified Net Program Savings	213,377	184.6	24.5	24.7
Verified Net Carryover Savings	63,144	53.9	7.1	7.2
Verified Total PY7 Net Savings	276,521	238.5	31.6	31.9

Source: ComEd tracking data and evaluation team analysis

<sup>1</sup> PY7 began June 1, 2014, and ended May 31, 2015.

<sup>2</sup> Net savings attributable to the EEPS portfolio is 269,425 MWh and the IPA portfolio is 7,097 MWh. All IPA savings are attributable to PY6 Specialty CFLs that are part of PY7 carryover.

<sup>3</sup> The ex ante gross savings estimates shown in this table and the following EEPS and IPA tables have not been adjusted by the gross realization rate which applies the first year installation rate and interactive effect estimates.

**Table E-2. PY7 Residential ES Lighting Program Electric Savings - EEPS**

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Ex Ante Gross Savings	349,611	n/a	n/a	n/a
Verified Gross Savings	350,816	303.3	40.4	40.7
Verified Net Savings	213,377	184.6	24.5	24.7

Source: ComEd tracking data and evaluation team analysis

**Table E-3. PY7 Residential ES Lighting Program Electric Savings – IPA**

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

Source: ComEd tracking data and evaluation team analysis

**Table E-4. PY7 Residential ES Lighting Program Electric Savings from Carryover**

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Ex Ante Gross Savings	139,195	n/a	n/a	n/a
Verified Gross Savings	111,787	95.5	12.6	12.8
Verified Net Savings	63,144	53.9	7.1	7.2

Source: ComEd tracking data and evaluation team analysis

**Table E-5. PY7 Residential ES Lighting Program Electric Savings from Carryover - EEPS**

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Ex Ante Gross Savings	129,255	n/a	n/a	n/a
Verified Gross Savings	101,847	87.4	11.3	11.3
Verified Net Savings	57,776	49.5	6.4	6.4

Source: ComEd tracking data and evaluation team analysis



**Table E-6. PY7 Residential ES Lighting Program Electric Savings from Carryover - IPA<sup>4</sup>**

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Ex Ante Gross Savings	9,940	n/a	n/a	n/a
Verified Gross Savings	9,940	8.2	1.3	1.4
Verified Net Savings	5,368	4.4	0.7	0.8

Source: ComEd tracking data and evaluation team analysis

## E.2 Program Savings by Bulb Type

Table E-7 summarizes the electricity savings from the ComEd PY7 Residential ES Lighting program by program bulb type. As this table shows, standard CFLs made up 77 percent of the total verified net savings, specialty CFLs made up 9 percent of the savings, and light-emitting diodes (LEDs) made up the remaining 14 percent of the savings. Table E-8 and Table E-9 contain similar findings for megawatts (MW) and peak MW savings. These tables do not include any PY7 carryover savings (savings from bulbs purchased during PY5 and PY6 that are installed in PY7). PY7 carryover savings are presented in Table E-11 through Table E-14.

**Table E-7. PY7 Program MWh Results by Measure<sup>5</sup>**

Savings Category	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
Ex Ante Gross Savings (MWh)	268,702	39,395	15,850	25,664	349,611
Unadjusted Gross Savings (MWh)	350,605	41,185	16,641	23,940	432,370
Verified Gross Installed Savings Realization Rate <sup>6</sup>	78%	88%	99%	102%	81%
Verified Gross Savings (MWh)	273,717	36,155	16,476	24,468	350,816
Net-to-Gross Ratio* (NTGR)	0.60	0.51	0.75	0.75	0.61
Verified Net Savings (MWh)	164,230	18,439	12,357	18,351	213,377

\* A deemed value from "ComEd\_NTG\_History\_and\_PY8\_Recommendations\_20015\_02\_24\_v2\_clean-1.xls," available on the IL SAG website: <http://ilsag.info/net-to-gross-framework.html>

Source: ComEd tracking data and evaluation team analysis

<sup>4</sup> PY7 carryover savings are all attributable to both the EEPs and IPA portfolio (only specialty bulbs purchased in PY6 are attributable to the IPA portfolio).

<sup>5</sup> These tables do not include PY7 carryover savings.

<sup>6</sup> The verified gross installed savings realization rate adjusts the unadjusted gross savings estimates to account for the first year installation rate and any interactive effects associated with the measure. It is different from them ex ante realization rate which is the ratio of the ex post verified savings estimate over the ex ante savings estimate.

**Table E-8. PY7 Program MW Results by Measure**

Savings Category	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
Ex Ante Gross Demand Reduction (MW)	n/a	n/a	n/a	n/a	n/a
Unadjusted Gross Demand Reduction (MW)	328.9	36.9	15.6	22.0	403.4
Verified Gross Installed Savings Realization Rate <sup>6</sup>	72%	82%	92%	95%	75%
Verified Gross Demand Reduction (MW)	237.8	30.3	14.4	20.9	303.3
Net-to-Gross Ratio* (NTGR)	0.60	0.51	0.75	0.75	0.61
Verified Net Demand Reduction (MW)	142.7	15.5	10.8	15.7	184.6

\* A deemed value from "ComEd\_NTG\_History\_and\_PY8\_Recommendations\_20015\_02\_24\_v2\_clean-1.xls," available on the IL SAG website: <http://ilsag.info/net-to-gross-framework.html>

Source: ComEd tracking data and evaluation team analysis

**Table E-9. PY7 Program Summer Peak MW Results by Measure**

Savings Category	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
Ex Ante Gross Summer Peak Demand Reduction (MW)	n/a	n/a	n/a	n/a	n/a
Unadjusted Gross Summer Peak Demand Reduction (MW)	36.8	4.5	1.7	2.5	45.6
Verified Gross Installed Savings Realization Rate <sup>6</sup>	85%	94%	108%	111%	89%
Verified Gross Summer Peak Demand Reduction (MW)	31.5	4.3	1.9	2.8	40.4
Net-to-Gross Ratio* (NTGR)	0.60	0.51	0.75	0.75	0.61
Verified Net Summer Peak Demand Reduction (MW)	18.9	2.2	1.4	2.1	24.5

\* A deemed value from "ComEd\_NTG\_History\_and\_PY8\_Recommendations\_20015\_02\_24\_v2\_clean-1.xls," available on the IL SAG website: <http://ilsag.info/net-to-gross-framework.html>

Source: ComEd tracking data and evaluation team analysis

**Table E-10. PY7 Program Winter Peak MW Results by Measure**

Savings Category	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
Ex Ante Gross Winter Peak Demand Reduction (MW)	n/a	n/a	n/a	n/a	n/a
Unadjusted Gross Winter Peak Demand Reduction (MW)	42.4	6.0	2.0	3.3	53.8
Verified Gross Installed Savings Realization Rate <sup>6</sup>	73%	82%	92%	95%	76%
Verified Gross Winter Peak Demand Reduction (MW)	30.8	4.9	1.9	3.1	40.7
Net-to-Gross Ratio* (NTGR)	0.60	0.51	0.75	0.75	0.61
Verified Net Winter Peak Demand Reduction (MW)	18.5	2.5	1.4	2.4	24.7

\* A deemed value from "ComEd\_NTG\_History\_and\_PY8\_Recommendations\_20015\_02\_24\_v2\_clean-1.xls," available on the IL SAG website: <http://ilsag.info/net-to-gross-framework.html>

Source: ComEd tracking data and evaluation team analysis

**Table E-11. PY7 Carryover MWh Savings Results by Measure**

Savings Category	Standard CFLs	Specialty CFLs	Other <sup>7</sup>	Total
Ex Ante Gross Savings (MWh)	n/a	n/a	n/a	n/a
Verified Gross Savings (MWh)	98,179	13,507	102	111,787
Net-to-Gross Ratio (NTGR)	0.57*	0.53*	0.53*	0.56*
Verified Net Savings (MWh)	55,993	7,097	54	63,144

\* Based on evaluation research findings.

Source: ComEd tracking data and evaluation team analysis

**Table E-12. PY7 Carryover MW Savings Results by Measure**

Savings Category	Standard CFLs	Specialty CFLs	Other <sup>7</sup>	Total
Ex Ante Gross Demand Reduction (MW)	n/a	n/a	n/a	n/a
Verified Gross Demand Reduction (MW)	83.9	11.5	0.1	95.5
Net-to-Gross Ratio (NTGR)	0.57*	0.53*	0.53*	0.56*
Verified Net Demand Reduction (MW)	47.8	6.0	0.0	53.9

Based on evaluation research findings.

Source: ComEd tracking data and evaluation team analysis

**Table E-13. PY7 Carryover Summer Peak MW Savings Results by Measure**

Savings Category	Standard CFLs	Specialty CFLs	Other <sup>7</sup>	Total
Ex Ante Gross Summer Peak Demand Reduction (MW)	n/a	n/a	n/a	n/a
Verified Gross Summer Peak Demand Reduction (MW)	10.9	1.7	0.0	12.6
Net-to-Gross Ratio (NTGR)	0.57*	0.53*	0.53*	0.57*
Verified Net Summer Peak Demand Reduction (MW)	6.2	0.9	0.0	7.1

\* Based on evaluation research findings.

Source: ComEd tracking data and evaluation team analysis

**Table E-14. PY7 Carryover Winter Peak MW Savings Results by Measure**

Savings Category	Standard CFLs	Specialty CFLs	Other <sup>7</sup>	Total
Ex Ante Gross Winter Peak Demand Reduction (MW)	n/a	n/a	n/a	n/a
Verified Gross Winter Peak Demand Reduction (MW)	10.8	2.0	0.0	12.8
Net-to-Gross Ratio (NTGR)	0.57*	0.53*	0.53*	0.56*
Verified Net Winter Peak Demand Reduction (MW)	6.2	1.0	0.0	7.2

\* Based on evaluation research findings.

Source: ComEd tracking data and evaluation team analysis

<sup>7</sup> The “Other” measure category includes LED bulbs, and LED and CFL fixtures.

### E.3 Impact Estimate Parameters for Future Use

In the course of our PY7 study, the evaluation team conducted research on parameters used to estimate program impacts. Some of these parameters are eligible for inclusion in future versions of the Illinois Statewide Technical Reference Manual for Energy Efficiency (Illinois TRM) or as recommended values for the net-to-gross ratio (NTGR) framework. Table E-15 shows the evaluation team's parameter updates available for future use. The evaluation team also completed in-store intercepts as part of its PY7 research designed (among other things) to calculate NTGR values for LED program bulbs. The LED value in the following table is from that research.

**Table E-15. Impact Estimate Parameters for Future Use**

Parameter	Value	Data Source
Res/Non-Res Split	96% / 4% CFLs	3-year rolling average (PY5-PY7) of Evaluation Research Findings
	98%/2% LEDs	PY7 Evaluation Research Findings
1 <sup>st</sup> Year Installation Rate	74.7% Standard CFL 91.4% Specialty CFL	3-year rolling average (PY5-PY7) of Evaluation Research Findings
	95.0% LEDs	PY7 Evaluation Research Findings
NTGR	0.64 Standard CFL 0.43 Specialty CFL	PY7 Evaluation Research Findings
	0.73 LEDs	PY7 Evaluation Research Findings

Source: Evaluation team analysis

### E.4 Program Volumetric Detail

The PY7 Residential ES Lighting program incentivized 10,347,580 standard CFLs, 989,999 specialty CFLs, 471,710 omni-directional LEDs, and 472,824 directional LEDs, as shown in Table E-16

**Table E-16. PY7 Volumetric Findings Detail**

Participation	Total	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs
PY7 Incentivized Bulbs	12,237,113	10,347,580	989,999	471,710	427,824
PY7 1 <sup>st</sup> Year Installed Bulbs	9,134,352	7,481,197	812,750	433,973	406,433
PY5 Carryover Bulbs – Installed in PY7	1,366,470	1,262,674	102,242 <sup>8</sup>	1,554 <sup>9</sup>	n/a
PY6 Carryover Bulbs – Installed in PY7	1,597,802	1,529,484	68,319	0	0
Total Installed Bulbs in PY7	12,098,625	10,273,354	983,310	435,527	834,257

Source: ComEd tracking data and evaluation team analysis

<sup>8</sup> Includes CFL Fixtures.

<sup>9</sup> Includes all LEDs bulbs and LED fixtures. LEDs in PY5 were not broken out by directional and omni-directional bulb types.

## E.5 Results Summary

Table E-17 summarizes the key metrics from PY7.

**Table E-17. PY7 Verified Savings Results Summary**

Key Metrics	Units	EEPS Portfolio	IPA Portfolio	EEPS Carryover	IPA Carryover
Unadjusted Gross Savings	MWh	432,370	n/a	n/a	n/a
Unadjusted Gross Demand Reduction	MW	403.4	n/a	n/a	n/a
Unadjusted Gross Summer Peak Demand Reduction	MW	45.6	n/a	n/a	n/a
Unadjusted Gross Winter Peak Demand Reduction	MW	53.8	n/a	n/a	n/a
Installed Savings Realization Rate (MWh) <sup>10</sup>	%	81%	n/a	n/a	n/a
Installed Savings Realization Rate (MW) <sup>10</sup>	%	75%	n/a	n/a	n/a
Installed Savings Realization Rate (Summer Peak MW) <sup>10</sup>	%	89%	n/a	n/a	n/a
Installed Savings Realization Rate (Winter Peak MW) <sup>10</sup>	%	76%	n/a	n/a	n/a
Verified Gross Savings	MWh	350,816	n/a	101,847	9,940
Verified Gross Demand Reduction	MW	303.3	n/a	87.4	8.2
Verified Gross Summer Peak Demand Reduction	MW	40.4	n/a	11.3	1.3
Verified Gross Winter Peak Demand Reduction	MW	40.7	n/a	11.3	1.4
NTGR	#	0.61 <sup>11</sup>	n/a	n/a	n/a
Verified Net Savings	MWh	213,377	n/a	57,776	5,368
Verified Net Demand Reduction	MW	184.6	n/a	49.5	4.4
Verified Net Summer Peak Demand Reduction	MW	24.5	n/a	6.4	0.7
Verified Net Winter Peak Demand Reduction	MW	24.7	n/a	6.4	0.8
Standard CFLs incentivized	#	10,347,580	n/a		2,642,647
Specialty CFLs incentivized	#	989,999	n/a		318,929
Omni-directional LEDs incentivized	#	471,710	n/a		
Directional LEDs incentivized	#	427,824	n/a		2,696
CFL and LED Fixtures	#	0	n/a		

Source: ComEd tracking data and evaluation team analysis

## E.6 Findings and Recommendations

The PY7 Residential ES Lighting program was successful in accomplishing its goals and objectives. The program significantly exceeded both its planning targets by 2 million bulbs (a 20 percent increase over the

<sup>10</sup> The verified gross installed savings realization rate adjusts the unadjusted gross savings estimates to account for the first year installation rate and any interactive effects associated with the measure.

<sup>11</sup> This represents an average NTGR across standard and specialty CFLs and directional and omni-directional LEDs.

program's target volume) and exceeding their net energy savings target by 7 percent (net savings target was 199,458 MWh, versus the program achieved verified net savings of 213,377 MWh). The following provides insight into key program findings and recommendations.<sup>12</sup> Numbered findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

### Program Tracking Data

**Finding 1.** In PY7, the model numbers in the Residential ES Lighting program tracking database and the PY7 goals tracker continue not to match entirely. These non-matches require the evaluators to perform manual matches, based on a series of fields and online data lookups, in order to link the two datasets which is necessary in order to collect the bulb information used to estimate ex post program impacts (lumens, wattage, etc.).<sup>13</sup>

**Recommendation 1.** We recommend creating a bulb information database (Goals Tracker or otherwise) with a clear one-to-one match with the model numbers in the tracking data, to aid in establishing base wattages and streamline future evaluation efforts. A similar recommendation was made in the PY6 evaluation report, which was acknowledged as an improvement that would be made in the PY7 goals tracker, but the evaluation team still had to manually match Goals Tracker and tracking data records to fully join the datasets in PY7.

### Program Volumetric Findings

**Finding 4.** The total number of bulbs sold during the PY7 Residential ES Lighting program was estimated to be 12,237,113, which is a 10 percent increase from the bulbs sold in the sixth program year (PY6). Eighty-five percent of the bulbs sold in PY7 were Standard CFLs, 8 percent were Specialty CFLs, 4 percent were Omni-directional LEDs, and 3 percent were Directional LEDs. The volume of Standard CFLs incentivized through the program increased by 15 percent in PY7, while the volume of Specialty CFLs decreased by 53 percent. This significant decrease in Specialty CFL sales was planned as an intermediate step to a complete phase out of Specialty CFLs by PY8. In PY8 all specialty bulbs (Globes, Reflectors, Candelabra, etc.) incentivized through the program are LEDs.

**Finding 5.** Analysis of PY7 program bulb sales found the average cost per MWh of energy saved from Specialty CFLs, Omni-directional LEDs, and Directional LEDs is higher than it is for Standard CFLs (roughly \$75/net MWh for a Standard CFL, \$82/net MWh for an Omni-directional LED, \$93/net MWh for a Directional LED, and \$105/net MWh for a Specialty CFL). The cost per kWh saved will continue to be lower for Standard CFLs than for Specialty CFLs and LEDs as these bulbs continue to require greater incentives to encourage market uptake due to their higher non-incentivized market prices.

**Recommendation 3.** The evaluation team supports ComEd's decision to exit the Specialty CFL market and to focus the program more substantially on the LED market. Specialty CFLs have typically had the highest rates of free-ridership and cost per MWh of energy saved. Incentivizing LEDs not only offsets the cost of LEDs leading to greater installation in

<sup>12</sup> Numbered findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

<sup>13</sup> Manual matching efforts included matching partial model numbers in one dataset to the full model number in the other dataset; matching retailers' model numbers with manufacturers' model numbers; and matching spelled out manufacturers' names with manufacturer name acronyms.

customer homes, it also increases LED awareness and acceptance which helps to build a larger market for LEDs which in turn will likely facilitate the rapid decline in LED market prices.

#### **Awareness of ComEd Incentives Offered**

**Finding 6.** Awareness of ComEd’s Residential ES Lighting program seems to be rising slightly over time. In PY7, 57 percent of survey respondents purchasing bulbs incentivized by ComEd were aware that the bulbs they were buying were discounted (compared to 55 percent in PY6 and 56 percent in PY5), and 54 percent of those knew the incentive was provided by ComEd (up from 29 percent in PY6). This means 31 percent of respondents knew they were purchasing program bulbs incentivized by ComEd compared to 16 percent in the previous year. Only 12 percent of non-program bulb purchasers were aware that the store they were shopping in was selling CFLs or LEDs incentivized by ComEd.

**Recommendation 4.** The evaluation team recommends that ComEd continue to be a leader in the promotion of LEDs for use in residential homes. The implementation of the 2007 EISA standards, along with a decline in the cost of high efficiency LEDs, will require customers to think more about their household lighting purchases. ComEd can have a big role in supporting their customers with this transition through their continued distribution of educational materials and program incentives, which will likely lead to a greater program awareness and technology acceptance.

Complete findings and recommendations can be found in Section 6.

## 1 Introduction

### 1.1 Program Description

This report presents a summary of the findings and results from Navigant Consulting, Inc.'s (Navigant's) impact and process evaluation of the Residential ENERGY STAR® (ES) Lighting program's seventh program year (PY7). The PY7 Residential ES 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, as well as promote proper bulb disposal. The PY7 Residential ES Lighting program accounted for a substantial portion of the Commonwealth Edison Company's (ComEd's) Residential energy efficiency portfolio, making an important contribution to meeting ComEd's energy efficiency goals.

The PY7 Residential ES Lighting program is delivered upstream (at the retailer level), which minimizes the burden on consumers and lowers barriers to participation, but makes program participant identification (and thus evaluation) more difficult. As a result, it is not possible to match specific purchases in the program tracking data to other characteristics of those bulb purchasers or to specific details on how the bulbs will be used.

During PY7, 17 retailers participated in the Residential ES Lighting program, which resulted in 925 retail outlets selling program bulbs within ComEd service territory. Across the 17 retailers, nearly 400 unique lighting measures<sup>14</sup> were available to ComEd customers.

### 1.2 Evaluation Objectives

The Evaluation Team identified the following key researchable questions for PY7.

#### 1.2.1 Impact Questions

1. What is the level of gross annual energy (kilowatt-hours [kWh]) and peak demand (kilowatts [kW]) savings induced by the program?
2. What are the net impacts from the program? What is the level of free-ridership associated with this program? What is the level of participant and nonparticipant spillover from the program?
3. Did the program meet its energy and demand goals? If not, why not?
4. What is the researched value for Net-to-Gross (NTG) ratio?
5. What is the appropriate winter peak capacity factor estimate (based on the PJM Winter Peak time period) for the program?
6. What updates are recommended for the Illinois Technical Reference Manual (TRM)?

---

<sup>14</sup> Unique by manufacturer, model number, and retailer.



### **1.2.2 Process Questions**

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

## 2 Evaluation Approach

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

### 2.1 Overview of Data Collection Activities

The primary data collection activities in PY7 was in-store intercept surveys.

**Table 2-1. Primary Data Collection Activities**

What	Who	Target Completes	Completes Achieved	When	Comments
In-store Intercept Survey	Retail Lighting Purchasers	800	726 <sup>15</sup>	August – September 2014	Data collection supporting Gross and Net impact assessment and process analysis.

Source: Evaluation team

**Table 2-2. Additional Resources**

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

Source: Evaluation team

### 2.2 Verified Savings Parameters

Verified gross and net savings (energy and coincident peak demand) resulting from the PY7 Residential ES Lighting program were calculated using the following algorithms as defined by the Illinois TRM v3.0<sup>16</sup>

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

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

**Verified Gross Annual Summer Peak kW Savings** = Gross Annual kW Savings × Summer Peak CF × IEe

<sup>15</sup> Fifty-two percent of the surveys completed were conducted with retail customers who were purchasing one or more ComEd incentivized bulb.

<sup>16</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 3.0 (effective 6/1/2014). Available here: <http://www.ilsag.info/technical-reference-manual.html>

$$\text{Verified Gross Annual Winter Peak kW Savings} = \text{Gross Annual kW Savings} \times \text{Winter Peak CF}^{17}$$

Where:

- Delta Watts = Difference between the Baseline Wattage and CFL Wattage
- HOU = Annual hours of use
- ISR = Installation rate
- 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<sup>18</sup>
- IEe = Energy interactive effects
- IED = Demand interactive effects (applied to summer Peak kW estimates only<sup>19</sup>)

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

### 2.2.1 Verified Gross Program Savings Analysis Approach

Where data allowed, the evaluation team calculated verified savings by measure. For PY7, the evaluation team calculated verified savings for standard CFLs, specialty CFLs, omni-directional LEDs and directional LEDs. The data used to estimate the verified gross program savings came from the PY7 program tracking data, the Illinois Statewide Technical Reference Manual for Energy Efficiency Version 3.0 (Illinois TRM v3.0), and PY7 in-store intercept surveys.

### 2.2.2 Verified Net Program Savings Analysis Approach

Verified net energy and demand (coincident peak and overall) savings were calculated by multiplying the verified gross savings estimates by a net-to-gross ratio (NTGR). The NTGR estimates applied to calculate verified net savings were 0.60 for standard CFLs, 0.51 for specialty CFLs, and 0.75 for LED bulbs. In PY7, the NTGR estimate used to calculate the net verified savings for the EEPS portfolio was based on past evaluation research and approved through the Illinois Stakeholder Advisory Group (IL SAG) consensus process.<sup>21</sup>

---

<sup>17</sup> Because ComEd is an electric utility and the majority of ComEd's customer have gas heating, no heating penalties have been included in the winter peak savings estimate.

<sup>18</sup> 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.

<sup>19</sup> 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.

**Table 2-3. Verified Savings Parameter Data Sources**

Verified Savings Parameters	Data Source	Deemed or Evaluated?
Program Bulbs	PY7 Program Tracking Data	Evaluated
Delta Watts	Illinois TRM v3.0	Deemed
Res / Non-Res Split	Illinois TRM v3.0	Deemed
Hours of Use (HOU)	Illinois TRM v3.0, PY7 Intercept Survey	Deemed/Evaluated
Summer Peak Coincidence Factor (CF)	Illinois TRM v3.0, PY7 Intercept Survey	Deemed/Evaluated
Winter Peak Coincidence Factor (CF)	Evaluation Team Analysis <sup>20</sup>	Evaluated
Energy Interactive Effects	Illinois TRM v3.0	Deemed
Demand Interactive Effects	Illinois TRM v3.0	Deemed
Realization Rate	Illinois TRM v3.0	Deemed
NTGR	IL Stakeholder Advisory Group consensus process (EEPS) <sup>21</sup>	Deemed/Evaluated

Source: Evaluation team

### 2.3 Process Evaluation

The process evaluation of the PY7 Residential ES Lighting Evaluation assessed the impact of program processes (e.g., the mechanics of how the program was implemented) on consumers who participated in the program 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, 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=726).

<sup>20</sup> This evaluation team analysis was summarized in the following memo delivered to ComEd on February 2, 2015, "Winter Peak Coincidence Factor Recommendation for Residential Lighting".

<sup>21</sup> ComEd\_NTG\_History\_and\_PY8\_Recommendations\_2015\_02\_24\_v2\_clean-1.xls, available on the IL SAG website here: <http://ilsag.info/net-to-gross-framework.html>

### 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 PY7 verified gross energy savings estimate (excluding carryover) are 350,816 MWh, 303.3 MW, 40.4 MW summer peak demand, and 40.7 MW winter peak demand.

#### 3.1 Tracking System Review

The Residential Lighting Project Information Database was the upstream lighting database used for the PY7 evaluation. This database contained a record for all retail program bulb sales invoices (by model number and store) that were sold during PY1 through PY7. The key variables in this database included the retailer store name and address, the bulb description and model number, the number of program bulbs sold, and the rebates paid for these program bulbs. The Residential Lighting Project Information Database included all upstream program CFL and LED sales since the program inception. A number of data cleaning steps were taken to make sure PY7 bulb sales were complementary and non-overlapping with bulb sales attributed to PY1 through PY6. The PY7 analysis dataset was finalized based on the most recent program tracking database received from ComEd (dated August 17, 2015). This dataset contained 233,164 records, representing 12,237,113<sup>22</sup> program bulbs sold in PY7.

As in prior years, in PY7 the evaluation team was also provided a spreadsheet created by the implementation contractor for ComEd which is entitled the *Goals Tracker*. This spreadsheet tracks cumulative weekly program bulb sales compared to sales goals and allocated program dollars. Along with bulb sales, the record for each combination of model number and retailer included the suggested retail price per package and incentive(s) requested from sponsor per package. Records also included manufacturer, product description, bulb type, actual bulb wattage, rated life, and the number of bulbs per package. Again in PY7, the goals tracker was relied upon for all bulb information because the Residential Lighting Project Information Database did not contain all of the data elements required by the evaluation team, including the ex ante gross measure level savings, and thus the overall ex ante gross and net savings were taken from the final PY7 Goals Tracker spreadsheet.

**Finding 1.** We were able to extract most of the necessary information from the Residential Lighting Project Information Database and the PY7 Goals Tracker spreadsheet, but similar to previous program years, these two data sources did not align perfectly. Matching across these two databases by manufacturer and model number initially matched 77 percent of unique model numbers (up from a 70 percent match in PY6). There were, however, 78 unique retailer and model number combinations in the tracking data that did not have a direct match in Goals Tracker.<sup>23</sup> For all 78 unmatched tracking records, it was necessary to do a manual comparison of model number with the Goals Tracker. While the large majority of necessary

<sup>22</sup> This matched the final PY7 Goals Tracker data exactly.

<sup>23</sup> In some cases, the remaining non-matches were due to one data set listing the manufacturer model number and the other data set listing the manufacturer model number and the retail model number. In other cases, one data set sometimes listed the manufacturer as an acronym rather than the spelled out name.

bulb information was ultimately matched using the data provided, matching and partial matching across multiple incomplete databases and looking up model numbers and manufacturer names with manual internet research was a time consuming process.

**Recommendation 1.** We recommend creating a bulb information database (Goals Tracker or otherwise) with a clear one-to-one match with the model numbers in the tracking data, which would streamline future evaluation efforts. A similar recommendation was made in the PY6 evaluation report, which was acknowledged as an improvement that would be made in the PY7 goals tracker, but the evaluation team had to manually match Goals Tracker and tracking data records to fully merge the datasets in PY7.

### 3.2 Program Volumetric Findings

The total number of bulbs sold during the PY7 Residential ES Lighting program is estimated to be 12,237,113, which is a 10 percent increase from the bulbs sold in the sixth program year (PY6). Eighty-five percent of the bulbs sold in PY7 were standard CFLs, 8 percent were specialty CFLs, 4 percent were Omni-directional LEDs, and 3 percent were directional LEDs. The volume of standard CFLs incentivized through the program increased by 15 percent in PY7, while the volume of specialty CFLs decreased by 53 percent. Table 3-1 shows the volume of bulbs, by bulb type, incentivized through the Residential ES Lighting program between PY3 and PY7.

**Table 3-1. Incentivized Program Bulbs by Year, PY3 to PY7**

Program Year	Standard CFLs	Specialty CFLs	CFL Fixtures	LED Bulbs	LED Fixtures	Coupons	Total
PY7 Sales	10,347,580	989,999	0	899,534	0	0	12,237,113
PY6 Sales	8,965,546	2,125,179	0	0	0	0	11,090,725
PY5 Sales	9,633,227	1,197,896	8,767	28,230	24,268	5,506	10,897,894
PY4 Sales	11,419,752	1,097,670	84,539	24,919	16,551	5,599	12,649,030
PY3 Sales	9,893,196	1,217,723	86,943	0	0	0	11,197,862

*Source: ComEd tracking data and evaluation team analysis*

Table 3-2 provides the volume of bulbs incentivized through the Residential ES Lighting program estimated to have been installed during PY7. This includes bulbs sold in prior program years and installed in PY7 and is broken down by program bulb type.

**Table 3-2. PY7 Volumetric Findings Detail**

Participation	Total	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs
PY7 Incentivized Bulbs	12,237,113	10,347,580	989,999	471,710	427,824
PY7 1 <sup>st</sup> Year Installed Bulbs	9,134,352	7,481,197	812,750	433,973	406,433
PY5 Carryover Bulbs – Installed in PY7	1,366,470	1,262,674	102,242 <sup>24</sup>	1,554 <sup>25</sup>	n/a
PY6 Carryover Bulbs – Installed in PY7	1,597,802	1,529,484	68,319	0	0
Total Installed Bulbs in PY7	12,098,625	10,273,354	983,310	435,527	406,433

Source: ComEd tracking data and evaluation team analysis

### 3.3 Gross Program Impact Parameter Estimates

The EM&V team conducted research to validate the parameters that were not specified in the Illinois TRM. The final list of parameter estimates used to calculate the PY7 verified gross savings are shown in Table 3-3.

**Table 3-3. PY7 Verified Gross Savings Parameters (continued on next page)**

Gross Impact Parameters	Population	PY7 ComEd Reported (Ex Ante)	PY7 Verified <sup>26</sup> Savings
Program Bulb Sales <sup>27</sup>	Standard CFLs	10,347,580	
	Specialty CFLs	989,999	
	Omni-directional LEDs	471,710	
	Directional LEDs	427,824	
	All Bulbs	12,237,113	
Delta Watts	Standard CFLs	31.8	
	Specialty CFLs	37.3	
	Omni-directional LEDs	33.1	
	Directional LEDs	51.3	
	All Bulbs	33.0	
Installation Rate	Standard CFLs	72.2%	
	Specialty CFLs	82.3% <sup>28</sup>	

<sup>24</sup> Includes CFL Fixtures.

<sup>25</sup> Includes all LEDs bulbs and LED fixtures. PY5 was not broken out by directional and omni-directional LEDs.

<sup>26</sup> Based on deemed parameters from the IL TRM (v3.0).

<sup>27</sup> CFL and LED Fixtures were not incentivized through the Residential Lighting program in PY7.

<sup>28</sup> The C&I portion of the IL TRM (v3.0) does not include a section for Specialty CFLs and thus the C&I standard CFL installation rate (75.5%) was applied to all CFLs installed in non-residential locations.

Gross Impact Parameters	Population	PY7 ComEd Reported (Ex Ante)	PY7 Verified <sup>26</sup> Savings
	Omni-directional LEDs	92%	
	Directional LEDs	95%	
	Non-Res CFL and LED	75.5%	
Res/Non-Res	CFLs	97%/3%	
	LEDs	97%/3%	
Hours of Use	Res HOU – Stan CFL	2.74 (1,000 hrs)	
	Res HOU – Spec CFL	2.57 (938 hrs)	
	Res HOU – Omni-Dir LED	2.57 (938 hrs)	2.74 (1,000 hrs)
	Res HOU – Directional LED	2.77 (1,010 hrs)	
	Non-Res HOU - CFL	12.53 (4,574 hrs)	10.75 <sup>29</sup> (3,923 hrs)
	Non-Res HOU - LED	n/a <sup>30</sup>	
Peak CF	Res CF – Stan CFL	NR <sup>31</sup>	0.095
	Res CF – Spec CFL	NR	0.095
	Res CF - LED	NR	0.095
	Non-Res CF - CFL	NR	0.672 <sup>32</sup>
Leakage	All Bulbs – CFL and LED	2.0% <sup>33</sup>	
Interactive Effects	Energy – Res CFL and LED	1.06	
	Demand – Res CFL and LED	NR	1.11
	Energy – Non-Res	1.06	1.24
	Demand – Non-Res	NR	1.46
Carryover Bulbs	PY5 and PY6 Sales	2,964,272	

Source: Illinois TRM v3.0, available on the IL SAG website: <http://www.ilsag.info/technical-reference-manual.html>

### 3.4 Verified Gross Program Impact Results

The resulting total program verified gross savings is 350,816 MWh, 303.3 MW, 40.4 summer peak MW and 40.7 winter peak MW as shown in the following tables. These tables present savings at the portfolio level (all PY7 program bulbs are included in EEPS), as well as splitting out the savings attributable to the residential versus non-residential sectors. These saving estimates are based on deemed parameter

<sup>29</sup> This was calculated as the weighted average TRM results from MF Common Area and Non-residential Miscellaneous using a 13%/87% (based on in-store intercept survey data).

<sup>30</sup> Ex Ante assumed all LEDs installed in Residential location.

<sup>31</sup> Not Reported.

<sup>32</sup> This was calculated as the weighted average TRM results from MF Common Area and Non-residential Miscellaneous using a 13%/87% (based on in-store intercept survey data).

<sup>33</sup> The leakage rate applied for Residential Lighting was calculated as 1 – final lifetime installation rate (0.98). No additional estimate of leakage was applied in addition to that estimate.



estimates from the Illinois TRM v3.0. The evaluation team verified the quantity of bulbs sold based on the tracking data and found they matched 100 percent with the ex ante estimates.

**Table 3-4. PY7 Verified Gross Impact Savings Estimates by Measure Type - MWh<sup>34</sup>**

	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
<b>Residential</b>					
Verified Gross MWh Savings	244,174	32,839	14,767	21,985	313,766
Installed Savings Gross MWh Realization Rate	77%	87%	98%	101%	80%
<b>Non-Residential</b>					
Verified Gross MWh Savings	29,543	3,316	1,709	2,483	37,050
Installed Savings Gross MWh Realization Rate	94%	94%	114%	118%	96%
<b>Total</b>					
Verified Gross MWh Savings	273,717	36,155	16,476	24,468	350,816
Installed Savings Gross MWh Realization Rate	78%	88%	99%	102%	81%
Realization Rate <sup>35</sup>	102%	92%	104%	95%	100%

Source: Evaluation team analysis

<sup>34</sup> The installed savings realization rates shown in this table and the following tables are calculated as the installation rate times the interactive effects estimate. They do not represent the proportion of ex ante savings found within the verified savings analysis.

<sup>35</sup> This realization rate is equal to the Verified Gross MWh Savings divided by the Ex Ante Gross MWh Savings.

**Table 3-5. PY7 Verified Gross Impact Savings Estimates by Measure Type – MW**

	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
<b>Residential</b>					
Verified Gross MW Savings	230.4	29.5	13.9	20.2	294.0
Installed Savings Gross MW Realization Rate	72%	82%	92%	95%	75%
<b>Non-Residential</b>					
Verified Gross MW Savings	7.4	0.8	0.4	0.6	9.3
Installed Savings Gross MW Realization Rate	76%	76%	92%	95%	77%
<b>Total</b>					
Verified Gross MW Savings	237.8	30.3	14.4	20.9	303.3
Installed Savings Gross MW Realization Rate	72%	82%	92%	95%	75%

Source: Evaluation team analysis

**Table 3-6. PY7 Verified Gross Impact Savings Estimates by Measure Type – Summer Peak MW**

	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
<b>Residential</b>					
Verified Gross Summer Peak MW Savings	24.3	3.4	1.5	2.2	31.4
Installed Savings Gross Summer Peak MW Realization Rate	80%	91%	102%	105%	83%
<b>Non-Residential</b>					
Verified Gross Summer Peak MW Savings	7.2	0.8	0.4	0.6	9.0
Installed Savings Gross Summer Peak MW Realization Rate	110%	110%	134%	139%	113%
<b>Total</b>					
Verified Gross Summer Peak MW Savings	31.5	4.3	1.9	2.8	40.4
Installed Savings Gross Summer Peak MW Realization Rate	85%	94%	108%	111%	89%

Source: Evaluation team analysis

**Table 3-7. PY7 Verified Gross Impact Savings Estimates by Measure Type – Winter Peak MW**

	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
<b>Residential</b>					
Verified Gross Winter Peak MW Savings	26.7	4.4	1.6	2.8	35.6
Installed Savings Gross Winter Peak MW Realization Rate	72%	82%	92%	95%	76%
<b>Non-Residential</b>					
Verified Gross Winter Peak MW Savings	4.1	0.5	0.2	0.3	5.1
Installed Savings Gross Winter Peak MW Realization Rate	76%	76%	92%	95%	77%
<b>Total</b>					
Verified Gross Winter Peak MW Savings	30.8	4.9	1.9	3.1	40.7
Installed Savings Gross Winter Peak MW Realization Rate	73%	82%	92%	95%	76%

Source: Evaluation team analysis

The PY7 Residential ES Lighting program is able to claim energy and demand savings from program bulbs purchased during PY5 and PY6, but not installed (i.e., used by the consumer) until PY7. Table 3-8 below provides estimates of the verified gross savings resulting from these carryover bulbs. PY7 carryover savings from all PY5 bulbs and PY6 standard bulbs were attributed to the EEPS portfolio. PY6 specialty bulbs were attributed to the IPA portfolio. <sup>36</sup>

**Table 3-8. PY7 Verified Gross Impact Savings from PY5 and PY6 Carryover Bulbs**

	Standard CFLs	Specialty CFLs	Other Bulbs and Fixtures	Total
<b>PY7 Verified Gross Carryover Savings</b>				
Verified Gross MWh Savings	98,179	13,507	102	111,787
Verified Gross MW Savings	83.9	11.5	0.1	95.5
Verified Gross Summer Peak MW Savings	10.9	1.7	0.0	12.6
Verified Gross Winter Peak MW Savings	10.8	2.0	0.0	12.8

Source: Evaluation team analysis

<sup>36</sup> The PY7 carryover gross savings attributable to the IPA portfolio were 9,940 MWh, 8.2 MW, 12.6 Summer Peak MW, and 12.8 Winter Peak MW.

Table 3-9 below shows the total PY7 Verified Gross Impact Savings from PY7 sales and carryover bulbs.

**Table 3-9. PY7 Total Verified Gross Impact Savings from PY7 Sales and Carryover Bulbs**

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Summer Peak Demand Savings (MW)	W Peak Demand Savings (MW)
Verified Gross Program Savings	350,816	303.3	40.4	40.7
Verified Gross Carryover Savings	111,787	95.5	12.6	12.8
Verified Total PY7 Gross Savings	462,603	398.9	53.0	53.5

*Source: Evaluation team analysis*

## 4 Net Impact Evaluation

Verified net energy and demand (coincident peak and overall) savings were calculated by multiplying the verified gross savings estimates by a NTGR. In PY7, the NTGR estimates used to calculate the net verified savings for the EEPs portfolio were based on past evaluation research and approved through the IL SAG consensus process.<sup>37</sup>

### 4.1 PY7 Program and Carryover Savings Estimate

In PY7, all new program bulbs sales (standard and specialty CFLs and omni-directional and directional LEDs) were attributed to the EEPs portfolio. The NTGR estimates applied to calculate verified net savings were based on past evaluation research and approved through the IL SAG consensus process, they are as follows: 0.60 for standard CFLs, 0.51 for specialty CFLs, and 0.75 for LEDs (omni-directional and directional). Using these NTGR values, the evaluation team calculated verified net savings of 213,377 MWh, 184.6 MW, 24.5 summer peak MW, and 24.7 winter peak MW as shown in Table 4-1, Table 4-2, Table 4-3 and Table 4-4.

**Table 4-1. PY7 Verified Net Impact Savings Estimates by Measure Type – MWh**

	Standard CFLs	Specialty CFLs	Omni- directional LEDs	Directional LEDs	Total
<b>Residential</b>					
Verified Gross MWh Savings	244,174	32,839	14,767	21,985	313,766
Verified Net MWh Savings	146,505	16,748	11,076	16,489	190,817
<b>Non-Residential</b>					
Verified Gross MWh Savings	29,543	3,316	1,709	2,483	37,050
Verified Net MWh Savings	17,726	1,691	1,281	1,862	22,561
<b>Total</b>					
Ex Ante Gross MWh Savings	268,702	39,395	15,850.00	25,664.00	349,611
Installed Savings Gross MWh Realization Rate <sup>38</sup>	78%	88%	99%	102%	81%
Verified Gross MWh Savings	273,717	36,155	16,476	24,468	350,816
NTGR	0.60	0.51	0.75	0.75	0.61
Verified Net MWh Savings	164,230	18,439	12,357	18,351	213,377

Source: Evaluation team analysis

<sup>37</sup> ComEd\_NTG\_History\_and\_PY8\_Recommendations\_2015\_02\_24\_v2\_clean-1.xls, available on the IL SAG website here: <http://ilsag.info/net-to-gross-framework.html>

<sup>38</sup> The installed savings realization rate for the Residential ES Lighting program includes the program bulb first year installation rate and interactive effects.

**Table 4-2. PY7 Verified Net Impact Savings Estimates by Measure Type –MW**

	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
<b>Residential</b>					
Verified Gross MW Savings	230.4	29.5	13.9	20.2	294.0
Verified Net MW Savings	138.2	15.0	10.4	15.2	178.9
<b>Non-Residential</b>					
Verified Gross MW Savings	7.4	0.8	0.4	0.6	9.3
Verified Net MW Savings	4.5	0.4	0.3	0.5	5.7
<b>Total</b>					
Ex Ante Gross MW Savings	n/a	n/a	n/a	n/a	n/a
Installed Savings Gross MW Realization Rate <sup>39</sup>	72%	82%	92%	95%	75%
Verified Gross MW Savings	237.8	30.3	14.4	20.9	303.3
NTGR	0.60	0.51	0.75	0.75	0.61
Verified Net MW Savings	142.7	15.5	10.8	15.7	184.6

Source: Evaluation team analysis

**Table 4-3. PY7 Verified Net Impact Savings Estimates by Measure Type – Summer Peak MW**

	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
<b>Residential</b>					
Verified Gross Summer Peak MW Savings	24.3	3.4	1.5	2.2	31.4
Verified Net Summer Peak MW Savings	14.6	1.8	1.1	1.6	19.1
<b>Non-Residential</b>					
Verified Gross Summer Peak MW Savings	7.2	0.8	0.4	0.6	9.0
Verified Net Summer Peak MW Savings	4.3	0.4	0.3	0.5	5.5
<b>Total</b>					
Ex Ante Gross Summer Peak MW Savings	n/a	n/a	n/a	n/a	n/a
Installed Savings Gross Summer Peak MW Realization Rate <sup>40</sup>	85%	94%	108%	111%	89%
Verified Gross Summer Peak MW Savings	31.5	4.3	1.9	2.8	40.4
NTGR	0.60	0.51	0.75	0.75	0.61
Verified Net Summer Peak MW Savings	18.9	2.2	1.4	2.1	24.5

Source: Evaluation team analysis

<sup>39</sup> The installed savings realization rate for the Residential ES Lighting program includes the program bulb first year installation rate and interactive effects.

<sup>40</sup> The installed savings realization rate for the Residential ES Lighting program includes the program bulb first year installation rate and interactive effects.

**Table 4-4. PY7 Verified Net Impact Savings Estimates by Measure Type – Winter Peak MW**

	Standard CFLs	Specialty CFLs	Omni-directional LEDs	Directional LEDs	Total
<b>Residential</b>					
Verified Gross Winter Peak MW Savings	26.7	4.4	1.6	2.8	35.6
Verified Net Winter Peak MW Savings	16.0	2.3	1.2	2.1	21.6
<b>Non-Residential</b>					
Verified Gross Winter Peak MW Savings	4.1	0.5	0.2	0.3	5.1
Verified Net Winter Peak MW Savings	2.5	0.2	0.2	0.3	3.1
<b>Total</b>					
Ex Ante Gross Winter Peak MW Savings	n/a	n/a	n/a	n/a	n/a
Installed Savings Gross Winter Peak MW Realization Rate <sup>41</sup>	73%	82%	92%	95%	76%
Verified Gross Winter Peak MW Savings	30.8	4.9	1.9	3.1	40.7
NTGR	0.60	0.51	0.75	0.75	0.61
Verified Net Winter Peak MW Savings	18.5	2.5	1.4	2.4	24.7

Source: Evaluation team analysis

Table 4-5 provides estimates of the verified net savings resulting from PY5 and PY6 carryover bulbs installed in PY7. All PY7 carryover savings, except the savings from specialty CFLs sold in PY6, were attributed to the EEPs portfolio. Because specialty CFLs were part of the IPA portfolio in PY6, their carryover savings have also been attributed towards the IPA portfolio.<sup>42</sup>

**Table 4-5. PY7 Verified Net Impact Savings from PY5 and PY6 Carryover Bulbs**

	Standard CFLs	Specialty CFLs	Other Bulbs and Fixtures	Total
<b>PY7 Verified Net Carryover Savings</b>				
Verified Net MWh Savings	55,993	7,097	54	63,144
Verified Net MW Savings	47.8	6.0	0.0	53.9
Verified Net Summer Peak MW Savings	6.2	0.9	0.0	7.1
Verified Net Winter Peak MW Savings	6.2	1.0	0.0	7.2

Source: Evaluation team analysis

<sup>41</sup> The installed savings realization rate for the Residential ES Lighting program includes the program bulb first year installation rate and interactive effects.

<sup>42</sup> The PY7 carryover net savings attributable to the IPA portfolio were 5,368 MWh, 4.4 MW, 0.7 Summer Peak MW, and 0.8 Winter Peak MW.

Table 4-6 shows the total PY7 verified net impact savings from PY7 sales and carryover bulbs.

**Table 4-6. PY7 Total Verified Net Impact Savings from PY7 Sales and Carryover Bulbs**

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Summer Demand Savings (MW)	Peak Winter Demand Savings (MW)
Verified Net Program Savings	213,377	184.6	24.5	24.7
Verified Net Carryover Savings	63,144	53.9	7.1	7.2
Verified Total PY7 Net Savings	276,521	238.5	31.7	31.9

Source: Evaluation team analysis

## 4.2 PY8 Carryover Savings Estimate

Calculation of the PY8 carryover estimate relies upon the Illinois TRM (v3.0 and v4.0) and the PY6 and PY7 reports. At this time all of these data sources are available and thus it is possible to estimate the gross and net carryover energy savings that the evaluation team recommends for PY8. The energy and demand savings from these PY6 and PY7 late installed bulbs are calculated based on the following parameters:

- Delta Watts – Verified savings estimate from the year of installation (source: Illinois TRM v4.0)
- Res/Non-Res Split - Evaluation research from the year of purchase (PY6 and PY7 Reports)
- HOU and Peak CF – Verified savings estimate from the year of installation (source: Illinois TRM v4.0)
- Energy and Demand IE – Verified savings estimate from the year of installation (source: Illinois TRM v4.0)
- Installation Rate - Verified savings estimate from the year of purchase (source: IL TRM v2.0 and Illinois TRM v3.0)
- NTGR – Evaluation research from the year of purchase (source: PY6 and PY7 Reports)

Table 4-7 shows that in PY8, 2,714,371 EEPs portfolio bulbs and 184,551 IPA portfolio bulbs that were purchased during either PY6 or PY7, are expected to be installed within ComEd service territory. The table below provides both the gross and net energy and demand savings from these bulbs attributable to the EEPs and IPA portfolios. Combined across these two portfolios, the total net energy savings is estimated to be 58,506 MWh, 57.1 MW, 6.8 Summer Peak MW, and 7.7 Winter Peak MW which will be counted in PY8 as Residential ES Lighting program carryover savings.



**Table 4-7. PY8 Carryover Savings Estimates by Portfolio**

PY8 Verified Savings Carryover Estimate	EEPS Portfolio			IPA Portfolio		
	PY6 Bulbs	PY7 Bulbs	PY8 EEPS Carryover	PY6 Bulbs	PY7 Bulbs	PY8 IPA Carryover
Carryover Bulbs Installed in PY8	1,174,487	1,539,885	2,714,371	184,551	n/a	184,551
Average Delta Watts	32.1	32.2	n/a	37.6	n/a	n/a
Average Daily Hours of Use	2.6	2.5	n/a	2.8	n/a	n/a
Summer Peak Load Coincidence Factor	0.10	0.10	n/a	0.12	n/a	n/a
Winter Peak Load Coincidence Factor	0.13	0.13	n/a	0.18		
Gross kWh Impact per unit	30.7	29.9	n/a	38.1	n/a	n/a
Gross kW Impact per unit	0.03	0.03	n/a	0.04	n/a	n/a
Installation Rate	100%	100%	n/a	100%	n/a	n/a
Energy Interactive Effects	1.10	1.07	n/a	1.11	n/a	n/a
Demand Interactive Effects	1.22	1.12	n/a	1.25	n/a	n/a
Carryover Gross MWh Savings	39,600	49,210	87,810	7,842	n/a	7,842
Carryover Gross MW Savings	37.6	49.6	87.2	6.9	n/a	6.9
Carryover Gross Peak Summer MW Savings	4.8	5.5	9.9	1.0	n/a	1.0
Carryover Gross Peak Winter MW Savings	5.0	6.5	11.5	1.2		1.2
Net-to-Gross Ratio	0.59	0.63	n/a	0.54	n/a	n/a
Carryover Net MWh Savings	23,364	30,908	54,272	4,234	n/a	4,234
Carryover Net MW Savings	22.2	31.1	53.3	3.7	n/a	3.7
Carryover Net Summer Peak MW Savings	2.8	3.4	6.3	0.5	n/a	0.5
Carryover Net Winter Peak MW Savings	3.0	4.1	7.1	0.7	n/a	0.7

*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 PY7 Residential ES Lighting Evaluation assessed the impact of program processes (e.g., the mechanics of how the program was implemented) on consumers who participated in the program 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, 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=726). Complete process evaluation results are presented in Appendix Section 7.2. The following section includes key process findings from the study.

### 5.2 High-Level Process Findings

- **Program Bulbs.** The PY7 ComEd Residential Lighting program continued to be predominantly be a CFL program (93 percent of the bulbs sold through the program were CFLs; 85 percent standard CFLs and 8 percent Specialty CFLs) with LEDs making up the remaining 7 percent of program bulbs sold.
- **Prior Usage of High Efficiency Bulbs by Program Participants.** The majority of program participants have experience with high efficiency bulbs. Ninety-four percent of the customers buying ComEd incentivized bulbs reported they have installed CFLs previously and 67 percent reported they have installed LEDs previously. LEDs were most frequently being purchased to replace incandescent bulbs (56 percent) or CFLs (22 percent), and roughly two-thirds of participants buying program LEDs said some or all of the LEDs they were purchasing would replace bulbs that were still in working order (early replacement).
- **Effectiveness of Program Marketing.** Program awareness continues to be quite low: Awareness of lighting discounts was moderate amongst both CFL and LED program bulb purchasers and only half of those who were aware of the discount knew it was provided by ComEd. Overall, less than one-third of the participants surveyed knew they were purchasing ComEd discounted bulbs. Roughly half of those who knew about the ComEd incentive learned about it from the ComEd Point-of-Purchase materials located on the retail store shelves.
- **Customer Purchasing Decisions.** The majority of customers surveyed planned to purchase lightbulbs when they entered the store on the day of the intercepts (74 percent) and just over half of these customers planned to buy at least one high efficiency bulb. Those planning to buy high efficiency bulbs typically bought the bulb type they planned to buy (greater than 96 percent), whereas 19 percent of those who planned to buy standard efficiency bulbs ended up buying high efficiency bulbs instead. Sixty-eight percent of the customers who were not planning to buy any bulbs when they entered the store ended up buying high efficiency bulbs. The most frequently

reported factor influencing LED purchases was the bulbs longevity (32 percent). CFLs purchasers were most often influenced by the low purchase price (25 percent).

- **Barriers to CFL and LED Use.** A lack of information or familiarity with LEDs (33 percent) and their relatively high cost (26 percent) were the most frequently reported barriers to purchasing LEDs. This differs from the primary barriers to CFL purchase, which were a dislike of CFLs light color, quality, or the way they look in fixtures (25 percent) and the need for a specialty bulb type<sup>43</sup> (24 percent). Overcoming the barriers to LED purchase should become easier as LEDs become more mainstream and increase in availability and decrease in price. The barriers to CFL purchase are more difficult to overcome as many customers may have negative feelings about CFLs that are difficult to shed.
- **General LED Usage and Awareness.** The percentage of survey respondents purchasing LEDs increased slightly between PY6 and PY7 (from 10 percent in PY6 to 15 percent in PY7), however reported familiarity with LED technology, among non-LED purchasers, declined somewhat (from 70 percent to 63 percent). ComEd's Residential Lighting program is well positioned in PY8 to significantly address both of the reported primary barriers to LED purchase: Lack of familiarity – ComEd's program is increasing its focus on LEDs from 7 percent of the overall program in PY7 to 44 percent of the program in PY8; and Price – ComEd's LED incentives will increase substantially in PY8 and the program will include many Omni-directional LEDs at sub-\$2.00 price points (and some as low as \$0.88) sold through a variety of program retailers.

---

<sup>43</sup> Presumably a bulb type not readily available in CFL technology (this includes dimming which is available in CFL technology but is not a standard feature and thus has a higher price associated with it).

## 6 Findings and Recommendations

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

The PY7 Residential ES Lighting program planning target was to sell 10,165,000 incentivized CFL and LED bulbs to Residential customers within ComEd's service territory. The program exceeded this goal by selling a total of 12,237,113 CFLs and LEDs. These CFL and LED sales led to the program achieving 120 percent of its targeted net energy savings. Retailer participation in the Residential ES Lighting program remained stable between PY6 and PY7. In total, there were 17 retail chains participating in the PY7 Residential ES Lighting program, resulting in a total of just over 925 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 over 90 percent of PY7 program bulbs).

### Program Tracking Data

**Finding 1.** In PY7, the model numbers in the Residential ES Lighting program tracking database and the PY7 goals tracker continue not to match entirely. These non-matches require the evaluators to perform manual matches, based on a series of fields and online data lookups, in order to link the two datasets which is necessary in order to collect the bulb information used to estimate ex post program impacts (lumens, wattage, etc.)<sup>44</sup>

**Recommendation 1.** We recommend creating a bulb information database (Goals Tracker or otherwise) with a clear one-to-one match with the model numbers in the tracking data, to aid in establishing base wattages and streamline future evaluation efforts. A similar recommendation was made in the PY6 evaluation report, which was acknowledged as an improvement that would be made in the PY7 goals tracker, but the evaluation team continued to need to manually match the Goals Tracker and tracking data records to fully link the datasets in PY7.

### Verified Gross Impacts and Installed Savings Realization Rate<sup>45</sup>

**Finding 2.** The PY7 gross verified energy savings were estimated to be 350,816 MWh (excluding carryover), the entirety of which was attributable to the EEPs portfolio. The installed savings realization rate on this savings estimate is 81 percent. This realization rate is primarily driven by the first year installation rate, which averaged 74.6 percent across all bulbs sold in PY7, but also reflects a magnification in energy savings due to the reduction in a home's cooling load required to offset the heat given off by incandescent bulb (interactive effects).

<sup>44</sup> Manual matching efforts included matching partial model numbers in one dataset to the full model number in the other dataset; matching retailers' model numbers with manufacturers' model numbers; and matching spelled out manufacturers' names with manufacturer name acronyms.

<sup>45</sup> The verified gross installed savings realization rate adjusts the unadjusted gross savings estimates to account for the first year installation rate and any interactive effects associated with the measure. It is different from them ex ante realization rate which is the ratio of the ex post verified savings estimate over the ex ante savings estimate.

## Summer and Winter Peak Demand Reduction

**Finding 3.** PY7 is the first year in which both summer and winter peak demands have been estimated. While the summer peak CF estimates are lower than the winter peak CF estimates, the resulting gross and net savings are nearly identical due to the demand interactive effects that are applied to the summer peak savings estimates and inflate it by roughly 11 percent. Across all PY7 installations (1<sup>st</sup> year and carryover) the net summer peak savings was estimated to be 31.6 MW and the net winter peak savings was estimated to be 31.9 MW.

**Recommendation 2.** The winter peak CF estimate<sup>46</sup> was derived from data collected as part of the lighting logger study conducted for the PY5/PY6 ComEd Residential Lighting Program evaluation. Loggers within this study were installed in homes in June of 2013 and removed in January of 2014. While the availability of this data is extremely beneficial for the calculation of alternate peak period coincidence factor estimates, the fact that this data did not include the entire Winter Peak period (January 1 – February 28) required the use of analyses to determine a proxy period for the January 1 – February 28 timeframe. The evaluation team recommends that the next time a light metering study is performed in ComEd territory that the study be extended to include the months of January and February in order to directly measure the Winter Peak CF from data collected during the winter peak period.

## Program Volumetric Findings

**Finding 4.** The total number of bulbs sold during the PY7 Residential ES Lighting program was estimated to be 12,237,113, which is a 10 percent increase from the quantity of bulbs sold in the sixth program year (PY6). Eighty-five percent of the bulbs sold in PY7 were standard CFLs, 8 percent were specialty CFLs, 4 percent were omni-directional LEDs, and 3 percent were directional LEDs. No CFL or LED fixtures were incentivized through the program in PY7. The volume of standard CFLs incentivized through the program increased by 15 percent in PY7, while the volume of Specialty CFLs decreased by 53 percent. This significant decrease in specialty CFL sales was planned as an intermediate step to a complete phase out of specialty CFLs by PY8. In PY8 all specialty bulbs (Globes, Reflectors, Candelabra, etc.) incentivized through the program are LEDs.

**Finding 5.** Analysis of PY7 program bulb sales found the average cost per MWh of energy saved from specialty CFLs, omni-directional LEDs, and directional LEDs is higher than it is for standard CFLs (roughly \$75/net MWh for a standard CFL, \$82/net MWh for an omni-directional LED, \$93/net MWh for a directional LED, and \$105/net MWh for a specialty CFL). The cost per kWh saved will continue to be lower for standard CFLs than for specialty CFLs and LEDs as these bulbs continue to require greater incentives to encourage market uptake due to their higher non-incentivized market prices.

**Recommendation 3.** The evaluation team supports ComEd's decision to exit the Specialty CFL market and to focus the program more substantially on the LED market. Specialty CFLs have typically had the highest rates of free-ridership and cost per MWh of energy saved. Incentivizing LEDs not only offsets the cost of LEDs leading to greater installation in customer homes, it also increases LED awareness and acceptance which helps to build a

---

<sup>46</sup> The memo delivered to ComEd outlining the Winter Peak CF is included as an appendix to this report.

larger market for LEDs which in turn will likely facilitate the rapid decline in LED market prices.

#### **Awareness of ComEd Incentives Offered**

**Finding 6.** Program awareness continues to be quite low: Awareness of lighting discounts was moderate amongst both CFL and LED program bulb purchasers and only half of those who were aware of the discount knew it was provided by ComEd. In PY7, 57 percent of survey respondents purchasing bulbs incentivized by ComEd were aware that the bulbs they were buying were discounted (compared to 55 percent in PY6 and 56 percent in PY5). In PY7, 54 percent of those knew the incentive was provided by ComEd (up from 29 percent in PY6). This means 31 percent of respondents knew they were purchasing program bulbs incentivized by ComEd compared to 16 percent in the previous year. Only 12 percent of non-program bulb purchasers were aware that the store they were shopping in was selling CFLs and LEDs incentivized by ComEd. In PY8 ComEd has increased the volume of LED bulbs included in the program, increased the incentives offered on LEDs, and updated the point of purchase signage to more clearly indicate the lower price is being provided by ComEd. Each of these items will likely result in an increase in shoppers' awareness of ComEd's lighting program.

**Recommendation 4.** The evaluation team recommends that ComEd continue to be a leader in the promotion of LEDs for use in residential homes. The implementation of the 2007 EISA standards, along with a decline in the cost of high efficiency LEDs, will require customers to think more about their household lighting purchases. ComEd can have a big role in supporting their customers with this transition through their continued distribution of educational materials and program incentives, which will likely lead to a greater program awareness and technology acceptance.

#### **PY8 Carryover Savings Estimate**

**Finding 7.** In PY8 the savings from nearly 3 million high efficiency bulbs, purchased during either PY6 or PY7, are expected to be installed within ComEd service territory. These bulbs are estimated to yield total net savings of 58,506 MWh, 57.1 MW, 6.8 Summer Peak MW, and 7.7 Winter Peak MW. Estimated net carryover savings for PY8 is 93 percent of PY7 net carryover savings. Approximately 93 percent of the PY8 carryover savings are attributable to the EEPS portfolio (54,272 MWh) and the remaining 7 percent of carryover savings are attributable to the IPA portfolio (4,234 MWh).

#### **Impact Estimates for Future Use**

**Finding 8.** During the course of the PY7 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.

**Recommendation 5.** The evaluation recommends using the results shown in the table below to estimate impact for future program years.

**Table 6-1. Impact Estimate Parameters for Future Use**

Parameter	Value	Data Source
Res/Non-Res Split	96% / 4% CFLs	3-year rolling average (PY5-PY7) of Evaluation Research Findings
	98%/2% LEDs	PY7 Evaluation Research Findings
1 <sup>st</sup> Year Installation Rate	74.7% Standard CFL 91.4% Specialty CFL	3-year rolling average (PY5-PY7) of Evaluation Research Findings
	95.0% LEDs	PY7 Evaluation Research Findings
NTGR	0.64 Standard CFL 0.43 Specialty CFL	PY7 Evaluation Research Findings
	0.73 LEDs	PY7 Evaluation Research Findings

## 7 Appendix

### 7.1 Evaluation Research Impact Approaches and Findings

#### 7.1.1 Evaluation Research Gross Impact Parameter Estimates

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

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

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

**Verified Gross Annual Summer Peak kW Savings** = Gross Annual kW Savings × Summer Peak CF × IEd

**Verified Gross Annual Winter Peak kW Savings** = Gross Annual kW Savings × Winter Peak CF<sup>47</sup>

Where:

- Delta Watts = Difference between the Baseline Wattage and CFL Wattage
- HOU = Annual hours of use
- ISR = Installation rate
- Summer Peak CF = Peak load coincidence factor, the percentage of Program Bulbs turned on during peak summer hours (summer 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<sup>48</sup>
- IEe = Energy interactive effects
- IEd = Demand interactive effects (applied to summer peak kW estimates only<sup>49</sup>)

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

- Evaluation research estimated installation rates were found to be 5 percent higher across all bulb types than the deemed estimates included in Illinois TRM v3.0. The evaluation research estimates

<sup>47</sup> Because ComEd is an electric utility and the majority of ComEd's customer have gas heating, no heating penalties have been included in the winter peak savings estimate.

<sup>48</sup> 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.

<sup>49</sup> 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.



for CFLs and LEDs were based on customer self-reports during the PY7 in-store intercept surveys.

- Evaluation research estimated HOU and Summer Peak CF rates were based upon the PY5/PY6 ComEd Residential Lighting Logger study.<sup>50</sup> The evaluation research HOU and Peak CF estimates were between 10 and 20 percent lower than the HOU and Peak CF estimates included in Illinois TRM v3.0.

**Table 7-1. Evaluation Research Gross Savings Parameters (continued on next page)**

Gross Impact Parameters	Population	PY7 Evaluation Research
Program Bulb Sales	Standard CFLs	10,347,580
	Specialty CFLs	989,999
	Omni-directional LEDs	471,710
	Directional LEDs	427,824
	All Bulbs	12,237,113
Delta Watts	Standard CFLs	31.8
	Specialty CFLs	37.3
	LED Omni-directional	33.1
	LED Directional	51.3
	All Bulbs	33.0
Installation Rate	Standard CFLs	75.2%
	Specialty CFLs	88.9%
	LEDs	99.3%
Res/Non-Res	Standard CFLs	94%/6%
	Specialty CFLs	95%/5%
	LEDs	98%/2%
Hours of Use	Res HOU – Stan CFL	2.32
	Res HOU – Spec CFL	2.27
	Res HOU – Omni-Dir LED	2.32
	Res HOU – Directional LED	2.44
	Non-Res HOU – CFL and LEDs	10.75
Summer Peak CF	Res Summer CF – Stan CFL	0.081
	Res Summer CF– Spec CFL	0.085
	Res Summer CF– Omni-Dir LED	0.081
Summer Peak CF (cont.)	Res Summer CF – Dir LED	0.094
	Non-Res Summer CF – CFL and LEDs	0.73
Winter Peak CF	Res Winter CF – Stan CFL	0.116

<sup>50</sup> PY5/PY6 Lighting Logger Study Results – Final, dated December 5, 2014.

Gross Impact Parameters	Population	PY7 Evaluation Research
Leakage	Res Winter CF– Spec CFL	0.151
	Res Winter CF– Omni-Dir LED	0.116
	Res Winter CF – Dir LED	0.138
	Non-Res Winter CF – CFL and LEDs	0.55
	Standard CFLs	3%
	Specialty CFLs	2%
	LEDs	0%
Interactive Effects	Energy - Res	1.06
	Demand - Res	1.11
	Energy – Non-Res	1.27
	Demand – Non-Res	1.49
Carryover Bulbs	PY5 and PY6 Sales	2,964,272

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 PY7 Bulb Sales Estimates

Verified savings and evaluation research program bulb sales estimates were derived from the PY7 tracking databases provided by ComEd to the evaluation team. The total number of bulbs sold during the PY7 Residential ES Lighting program is estimated to be 12,237,113, which is a 10 percent increase from the bulbs sold in PY6. Eighty-five percent of these were standard CFLs, 8 percent were specialty CFLs, 4 percent were omni-directional LEDs, and 3 percent were directional LEDs. Specialty bulbs became a significantly smaller portion of the program in PY7 with sales shrinking by 1,135,180 (a 53 percent decrease compared to PY6). Table 7-2, shows that the large majority of standard and specialty CFLs were sold in multi-packs (99 percent and 92 percent, respectively), while LEDs were much more likely to be sold in single packs (overall 45 percent of LEDs were sold in single packs).

**Table 7-2. PY7 Bulb Sales by Pack Size**

Single vs. Multi-Pack	Standard CFL	Specialty CFL	Omni-directional LED	Directional LED	Total
Single Pack	63,871	79,650	274,381	133,642	551,544
Multi-Pack	10,283,709	910,349	197,329	294,182	11,685,569
PY7 Total Bulb Sales	10,347,580	989,999	471,710	427,824	12,237,113
% Multi-Pack	99%	92%	42%	69%	95%

Source: Evaluation team analysis

Table 7-3 shows bulb sales by retailer type. Across all bulb types, 90 percent of PY7 bulbs were sold at DIY, warehouse or big box stores. Overall 48 percent of CFLs were sold at DIY stores and 58 percent of LEDs were sold at warehouse stores.<sup>51</sup>

**Table 7-3. PY7 Bulb Sales by Type of Retailer**

Retailer Type	Standard CFL	Specialty CFL	Omni-directional LED	Directional LED	Total	
DIY	4,876,436	598,640	231,089	77,025	5,783,190	47%
Warehouse	2,127,768	216,872	199,030	319,181	2,862,851	23%
Big Box	2,288,513	82,380	26,977	12,118	2,409,988	20%
Dollar Store	545,788	28,616	--	--	574,404	5%
Small Hardware	286,378	27,528	14,614	19,500	348,020	3%
Other <sup>52</sup>	222,697	35,963	--	--	258,660	2%
PY7 Total Bulb Sales	10,347,580	989,999	471,710	427,824	12,237,113	100%

Source: Evaluation team analysis

#### 7.1.1.2 PY7 Delta Watts

Displaced watts or “delta watts” is calculated as the difference between the program bulb wattage and baseline incandescent equivalent wattage. Program bulb wattages as specified by the manufacturer were easily obtained from the goals tracker. Appropriate baseline wattages are more difficult to establish as this metric depends on various factors including bulb type / shape, directionality, and federal standards.<sup>53</sup> In previous program years (PY5 and PY6), the verified savings delta watts estimates were based on the deemed base wattage estimates outlined in the Illinois TRM (v3.0 for PY7) and the evaluation research delta watts were estimated by applying a custom lumen mapping based on the program bulb type, bulb shape, and directionality (omni-directional, globes, directional, decorative). This delta watts approach is technology neutral, meaning that lumen ranges for specific bulb types are consistent across technologies.

<sup>51</sup> Eighteen percent of the program bulbs sold at Warehouse stores are LEDs, compared to only 4 percent across all of the other program retailers.

<sup>52</sup> Includes discount and grocery stores.

<sup>53</sup> 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 v3.0, delta watts was calculated for each program bulb by subtracting the program bulb wattage from the Illinois TRM baseline wattage. Average delta watts values by bulb type are presented in Table 7-4.

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

	Standard CFLs	Specialty CFLs	Omni-directional LED	Directional LED	All PY7 Bulbs
Bulbs Sold	10,347,580	989,999	471,710	427,824	12,237,113
Average Bulb Wattage	16.6	16.6	10.8	11.2	16.1
Average Delta Watts	31.8	37.3	33.1	51.3	33.0

*Source: Evaluation team analysis*

### 7.1.1.3 PY7 CFL Installation Rates

The overall evaluation research installation rate (IR) estimated based on the PY7 in-store intercepts was found to be 78 percent.<sup>54</sup> This estimate is slightly higher than the PY6 evaluation research estimate of 76 percent. The installation rates for standard and specialty CFLs were estimated to be 75.2 percent and 88.9 percent, respectively. LEDs were introduced to the program in PY7 and the installation rate for LEDs was estimated to be 99.3 percent.

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.

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

Retailer Type	In-store Intercept Installation Rate			
	Standard CFLs	Specialty CFLs	LEDs	All Bulbs
Big Box	74%	90%	100%	75%
DIY	82%	91%	98%	84%
Warehouse	61%	81% <sup>55</sup>	100%	69%
Retailer Sales Weighted	75.2%	88.9%	99.3%	78.2%

*Source: Evaluation team analysis*

As the table above shows, installation rates varied by both bulb type and retailer type. Customers purchasing Specialty CFLs and LEDs reported higher installation rates than those purchasing standard CFLs, which is to be expected as those bulb types are significantly more expensive than standard CFLs and thus less likely to be purchased and placed in storage. Customers purchasing program bulbs from warehouse stores, where the average number of bulbs per package was 3.3 bulbs, reported lower installation rates than customers purchasing program bulbs from DIY stores where the average number of bulbs per package was 2.9.

<sup>54</sup> This is a retailer sales-weighted estimate.

<sup>55</sup> 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.

Again in PY7, the evaluation team analyzed the in-store data to determine if surveys conducted while a demonstration event was occurring in the retail store had an impact on the forecasted program bulb installation rates.<sup>56</sup> Similar to PY5 and PY6, no statistically significant difference was detected.

#### **7.1.1.4 PY7 Program Bulb Leakage Rate**

In PY7, the overall leakage rate across bulb types and retailer types was estimated to be 3.0 percent,<sup>57</sup> which is similar to the PY6 value of 2.6 percent. The PY7 program bulb leakage was driven by 10 program bulb purchasers who said that they were planning to install the bulbs that they purchased in homes that were located outside of ComEd service territory. Six of the customers who purchased program bulbs said that they do not receive a ComEd bill, while the remaining four customers said that they do not live in the area.

#### **7.1.1.5 PY7 Residential/Non-residential Installation Location Split**

The percentage of program bulbs being installed in residential versus non-residential locations in PY7 was estimated to be 94/6 for Standard CFLs, 95/5 for Specialty CFLs, and 98/2 for LEDs<sup>58</sup> based on data collected during the in-store intercept surveys. These estimates are very similar to the results found across the past four program years (PY6: 95/5; PY5: 98/4; PY4: 95/5; PY3: 97/3; Average: 96/4).

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 PY7 Hours of Use and Peak Coincidence Factor**

##### Residential Evaluation Research Estimates

The Residential HOU and peak CF estimates used to calculate the evaluation research impact estimates for the PY7 Residential Lighting evaluation were taken from the PY5/PY6 Logger Study.<sup>59</sup>

---

<sup>56</sup> The theory being tested was that the information customers received from program reps during demo events may encourage them to install a greater percentage of the bulbs they were purchasing immediately.

<sup>57</sup> The 90/10 confidence interval on the leakage estimate based on the intercept surveys is a lower bound of 1.3 percent and an upper bound of 4.0 percent.

<sup>58</sup> This analysis excluded program bulbs that were reportedly installed in locations outside of ComEd service territory.

<sup>59</sup> The complete PY5/PY6 Lighting Logger Study was included as an Appendix to the PY6 report.

The bulb type and overall weighted residential HOU and peak CF estimates for both the verified savings and the evaluation research are shown in Table 7-6. The overall evaluation research HOU is 16 percent lower than the verified savings estimate, while the peak CF estimate is 15 percent lower than the verified savings estimates.

**Table 7-6. Residential HOU and Peak CF Estimates**

Bulb Type		Verified Savings			Evaluation Research		
		Bulbs <sup>60</sup>	Daily HOU	Peak CF	Bulbs <sup>61</sup>	Daily HOU	Peak CF
CFL	Standard - Twist	9,734,579	2.74	0.095	9,731,539	2.32	0.081
	3-way	14,376	2.46	0.081	13,941	2.32	0.081
	A-lamp	102,178	2.74	0.095	99,082	2.32	0.081
	Candelabra	127,474	3.64	0.122	123,611	1.94	0.063
	Dimmable Reflector	12,984	2.57	0.095	12,591	2.36	0.091
	Dimmable Twist	5,306	2.46	0.081	5,145	2.32	0.081
	Globe	49,917	2.32	0.116	48,405	1.75	0.075
	High Wattage	8,410	2.57	0.095	8,155	2.32	0.081
	Post	1,328	5.00	0.184	1,288	6.78	0.273
	Reflector	639,830	2.81	0.104	620,442	2.36	0.091
LED	Omni-directional	471,710	2.74	0.095	471,710	2.32	0.081
	Directional	427,824	2.77	0.095	427,824	2.32	0.081
Bulb Weighted Average		11,595,916	2.74	0.095	11,563,731	2.31	0.082

Source: Evaluation team analysis

#### Non-Residential Impact Evaluation Research Estimates

The non-residential HOU and peak CF estimates used to calculate the evaluation research impact estimates are also taken from the commercial lighting portion of the Illinois TRM v3.0, however as part of the evaluation research the business types of non-residential customers purchasing program bulbs are collected and the business type specific estimates are applied and weighted accordingly. The non-residential portion of the Illinois TRM does not provide separate estimates for standard and specialty CFLs.

Of the intercept survey respondents who reported purchasing bulbs for their business, the majority reported they would be installed in an office location (34 percent), an apartment building common area (26 percent), or a retail/service business (23 percent). The distribution of business types purchasing program bulbs, along with their associated HOU and peak CF, and the overall weighted HOU and peak CF estimates are shown below in Table 7-7.

<sup>60</sup> Representative of the deemed 96 percent of PY7 bulb sales estimated to have been installed in Residential locations.

<sup>61</sup> Representative of the deemed 94 percent of CFL and 100 percent of LED PY7 bulb sales estimated to have been installed in Residential locations.

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

ComEd Business Type	Bulbs	%	Annual HOU	Daily HOU	Peak CF
Apartment	34	26%	5,950	16.30	0.75
Public Assembly <sup>62</sup>	12	9%	3,198	8.76	0.66
Office	44	34%	3,088	8.46	0.66
Restaurant	6	5%	4,784	13.11	0.80
Retail/Service	30	23%	2,935	8.04	0.83
Health Care Clinic	3	2%	4,207	11.53	0.75
Bulb Weighted Average		100%	3,922	10.74	0.73

Source: Evaluation team analysis

#### 7.1.1.7 Interactive Effects

The interactive effects estimates (both energy and demand) used to estimate the verified savings and evaluation research impacts were taken from the Residential and C&I portions of the Illinois TRM v3.0. The non-residential verified savings estimates were taken directly from the “Miscellaneous” category estimates. Similar to the method used to calculate the Non-residential evaluation research HOU and peak CF estimates, evaluation research energy and demand IE were calculated by taking a weighted average of the business type specific IE estimates using the distribution of business types found during the in-store intercept surveys. Table 7-8 presents these Illinois TRM based IE estimates.

**Table 7-8. PY7 Energy and Demand Interactive Effects**

Sector	Verified Savings		Evaluation Research	
	Energy IE	Demand IE	Energy IE	Demand IE
Residential	1.06	1.11	1.06	1.11
Non-residential	1.24	1.46	1.27	1.49

Source: Evaluation team analysis

#### 7.1.1.8 Carryover Bulb Savings Estimation

The PY7 residential CFL energy and demand savings estimates include savings resulting from bulbs purchased during PY5 and PY6, 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 PY7, but not installed in PY7, can be counted in future program years. This section presents the verified savings estimates for the carryover bulbs installed in PY7.

<sup>62</sup> The Illinois TRM v3.0 did not include deemed HOU or peak CF estimates for bulbs installed within public assembly buildings, and thus the “Miscellaneous” category estimates were used for these program bulbs.

### PY7 Carryover Savings Estimation

The source for the parameter estimates that go into the energy and demand impact calculations for the PY7 carryover bulbs are provided in Table 7-9.

**Table 7-9. PY7 Carryover Parameter Sources**

Parameter Estimate	Parameter Timing	PY5 Sales	PY6 Sales
Installation Rate	Year of Bulb Purchase	Illinois TRM v1.0	Illinois TRM v2.0
Delta Watts	Year of Bulb Installation	Illinois TRM v3.0	Illinois TRM v3.0
Res/Non-Res Split	Year of Bulb Purchase	Illinois TRM v1.0	Illinois TRM v2.0
HOU and Peak CF	Year of Bulb Installation	Illinois TRM v3.0	Illinois TRM v3.0
Energy/Demand IE	Year of Bulb Installation	Illinois TRM v3.0	Illinois TRM v3.0
NTGR	Year of Bulb Purchase	PY5 Report	PY6 Report

*Source: Evaluation team analysis*

Table 7-10 shows that 2,964,272 bulbs sold through the program in PY5 or PY6 were estimated to have been installed in PY7. The estimate of the number of PY5 bulbs installed in PY7 was calculated based on the Illinois TRM v1.0<sup>63</sup> deemed third year installation rate and the estimate of the number of PY6 bulbs installed in PY7 as calculated based on the Illinois TRM v2.0<sup>64</sup> deemed second year installation rate.

**Table 7-10. PY7 Carryover Bulb Estimates**

Carryover Bulbs	PY5 Verified Savings Estimate	PY6 Verified Savings Estimate
Program Year Total Bulbs Sold	10,897,894	11,090,725
Installed During PY5	7,706,971	n/a
Installed During PY6	1,606,495	7,912,071
Installed During PY7	1,366,470	1,597,802
Installed During PY8	n/a	1,359,037
Total Installed	10,679,936	10,868,911
Lifetime Installation Rate	98%	98%

*Source: Evaluation team analysis*

<sup>63</sup> The Illinois TRM v1.0 (effective in PY5) was in place at the time the PY5 program bulbs were sold and, thus, govern the estimated installation rates for PY5 bulbs.

<sup>64</sup> The Illinois TRM v2.0 (effective in PY6) was in place at the time the PY6 program bulbs were sold and, thus, govern the estimated installation rates for PY6 bulbs.



Table 7-11 provides estimates of energy and demand savings in PY7 resulting from the delayed installation of PY5 and PY6 program bulbs.

**Table 7-11. PY7 Verified Savings Estimate for Carryover Bulbs**

PY7 Verified Savings Carryover Estimate	PY5 Program Bulbs	PY6 Program Bulbs	Total PY7 Carryover
Program Bulbs Installed During PY7	1,366,470	1,597,802	2,964,272
PY7 Carryover Gross Energy Savings (MWh)	48,483	63,305	111,787
PY7 Carryover Gross Demand Savings (MW)	43.1	52.4	95.5
PY7 Carryover Gross Summer Peak Demand Savings (MW)	5.0	7.6	12.6
PY7 Carryover Gross Winter Peak Demand Savings (MW)	5.4	7.3	12.8
Net-to-Gross Ratio	0.54	0.58	0.56
PY7 Carryover Net Energy Savings (MWh)	26,291	36,853	63,144
PY7 Carryover Net Demand Savings (MW)	23.4	30.5	53.9
PY7 Carryover Net Summer Peak Demand Savings (MW)	2.7	4.4	7.1
PY7 Carryover Net Winter Peak Demand Savings (MW)	2.9	4.3	7.2

*Source: Evaluation team analysis*

### 7.1.2 Evaluation Research Gross Program Impact Results

The total PY7 Residential ES Lighting program evaluation research gross savings is estimated to be 367,977 MWh, 317.5 MW, 45.8 summer peak MW and 44.9 winter peak MW. Table 7-12 shows evaluation research gross savings by portfolio (EEPS and IPA<sup>65</sup>) and overall, and presents the evaluation research gross realization rates<sup>66</sup> that are associated with these impact estimates.

#### 7.1.1 Evaluation Research Net Impact Parameter Estimates

The PY7 evaluation research NTGR for standard CFLs was estimated to be 0.62 and the PY7 evaluation research NTGR for specialty CFLs was estimated to be 0.44. These results are a slight increase in the evaluation estimated NTGR for standard CFLs and a fairly large decrease for specialty CFLs over the PY6 results. PY7 was the first year that NTG was estimated for LEDs. These results are all shown in Table 7-13 below.

<sup>65</sup> All PY7 program bulb sales are included in the EEPS portfolio.

<sup>66</sup> The evaluation research gross realization rates are equal to the evaluation research gross savings/verified savings gross estimate.

**Table 7-12. PY7 Evaluation Research Gross Impact Savings Estimates**

	EEPS Portfolio	IPA Portfolio	Total
<b>PY7 Evaluation Research Gross Savings</b>			
Gross MWh Savings	367,977	n/a	367,977
Gross MW Savings	317.5	n/a	317.5
Gross Summer Peak MW Savings	45.8	n/a	45.8
Gross Winter Peak MW Savings	44.9	n/a	44.9
<b>PY7 Evaluation Research Gross Savings Realization Rates<sup>66</sup></b>			
Gross MWh Savings	105%	n/a	105%
Gross MW Savings	105%	n/a	105%
Gross Summer Peak MW Savings	113%	n/a	113%
Gross Winter Peak MW Savings	110%	n/a	110%

Source: Evaluation team analysis

**Table 7-13. NTGR by Bulb Type**

Bulb Type	Wt'd Free-Ridership	Spillover Part/Nonpart	Wt'd NTGR
Standard CFLs	0.38	0.02	0.64 <sup>67</sup>
Specialty CFLs	0.59	0.02	0.43
LEDs	0.44	0.01/0.16	0.73

Source: Evaluation team analysis

<sup>67</sup> These results include additional significant digits not shown in this table.

Table 7-14, compares the free-ridership, spillover and NTGR estimates for PY7 to those from the previous program years.

**Table 7-14. PY7 FR, Spillover, and NTGR Estimates Compared to Prior Program Years**

Net Impact Parameters	Population	PY2	PY3	PY4	PY5	PY6	PY7
Free-ridership	Standard CFLs	n/a	n/a	0.47	0.47	0.41	0.38
	Specialty CFLs	n/a	n/a	0.58	0.53	0.47	0.59
	LEDs	n/a	n/a	n/a	n/a	n/a	0.44
Spillover	Standard CFLs	n/a	n/a	0.02	0.02	0.01	0.02
	Specialty CFLs	n/a	n/a	0.02	0.02	0.01	0.02
	LEDs	n/a	n/a	n/a	n/a	n/a	0.17
NTGR	Standard CFLs	n/a	n/a	0.55	0.55	0.59	0.64
	Specialty CFLs	n/a	n/a	0.44	0.48	0.54	0.43
	LEDs	n/a	n/a	n/a	n/a	n/a	0.73

Source: Evaluation team analysis

#### 7.1.1.9 Evaluation Research NTGR Methodology

As was done in PY5 and PY6, the PY7 NTGR was estimated using the customer self-report method based on data collected during the PY7 in-store intercept surveys. The in-store intercept data was used to estimate the level of PY7 free-ridership, as well as the PY7 participant and nonparticipant spillover. Once these parameters were estimated, NTGR was calculated as follows:

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

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

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

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

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

The method used to estimate free-ridership in PY7 applied the same algorithm used to estimate free-ridership in PY6.

#### 7.1.1.10 PY7 Evaluation Verified Free-ridership Results

Table 7-15 and Table 7-16 present the free-ridership estimates for standard and specialty CFLs,<sup>68</sup> respectively. As these tables show, free-ridership segmentation analysis was conducted using numerous segmentation variables including:

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

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

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

Standard CFL Free-Ridership Segmentation Analysis		N	%	Unweighted FR	Lower 90%CL	Upper 90%CL
All Standard CFLs		262	100%	0.37	0.33	0.40
Demo Event	Yes	78	30%	0.31	0.25	0.36
	No	184	70%	0.39	0.35	0.43
Demo Event & Retailer	Big Box	16	6%	0.35	0.23	0.48
	DIY	36	14%	0.42	0.34	0.50
	Warehouse	26	10%	0.13	0.05	0.22
Non-Demo Event & Retailer	Big Box	41	16%	0.26	0.20	0.33
	DIY	100	38%	0.49	0.44	0.55
	Warehouse	43	16%	0.33	0.25	0.42
Retailer Type	Big Box	57	22%	0.29	0.23	0.35
	DIY	136	52%	0.47	0.42	0.51
	Warehouse	69	26%	0.26	0.20	0.33
Awareness of Discount	Aware	158	60%	0.31	0.27	0.34
	Unaware	104	40%	0.48	0.42	0.54

Source: Evaluation team analysis

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

- » Free-ridership varied significantly across retailer type with big box stores having the lowest levels of free-ridership, warehouse stores having slightly higher free-ridership and DIY stores having significantly higher levels of free-ridership than either of the other store types.

<sup>68</sup> Similar results for LEDs were provided to ComEd in a PY7 ComEd Residential Lighting LED NTGR Estimation memo delivered on 12/18/2014.

- » At two of the three retailer types where intercepts were conducted, in-store demo events were correlated with significantly lower levels of free-ridership. This is a strong indication that these demo events are providing customers with information that is increasing the programs influence.
- » Survey respondents who were aware the bulbs they were purchasing were discounted were found to have significantly lower levels of free-ridership.

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

Similar to the standard CFL segmentation analysis, big box stores had the lowest levels of free-ridership and DIY stores had the highest level of free-ridership (a difference that was statistically significantly at the 90 percent level). No difference was detected in the level of specialty bulb free-ridership for intercepts that were conducted at the time of an in-store demo event.

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

Specialty CFL Free-Ridership Segmentation Analysis		N	%	Unweighted FR	Lower 90%CL	Upper 90%CL
All Specialty CFLs		71	100%	0.49	0.43	0.55
Demo Event	Yes	18	25%	0.49	0.37	0.60
	No	53	75%	0.49	0.42	0.56
Retailer Type	Big Box	29	41%	0.33	0.25	0.42
	DIY	36	51%	0.62	0.55	0.69
	Warehouse	6	8%	0.62	0.36	0.87
Awareness of Discount	Aware	33	46%	0.43	0.35	0.50
	Unaware	38	54%	0.55	0.46	0.65

Source: Evaluation team analysis

### Weights

Case weights were applied to the retailer-type free-ridership estimates for standard CFLs, specialty CFLs, and LEDs in order to come up with overall free-ridership estimates by bulb type that were representative of the distribution of PY7 bulb sales. Table 7-17 shows the distribution of PY7 standard and Specialty CFL sales by retailer type based on the final tracking database provided to the evaluation team. As this table shows, the final weighting of the free-ridership estimates makes the estimates representative of 91 percent of the standard CFLs sold in PY7, 90 percent of specialty CFLs sold in PY7, and 96 percent of the LEDs sold in PY7.

**Table 7-17. Standard and Specialty PY7 Bulb Sales used for Analysis Weights**

Intercept Store?	Retailer Type	Standard CFLs	%	Specialty CFLs	%	LEDs	%
Yes	Big Box	2,288,513	22%	82,380	8%	39,095	9%
	DIY	4,876,436	47%	598,640	60%	308,114	67%
	Warehouse	2,127,768	21%	216,872	22%	518,211	117%
	Intercept Stores	9,292,717	90%	897,892	91%	865,420	96%
No	Discount	36,774	0%	14,968	2%	--	--
	Dollar Store	545,788	5%	28,616	3%	--	--
	Grocery	185,923	2%	20,995	2%	--	--
	Small Hardware	286,378	3%	27,528	3%	34,114	8%
	Non-Intercept Stores	1,054,863	10%	92,107	9%	34,114	8%
Total		10,347,580	85%	989,999	8%	899,534	7%

Source: Evaluation team analysis

#### Weighted Free-ridership Results

Table 7-18 presents the weighted standard CFL, specialty CFL, and LED free-ridership estimates for PY7 based on the customer self-report method.

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

Retailer Type	PY7 Bulb Sales Weighted Free-Ridership		
	Standard CFLs	Specialty CFLs	LEDs <sup>69</sup>
Big Box	0.29	0.33	0.44
DIY	0.47	0.62	0.57
Warehouse	0.26	0.62	0.13
Overall Weighted	0.38	0.59	0.44

Source: Evaluation team analysis

#### **7.1.1.11 Spillover**

In PY7, both participant and nonparticipant spillover were estimated based on data collected during the in-store intercept surveys. The participant and nonparticipant spillover results for CFLs are presented below. The LED spillover results were included in the LED memo mentioned previously.

<sup>69</sup> These are the Non-Demo Event day results. The Demo event and Non-Demo event day results are very different for LEDs. The final LED NTG estimate was based on a 5/95 Demo/NonDemo event day split.

### Participant Spillover

During the PY7 in-store intercepts only one surveyed customer who was purchasing program bulbs also reported purchasing non-incentivized CFLs. A portion of the non-program CFL purchases of this respondent was classified as spillover since the respondent stated the ComEd Residential ES Lighting program at least partially influenced their non-program CFL purchase decision.<sup>70</sup> Using this data, participant spillover was calculated as the ratio of the spillover purchases to the program purchases. This yielded a participant spillover rate of 0.1 percent as shown in Table 7-19.

**Table 7-19. PY7 Participant Spillover Results – Self-Report Method**

Participant Spillover	n	Bulb/Purchase	Bulbs
Non-Program CFL Purchases By Participants	1	4.0	4
Spillover Purchases	1	3.2	3
Program Purchases	327	6.85	2,239
Participant Spillover Rate			0.1%

*Source: Evaluation team analysis*

### Nonparticipant Spillover

Six customers who were not purchasing program bulbs reported they were influenced to some degree by ComEd's program leading them to purchase the non-program CFLs. Based on this data, the nonparticipant spillover rate was extrapolated to the population of ComEd customers to yield an estimated 149,569 non-program bulbs being purchased by program nonparticipants. Dividing these bulbs by the total number of program bulbs sold in PY7 resulted in an estimated nonparticipant spillover rate of 1.5 percent, as shown in Table 7-20.

**Table 7-20. PY7 Nonparticipant Spillover Results – Self-Report Method**

Nonparticipant Spillover	n	Average Bulbs / Purchase	Total Bulbs
Nonparticipant Spillover Purchases	6	4.3	26
Population Extrapolated Spillover Purchases	35,193	4.3	149,569
PY7 Program Bulb Sales			10,069,015
Nonparticipant Spillover Rate			1.5%

*Source: Evaluation team analysis*

## **7.1.2 Evaluation Research Net Impact Results**

Applying the evaluation research NTGR to the evaluation research gross savings estimates resulted in evaluation research net savings of 228,619 MWh, 199.7 MW, 28.2 Summer Peak MW, and 28.0 Summer Peak MW as shown in Table 7-21. This table also shows that all of the evaluation research net energy savings estimates exceeded the verified savings net estimates. These high realization rates are primarily

<sup>70</sup> This portion is based on the number of non-program bulbs they purchased as well as the influence level they provided for the program.

the result of the evaluation research NTGR being higher<sup>71</sup> than the deemed verified savings NTGR for standard CFLs which make up 85 percent of PY7 program bulb sales.

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

	EEPS Portfolio	IPA Portfolio	Total
<b>PY7 Evaluation Research Net Savings</b>			
Net MWh Savings	231,213	n/a	231,213
Net MW Savings	199.7	n/a	199.7
Net Summer Peak MW Savings	28.7	n/a	28.7
Net Winter Peak MW Savings	28.2	n/a	28.2
<b>PY7 Evaluation Research Net Savings Realization Rates</b>			
Net MWh Savings	108%	n/a	108%
Net MW Savings	108%	n/a	108%
Net Summer Peak MW Savings	117%	n/a	117%
Net Winter Peak MW Savings	114%	n/a	114%

*Source: Evaluation team analysis*

## 7.2 Detailed Process Findings

The process evaluation of the PY7 Residential ES Lighting Evaluation assessed the impact of program processes (e.g., the mechanics of how the program was implemented) on residential lighting consumers who participated in the program and the current state of the efficient lighting market in ComEd 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, 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=726).

Table 7-22 shows the distribution of in-store intercept respondent's bulb purchases by retailer type. This table is at a bulb level so all respondent bulb purchases, both program and non-program, are included. In PY7, the percentage of customers buying CFLs (standard and specialty, program and non-program) continued to rise (56 percent in PY7 vs. 46 percent in PY6) and respondents buying incandescent or halogen bulbs continued to fall (38 percent in PY7 vs. 48 percent in PY6). It is interesting to note that 97 percent of the bulbs respondents were buying at warehouse stores were program bulbs compared with 58 percent and 45 percent of the bulbs at big box and DIY stores. This is not entirely unexpected as the Warehouse store visited no longer sells incandescent bulbs and the program make up a larger percentage of their in-store inventory.

<sup>71</sup> The evaluation research NTGR for standard CFLs was 7 percent higher (0.64 vs. 0.60).



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

Program vs. Non-Program	Bulb Type	Big Box		DIY		Warehouse		Total	
		Bulbs Sold	%	Bulbs Sold	%	Bulbs Sold	%	Bulbs Sold	%
Program Bulbs	Standard CFLs	365	40%	900	35%	632	88%	1,897	45%
	Specialty CFLs	155	17%	160	6%	27	4%	342	8%
	Omni Directional LEDs	15	2%	70	3%	30	4%	115	3%
	Directional LEDs	1	0%	20	1%	2	0%	23	1%
	Total	536	58%	1150	45%	691	97%	2,377	57%
Non-Program Bulbs	Incandescent	256	28%	996	39%	0	0%	1,252	30%
	Halogen	96	10%	225	9%	18	3%	339	8%
	Non-program CFL	29	3%	63	2%	0	0%	92	2%
	Non-Program LED	6	1%	120	5%	7	1%	133	3%
	Total	387	42%	1,404	55%	25	3%	1,816	43%

Source: In-Store Intercept Survey (PY7)

Table 7-23 provides the average number of bulbs purchased by survey respondents across the various bulb types and program retailer types where intercepts were conducted. This table shows that on average, across all bulb types, survey respondents tended to purchase higher volumes of bulbs at warehouse stores (7.7 per respondent). DIY and big box stores had lower average bulb sales (5.6 and 5.4). Overall, the average number of bulbs purchased per intercept survey was lower than the average number of bulbs purchased by intercept respondents in PY6 (6.3 in PY6 vs. 5.8 in PY7). Standard program CFLs were purchased on average in the largest quantities.

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

Retailer Type	Program Bulbs					Non-Program Bulbs						All Intercepts
	Stan CFL	Spec CFL	Omni Dir Led	Dir LED	Pgm Avg	Stan CFL	Spec CFL	Omni Dir LED	Dir LED	Non-EE	NonPgm Avg	
Big Box	6.4	5.3	3.8	1.0	6.2	6.5	5.3	1.5	--	4.3	4.4	5.4
DIY	6.6	4.4	2.3	2.5	5.6	12	2.7	2.6	2.2	5.8	5.2	5.6
Warehouse	9.2	4.5	2.3	2.0	7.9	--	--	2.0	1.5	6.0	3.6	7.7
Total	7.2	4.8	2.4	2.3	6.3	9.8	3.3	2.4	2.1	5.4	5.0	5.8

Source: In-Store Intercept Survey (PY7)

### 7.2.1 Program Bulbs

In PY7, CLEAResult and ComEd have continued to work to ensure that a wide variety of independently tested ENERGY STAR CFLs and LEDs are available for incentivized purchase through the ComEd Residential ES Lighting program. Table 7-24 shows the distribution of program bulbs sold in PY7 across bulb types and specific product subcategories (base wattages for standard bulbs and bulb type for

specialty bulbs). As this table shows, in PY7 85 percent of the bulbs sold through the program were standard CFLs, 8 percent were specialty CFLs, and 7 percent were LEDs. Within standard CFLs, the majority of bulbs sold continued to be low-wattage CFLs (13 and 14-watts, with lumens equivalent to a 43-watt incandescent).

**Table 7-24. Distribution of PY7 Residential ES Lighting Program Sales across Bulb Types**

Bulb Type	Product	% of Bulbs Sold	% of Bulbs Sold
Standard CFL	29 (40) Watt Replacement	5.2%	84.5%
	43 (60) Watt Replacement	64.6%	
	53 (75) Watt Replacement	3.3%	
	72 (100) Watt Replacement	11.4%	
Specialty CFL	Reflector	5.4%	8.1%
	Candelabra	1.1%	
	A-Lamp	0.9%	
	Globe	0.4%	
	Other Specialty	0.3%	
LED	Omni-directional	3.9%	7.4%
	Directional	3.5%	
<b>Residential ES Lighting Program</b>		<b>100%</b>	<b>100%</b>

Source: Evaluation team analysis of PY7 ComEd Tracking data

## 7.2.2 Prior Usage of High Efficiency Bulbs by Program Participants

Respondents purchasing program bulbs were asked about prior usage of CFLs and LEDs in their homes and businesses, and, as shown in Table 7-25, 94 percent of respondents reported that they already had CFLs installed in their home and/or business and 67 percent reported they already had an LED installed in their home.

**Table 7-25. Prior Installation of CFLs and LEDs in Homes and Businesses**

Prior Installation?	CFL		LED	
	Home	Business	Home	Business
Yes	94%	94%	67%	100%
No	5%	6%	33%	--
Don't Know	1%	--	--	--
N	318	17	43	1

Source: PY7 In-Store Intercept Survey

LEDs were most frequently being purchased to replace incandescent bulbs or CFLs. Fifty-six percent of respondents reported that the LEDs they were purchasing would replace incandescent bulbs, 22 percent

said that the bulbs would replace CFLs, 7 percent reported that the bulbs would replace LEDs, 7 percent reported that the bulbs would replace halogen bulbs, and 9 percent did not know what they would replace. Roughly two-thirds of LED program bulb purchasers reported that some or all of the LEDs they were purchasing would replace bulbs that were still in working order.<sup>72</sup> Significantly fewer CFLs were being purchased to replace bulbs that were still in working order (46 percent). This difference is likely related to the number of customers purchasing LEDs to replace CFLs due to their increased efficiency, lifespan, and perceived light quality.

### 7.2.3 Effectiveness of Program Marketing

Program awareness continues to be quite low: Awareness of lighting discounts was moderate amongst both CFL and LED program bulb purchasers and only half of those who were aware of the discount knew it was provided by ComEd. In-store intercept respondents who were purchasing program bulbs were asked if they knew that they were purchasing an incentivized bulb and if so, if they knew the incentive was provided by ComEd. In PY7, 57 percent of respondents reported knowing they were purchasing incentivized bulbs, as shown in Table 7-26, with the highest awareness among customers who were purchasing program bulbs at a big box store. Only 54 percent of the respondents who were aware of the discount knew that the incentive was provided by ComEd. Therefore, only 31 percent ( $57\% \times 54\% = 31\%$ ) of PY7 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 price was low and the majority thought it was (79 percent reported it was low for CFLs, 69 percent reported it was low for LEDs).

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

Aware of program discount	CFL Purchasers	LED Purchasers	Big Box	DIY	Warehouse	Overall
Yes	57%	55%	67%	55%	51%	57%
No	42%	23%	33%	45%	36%	40%
Not Asked	--	21%	--	--	14%	3%
N	327	56	87	206	87	380

Source: PY7 In-Store Intercept Survey

As shown in Table 7-27, the majority (77 percent) of survey respondents who were aware the program bulbs they were purchasing were incentivized by ComEd reported learning of the incentive from a ComEd sticker on the shelf or a retail lighting demonstration. Non-program bulb purchasers reported that they primarily learned about the ComEd discount through a ComEd sticker on the shelf (46 percent) and in-store marketing materials (20 percent).

<sup>72</sup> Replacing a bulb that is installed and in working order is known as “early replacement”.

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

Source of ComEd Discount Awareness	Purchasing Program Bulbs	Not Purchasing Program Bulbs	Overall
ComEd sticker on the shelf	47%	46%	47%
Saw a retail lighting demonstration	30%	5%	23%
Read about it in ComEd Bill	5%	7%	6%
In-store Marketing Materials (unspecified)	9%	20%	12%
Store employee	7%	7%	7%
Friend	0%	2%	1%
Newspaper/TV/Radio ad	0%	7%	2%
Don't know or Other	2%	4%	3%
N	118	41	159

Source: PY7 In-Store Intercept Survey

All intercept respondents who were purchasing program bulbs were asked whether or not they had seen any information or displays about energy efficient lighting in the store. Table 7-28 shows that most respondents (64 percent) reported they had not seen any in-store information about energy efficient lighting. Big box shoppers were the least aware of in-store lighting materials, with 75 percent reporting that they had not seen in-store information or displays about energy efficient lighting. Seventy-one and 59 percent of warehouse and DIY shoppers reported that they had not seen the in-store energy efficient lighting materials, respectively. Forty-five percent of customers who saw energy efficient lighting information in the store reported it was provided by ComEd, 29 percent did not know who sponsored the information, 12 percent reported it was sponsored by the retailer, and the remaining 16 percent reported it was provided by another source.

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

Awareness of CFL In-Store Materials	Overall	Warehouse	DIY	Big Box
Yes	34%	29%	39%	24%
No	64%	71%	59%	75%
Don't know	2%	0%	3%	1%
N	726	93	462	171

Source: PY7 In-Store Intercept Survey

Over two-thirds (69 percent) of respondents who purchased program bulbs and saw in-store information regarding energy efficient lighting, reported that materials were extremely influential. Overall, the LED purchasers rated the influence of the marketing materials higher than the CFL purchasers, as shown in Table 7-29. Warehouse stores also had the highest influence ratings compared to the ratings respondents reported for in-store marketing materials at big box and DIY stores.

**Table 7-29. Influence of Energy Efficient Lighting In-Store Materials**

Level of Influence	Overall	Warehouse	Big Box	DIY	Standard	Specialty	LED
Not Very Influential (0 to 3)	16%	8%	15%	19%	16%	29%	7%
Moderately Influential (4 to 6)	19%	17%	20%	19%	20%	4%	22%
Extremely Influential (7 to 10)	65%	75%	65%	62%	64%	67%	71%
N <sup>73</sup>	134	24	34	76	87	24	28

Source: PY7 In-Store Intercept Survey

#### 7.2.4 Customer Purchasing Decisions

The influence of in-store marketing materials can also be seen by comparing customers' purchase plans against their eventual purchases. Table 7-30 shows that 74 percent of the in-store intercept survey respondents reported that they had planned to buy light bulbs when they came to the store. Thirty-four percent of these respondents were planning on buying CFLs exclusively; 13 percent of respondents were planning on buying LEDs exclusively; 4 percent were planning on buying a mix of LEDs, CFLs, and/or another bulb type; 40 percent were planning on buying bulbs other than CFLs and LEDs; and 9 percent of respondents were not sure what type of bulb they wanted to buy when they entered the store. As shown in the table below, the majority of customers surveyed purchased the types of bulbs that they had planned to buy when they entered the store; 88 percent of the respondents who planned to at least one LED bought only LEDs, 86 percent of the respondents who planned to purchase at least one CFL bought only CFLs, and 81 percent of the respondents who planned to purchase non-energy efficient bulbs bought only incandescent and halogen bulbs.

<sup>73</sup> Some customers purchased more than one bulb type (standard CFL, specialty CFL, and LEDs) and were asked to rank the influence that in-store materials had on their decision purchase each of the bulb types separately, therefore, the sum of the n's for each bulb type is greater than the overall n.

**Table 7-30. Purchase Intentions versus Actual Purchases**

Purchasing Intentions	(n=726)
Planned on purchasing light bulbs prior to entering the store	74%
Customers who planned on purchasing at least one LED bulb, eventually purchased...	(n = 78)
LEDs Only	88%
CFLs Only	3%
At least one LEDs + Other bulbs	4%
CFLs +Non-Energy Efficient Bulbs	1%
Non-Energy Efficient Bulbs Only	4%
Customers who planned on purchasing at least one CFL bulb, eventually purchased...	(n = 201)
CFLs Only	86%
LEDs Only	1%
At least one CFLs +Other Bulbs	11%
LEDs +Non-Energy Efficient Bulbs	0%
Non-Energy Efficient Bulbs Only	2%
Customers who planned on purchasing a type of bulb other than LEDs and CFLs eventually purchased...	(n = 218)
Non-Energy Efficient Bulbs Only	81%
LEDs and/or CFLs Only	13%
A mix of LEDs, CFLs and/or Other Non-Energy Efficient Bulbs	6%
Customers who did not plan on purchasing bulbs when they entered the store...	(n = 185)
CFLs Only	54%
LEDs Only	14%
Non-Energy Efficient Bulbs or a Mix of Bulb Types	31%

*Source: PY7 In-Store Intercept Survey*

Respondents were asked about the factors that influenced their decision to purchase CFLs and LEDs. In PY7, the top three factors that customers said most influenced their decision to buy CFLs included: the purchase price of CFLs (25 percent), the light quality that CFLs produce (20 percent), and the energy used by CFLs (18 percent).

The top three factors that customers reported were the most influential in their decision to purchase LEDs were the longevity of the bulbs (32 percent), the light quality that LEDs produce (22 percent), and the energy used by LEDs (20 percent).

**Table 7-31. Factors Influencing CFL Purchase Decisions**

Influence Factor	Most Important	Least Important
The purchase price of CFLs	25%	17%
The light quality that CFLs produce	20%	11%
The energy used by CFLs	18%	7%
How long the CFLs will last	15%	24%
The monthly bill savings resulting from using CFLs	15%	10%
The environmental impact of using CFLs	5%	20%
Don't know	2%	11%

Source: PY7 In-Store Intercept Survey

**Table 7-32. Factors Influencing LED Purchase Decisions**

Influence Factor	Most Important	Least Important
How long the LEDs will last	32%	15%
The light quality that LEDs produce	22%	7%
The energy used by LEDs	20%	6%
The monthly bill savings resulting from using LEDs	12%	10%
The purchase price of LEDs	9%	24%
The environmental impact of using LEDs	4%	39%

Source: PY7 In-Store Intercept Survey

Only four percent of respondents purchased a mix of bulb types, and most of these respondents purchased at least one energy efficient bulb. When asked why they were purchasing more than one type of bulb respondents gave a variety of responses, but the top three reasons included that they were purchasing bulbs for fixtures that required a particular bulb type<sup>74</sup> (31 percent), that there are certain fixtures where they like the look/light quality of incandescent bulbs (28 percent), and that they wanted to try CFLs or LEDs (17 percent). When respondents were asked, if the price of CFLs were the same as, or less than the price of an incandescent or halogen bulb, how likely they would be on a scale from zero to 10 (with 0 being not likely and 10 being extremely likely) to purchase all CFLs, one-third of respondents said they were extremely likely and one-third said they were not at all likely. Similarly, respondents were asked how likely they would be to purchase all LEDs if the price of LEDs was the same or less than CFL, incandescent, or halogen bulbs, and 32 percent said extremely likely, 27 percent said not likely, and 11 percent were neutral (rating of 5).

Nearly all (98 percent) of respondents purchasing Standard CFLs opted for ComEd discounted program bulbs, 85 percent of respondents purchasing Specialty CFLs selected ComEd program bulbs, 55 percent of respondents purchasing Omni-directional LEDs chose program bulbs, and 32 percent of respondents

<sup>74</sup> These respondents noted several reasons why they purchased a variety of bulbs including: they have a fixture that needed a 3-way bulb, a dimmable bulb, or that they cannot use CFL type bulbs in particular fixtures.

purchasing Directional LEDs opted for program bulbs. The primary reasons that CFL and LED purchasers provided for not purchasing program bulbs were that they were unable to find discounted bulb in the type that they needed (CFL purchasers: 33 percent; LED purchasers: 41 percent) and they were unaware of the discount (CFL purchasers: 27 percent; LED purchasers: 24 percent).

### 7.2.5 Barriers to CFL and LED Use

Fifty-three percent of the customers completing an in-store intercept survey (all of whom were purchasing light bulbs) did not purchase CFL bulbs. The majority of respondents who reported they had not considered purchasing CFLs when they entered the store, did not eventually purchase any CFLs (n=278). These respondents provided a variety of reasons for not purchasing CFLs, including: they needed a specialty bulb type (24 percent), they did not like the light quality/color of CFLs/flicker (19 percent), they did not like the way CFLs fit or look in fixtures (16 percent), and they did not know enough about CFLs/were not aware of CFLs before today (15 percent).

Table 7-33 presents the barriers to purchasing CFLs reported by survey respondents. As this table shows, very few warehouse store respondents are included in the barriers to purchase analysis because the only 6 percent of Warehouse store respondents did not buy program bulbs, while, a greater percentage of big box and DIY respondents did not buy program bulbs (49 percent and 55 percent, respectively).

**Table 7-33. Barriers to CFL Purchase**

Reasons for not buying CFLs	Overall	DIY	Big Box	Warehouse
Needed other specialty bulb (including needed a dimmable, 3-way, or exterior bulb)	24%	25%	25%	33%
Dislike the light quality/color of CFLs/flicker	19%	20%	17%	33%
Don't like the way CFLs fit or look in fixtures	16%	18%	13%	--
Don't know enough about CFLs/Not aware of CFLs before today	15%	15%	16%	--
CFLs are too expensive	13%	13%	11%	--
Accustomed to incandescent bulbs	12%	16%	9%	--
CFLs take too long to reach full brightness	5%	8%	1%	33%
Matching/replacing existing bulbs with the same kind	2%	3%	4%	--
Burn out too fast/Don't work well	2%	3%	1%	--
Mercury/Dangerous	2%	2%	4%	--
Don't need standard CFLs right now	2%	2%	1%	--
Don't know	4%	5%	--	--
Other	2%	3%	3%	--
N	275	197	75	3

Source: PY7 In-Store Intercept Survey

Eighty-five percent of the respondents who completed an in-store intercept survey did not purchase any LED bulbs. Half of these respondents reported they had not considered purchasing LEDs when they



entered the store (n=300). The top reasons these respondents provided for not purchasing LEDs were: they did not know enough about LEDs or were not aware of them prior to the interview (33 percent), they think LEDs are too expensive (26 percent), and they needed another specialty bulb type (19 percent). On average, respondents who reported that LEDs were too expensive reported only moderate likelihood (a 5 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 bulbs. This indicates there is more than just the bulb price keeping them from purchasing LEDs.

Table 7-34 presents the barriers to purchasing LEDs reported by survey respondents. As previously mentioned, very few Warehouse store respondents are included in the barriers to purchase analysis because the majority of Warehouse store respondents purchased program bulbs.

**Table 7-34. Barriers to LED Purchase**

Reasons for not buying LEDs	Overall	DIY	Big Box	Warehouse
Don't know enough about LEDs/Not aware of LEDs before today	33%	31%	37%	--
LEDs are too expensive	26%	31%	17%	33%
Needed other specialty bulb (including needed a dimmable, 3-way, or exterior bulb)	19%	14%	29%	33%
Accustomed to incandescent bulbs	10%	13%	4%	--
Dislike the light quality/color of LEDs/flicker	5%	4%	6%	33%
Don't like the way LEDs fit or look in fixtures	4%	5%	1%	--
LEDs take too long to reach full brightness	1%	--	1%	--
Don't know	1%	2%	--	--
Other	2%	1%	4%	--
N	198	125	70	3

Source: PY7 In-Store Intercept Survey

### 7.2.6 General LED Usage and Familiarity

LEDs are often mentioned as the next alternative lighting technology and a potential direction for utility lighting programs. We asked ComEd lighting purchasers, who were not purchasing LEDs, some questions during the in-store intercept survey to gauge their current awareness level and usage of LEDs. Surprisingly, in PY7 the percentage of respondents who had purchased an LED or reported that they were familiar with LED bulbs was slightly lower than in PY6 (69 percent vs 76 percent, respectively). In total, 33 percent of those surveyed were either purchasing an LED to install in their home or indicated they had previously installed an LED bulb in their home or business (down from 40 percent in PY6).

## 7.3 Illinois TRM Recommendations

As part of the PY7 study, research was conducted to support updates to the Illinois TRM.

### 7.3.1 Recommendations for Updates to the Illinois TRM

As noted in previous evaluation reports, the evaluation team recommends updating a number of parameters in the Illinois TRM annually based on 3-year rolling averages of the evaluation primary research based parameter estimates. It should be noted that including a 3-year rolling average of research findings in the Illinois TRM reduces volatility that a single year of research could introduce and ensures that the most recent evaluation research estimates are being applied. However, if a significant change is made to the Residential ES Lighting program that would render the 3-year rolling average inappropriate and justifiably warrants a change to the parameter estimate away from a 3-year rolling average, this should be considered. The evaluation team's recommended parameters for the IL TRM are shown in Table 7-35.

**Table 7-35. Impact Estimate Parameters for Future Use**

Parameter	Value	Data Source
Res/Non-Res Split <sup>75</sup>	96% / 4% CFL	3-year rolling average (PY5-PY7) of Evaluation Research Findings
	98% / 2% LEDs	PY7 Evaluation Research Findings
1st Year Installation Rate	74.7% Standard CFL	3-year rolling average (PY5-PY7) of Evaluation Research Findings
	91.4% Specialty CFL	
	95% LEDs	PY7 Evaluation Research Findings

Source: Evaluation team analysis

The res/non-res split was included in the Illinois TRM v2.0. Including this parameter as a deemed value in the Illinois TRM helps improve the verified savings realization rate by removing the uncertainty that surrounds this estimate within the calculation of verified savings. In Illinois TRM v3.0, the res/non-res split is deemed at 97 percent/3 percent for standard and specialty CFLs "based on a weighted (by sales volume) average of ComEd PY3, PY4, and PY5 and Ameren PY5 in-store intercept survey results."<sup>76</sup> Since to date there has not been enough LED data to develop a distinct Res/Non-Res split for LEDs, the CFL res/non-res split is being applied. The evaluation team recommends updating the deemed res/non-res split annually based on a rolling 3-year average from the most recent evaluation research findings from ComEd and Ameren. It is not possible for the evaluation team at this time to estimate what the statewide deemed res/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 CFL bulb type and for LEDs. This is shown in Table 7-36.

<sup>75</sup> Residential/Non-residential (Res/Non-Res).

<sup>76</sup> Illinois TRM v3.0 at p. 576

**Table 7-36. 3-Year Average Res/Non-Res Split for ComEd**

Program Year	Standard CFLs		Specialty CFLs		LEDs	
	Bulbs	Res/Non-Res	Bulbs	Res/Non-Res	Bulbs	Res/Non-Res
PY5	9,633,227	98% / 2%	1,197,896	98% / 2%		
PY6	8,965,546	95% / 5%	2,125,179	95% / 5%		
PY7	10,347,580	94% / 6%	989,999	95% / 5%	899,534	98%/2%
3-year Weighted Average	-	96% / 4%	-	96% / 4%		98% / 2%

Source: Evaluation team analysis

The evaluation team recommends updating the deemed installation rates for CFLs annually based on a rolling 3-year average from the most recent evaluation research findings (from both ComEd and Ameren IL when available). This insures the deemed installation rates are reflective of the most recent data available. It is not possible at this time to estimate the statewide deemed installation rate for the Illinois TRM due to the lack of Ameren IL data, however Table 7-37 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 7-37. 3-Year Average Standard and Specialty Installation Rates for ComEd**

Program Year	Standard CFLs		Specialty CFLs		LEDs	
	Bulbs	1 <sup>st</sup> Year ISR	Bulbs	1 <sup>st</sup> Year ISR	Bulbs	1 <sup>st</sup> Year ISR
PY5	9,633,227	76.0%	1,197,896	91.6%		
PY6	8,965,546	72.6%	2,125,179	92.4%		
PY7	10,347,580	75.2%	989,999	88.9%	899,534	95%
3-year Weighted Average	-	74.7%	-	91.4%		95% <sup>77</sup>

Source: Evaluation team analysis

## 7.4 NTGR Recommendations

### 7.4.1 NTGR Estimate for Future Use

The NTGR for PY7 was deemed for bulbs sold through the EEPs portfolio based on past evaluation research and approved through the IL SAG consensus process.

Table 7-38 provides three years of evaluation research NTGR estimates (PY5-PY7) for standard and specialty CFLs, as well as the 3-year weighted NTGR estimates which are available for future use.

<sup>77</sup> Only a single year of results is available and thus this result is not a 3-year weighted average.

**Table 7-38. 3-Year Average Standard and Specialty NTGR Available for Future Use**

Program Year	Standard CFLs		Specialty CFLs		LEDs	
	Bulbs	NTGR	Bulbs	NTGR	Bulbs	NTGR
PY5	9,633,227	0.55	1,197,896	0.48		
PY6	8,965,546	0.59	2,125,179	0.54		
PY7	10,347,580	0.64	989,999	0.43	899,534	0.73
3-year Weighted Average		0.59		0.50		0.73 <sup>78</sup>

Source: Evaluation team analysis

Table 7-39 provides the NTGR Parameters available for deeming for future use, based on previous evaluation research.

**Table 7-39. NTGR Parameters Available for Future Use**

Parameter	Value	Data Source
NTGR	0.64 Standard CFL	PY7 Evaluation Research Findings
	0.43 Specialty CFL	
	0.73 LEDs	

Source: Evaluation team analysis

## 7.5 PJM Data and Findings

ComEd Residential ENERGY STAR® Lighting Program

Program Year 7 – June 2013 – May 2014

PY7 Ex Post Program Gross Evaluation Research Summer Peak Demand Savings = 45.1 MW

PY7 Ex Post Program Gross Evaluation Research Winter Peak Demand Savings = 44.6 MW

PY7 Ex Post Carryover Gross Evaluation Research Summer Peak Demand Savings = 12.6 MW

PY7 Ex Post Carryover Gross Evaluation Research Winter Peak Demand Savings = 12.8 MW

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

1. PY7 Program Bulbs Sold
2. Delta Watts
3. Residential / Non-residential Split
4. Peak Coincidence Factor (Peak CF) – Summer and Winter
5. Installation Rate
6. Demand Interactive Effects

<sup>78</sup> Only a single year of results is available and thus this result is not a 3-year weighted average.

## 7.6 Attachments

### 7.6.1 PY7 In-Store Intercept Survey Instrument

## COMED PY7 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
3. Sam's Club
4. Wal-Mart

#### Q1. Record Bulb Type

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

#### Q2. Record number of bulbs in the package

	Package 1	Package 2	Package 3	Package 4
# of Bulbs				

#### Q3. Record Bulb Shape

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

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

	Package 1	Package 2	Package 3	Package 4
Dimmable				
3-way				

G24 Base				
Ceiling Fan Bulb				
Candelabra Base				
QuickStart				
Silicone				
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				

Q8. Are there any more unique lighting packages in the customers' basket?

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

**CREATE FLAGS TO CLASSIFY BULB PURCHASES AND SUM PURCHASES:**

If Q1(i) = CFL then BULBTYPE(i) = CFL

If Q1(i) = LED then BULBTYPE(i) = LED

If Q1(i) = Incandescent then BULBTYPE(i) = INC

If Q1(i) = Halogen then BULBTYPE (i)= HALOGEN

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

*If Q1(i) = CFL and Q3 = Spiral and Q3a = None then BULBGROUP(i) = STANDARD*

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

*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*

*PSTANCFL = sum of (Q2(i)\*Q6(i)) where BULBGROUP(i) = SPECIALTY 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 STANDARD 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 SPECIALTY CFLS (SPECCFL >0) READ:***

“When I refer to Specialty CFLs I am talking about CFLs that either have a special shape (such as a globe, a candelabra or a covered glass (a-lamp) bulb) or special feature (such as dimmable, 3-way, floodlights, high wattage or non-Medium Screw Base).”

***(IF PURCHASING PROGRAM STANDARD CFLS, (PSTANCFL >0))***

Q15stan. Where are you planning to install the **STANDARD** CFLs you are buying today - in your home, a business, or both?

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

***(IF PURCHASING PROGRAM SPECIALTY CFLS (PSPECCFL >0))***

Q15spec. Where are you planning to install the **SPECIALTY** CFLs you are buying today - in your home, a business, or both?

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

**(IF PURCHASING PROGRAM LEDs (*PLED >0*))**

Q15led. Where are you planning to install the **LEDs** you are buying today - in your home, a business, or both?

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

**(IF ANY OF THE BULBS WILL BE INSTALLED IN A BUSINESS, if Q15stan or Q15spec or Q15led in (2, 3))**

Q16. What type of business is it?

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

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



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

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

**Customer Intentions and History**

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

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

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

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

**(IF Q9 =1)**

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

1. CFLs
2. Incandescent
3. Halogen
4. LED
5. Other \_\_\_\_\_
6. Don't know

**(IF PURCHASING LEDs, LEDs > 0)**

Q13. Have you ever purchased or been given any LEDs before today?

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

**(IF ANY OF THE CFLs WILL BE INSTALLED IN A BUSINESS- Q15stan or Q15spec in (2,3))**

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

1. Yes
2. No

3. Don't know

**(IF ANY OF THE LEDs WILL BE INSTALLED IN A BUSINESS- Q15led in (2,3))**

Q18led. Do you have any LEDs installed right now in your business?

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

**(IF ANY OF THE BULBS WILL BE INSTALLED IN A BUSINESS- Q15stan or Q15spec or Q15led in (2, 3))**

Q19. Does ComEd deliver electricity to your business?

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

**(If Q19 = 2 or 3)**

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

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

**(IF THE PROGRAM CFLs ARE FOR A HOME- Q15stan or Q15spec in (1,3))**

Q20. Do you have any CFLs installed right now in your home?

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

**(IF THE PROGRAM LEDs ARE FOR A HOME- Q15led = 1 or 3)**

Q20led. Do you have any LEDs installed right now in your home?

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

**(IF THE PROGRAM BULBS ARE FOR A HOME- Q15stan or Q15spec or Q15led in (1, 3))**

Q21. Does ComEd deliver electricity to your home?

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

**(IF Q21 = 2 or 3)**

Q21\_B. Do you receive a bill from ComEd for your electricity usage? **(IF NEEDED, READ: “Some customers in this region purchase their electricity from a Retail Electric Supplier but ComEd still bills these customers.”)**

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

**(ASK Q11 and QPRICE IF PURCHASING CFLs 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 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
2. CFLs were on sale/inexpensive
3. Want to try CFLs
4. Want to try LEDs
5. Has fixtures that need 3-way bulbs
6. Has fixtures that need dimmable bulbs
7. There are certain fixtures where they prefer the look of incandescent bulbs
8. There are certain fixtures where they prefer the light quality of incandescent bulbs
9. For fixtures that can’t use CFLs (not reason 4 – 7) List reason: \_\_\_\_\_
10. Other \_\_\_\_\_
11. Don’t Know

**(IF PURCHASING CFLS BULBS)**

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

	Most Important	Least Important
--	----------------	-----------------

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

**(IF PURCHASING LEDs BULBS)**

Q22la-lf. 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
4. Don't Know

**(IF PURCHASING SPECIALTY CFLS, SPECCFL > 0)**

Q25spec. Of the <SPECCFL> **Specialty** CFLs you are purchasing today, how many do you expect to install in the next 6 months?

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

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

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

**(IF PURCHASING LEDs, LED > 0 ASK Q25led and Q29led)**

Q25led. Of the <LED> LEDs you are purchasing today, how many do you expect to install in the next 6 months?

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

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

1. Incandescent
2. CFL
3. Halogen
4. LED
5. 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
4. Don't Know

**Program Purchase Decision**

**(IF CUSTOMER IS PURCHASING 1 OR MORE PROGRAM BULB (PSTANCFL + PSPECCFL + PLED > 0), ASK Q33, OTHERWISE, SKIP TO Q30)**

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

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

**(IF CUSTOMER IS PURCHASING 1 OR MORE PROGRAM CFLS (PSTANCFL + PSPECCFL > 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
5. 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
5. 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
3. 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
8. Other\_\_\_\_\_
9. 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

3. Don't know

**PROGRAM CFL NTG BATTERY**

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

*"The discount ComEd offers on select CFLs is around \$1.25 per bulb for Standard CFLs and \$2.00 per bulb for Specialty CFLs. The  $<PSTANCFL + PSPECCFL>$  CFLs you are purchasing today that have been discounted by ComEd would have cost a total of  $\$<PSTANCFL*1.25 + PSPECCFL*2>$  more without the ComEd incentive."*

**(IF PURCHASING PROGRAM STANDARD CFLS,  $PSTANCFL > 0$ )**

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

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

**(IF PURCHASING PROGRAM SPECIALTY CFLS,  $PSPECCFL > 0$ )**

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

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

**(IF PURCHASING STANDARD CFLS DISCOUNTED BY COMED,  $PSTANCFL > 0$ )**

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

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

**(ASK IF  $Q37stan=2$ )**

Q37stan2. How many of the  $<PSTANCFL>$  standard CFLs would you have purchased if they had cost \$1.25 more per bulb?

\_\_\_\_ [NUMERIC OPEN END, 1 –  $<PSTANCFL>$ ];

00 None

98. Don't know

**(ASK IF  $Q37stan=2, 3$ )**

Q38stan. Would you have purchased a different type of light bulb instead of the standard CFLs?

1. Yes, Would have purchased a different type of light bulb

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

**[ASK IF Q38stan =1]**

Q38stan2. What type of light bulbs would you have purchased instead of the standard CFLs? Would you have purchased... (**ALLOW MULTIPLE RESPONSES**)

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

**(IF PURCHASING SPECIALTY CFLS DISCOUNTED BY COMED, PSPECCFL > 0)**

Q37spec.If the ComEd discount had not been offered, and the <PSPECCFL> discounted specialty CFL(s) had instead cost **\$2.00** more per bulb, or a total of <2\*PSPECCFL> more, would you still have purchased all of these Specialty CFLs, some of them, or none of them?

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

**(ASK IF Q37spec=2)**

Q37spec2. How many of the <PSPECCFL> Specialty CFLs would you have purchased if they had cost \$2.00 more per bulb?

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

**(ASK IF Q37spec=2, 3)**

Q38spec. Would you have purchased a different type of light bulb instead of the specialty CFLs?

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

**[ASK IF Q38Spec=1]**

Q38spec2. What type of light bulbs would you have purchased instead of the specialty CFLs? Would you have purchased... (**ALLOW MULTIPLE RESPONSES**)

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

**PROGRAM LED NTG BATTERY**



**IF BUYING PROGRAM LEDs (PLED > 0) READ:**

*"The discount ComEd offers on select LEDs is around \$2.00 per bulb for Standard LEDs and \$4.00 per bulb for Reflector LEDs. The <PLED> LEDs you are purchasing today that have been discounted by ComEd would have cost a total of \$<PLEDOMNI\*2 + PLEDDIR\*4> more without the ComEd incentive."*

**(IF PURCHASING PROGRAM LEDs, PLED > 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 LEDs today?

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

**(IF PURCHASING ONE PROGRAM OMNILED, PLEDOMNI = 1)**

Q37ledSO. If the ComEd discount had not been offered, and the discounted **Standard LED** you are purchasing had instead cost \$2 more, would you still have purchased this **Standard LED**? [ If needed: "Standard LEDs are LEDs that can be used to replace a basic incandescent bulb."]

1. Yes
2. No
3. 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 **Standard LEDs** you are purchasing had instead cost a total of <2\*PLEDOMNI> more, would you still have purchased all of these **Standard LEDs**, some of them, or none of them? [ If needed: "Standard LEDs are LEDs that can be used to replace a basic incandescent bulb."]

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

**(ASK IF Q37ledMO=2 and PLEDOMNI > 1)**

Q37led2MO. How many of the <PLEDOMNI> **Standard LEDs** would you have purchased if they had cost \$2.00 more per bulb?

\_\_\_\_ [NUMERIC OPEN END, 1 – <PLEDOMNI >];

00 None

98. Don't know

**(IF PURCHASING ONE PROGRAM DIRLED, PLEDDIR = 1)**

Q37ledSD. If the ComEd discount had not been offered, and the discounted **Reflector LED** you are purchasing had instead cost \$4 more, would you still have purchased this **Reflector LED**? [ If needed: "Reflector LEDs are LEDs that can be used to replace a floodlight or spot light bulb."]

1. Yes

2. No
3. 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 **Reflector LEDs** you are purchasing had instead cost a total of <4\*PLEDDIR> more, would you still have purchased all of these **Reflector LEDs**, some of them, or none of them? [ If needed: " Reflector LEDs are LEDs that can be used to replace a floodlight or spot light bulb."]

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

**(ASK IF Q37ledMD=2 and PLEDDIR > 1)**

Q37led3. How many of the <PLEDDIR> **Reflector LEDs** would you have purchased if they had cost \$4.00 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
3. 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
4. Don't know

**(IF PURCHASING ONE OR MORE PROGRAM DIRLEDs BUT NO PROGRAM OMNILEDS**

**[PLEDDIR > 0 AND PLEDOMNI = 0])**

Q55O. If the ComEd discount on **Standard LEDs** was increased from \$2 per bulb to \$5 per bulb, would you have purchased any **Standard LEDs** today?

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

**(IF PURCHASING ONE OR MORE PROGRAM OMNILEDs, PLEDOMNI > 0)**

Q55OM. If the ComEd discount on **Standard LEDs** was increased from \$2 per bulb to \$5 per bulb, would you have increased the number of **Standard LEDs** you are purchasing today?

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

**(IF Q55O = 1 or Q55OM = 1 then ASK Q56O)**

Q56O. How many (if Q55OM = 1 then read "additional") **Standard LEDs** do you think you would have purchased?

\_\_\_ [NUMERIC OPEN END]

98. Don't know

**(IF PURCHASING ONE OR MORE PROGRAM OMNILEDs BUT NO PROGRAM DIRLEDS  
[PLEDOMNI > 0 AND PLEDDIR = 0])**

Q55D. If the ComEd discount on **Reflector LEDs** was increased from \$4 per bulb to \$7 per bulb, would you have purchased any **Reflector LEDs** today?

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

**(IF PURCHASING ONE OR MORE PROGRAM DIRLEDS, PLEDDIR > 0)**

Q55DM. If the ComEd discount on **Reflector LEDs** was increased from \$4 per bulb to \$7 per bulb, would you have increased the number of **Reflector LEDs** you are purchasing today?

4. Yes
5. No
6. Don't know

**(IF Q55D = 1 or Q55DM = 1 then ASK Q56D)**

Q56D. How many (if Q55DM = 1 then read "additional") **Reflector LEDs** do you think you would have purchased?

\_\_\_ [NUMERIC OPEN END]

98. Don't know

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

1. Yes
2. No
3. 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
3. Other \_\_\_\_\_
4. Don't know

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

1. Yes
2. No
3. 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
3. 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) \_\_\_\_\_
2. Don't know

**(IF PURCHASING SPECIALTY CFLS DISCOUNTED BY COMED (PSPEC CFL > 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)))**

Q41spec. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the in-store information regarding Energy Efficient Lighting that you saw or heard about from [RETAILER] personnel in your decision to buy **Specialty** CFLs?

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

**(IF PURCHASING PROGRAM BULBS (PSTANCFL + PSPECCFL + PLED > 0) AND ONE OR MORE PACKAGE WAS LOCATED ON A PROGRAM DISPLAY (Q7\_X in (2,3))**

PLACE. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was the positioning 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) \_\_\_\_\_
2. Don't know

**Non-Program CFL Purchases**

**(IF CUSTOMER IS NOT PURCHASING ANY CFL BULBS DISCOUNTED BY COMED, (PSTANCFL + PSPECCFL + PLED = 0), 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)
3. 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
8. Open End \_\_\_\_\_
9. Don't know

**(IF CUSTOMER IS PURCHASING SOME NON-DISCOUNTED CFLS, IF (STANCFL+SPECCFL) > (PSTANCFL+PSPECCFL))**

Q32. (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

7. Other\_\_\_\_\_
8. Don't Know

**(IF CUSTOMER IS PURCHASING NON-DISCOUNTED CFLS (STANCFL + SPECCFL) > (PSTANCFL + PSPECCFL) AND KNEW ABOUT THE COMED DISCOUNT (Q30 = 1 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) \_\_\_\_\_
2. Don't know

**(IF CUSTOMER IS PURCHASING SOME NON-DISCOUNTED LEDs, IF (LED) > (PLED))**

Q32led. (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/manufacture
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
6. Other\_\_\_\_\_
7. Don't Know

**(IF CUSTOMER IS PURCHASING SOME NON-DISCOUNTED LEDs, IF (LED) > (PLED))**

QledNP. If ComEd increased the incentive they provided on LEDs to \$5 for a standard bulb and \$7 for a reflector, would you have likely purchased additional program LEDs?

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

**(IF QledNP = 1)**

Q99a. How many additional program Standard LEDs do you think you would have purchased?

\_\_\_ Standard LEDs [NUMERIC OPEN END]

98. Don't know

**(IF QledNP = 1)**

Q99b. How many additional program Reflector LEDs do you think you would have purchased?

\_\_\_ Reflector LEDs [NUMERIC OPEN END]

98. 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) \_\_\_\_\_
2. Don't know

### **Incandescent or Halogen Purchaser Section**

**(IF NOT PURCHASING EFFICIENT BULBS (STANCFL + SPECCFL = 0) & LED =0)**

Q42. Did you consider purchasing any CFLs today?

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

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

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

**(IF NOT PURCHASING LEDs, LED =0)**

Q42led. Did you consider purchasing any LEDs today?

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

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 \_\_\_\_\_
11. Don't Know

**(IF NOT PURCHASING CFLs (STANCFL + SPECCL = 0))**

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

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

**(IF 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) \_\_\_\_\_
2. Don't know

**(IF THE CUSTOMER IS NOT 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
3. Don't Know

**(IF LED1 = 1)**

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

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

**(IF LED2 = 2 or 3)**

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

1. Price of LEDs too high
2. Do not like look of LEDs



3. Unfamiliar with LED technology
4. Waiting for LED technology to become more mainstream
5. Other \_\_\_\_\_
6. Don't Know

**(IF LED3 = 1)**

LED4. What is the most you would consider paying for a Standard LED bulb? (if needed, a Standard LED bulb would replace an all-purpose light bulb)

1. Record as \$x.xx
2. Don't Know

LED5. What is the most you would consider paying for a Reflector LED? (if needed, a Reflector LED would replace a floodlight or spotlight)

1. Record as \$x.xx
2. 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. In a few months we will be conducting an online lighting preference study which will take about 5 minutes to complete. Would you be willing to take part in this online study? If so, I will need an email address for you so a link to the online study can be emailed to you. This information is strictly confidential and will not be sold or shared.**

**Email:** \_\_\_\_\_

**AFTER CUSTOMER HAS LEFT, PLEASE FILL OUT INFORMATION:**

QA1. Field Staff Name: \_\_\_\_\_

QA2. Date: \_\_\_\_\_

QA3. Store location: \_\_\_\_\_

1. xxx
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 PY7 LED NTG Memo

**To:** All Interested Parties in Illinois

**CC:** Dave Nichols, Dan Snyder, ComEd

**From:** Amy Buege, Navigant Evaluation Team

**Date:** December 18, 2014

**Re:** *PY7 ComEd Residential Lighting LED NTGR Estimation*

This memorandum presents the *Evaluation Research*<sup>79</sup> PY7 net-to-gross ratio (NTGR) estimates for Omnidirectional and Directional LEDs sold through the ComEd Residential Lighting program.

### *Results Summary*

The table below shows the overall PY7 Evaluation Research NTGR estimates for program LEDs. These results were estimated using a participant self-reported method that was similar to the method used for CFLs in previous evaluation. The recommended PY7 estimate shown in the table below is a program LED bulb-weighted estimate that includes both omnidirectional and directional LEDs (the sample size of directional LEDs was not large enough to support distinct values by bulb shape). It is also inclusive of both participant and non-participant spillover. As the table below shows, the NTGR estimates for bulbs purchased during demonstration events was quite a bit higher (0.90) than the NTGR estimate for bulbs purchased outside of the demonstration events (0.72). For this reason, and due to the fact that our in-store data collection methodology resulted in an over-sampling of demonstration event data<sup>80</sup> the final results were estimated for demonstration and non-demonstration event periods and then weighted by the estimated percentage of bulbs sold during demonstration event period. The final recommended result below is based on a 5%/95% demonstration event/non-demonstration event split which is believe to be an upper bound on the percentage of program LEDs sold during demonstration events. A sensitivity analysis performed on the demonstration/non-demonstration event split and it showed only a -0.01 fluctuation in the NTGR estimate when the demonstration event rate was dropped to 1% (1%/99%) and no change in the NTGR estimate when the demonstration event rate was increased to 10% (10%/90%).

<sup>79</sup> It should be noted that the NTGR estimates presented here are the evaluation verified estimates (based on the PY7 in-store intercept surveys) and weighted by the PY7 Goals Tracker estimates program sales data.

<sup>80</sup> Each three-day data collection period at a program retailer commenced with a half day demonstration event during which period the program implementation staff was able to introduce the surveyor to retail program staff and gain approval for the in-store data collection.

**Table 1 – PY7 Evaluation Research LED NTGR Results**

Segmentation	Free-Ridership	Part Spillover	Nonpart Spillover	NTGR
Non-Demo Event Periods	0.45	0.00	0.17	0.72
Demo Event Periods	0.23	0.06	0.06	0.90
<b>Recommended PY7 Estimate (5/95 Demo/Non-Demo split)</b>	<b>0.44</b>	<b>0.01</b>	<b>0.16</b>	<b>0.73</b>

While the free-ridership rate shown in the table above for the non-demonstration event periods is similar to the results found in recent years for CFLs sold through ComEd’s Residential Lighting program, the level of participant and non-participant spillover found for LEDs was substantially higher. Analysis of both PY7 in-store intercept survey data, as well as non-program LED bulb availability at program retailers, both supported this high level of spillover as the program LED offerings were quite limited<sup>81</sup> and other non-program LED offerings were available for purchase at or below the incentivized program pricing. The complete analysis results are provided below.

### ***PY7 Methodology***

The Evaluation Research LED NTGR estimates included in this memo are based on a total of 726 in-store intercept surveys conducted as part of the PY7 evaluation. Table 1 below shows (by retailer type and overall) the number of retail store locations where intercept surveys were conducted in PY7, the number of days of interviewing that took place, the distribution of the completed intercept surveys, as well as the forecasted<sup>82</sup> ComEd PY7 program bulb sales used for NTGR analysis retailer weighting. As this table shows, a total of 63 person days were spent in retail stores conducting intercept surveys and a total of 21 different program retail stores were visited across the three program retailers included in the sample. This table also shows that the greatest proportion of PY7 intercept surveys were conducted with lighting purchasers (both program and non-program) in DIY stores (64%). DIY stores accounted for 53% of PY7 forecasted program bulb sales. The average number of intercept surveys completed per day varied by retailer type, ranging from a high of 15 in DIY stores, to a low of six in Warehouse stores. The LED NTGR results presented in this memo are weighted by the PY7 retailer type program LED forecasted sales so that the results are representative of PY7 Residential Lighting program. Once the PY7 program is complete these results can be reweighted with the actual PY7 LED sales numbers.

<sup>81</sup> For instance at one of the largest program retailers only 60-watt replacement omnidirectional LEDs were incentivized.

<sup>82</sup> Based on the PY7 program bulbs sales forecast in the PY7 Goals Tracking spreadsheet.

**Table 2 – PY7 Intercept Surveys and Forecasted Program Bulb Sales by Retailer Type**

Retailer Type	Stores	Days	PY7 Intercepts		Avg Intercepts /Day	PY7 Bulb Sales <sup>83</sup>	
			#	%		#	%
Big Box	6	18	171	24%	9.5	1,592,295	15%
Do-It Yourself	10	30	462	64%	15.4	5,671,639	53%
Warehouse	5	15	93	13%	6.2	1,889,375	18%
Other	0	0	na	na	na	1,565,668	13%
Total	21	63	726	100%	11.5	10,718,977	100%

Table 3 below shows the distribution of PY7 intercept survey respondents by retailer type and bulb type purchased. As this table shows, 52% of intercept survey respondents purchased one or more program bulb (the majority of these being standard CFLs) and 51% of survey respondents purchased one or more non-program bulb (the majority of these being incandescent bulbs). While the majority of survey respondents purchasing CFLs (standard CFLs in particular) purchased program bulbs, survey respondents purchasing LEDs were just as likely to buy non-program LEDs as they were to purchase program LEDs. The “% Surveyed” row sums to more than 100% since some customers purchased more than one type of bulb.

**Table 3 –Distribution of PY7 Intercept Survey Respondents by Bulb Type Purchased**

Retailer Type	Program Bulbs					NonProgram Bulbs							Total
	CFL		LED		All Pgm	CFL		LED		Hal	Inc	All NP	
	Stan	Spec	Omni	Dir		Stan	Spec	Omni	Dir				
Big Box	57	29	4	1	87	2	3	4	0	20	64	89	171
DIY	136	36	30	8	206	3	10	30	19	51	168	271	462
Warehouse	69	6	13	1	87	0	0	2	2	3	0	7	93
Total	262	71	47	10	380	5	13	37	21	74	232	367	726
% Surveyed	36%	10%	6%	1%	52%	1%	2%	5%	3%	10%	32%	51%	100%

As noted above, Table 3 shows that while 95% of CFL purchasers were purchasing program CFLs, only 49% of LED purchasers were purchasing program bulbs. The evaluation team reviewed the non-program

<sup>83</sup> Forecasted savings based on the Goals Tracker spreadsheet.

LED purchases,<sup>84</sup> as well as the LEDs that were available for purchase within the DIY retail stores,<sup>85</sup> and found the following notable findings which explain the high rate of non-program LED purchases:

- The PY7 Residential Lighting program incentivized only three omnidirectional LEDs at the DIY retailer where the intercepts were conducted. All three of these omnidirectional LEDs were 60-watt replacement bulbs.
  - Roughly one-third of the non-program omnidirectional LEDs purchased during the intercept surveys were lower wattage LEDs (< 60 watt replacement lamps),
  - Roughly one-third of the non-program omnidirectional LEDs purchased during the intercept surveys were higher wattage LEDs (> 60 watt replacement lamps),
  - Approximately 10% of the non-program omnidirectional LEDs purchased during the intercept surveys were purchased in multi-packs (the PY7 program only incentivized single packs),
  - The cost (with the incentive) of the three PY7 omnidirectional program LEDs ranged from \$7-13 per bulb. Evaluation research indicated that there were numerous non-program LEDs for sale within that same price range without an incentive.
  - The PY7 program incentivized only omnidirectional LEDs manufactured by CREE and Philips. The DIY retailer evaluated also sold EcoSmart, TCP and GE omnidirectional LEDs.
  - A total of 22 similar 60-watt replacement LEDs were found to be sold without an incentive at the DIY program retailer evaluated.
- The PY7 Residential Lighting program incentivized eight directional LEDs at the DIY retailer where the intercepts were conducted. These directional LEDs were either BR30, BR40, PAR30 or PAR38 lamps.
  - Roughly one-half of the non-program directional LEDs purchased during the intercept surveys were in a replacement wattage range that was not included in the program (either higher or lower),
  - The cost (with the incentive) of the eight PY7 directional program LEDs ranged from \$15-31 per bulb, with the average price being ~\$24. Evaluation research indicated that there were numerous non-program LEDs for sale within that same price range or lower without an incentive.<sup>86</sup> Three EcoSmart BR30 models were offered for \$13 a bulb.
  - The PY7 program incentivized only directional LEDs manufactured by CREE, LSGC and Philips. The DIY retailer evaluated also sold EcoSmart, TCP and GE directional LED bulbs.
  - A total of 41 similar BR30, BR40, PAR30 or PAR38 shaped lamps were found to be sold at the DIY program retailer evaluated.

Table 4 below is similar to Table 3 above except that it shows the distribution of bulbs purchased by PY7 intercept survey respondents. As this table shows, 57% of the bulbs being purchased by intercept survey respondents were program bulbs (80% of which were standard CFLs) and the remaining 43% of the bulbs

---

<sup>84</sup> The evaluation team focused on DIY stores since that was the retailer type where the majority of in-store intercepts and LED purchases were made.

<sup>85</sup> Shelf surveys were not conducted at the time of the PY7 in-store intercept surveys and so this analysis relied upon internet research on LED bulbs available for purchase at a DIY retail storefront located within ComEd service territory (the DIY store was located in Lincoln Park).

<sup>86</sup> Three EcoSmart BR30 packages were offered at the DIY retailer for \$13 without an incentive.

being purchased were non-program bulbs (69% of which were incandescent bulbs and 19% of which were halogen bulbs).

**Table 4 – Distribution of PY7 Bulb Purchases by Intercept Respondents**

Retailer Type	Program Bulbs					NonProgram Bulbs							Total
	CFL		LED		All Pgm	CFL		LED		Hal	Inc	All NP	
	Stan	Spec	Omni	Dir		Stan	Spec	Omni	Dir				
Big Box	365	155	15	1	536	16	13	6	0	96	256	387	923
DIY	900	160	70	20	1,150	27	36	78	42	225	996	1,404	2,554
Warehouse	632	27	30	2	691	0	0	4	3	18	0	25	716
Total	1,897	342	115	23	2,375	43	49	88	45	339	1,252	1,816	4,193
% Surveyed	45%	8%	3%	1%	57%	1%	1%	2%	1%	8%	30%	43%	100%

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 two bulbs more than the average survey respondent at Big Box or DIY stores. On average, across both program and non-program bulbs, Standard CFLs were purchased in the largest quantities.

**Table 5 – Average Number of Bulbs Purchased by PY7 Intercept Respondents**

Retailer Type	Program Bulbs					NonProgram Bulbs							Total
	CFL		LED		All Pgm	CFL		LED		Hal	Inc	All NP	
	Stan	Spec	Omni	Dir		Stan	Spec	Omni	Dir				
Big Box	6.4	5.3	3.8	1.0	6.2	8.0	4.3	1.5	-	4.8	4.0	4.3	5.4
DIY	6.6	4.4	2.3	2.5	5.6	9.0	3.6	2.6	2.2	4.4	5.9	5.2	5.5
Warehouse	9.2	4.5	-	2.0	7.9	-	-	2.0	1.5	6.0	-	3.6	7.7
Total	7.2	4.8	2.4	2.3	6.3	8.6	3.8	2.4	2.1	4.6	5.4	4.9	5.8

Table 6 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 time periods). Demonstration events were used as the platform to get the in-store interviewers into program retail stores by allowing them to accompany a program implementation staff member. As this table shows, demonstration events were taking place approximately 16% of the time interviewers were in the stores and 23% of the completed surveys were conducted during a demonstration event. As one would expect demonstration events, which promote the benefits of high efficiency lighting, led to increased rates of CFL and LED purchase (32% of program CFL sales and 43% of program LED sales occurred during demonstration events whereas only 15% of nonprogram bulb sales occurred during demonstration events). Typically 20-40 demonstration events occur each month across all program

retailers and thus the percentage of program sales that occurred during demonstration events in our sample of completed interviews is significantly biased upwards.<sup>87</sup> In order to account for this demonstration event bias in our sample the NTG results were segmented by whether or not the in-store intercept survey took place during a demonstration event.

**Table 6 – PY7 Intercept Surveys and Forecasted Program Bulb Sales by Retailer Type**

Retailer Type	Days <sup>88</sup>		PY7 Intercepts		PY7 Bulb Sales					
	#	%	#	%	Pgm LEDs	%	Pgm CFLs	%	NonPgm Bulbs	%
NonDemo Event	53	84%	561	77%	79	57%	1,530	68%	1,535	85%
Demo Event	30	16%	165	23%	59	43%	709	32%	281	15%
Total	63	100%	726	100%	138	100%	2,239	100%	1,816	100%

### PY7 NTGR Estimation Methodology

In PY7, NTGR estimates for LEDs were calculated using the customer self-report method based on data collected during the PY7 in-store intercept surveys. The in-store intercept data was used to estimate the level of PY7 free ridership, as well as the PY7 participant and non-participant spillover.

Once these two parameters were estimated NTGR was calculated as follows:

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

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

- 1) *Program Influence Score (PI Score)* - The degree of influence the program<sup>89</sup> had on the customers' decision to install CFLs, on a scale of 0 to 10.
- 2) *No-Program Score (NP Score)* – The customer's self-reported purchasing plans if the ComEd incentive had not been offered and the bulbs had been more expensive.

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

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

<sup>87</sup> The evaluation team estimates that between 1% and 5% of all program sales occur during demo events. This assumption is based on roughly 40 demo events occurring monthly, roughly 800 participating retail store fronts and a four-fold increased rate of sale during the demo events.

<sup>88</sup> Demonstration events lasted for 4 hours and so were considered 0.5 of a day.

<sup>89</sup> This program influence could come from the program incentive, the program in-store information materials, the placement of the incentivized bulbs, or information from a store retailer that also mentions the ComEd program.



## PY7 Evaluation Verified Free-ridership Results

Table 7 below present the free-ridership estimates for Omnidirectional LEDs, Directional LEDs and all LEDs (combined omnidirectional and directional). The table below also presents the unweighted free-ridership results across all program LEDs segmented by Demo Event (whether the intercept survey occurred during a demonstration event) and Retailer Type (the retail store type, Big Box, Do-It-Yourself, Warehouse, where the intercept was conducted).

**Table 7 – Unweighted PY7 LED Free-Ridership Segmentation Analysis**

LED Free-Ridership Segmentation Analysis		N	Free-Ridership	Lower 90%CL	Upper 90%CL
All Omnidirectional LEDs		35	0.38	0.24	0.52
All Directional LEDs		10	0.46	0.20	0.72
All LEDs (unweighted)		44	0.40	0.27	0.52
Demo Event (All LEDs)	Yes	17	0.25	0.08	0.43
	No	27	0.53	0.37	0.69
Retailer Type (All LEDs)	Big Box	5	0.26	0	0.58
	DIY	37	0.43	0.30	0.57
	Warehouse	2	0.13	0	0.51
Demo Event and Retailer Type (All LEDs)	Big Box – No Demo	2	0.44	0	1
	Big Box – Demo	3	0.23	0	0.63
	DIY – No Demo	23	0.57	0.40	0.74
	DIY – Demo	14	0.26	0.07	0.46
	WH – No Demo	2	0.13	0	0.51
	WH – Demo	0	n/a	n/a	n/a

A few notable findings from the LED free-ridership segmentation analysis shown in the table above:

- Omnidirectional LEDs had lower free-ridership than Directional LEDs;
- Free-ridership varied by retailer type with Warehouse stores having the lowest levels of free-ridership, Big Box stores having slightly higher free-ridership and DIY stores having the highest levels of free-ridership (although these results are not statistically significantly different from one another due to the large confidence intervals surrounding them caused by the small sample sizes); and,

- Customers who purchased their program LEDs during an in-store demonstration event had lower levels of free-ridership, than those who did not purchase during a demonstration event (this difference is statistically significant).

### 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 for all LEDs in order to come up with an overall LED free-ridership estimates that was representative of the anticipated<sup>90</sup> distribution of PY7 bulb sales. The table below shows the distribution of PY7 Omnidirectional and Directional LEDs forecasted by retailer-type based on the preliminary Goals Tracker spreadsheet that was provided to the evaluation team. As this table shows the final weighting of the free-ridership estimates makes the estimates representative of 85% of the forecasted Omnidirectional LEDs sales in PY7 and 86% of forecasted Directional LEDs sales in PY7.

**Table 8 – Forecasted PY7 LED Sales used for Analysis Weights**

Intercept Store?	Retailer Type	Omnidirectional LEDs	%	Directional LEDs	%
Yes	Big Box	58,000	16%	39,000	14%
	DIY	166,887	45%	109,252	39%
	Warehouse	87,000	24%	92,500	33%
	Intercept Stores	311,887	85%	240,752	86%
No	Dollar Store	0	0%	0	0%
	Grocery	0	0%	0	0%
	Hardware	57,145	15%	40,178	14%
	Non-Intercept Stores	57,145	15%	40,178	14%
Total		369,032	100%	280,930	100%

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 run assuming three different proportions of sales occurring during demo events, 1%, 5% and 10%, in order to test the sensitivity of this parameter.

### Weighted Free-ridership Results

Table 9 below presents the weighted LED free-ridership estimates for PY7 based on the customer self-report method and the Demonstration Event and Retailer Type segmentations. This table shows that the Retailer Type weighted free-ridership estimate for program bulb sales that do not occur during a demonstration event is 0.45 (0.55 NTG excluding spillover) and the Retailer Type weighted free-ridership estimate for program bulb sales that do occur during a demonstration event is 0.23 (0.77 NTG excluding

<sup>90</sup> Based on the PY7 Goals Tracker spreadsheet.

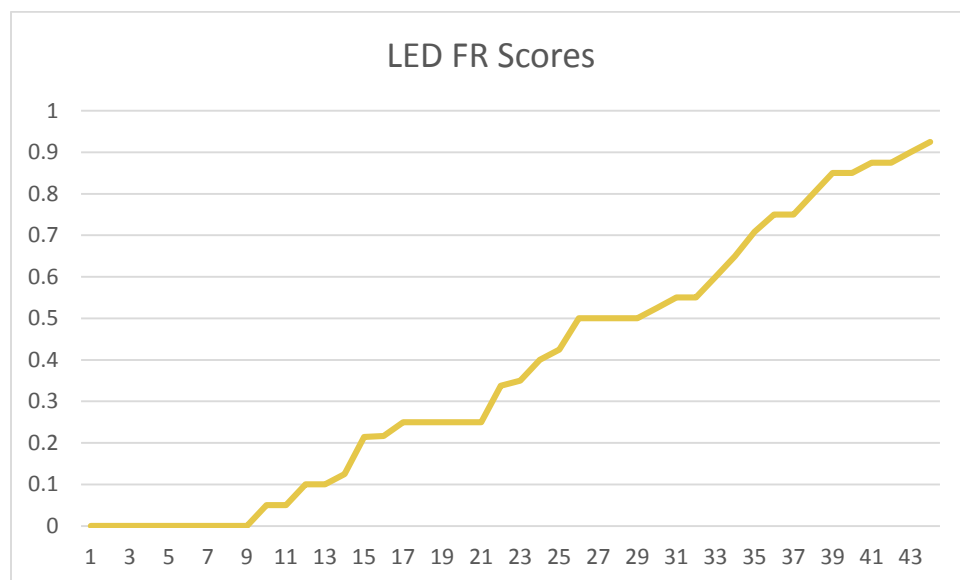
spillover). The last three rows present the overall weighted free-ridership scores assuming 1%, 5% and 10% of program bulb sales occurring during demonstration events. As this table shows the overall weighted free-ridership score is not very sensitive to a 5% swing in the percentage of program bulb sales that occurring during demo events.

**Table 9 –Weighted LED Free-Ridership Estimates**

Demo Event	Retailer Type	PY7 Bulb Sales Weighted Free-Ridership	
		Retailer Type Weighting	Free-ridership
No	Big Box	15%	0.44
No	DIY	53%	0.57
No	Warehouse	18%	0.13
No Demo Retailer Type Weighted		n/a	0.45
Yes	Big Box	15%	0.23
Yes	DIY	53%	0.26
No	Warehouse	18%	0.13
Demo Retailer Type Weighted		n/a	0.23
Weighted 1/99 demo/non-demo		n/a	0.45
Weighted 5/95 demo/non-demo		n/a	0.44
Weighted 10/90 demo/non-demo		n/a	0.43

Figure 1 below, shows the distribution of LED free-ridership scores (both Omnidirectional and Directional) across the population of in-store intercept respondents included in the LED free-ridership analysis.

**Figure 1– Distribution of LED Free-ridership Scores**



As this figure shows there were no records that were assigned a free-ridership score of 1. In contrast to past and current year results for CFLs, in PY7 there were no program LED purchasers who reported both the ComEd incentive and program information had no influence on their decision to purchase program LEDs, and thus there were no LED purchasers who were assigned a Program Influence score of 0.

This moderately high level of free-ridership amongst non-demo event respondents is supported by the following data collected during the in-store intercept surveys.

- 50 percent of LEDs being purchased by survey respondents were non-program LEDs – these respondents may have been influenced by a program in-store demonstration event or other in-store marketing materials, but they did not require an incentive to purchase LED bulbs.
- 59 percent of respondents purchasing LEDs indicated they were planning on purchasing LEDs when they entered the store on their current shopping trip. Only one survey respondent who was purchasing LEDs reported they had come to the store specifically to purchase ComEd discounted program bulbs.
- 70 percent of respondents purchasing program LEDs indicated they had purchased LEDs previously<sup>91</sup> and 66 percent of program LEDs purchasers indicated they currently had one or more LEDs installed in their home. Both of these findings indicate the majority of the LED purchasers surveyed had prior experience with LED technology.

### LED Spillover

In PY7, participant and non-participant 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

<sup>91</sup> A similar percentage of respondents purchasing non-program LEDs had previously purchased LEDs.

down by demo versus non-demo event due to the increased program influence believed to result from the demonstration events. The participant and non-participant LED spillover results are presented below.

#### Participant LED Spillover

In total there were four customers surveyed who were purchasing program LEDs who also reported purchasing non-discounted LEDs. A portion of the non-program LED purchases of two of these respondents were classified as spillover bulbs as the respondent reported that the ComEd program was somewhat influential in their decision to purchase these non-program LEDs<sup>92</sup> and they had not intended to purchase ComEd program LEDs when they entered the store. One of these four interviews occurred during a demonstration event. Based on this data, the LED participant spillover rate was calculated as the ratio of the spillover LED purchases to the program LED purchases (segmented by demo event status). As the table below shows this yielded a participant LED spillover rate of 0.3% for bulbs purchased not during a demo event and a 6.1% participant LED spillover rate for bulbs purchased during a demo event.

**Table 10 – PY7 Participant LED Spillover Results – Self-Report Method**

Demo Event	Participant LED Spillover -	n	Bulb/Purchase	Bulbs
No	NonPgm LED Purchases By Participants	4	1.7	5
	Spillover Purchases	4	0.1	0.3
	Program Purchases	37	2.1	79
	Participant LED Spillover Rate			0.3%
Yes	NonPgm LED Purchases By Participants	1	4.0	4
	Spillover Purchases	1	3.6	3.6
	Program Purchases	19	3.1	59
	Participant LED Spillover Rate			6.1%

#### Nonparticipant Spillover

Eighteen customers who were not purchasing program LEDs reported they were influenced to some degree by ComEd's program which led them to purchase non-program LEDs. Fourteen of these customers were interviewed during non-demo event periods and four were interviewed during demo event periods. 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 136,066 non-program LEDs being purchased by program nonparticipants. Dividing these bulbs by the total number of program LEDs projected to be sold in PY7 resulted in an estimated nonparticipant

<sup>92</sup> This portion is based on the number of non-program bulbs they purchased as well as the influence level they provided for the program.

spillover rate of 16.8% for bulbs purchased not during a demo event and a 6.4% nonparticipant LED spillover rate for bulbs purchased during a demo event.

**Table 11 – PY7 Nonparticipant LED Spillover Results – Self-Report Method**

Demo Event	Nonparticipant LED Spillover	n	Average Bulbs / Purchase	Total Bulbs
No	Nonparticipant LED Spillover Purchases	14	1.3	17.9
	Population Extrapolated Spillover Purchases	81,230	1.3	103,568
	PY7 Program LED Sales			617,464
	Nonparticipant LED Spillover Rate			16.8%
Yes	Nonparticipant LED Spillover Purchases	4	0.5	1.9
	Population Extrapolated Spillover Purchases	4,384	0.5	2,082
	PY7 Program LED Sales			32,498
	Nonparticipant LED Spillover Rate			6.4%

The high level of spillover found is not unexpected due to the high level of non-program LED purchases activity that was found during the PY7 in-store intercept surveys. CFL spillover has typically been much lower, but the majority of CFL sales have been through the program. The table below shows the distribution of reasons survey respondents gave for not purchasing program LEDs.

**Table 12 – Reasons for Purchasing Non-program LEDs**

Reasons for Purchasing Nonprogram LEDs	n	NonProgram Bulb Wt'd	%
No discounted CFLs in this category	24	39	30%
Prefer this brand/manufacturer	10	29	22%
Didn't know about discount	17	23	18%
Don't know	5	9	7%
Prior experience with this model	5	8	6%
Wanted multi-pack	1	8	6%
Wanted different wattage	4	7	5%
Other	2	6	5%
All	68	129	100%

## NTGR

The table below shows the overall self-reported PY7 bulb-weighted NTGR (including participant and non-participant spillover) estimates for LEDs (Omnidirectional and Directional). This table shows the NTGR for bulbs purchased during demo events was 0.90 and the NTGR for bulbs purchased not during demo events was 0.72. The sensitivity analysis performed on the demo/nondemo rate showed a -0.01 fluctuation on the NTGR estimate when the demo rate was dropped to 1% and no change in the NTGR when the demo rate was increased to 10%. The evaluation recommended NTGR estimate for LEDs based on the PY7 in-store data collection is 0.73.

**Table 13 – PY7 LED NTGR**

Segmentation	Free-Ridership	Part Spillover	Nonpart Spillover	NTGR
Non-Demo Event Periods	0.45	0.00	0.17	0.72
Demo Event Periods	0.23	0.06	0.06	0.90
Recommended PY7 Estimate (5/95 Demo/NonDemo)	<b>0.44</b>	<b>0.01</b>	<b>0.16</b>	<b>0.73</b>
Demo Event Sensitivity (1/99 Demo/NonDemo)	0.45	0.00	0.17	0.72
Demo Event Sensitivity (10/90 Demo/NonDemo)	0.43	0.01	0.16	0.73

### 7.6.3 Winter Peak Coincidence Factor Memo

**Date:** February 2, 2015  
**To:** ComEd Residential Lighting Program & Interested Parties  
**CC:** Jeff Erickson, Rob Neumann and Randy Gunn; Navigant  
**From:** Amy Buege; Itron/Navigant Evaluation Team  
**RE:** Winter Peak Coincidence Factor Recommendation for Residential Lighting

This memorandum presents the recommended Winter Peak Coincidence Factor (WPCF) estimate for ComEd's Residential Lighting Program. This estimate was derived from data collected as part of the lighting logger study conducted for the PY5/PY6 ComEd Residential Lighting Program evaluation. ComEd requested that the evaluation team derive a WPCF estimate for the upcoming PJM reporting cycle. 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. This memo presents the recommended WPCF estimate, along with the data and methods used to derive this estimate for the Residential Lighting Program.

#### Methodology

As part of the PY5/PY6 evaluation of ComEd's Residential Lighting program, the Navigant Consulting team conducted a lighting logger study.<sup>93</sup> This study resulted in Hours of Use (HOU) and Summer Peak Coincidence Factor (Summer Peak CF) estimates for CFLs installed within the homes of ComEd residential customers.<sup>94</sup> For this study lighting loggers were installed in homes in June of 2013 and removed in January of 2014. While the availability of this data is extremely beneficial for the calculation of alternate peak period coincidence factor estimates, the fact that this data did not include the entire Winter Peak period (January 1 – February 28) required additional analyses to determine the most appropriate proxy period for the January 1 – February 28 timeframe. Two different approaches were evaluated: the first attempted to determine whether proxy months could be used in place of the January and February Winter Peak months, and the second modeled the WPCF as a function of the time of sunrise and sunset. Due to the start of daylight savings time in early November and the unequal distribution of sunrise and sunset times around the winter solstice, the evaluation team found that the best proxy period for defining the Winter Peak period was based upon the time of sunrise/sunset.

The Winter Peak Period was comprised of two distinct time periods, a morning period (6-8am) and an evening period (5-7pm), that were thought to have different lighting usage patterns. As a result, analyses was conducted separately for the morning and evening hours and then averaged to come up with an overall Winter Peak CF estimate.<sup>95</sup>

---

<sup>93</sup> A detailed description of the lighting logger study can be found in a document titled *ComEd PY5/PY6 Residential Energy Star Lighting Program Metering Study Protocols*. Finalized on April 22, 2013.

<sup>94</sup> Loggers were also installed on a portion of the LEDs found on-site, but the quantity of LEDs installed and logged was insufficient to develop distinct estimates of HOU and Peak CF for LEDs.

<sup>95</sup> Averaging of the morning and evening results was possible since both periods were the same length of time (2 hours).



### Winter Peak Period CF Estimates by Month

Figure 1 below shows the Morning Period Winter Peak CF estimates for each month where primary lighting logger data was available (June – January). As this table shows, no significant trend was apparent between the Morning WPCF estimate and the month of the year.

**Figure 1: Winter Peak CF by Month – Morning Period**

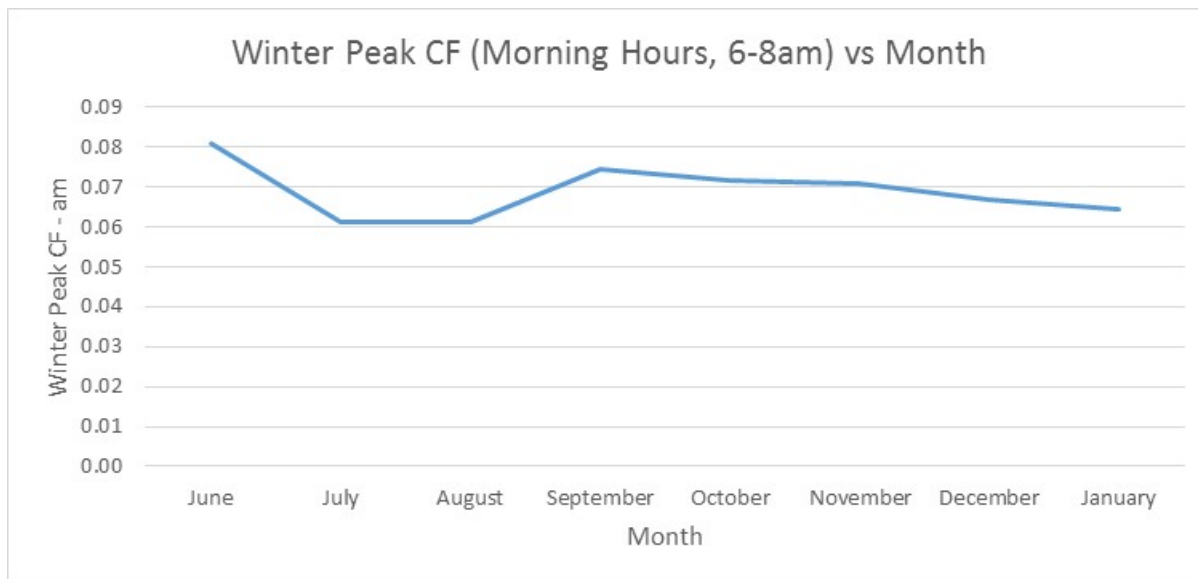
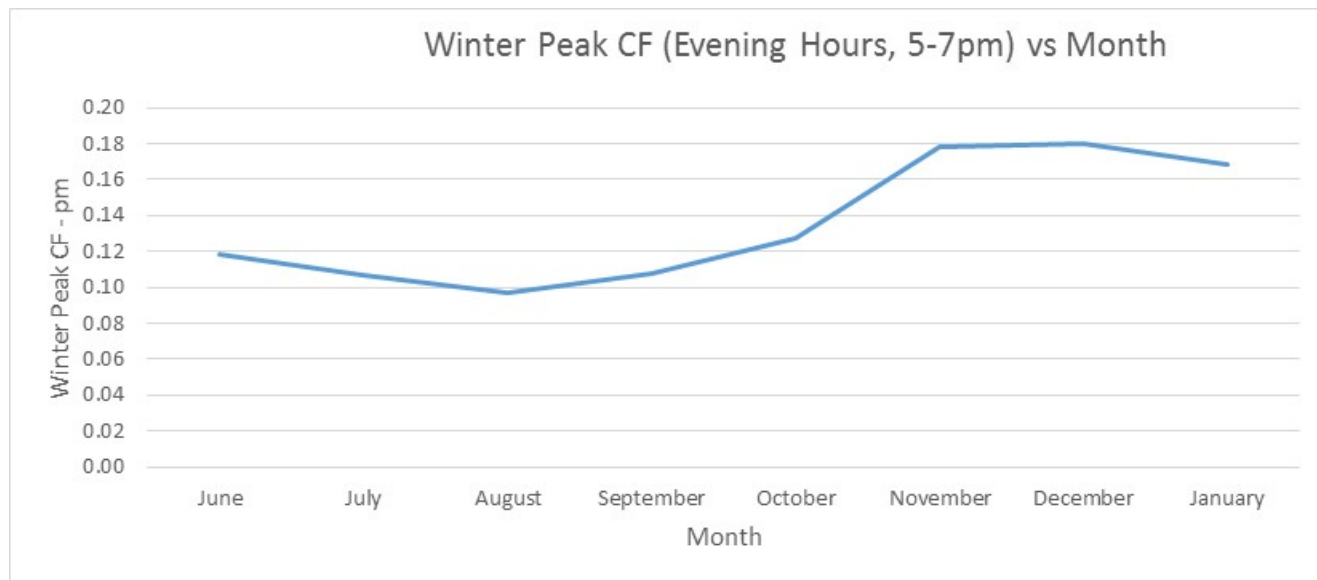


Figure 2 below shows the Evening Period Winter Peak CF estimates by month. As this table shows, the Evening WPCF seems to increase from the summer months to the winter months, which is to be expected as the sun sets after the Peak Period in the summer months and prior to the Peak Period in the winter months.

**Figure 2: Winter Peak CF by Month – Evening Period**



#### **Winter Peak Period CF Estimates by Time of Sunrise or Sunset**

To further investigate the relationship between the Morning and Evening WPCF estimates and the time of the sunrise or sunset (and thus the need for additional non-natural light), the time of sunrise and sunset<sup>96</sup> was appended to the logger study data. Figure 3 below shows the average Morning Period WPCF estimates by sunrise time period (grouped into 30 minute periods). As this table shows, there again appears to be no significant trend between the time of sunrise and the morning WPCF estimate.

<sup>96</sup> Sunrise and sunset data was fathered from The United States Naval Observatory (USNO) website (<http://www.usno.navy.mil/USNO/>). This website provides tables of the times of sunrise/sunset by day of the year and geographical location. For this analysis, 2013 data was used for Chicago Illinois.

**Figure 3: Morning Peak Period (6-8am) by Time of Sunrise**

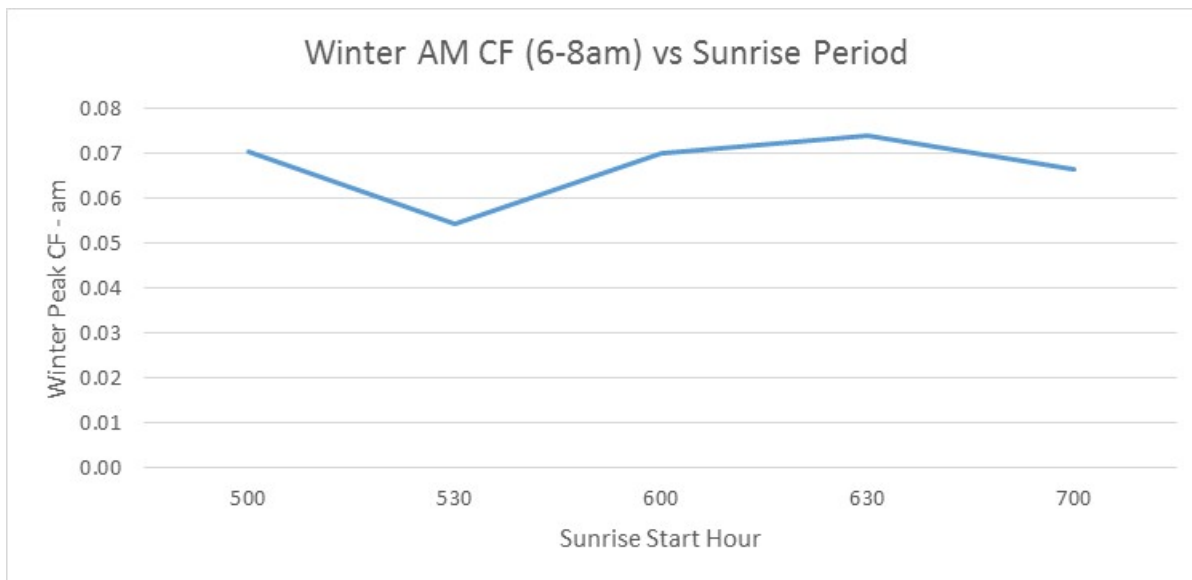
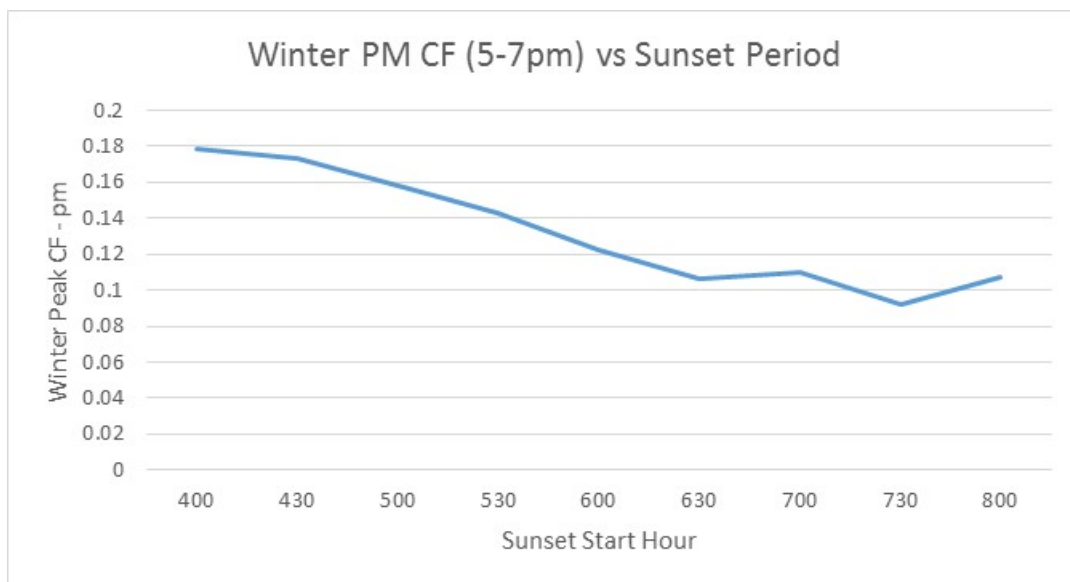


Figure 4 below shows the average Evening Period WPCF estimates by sunset time period (grouped into 30 minute periods). As this table shows, there is a very distinct trend that exists between the time of sunset and the evening WPCF estimate.

**Figure 4: Evening Peak Period (5-7pm) by Time of Sunrise**



## Winter Peak Period Estimation

Based on the hypothesized correlation between the Winter Peak CF and the daylight hours, which was subsequently corroborated by the lighting logger data, the evaluation team recommends estimating the WPCF by applying the Sunrise/Sunset results shown above to the sunrise and sunset hours that occur during the Winter Peak time period (January 1-February 28). The table below shows the distribution of the time of sunrise and sunset in Chicago IL during January and February. This distribution was applied to the WPCF sunrise and sunset estimates discussed above in order to derive morning and evening WPCF estimates for PJMs Winter Peak period.

**Table 1: Summer versus Winter Peak CF Results**

Sunrise Start Period	Days in WP	% of WP	WPCF Estimate
7:00 am	35	59%	0.067
6:30 am	22	37%	0.074
6:00 am	2	3%	0.070
<b>Morning Period Average</b>	<b>59</b>	<b>100%</b>	<b>0.070</b>
Sunset Start Period	Days in WP	% of WP	WPCF Estimate
4:30 pm	27	46%	0.173
5:00 pm	24	41%	0.158
5:30 pm	8	14%	0.143
<b>Evening Period Average</b>	<b>59</b>	<b>100%</b>	<b>0.163</b>

Table 2 below presents the Winter Peak CF results for both the Morning and Evening Peak periods and the average of these two periods. It also presents the results based on all available PY5/PY6 lighting logger data ("All Months", June – January) and the Sunrise/Sunset model described above. As this table shows, this analysis resulted in a recommended WPCF of 0.116.

**Table 2: Overall Winter Peak CF Results**

Winter Peak CF Period	Method	Winter Peak CF Estimate
Morning Peak (6-8 am)	All Months	0.068
	Sunrise Model	0.070
Evening Peak (5-7 pm)	All Months	0.129
	Sunset Model	0.163
Winter Peak Overall (6-8am and 5-7 pm)	All Months	0.099
	<b>Sunrise/Sunset Model</b>	<b>0.116</b>

### Summer Peak versus Winter Peak CF Results

Table 3 below presents the Summer versus Winter Peak CF (am, pm and overall) results based on the PY5/PY6 ComEd Residential Lighting logger study and this recently completed analysis. This table shows the overall Winter Peak CF results are 43% higher than the Summer Peak CF results and that this increase is driven by the increased lighting usage during the evening peak time period during the winter months.

**Table 3: Summer versus Winter Peak CF Results**

Peak CF Period	Peak CF Estimate	% Change from Summer
Summer Period (1-6pm)	0.081	n/a
Winter am (6-8am)	0.070	-14%
Winter pm (5-7pm)	0.163	101%
Winter Overall (6-8 am and 5-7pm)	0.116	43%