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Energy Efficiency / Demand Response Plan: Plan Year 4 (6/1/2011-5/31/2012)

Evaluation Report: Residential ENERGY STAR® Lighting

FINAL

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E. Executive Summary

This report presents a summary of the findings and results from the evaluation of ComEd's Residential ENERGY STAR® (ES) Lighting program in Program Year 2012 (PY4).[1] The main goal of this residential lighting program is to increase the market penetration of energy efficient lighting within 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.

E.1 Evaluation Objectives

The primary objectives of this evaluation are to quantify the gross and net energy impacts resulting from the Residential ES Lighting program and to assess program participants' prior awareness of compact fluorescent lamps (CFLs) and satisfaction with the program.

E.2 Evaluation Methods

The primary data collection activities conducted as part of the PY4 Residential ES Lighting Program evaluation included in-store intercept surveys with customers purchasing program and non-program bulbs and shelf surveys. Data collected during these interviews and surveys were essential in estimating gross and net savings parameters, and in evaluating the program from a process point of view.

E.3 Key Impact Findings and Recommendations

Table E-1 below provides a description of the parameters (both deemed and evaluated) used to estimate the Verified Savings for the Residential ES Lighting Program.

[1] June 1, 2011 to May 31, 2012. Note, that any reference to prior program years shall be designated by "PY" with the corresponding number of years one, two and three as follows: PY1, PY2 and PY3.

Table E-1. Verified Gross and Net Savings Parameters

Gross Savings Input Parameters	Data Source	Deemed or Evaluated?
Program Bulbs	PY4 EM&V Program Tracking Data Analysis	Evaluated
Delta Watts	CFL Lumen-based Lookup Tables, LED PY4 Lumen and Bulb Type -based Lookup Tables	CFL Deemed, LED Evaluated
Res / NonRes Split	PY4 Intercept Survey	Evaluated
Hours of Use (HOU)	Res – PY3 Metering Study NonRes – KEMA PY4 Operations Manual	Deemed
Peak Load Coincidence Factor	Res – PY3 Metering Study NonRes – KEMA PY4 Operations Manual	Deemed
Energy Interactive Effects	Res – PY4 Analysis NonRes – KEMA PY4 Operations Manual	Evaluated
Demand Interactive Effects	Res – PY4 Analysis NonRes – KEMA PY4 Operations Manual	Evaluated
Realization Rate	PY2 Evaluation Report	Deemed
Net-To-Gross Ratio	Standard Bulb and Fixtures - PY2 Evaluation Report Specialty Bulbs – ICC Order 10-0570	Deemed

Table E-2 below provides the PY4 Verified Gross and Net energy and demand savings. The Verified Net energy savings shown in this table are approximately 112% of the Ex Ante Net energy savings estimates.

Table E-2. PY4 Verified Savings Estimates

Savings Estimate	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Unadjusted Gross	642,616	-	-
Ex Ante Net	284,494	-	-
Ex Post Unadjusted Gross	701,430	606.3	77.1
Ex Post Adjusted Gross	533,162	446.3	62.3
Ex Post Net	319,243	267.2	37.3

Source: Evaluation Team Analysis of ComEd Tracking database

The program design and delivery methods did not substantially change for PY4 and so, in accord with the NTG Framework[2], we believe it is appropriate to use the NTG rate calculated in the PY2 evaluation

[2] "Proposed Framework for Counting Net Savings in Illinois." Memorandum March 12, 2010 from Philip Mosenthal, OEI, and Susan Hedman, OAG.

research. Thus the program falls under the following condition from the NTG Framework: "Where a program design and its delivery methods are relatively stable over time, *and* an Illinois evaluation of that program has estimated a NTG ratio, that ratio can be used *prospectively* until a new evaluation estimates a new NTG ratio."

The following list summarizes the key impact findings and recommendations from the study:

- **Tracking Data Issues:**
  Finding. Three separate datasets were provided that contained model specific bulb information necessary for the evaluation. All three datasets contained missing and / or inaccurate information for some bulb models, and all three had model number formats that differed from the tracking data. These factors made it difficult to establish critical bulb parameters for all program bulbs.
  Recommendation. Future evaluations would benefit greatly from a single, consistent model key that linked the tracking data (both regular program and coupon) with both the Goals Tracker and the bulb information table (Energy Star or similar lighting tables). Additionally the "Lookup Measure Res Lighting" table, the Energy Star table, and the Goals Tracker provided in PY4 each had missing or inaccurate bulb information on lumens, wattage, and manufacturer base wattage for some bulb models. All of these variables are critical to the evaluation process and should be verified for accuracy. While the evaluation team recognizes that it is not feasible to capture the retail price and date of sale for all program bulbs sold, making sure that these details are available for all increased incentive promotions will allow for a more robust analysis of consumer purchasing decisions based on bulb cost.
- **Delta Watts Estimation:**
  Finding. The PY4 deemed delta watts approach utilizes a single lumen to base wattage mapping regardless of program bulb type.
  Recommendation. The evaluation team recommends switching to a bulb type lumen mapping (such as the one presented within the Evaluation Research Findings section in Appendix 5.2 that is based on the new Energy Star draft specification for lamps[3]). Using a lumen-based method that also relies on bulb shape provides a more robust means of establishing base wattage equivalents across all bulb types, especially specialty CFLs and LEDs. Because lumen output is a measure of the total light produced in all directions from a source, bulbs such as reflectors (and LEDs in general) that focus light in a single direction require a different lumen mapping than a standard CFL. The TRM that goes into effect in PY5 assigns base-wattages using lumen bins that are not differentiated by bulb type and thus this issue continues under the PY5 TRM.
- **Residential versus Non-Residential Split:**
  Finding. Currently there is no deemed Residential versus Non-Residential (also referred to as "Res/NonRes") installation location split, nor is such a split included in the PY5 Technical Resource Manual (TRM)[4] for Residential Lighting. The evaluation findings from the last three program evaluation years have found the Res/NonRes split to be 90/10, 97/3 and 95/5, resulting in a three year program sales weighted average of 94/6.
  Recommendation. The evaluation team believes that due to the large impact this Res/NonRes split has on the resulting program impact estimates and the relatively stable split from year-to-

[3]http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/lamps/V1.0_Draft_2_Specification.pdf?4749-8e30

[4] The Illinois TRM was developed through a joint effort of all the members of the Illinois Stakeholder Advisory Group (SAG) and is filed for approval by the Illinois Commerce Commission (ICC) as of the filing of this report as a jointly agreed to TRM.

year, this parameter should be a deemed parameter (94/6) that is evaluated each year to ensure its continued appropriateness.

- **Interactive Effects – WHFd[5]:**
  Finding. The algorithm used to estimate the Demand Interactive Effects (WHFd) in the IL TRM, which goes into effect in PY5, includes a factor to account for the Peak CF[6] of the AC system (0.466). This factor is multiplied by the lighting Peak CF of 0.095 which assumes these two systems (lighting and heating) are effectively independent within the peak window. An argument could be made that whenever the lighting is on during the summer peak window, the AC system is also likely to be on (i.e. when the occupants are home), and that therefore these two factors are not independent.
  Recommendation. The evaluation team recognizes that there are many factors influencing the interaction between lighting and HVAC system load. The algorithm in the forthcoming Illinois TRM is the most informed approach that we have seen aside from the highly differentiated DOE-2 based building energy simulation approaches used in California (DEER) and secondarily in New York. The evaluation team recommends that the approach in the Illinois TRM should be regarded as the lower boundary of possible demand savings, which is appropriate given unknown factors about time delays between lighting waste heat and realized HVAC load, waste heat leakage through the building envelope, and occupant behavior factors such as thermostat operation. Because this factor has a significant range in magnitude across the different engineering approaches seen in various state TRMs, the evaluation team recommends that ComEd consider participating in a collective primary data collection effort among multiple program administrators aimed at bracketing the size of this effect across a range of climate conditions and housing configurations (discussion for such a study are currently in preliminary phases). Such an approach could maximize the value of the effort while moderating the cost. The current WHFd was estimated to be 1.10 across all PY4 bulbs which means that program demand savings get a 10% increase as a result of applying this factor. The true value of this WHFd factor is likely between 1 and 1.20 which means current demand savings estimates could be off by plus or minus 10%.

E.5 Key Process Findings and Recommendations

The following list summarizes the key process findings from the study:

- **Program Awareness:** Awareness of ComEd's Residential Lighting program and program discounts continues to be quite low with the vast majority (87%) of intercept survey respondents reporting they were unaware of the ComEd discounts. This includes 85% of customers purchasing ComEd discounted bulbs who reported to be unaware of the program. Utility bills were the most common self-reported source of program awareness and in-store marketing materials were the second most common self-reported source (e.g., 86% of respondents reported not seeing any in-store marketing materials). Only 4 of the 122 respondents reported learning about the program from a retail employee and all four of these respondents were purchasing their program bulbs from a DIY store.
- **Specialty Bulb Market Findings:** The PY4 evaluation found that there is still more that can be done to get consumers to purchase and install specialty CFLs. The most widely cited barrier to

[5] WHFd = Waste heat factor for demand to account for cooling savings from efficient lighting in cooled buildings is provided in the Illinois TRM in Section 6.5.
6 CF = Summer Peak Coincidence Factor for measure is provided in the Illinois TRM in Section 6.5.

purchasing CFLs in PY4 was the need for another type of specialty bulb (41%), which suggests that possibly more could be done to educate customers about the various types of specialty CFLs that are available. Another interesting survey finding was that 86% of respondents who purchased standard CFLs bought program bulbs, while only 63% of specialty CFL purchases were program bulbs. The majority of specialty CFL purchasers who did not buy program bulbs reported that they were unaware of the discount (49%). In-store marketing materials appear to be more influential to standard CFL purchasers (56% ranked them as extremely influential) than to specialty CFLs purchasers (50% ranked them as not very influential).

In PY4, specialty CFLs had higher than average gross impacts which were driven by larger estimated delta watts (which will continue to be larger since they are not affected by the EISA standards) and higher bulb installation rates. On the flip side, specialty CFLs had smaller than average net impacts due to the high level of free-ridership that continues to exist. As the evaluation team has pointed out in years past, we believe specialty bulbs experience higher levels of free ridership due to their higher initial cost[7] which continues to dissuade many consumers from purchasing them. Increasing incentives on specialty bulbs may increase the quantity of program bulbs sold, decrease free ridership and help make up for the program savings that will be lost due to the implementation of EISA for standard bulbs.

- **State of the LED Market:** Our analysis of the current LED market found moderate familiarity with LED technology (58%) and relatively high usage (26%). Cost was still the primary hurdle for most lighting purchasers (which is understandable at an average price of $35 per bulb), followed by lack of familiarity with the technology. Increased incentives and increased LED in-store information, either from ComEd or provided by the manufacturers on the packages themselves, may be necessary to assist customers in overcoming these existing barriers. The shelf surveys also indicate that at the current time, LEDs are not a replacement option for 75 or 100-watt standard incandescent bulbs as none were found that produced equivalent lumens at the retailers surveyed.
- **75 and 100-watt Replacement Lamp Availability:** PY4 shelf surveys of 75 and 100-watt standard incandescent equivalent bulbs provided interesting data. Across the surveyed stores, standard, a-lamp and dimmable CFLs (program and non-program) accounted for 50% of the bulbs on the shelves. Incandescent bulbs made up 42% of available bulbs, 53% of which were 100-watt incandescents, and halogens accounted for the remaining 8%. The average price of an incandescent bulb was $1.27, compared to the average halogen which was $3.06 and the average program CFL twister which was $2.40 (non-program twisters averaged $5.57).
- **Bulb Storage Patterns:** ComEd's Residential Lighting program does not appear to be encouraging customers to stock up on CFLs in any greater quantity than they stock up on incandescent bulbs. The average number of standard CFLs purchased per respondent was nearly identical to the average quantity of incandescent bulbs purchased (excluding warehouse stores which seem to be phasing out incandescent bulbs entirely).

[7] The PY4 shelf surveys found that program dimmable CFLs are 9 times more expensive than incandescent bulbs (which are also dimmable). This is in contrast to program standard CFLs which are approximately $1 more per bulb than incandescent bulbs.

1. Introduction to the Program

1.1 Program Description

The Residential ES Lighting Program provides incentives to increase the market share of ES qualified compact fluorescent lamp (CFL) bulbs, light emitting diodes (LEDs) bulbs and both CFL and LED fixtures sold through retail sales channels. It also seeks to distribute educational materials that will increase customer awareness and acceptance of energy-efficient lighting technology, as well as promote proper bulb disposal. The PY4 Residential ES Lighting Program accounted for nearly two-thirds of ComEd's targeted PY4 Ex Ante Net Residential MWh impacts and more than one-quarter of its overall PY4 Ex Ante Net MWh impacts, and thus the program is very important to meeting ComEd's energy efficiency goals.

The majority of the Residential ES Lighting Program is delivered midstream[8] (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 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. Instead, a wide variety of data collection methods, as characterized in Table 2-1, below, is used to characterize the most likely downstream usage of bulbs purchased through the program.

The Residential ES Lighting Program kicked-off in June 2008 and completed its fourth full year of operation at the end of May 2012. Program sales in Program Year 2012 (PY4) were over four times larger than PY1 sales, 53 percent greater than PY2 sales, and 13 percent greater than PY3 sales. In PY4, the program generally maintained similar incentive levels to PY3 and similar proportions of each bulb type (standard, specialty and fixtures) made up overall program sales.

In PY4 there were 16 retail chains that participated in the Residential ES Lighting Program, encompassing 918 individual retail locations. Most retailers were recruited in PY1 and continued their participation in PY2, PY3, and PY4. Three new retailers joined the program in PY4 and two retailers from PY3 dropped out.

Table 1-1 below lists the retailer categories that participated in the PY4 Residential ES Lighting Program, including the percentage of program bulbs and/or fixtures sold in each of the participating retailer categories and the number of storefronts within each of these categories. Do-It–Yourself (DIY) large home improvement stores were the largest category of participating retailers and accounted for 53% of the total program bulb sales, Warehouse stores were the next largest retail channel at 32%of total program bulb sales, and Grocery/Drug stores and Dollar stores, while having a relatively large number of participating storefronts, had very low overall program sales.

[8] A small percentage (less than 0.05%) of the CFL rebates was delivered via in-store coupons.

Table 1-1. PY4 Retailer Participation[9]

Retailer Category	PY4 % of Bulbs Sold	PY4 Storefronts
Big Box	9%	123
DIY	53%	139
Dollar Store	1%	262
Grocery/Drug	2%	218
Small Hardware	3%	140
Warehouse	32%	36
Program Total	**100%**	**918**

Source: Evaluation Team analysis of ComEd Tracking database

1.2 Evaluation Questions

The evaluation sought to answer the following key researchable questions.

Impact Questions:

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

Process Questions:

1. How aware are customers of the ComEd-sourced CFL bulb discounts? How effective are the in-store displays and marketing materials?
2. How aware are customers of the ComEd-sourced LED discounts? How effective are the in-store displays and marketing materials?
3. How aware are customers of changes in available lighting products as a result of EISA 2007 implementation? How do customers expect their own lighting purchasing decisions will be affected by the changes in the options available for purchase?
4. What does the marketplace currently look like within ComEd service territory for 75 and 100-watt incandescent equivalent bulbs (including CFL, halogen, incandescent and LED bulbs)?

[9] This excludes coupon bulbs which were less than 0.4% of program sales which were all sold at small hardware stores.

2. Evaluation Methods

In PY4, the analytical methods used for the evaluation of the Residential ES Lighting Program were driven to a large extent by the data available for programs that are delivered upstream at the retailer level such as this one. 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 Primary Data Collection

The data collected for the evaluation of the PY4 Residential ES Lighting Program was gathered via in-store intercept surveys, shelf surveys, ComEd tracking data analysis, and a deemed savings review. Table 2-1 below provides a summary of the data collection activities including the targeted population, the sample size, and the objectives of the efforts.

Table 2-1. PY4 Data Collection Activities

Collection Method	Targeted Population	Sample Size	Gross Impacts	Net Impacts	Process
Tracking Data	Program Participants	All	X	X	
In-Store Intercept Surveys	Retail Lighting Purchasers	719	X	X	X
In-Store Shelf Surveys	Program Stores	10 Stores	X	X	X
Deemed Savings Review	Deemed Savings Estimate	All	X	X	

2.1.1 Tracking Data

The tracking data delivered for this evaluation consisted of five databases. These databases consisted of the following:

- Residential Lighting Project Information Database
- Residential Lighting Retailer Database
- Residential Lighting Measure Lookup Database
- Final PY4 Goals Tracker
- Residential Lighting Coupon Database

The Residential Lighting Project Information Database included all upstream program CFL sales since the program inception. A number of data cleaning steps were taken to make sure PY4 bulb sales were complementary and non-overlapping with bulb sales attributed to PY1, PY2, and PY3. A small number of bulbs sold in PY3 were counted as PY4 sales due to a delay in the receipt of the retailer invoices for these

sales and thus their exclusion from the bulbs counted as PY3 sales.[10] In addition, bulbs sold and included in PY3 or PY4 sales estimates that were later returned (as indicated by negative quantities in the program tracking data) were subtracted from the PY4 sales. The PY4 analysis dataset was finalized based on the most recent program tracking database received from ComEd (dated September 21, 2012). This dataset contained 226,192 records, representing 12,643,431 program bulbs and fixtures sold in PY4. Additionally, the PY4 coupon dataset contained 4,021 records and 5,599 bulbs.

2.1.2 In-Store Intercept Surveys

The evaluation team conducted surveys in participating retail stores with customers purchasing lighting products. Interviews were conducted with customers purchasing program CFLs and LEDs, non-program CFLs and LEDs, incandescent light bulbs, and halogen bulbs. An insufficient number of interviews were completed with program LED purchasers to enable statistically significant analysis of data for that bulb type. The questionnaires contained questions for use in both the impact and process evaluations. For the impact evaluation, the survey contained questions designed to assess installation rates, leakage rates, residential and non-residential installation of program bulbs, non-residential hours-of-use (HOU), and free-ridership. For the process evaluation, the survey contained questions on reasons for purchasing different types of lighting, awareness of ComEd marketing efforts, and awareness of changes in the availability of incandescent bulbs because of EISA legislation. A copy of the survey instrument can be found in Section 5.4.

The evaluation team conducted in-store intercept surveys with customers at a mix of DIY, Warehouse and Big Box stores. The selection process for retail stores was based on several criteria. Participating stores from each retailer were first put in order by descending retail sales as of April 2012. Each store was then characterized as being located in an urban, suburban, or rural setting and they were also characterized geographically as being either near the center or near the edge of ComEd service territory. Strata were then created for each combination of urban/suburban/rural and center/edge for each retailer, and stores were prioritized in the process of making scheduling calls in an attempt to represent the diversity of the service territory across these criteria.

The field interviewers were instructed to station themselves in the lighting aisle of the store and approach customers after they had made their product selections and were preparing to leave the aisle. Interviewers asked customers to complete a short survey in exchange for a $5 gift card to that particular retailer. Customers received the gift card immediately after the survey was complete, and it could be used that day in the store.

After gaining consent to conduct the survey, the interviewer's first task was to record the products being purchased. This information was used to classify lighting customers into one of three categories: program participants purchasing CFLs or LEDs that had been discounted through the ComEd program, non-program purchasers purchasing CFLs or LEDs that were not discounted through the ComEd program and incandescent or halogen bulb purchasers. Note that there was only one program LED purchaser surveyed. This was not a large enough sample around which to develop analysis for program LED purchasers, so the program purchaser analysis is restricted to purchasers of program CFLs. Table 2-2 shows the number of retail locations at which surveys were conducted and the number of surveys completed for each retailer category.

[10] There were 4,607 bulbs sold in PY3 but included in the PY4 analysis. This amounts to approximately 0.04% of the total bulbs analyzed in PY4.

Table 2-2. In-Store Intercept Retailer Category and Completed Surveys

Retailer Category	Stores	Completed Surveys
DIY	8	470
Warehouse	2	149
Big Box	3	100
Totals	**13**	**719**

Source: Navigant Evaluation Team In-store Intercept Survey Analysis

The number of in-store intercept surveys was increased in PY4 (from 496 in PY3 to 719 in PY4) in an attempt to complete surveys with a large enough sample of customers who were purchasing specialty bulbs to allow for the estimation of program impact parameters by bulb type (standard vs. specialty)[11]. It should be noted that while the number of surveys increased between PY3 and PY4, the number of retailers that allowed in-store intercepts decreased from 5 in PY3 to 3 in PY4. The impact of reduced retailer participation with the in in-store data collection creates a loss in the accuracy of the results. If a retailer refuses to participate in the data collection effort, the evaluation team is unable to estimate for that retailer may of the key impact parameters (such as Residential vs. Non-Residential split, Non-Residential HOU, NTGR) that are estimated based on the in-store surveys. As a result, the parameters estimates from the retailer with the same retailer type (Warehouse, Big Box, DIY) were applied to the bulb sales from the unwilling retailers, which lessen the accuracy of the final results. Out of the 719 in-store intercept surveys completed, 60 were completed with program specialty CFL purchasers and 270 were completed with program standard CFL purchasers, allowing for the estimation of various impact parameters by bulb type. A single intercept survey was completed with a program LED purchaser. Assuming an average coefficient of variation (CoV) of 0.5 for the various parameters of interest being derived from the intercept surveys, the approximate confidence/precision level for the 60 specialty bulb purchasers is 90/10.6, 90/5 for the 270 standard bulb purchasers, and 90/4.5 for the 327 program bulb purchasers. The distribution of customers interviewed is in Table 2-3.

[11] Due to the very small number of LED bulbs and LED and CFL fixtures sold through the program (118,496, <1% of overall program sales) the evaluation team was unable to estimate installation rates for these products. An installation rate of 100% was assumed for these products due to their high price and hence the unlikelihood that they would be purchased and not installed.

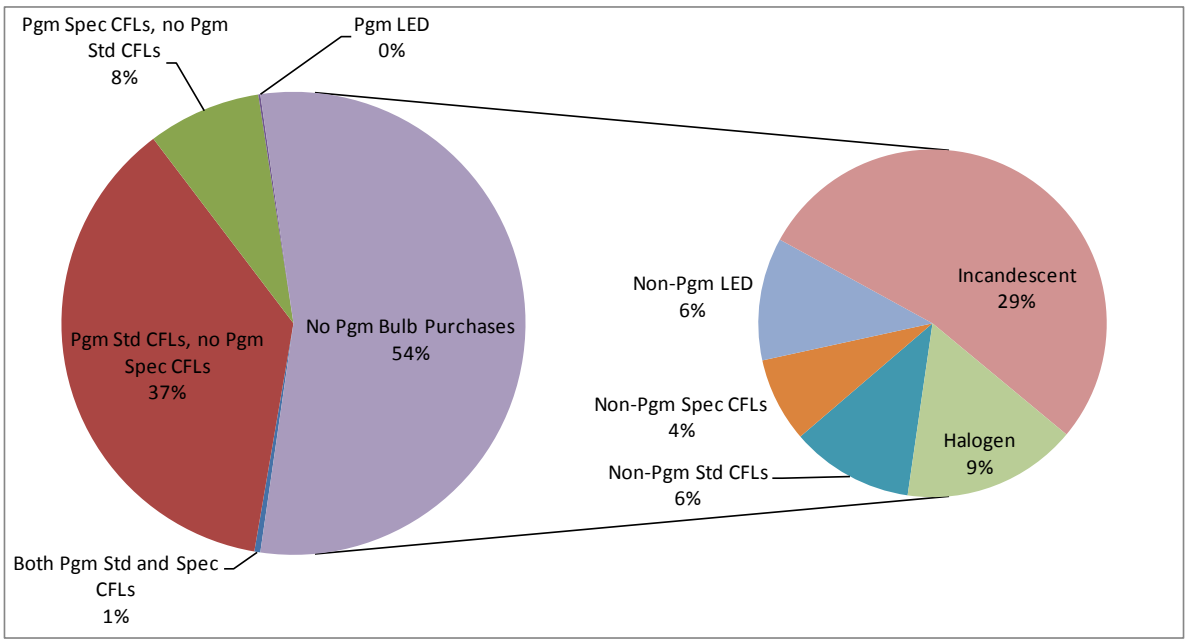
Table 2-3. In-Store Intercept Survey Respondent Types

Respondent Type	Completed Surveys
CFL Program Participants	327
LED Program Participants	1
Non-Program CFL Purchasers	75
Incandescent or Halogen Bulb Purchasers	316
Total[12]	**719**

Source: Navigant Evaluation Team In-store Intercept Survey Analysis

Among intercept respondents who did not purchase program bulbs, the majority purchased only incandescent bulbs, followed by halogen bulbs, as shown in Figure 2-1 below. Smaller proportions purchased only non-program LEDs and non-program standard and specialty CFLs. Analysis of all intercepts data – both program and non-program – will provide information on customer awareness regarding EISA, lumens, and the ComEd Residential Lighting Program, among other factors motivating customers' bulb purchasing decisions.

Figure 2-1. Intercept Distribution for Program and Non-Program Bulb Purchasers



Source: Navigant Evaluation Team In-store Intercept Survey Analysis

2.1.3 In-store Shelf Surveys

The in-store field work also included shelf surveys of lighting products. The evaluation team conducted 9 of these shelf surveys across three program retailers. The shelf surveys were conducted in conjunction

[12] This total does not equal the sum of the above quantities since some survey respondents purchased both standard and specialty CFLs and thus are included in both of those categories.

with the in-store intercept surveys discussed in the previous section. As with the intercepts, stores for shelf surveys were selected primarily based on lamp sales and the urban/suburban/rural and center/edge strata described in the intercepts methodology section.

The shelf survey contained two parts. The first was an assessment of the lighting products and promotional materials in the store. The field worker noted the presence of different types of marketing and promotional materials and the presence and location of different types of lighting products. The second part of the shelf survey was an inventory of all CFL lighting with incandescent equivalent wattage of 75W-100W[13] and lighting products that could be used in place of CFLs covering the same wattage range. The inventory noted the product manufacturer, model number, type of bulb, wattage (both CFL and incandescent equivalent when available), lumen output, location in the store, quantity in the pack, approximate number of packages on the shelf, original price and discounted price (when available). Table 2-4 shows the retailer categories where shelf surveys were conducted and the number of surveys conducted for each category.

Table 2-4. Shelf Survey Retailer Categories

Program Retailer Categories	Surveys Completed
DIY	6
Warehouse	2
Big Box	2

Source: Navigant Evaluation Team Analysis of Shelf Surveys

2.2 *Verified Savings Evaluation Methods*

Wherever possible in PY4, the Verified Savings were calculated separately for standard CFLs, specialty CFLs and CFL fixtures. LEDs bulbs and fixtures were new to the program in PY4 and so did not have deemed values associated with them. Overall program savings were estimated by assigning these new LED bulbs and fixtures either the deemed parameter associated with specialty bulbs or CFL fixtures, or new parameter estimates based on the PY4 Evaluation Research.

Verified Gross Program Savings

Verified Gross and Net Savings (energy, demand and coincident peak demand) resulting from the PY4 Residential ES Lighting Program were calculated using the following algorithms:

Verified Gross Annual kWh Savings = Program bulbs * Delta Watts/1000 * HOU * Energy IE* Realization Rate

Where:

- Delta Watts = Difference between Baseline Wattage (incandescent wattage) and CFL Wattage
- HOU = Annual Hours of Use
- Energy IE = Energy Interactive Effects
- Realization Rate = Installation Rate

[13] This is a change from last year when all standard and specialty bulbs were inventoried, regardless of wattage. The change in focus to 75 and 100-watt standard bulbs was made to assess the impact of the EISA 2007 standards.

Verified Gross Annual kW Savings = Program bulbs * Delta Watts/1000 * Realization Rate
Verified Gross Annual Peak kW Savings = Gross Annual kW Savings * Peak Load Coincidence Factor * Demand IE * Realization Rate

Where:

- Peak Load Coincidence Factor is calculated as the percentage of program bulbs turned on during peak hours (weekdays from 1 to 5 p.m.) throughout the summer.
- Demand IE = Demand Interactive Effects

Table 2-5 below shows the gross parameters data sources used to estimate the Verified Gross Savings for the Residential ES Lighting Program. As this table shows delta watts were not deemed for LED bulbs or fixtures and thus the Verified Savings for these bulbs were based on the lumen and bulb-type mappings established as part of the PY4 Evaluation Research[14]. In PY4 there were no deemed Interactive Effects or residential versus non-residential installation split (used to estimate overall HOU, Peak CF and Interactive Effects), so they were also determined based on the PY4 Evaluation Research. The PY4 deemed realization rate was estimated based on the PY2 evaluation estimated installation rate by bulb type. This realization rate does not include any adjustment for the leakage of program bulbs outside of ComEd service territory[15], nor did it apply the evaluation recommended 96% adjustment factor which accounted for the declining installation rate.

Table 2-5. Verified Gross Savings Parameter Data Sources

Gross Savings Input Parameters	Data Source	Deemed or Evaluated?
Program Bulbs	PY4 EM&V Program Tracking Data Analysis	Evaluated
Delta Watts	CFL Lumen-based Lookup Tables, LED PY4 Lumen and Bulb Type -based Lookup Tables	CFL Deemed, LED Evaluated
Res / NonRes Split	PY4 Intercept Survey	Evaluated
Hours of Use (HOU)	Res – PY3 Metering Study NonRes – KEMA PY4 Operations Manual	Deemed
Peak Load Coincidence Factor	Res – PY3 Metering Study NonRes – KEMA PY4 Operations Manual	Deemed
Energy Interactive Effects	Res – PY4 Analysis NonRes – KEMA PY4 Operations Manual	Evaluated
Demand Interactive Effects	Res – PY4 Analysis NonRes – KEMA PY4 Operations Manual	Evaluated
Realization Rate	PY2 Evaluation Report	Deemed

[14] A complete description of the PY4 Impact Evaluation Research methods and findings is provided is Section 6.
[15] The PY3 evaluation estimated leakage of program bulbs outside of ComEd service territory was just less than 1%.

Verified Net Program Savings

Verified net energy and demand (coincident peak and overall) savings resulting from the PY4 Residential ES Lighting Program were calculated by multiplying the Verified Gross Savings estimates by a net-to-gross ratio (NTGR). In PY4, the NTGR for the Residential Lighting Program was deemed by bulb types[16]. The estimate used for standard CFLs and Fixtures was deemed based upon the PY2 evaluation results (0.58). The source of the PY4 deemed NTGR for specialty bulbs (0.80) is the settlement stipulation included in ICC Order 10-0570[17].. The program design and delivery methods did not substantially change for PY4 and so, in accord with the NTG Framework[18], we believe it is appropriate to use the NTG rate calculated in the PY2 evaluation research. Thus, the program falls under the following condition from the NTG Framework: "Where a program design and its delivery methods are relatively stable over time, *and* an Illinois evaluation of that program has estimated a NTG ratio, that ratio can be used *prospectively* until a new evaluation estimates a new NTG ratio."

[16] NTGR were not deemed for LED bulbs or fixtures. PY4 Verified Net Savings were estimated for LED bulbs and fixtures by applying the deemed NTGR for specialty CFLs and CFL fixtures, respectively.
[17] This settlement stipulation states that the NTGR for Specialty bulbs will be 0.8 for all 3 years of the plan for evaluation and planning purposes.
[18] "Proposed Framework for Counting Net Savings in Illinois." Memorandum March 12, 2010 from Philip Mosenthal, OEI, and Susan Hedman, OAG.

3. Evaluation Results

3.1 Impact Evaluation Results

This section presents the Gross and Net Savings results from the PY4 Residential ES Lighting Program evaluation.

3.1.1 Verification and Due Diligence Procedure Review

Given modest changes in the program design, this topic was not revisited during PY4. Refer to the PY1 report for more information.

3.1.2 Tracking System Review

The tracking data delivered for this evaluation consisted of five databases. These databases consisted of the following:

- *Residential Lighting Project Information Database* - This database was the primary upstream lighting database and contained a record for all 605,831 retail program bulb sales invoices (by model number and store) that were sold during PY1 through PY4, 226,192 of which are specific to PY4. 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.
- *Residential Lighting Retailer Database* - This database contained the names of 11 retailers and associated retailer identification numbers that correspond to the retailer identification numbers in the Residential Lighting Project Information database. This database was not used because 5 of the 16 participating retailers were not included in the data. Additionally, the Residential Lighting Project Information database was missing the retail identification number for a large number of records. Because this database could not consistently be used to identify the retailer, retailer names were extracted from the store name variable in the project information database.
- *Residential Lighting Measure Lookup Database* – In prior years, this database contained a record for each CFL model sold through the upstream lighting program. Along with the model number and a description of the bulb, this database included for all program CFLs the wattage of the CFL, an estimate of the wattage of its incandescent equivalent, the bulb's rated life, the number of bulbs included in the package, the bulb manufacturer, the program year, and for a portion of model numbers it included the lumen output. This table was not updated for PY4 and was thus missing information for a large portion of bulbs (~36% of total PY4 sales). Because this data source was inadequate for such a large fraction of program bulbs, this database was not used to establish bulb information in PY4.
- *Final PY4 Goals Tracker* - This spreadsheet tracked cumulative weekly program bulbs 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, base wattage (per manufacturer), rated life, and the number of bulbs per package. In prior years, the Goals Tracker was used primarily to establish bulb price. In PY4, however, Goals Tracker was relied upon for all bulb information because the Residential Lighting Measure Lookup database was incomplete.

- *Residential Lighting Coupon Database* – This database contained a record for all bulbs purchased using a ComEd coupon. This database contained key information including the name, address and phone number of the coupon participant, the model and manufacturer of the program bulbs purchased[19], the store where the program bulbs were purchased, the wattage grouping of the bulbs purchased[20], the date of the program purchase and the number of bulbs in the program package. However, this database did not include key bulb information such as manufacturer base wattage or lumen output. Additionally, the bulb model numbers were not readily matched to bulb information in the PY4 Goals Tracker which made including coupon bulbs in the full evaluation analysis problematic[21].

Findings. As indicated above, only three out of the five databases were used. While we were able to extract most of the necessary information from the Residential Lighting Project Information database and the PY4 Goals Tracker, these two data sources did not align perfectly. Matching across these two databases by retailer name and model number initially matched 86% of bulb sales. There were, however, 110 unique retailer and model number combinations in the tracking data that did not have a direct match in Goals Tracker.[22] Partial matching on model number resulted in 101 more matches. Bulb information (excluding price) for the remaining nine model numbers was obtained through internet research. While the large majority of necessary bulb information was ultimately matched using the data provided, matching and partial matching across multiple incomplete databases and filling in the blanks with manual internet research was a time consuming process.

Additionally, the evaluation verified PY4 program bulbs differed from ComEd's reported PY4 program bulbs by approximately 10,900 bulbs.[23] Both the evaluation team and ComEd used the tracking database created by Frontier to calculate the number of program bulbs sold for a given program year. In PY4 a number of issues were identified in the preliminary "final" database which resulted in an initial discrepancy of more than 500,000 bulbs. The evaluation verified delta watts estimated also differed from the delta watts estimate used by ComEd to estimate their PY4 gross savings. The difference between the delta watts estimates resulted from a rounding error that was detected in the Goals Tracker spreadsheet. This rounding error resulted in a 5% difference between ComEd reported gross annual savings and the evaluation calculated gross annual savings.

Recommendations. Creating a bulb information database with a clear one-to-one match with the model numbers in the tracking data would streamline future evaluation efforts. It is our understanding that work is underway to develop a link between the current Energy Star Lighting qualified products information database and the retailer and manufacturer model numbers used in EFI's data. We support this endeavor and provide the following recommendations:

[19] The model numbers were missing for approximately 10% of coupon sales records.
[20] The evaluation team found this wattage grouping often did not match the wattage associated with a particular model number.
[21] Because precise coupon data was not readily available and due to the extremely low volume of coupon bulb sales (less than 0.4%) coupon bulbs were included with standard bulb in the overall portfolio analysis and so shared average impact parameter estimates with standard bulbs.
[22] In some cases, the remaining non-matches were due to one data set listing the manufacturer model number and the other data set listing the manufacturer model number and the retail model number. In other cases, one data set sometimes listed the manufacturer model number plus some sort of bulb descriptor.
[23] This figure includes approximately 4,600 bulbs sold late in PY3 and thus not included in the PY3 evaluation.

- If the Energy Star database is to be the only source of detailed bulb information, the list should be inclusive of CFLs, CFL fixtures, LEDs, and LED fixtures.
- The Energy Star database contains the majority of bulb parameters necessary for evaluation. However, it does not currently include a manufacturer base watt value. If possible, the same model key used to link the tracking data with the Energy Star data should be used to link to the Goals Tracker. This would allow all evaluation parameters, including retail price, to be merged with the tracking data (alternatively, retail price and manufacturer reported incandescent equivalent could be added as variables to the main tracking database as recommended in PY3).
- While the Energy Star qualified products list is a very reputable source for bulb information, it is not without its problems. A quick examination of the current Energy Star list showed that a number of bulb models were missing lumens values and / or wattage values. Additionally, some models had wattage values that were in direct contradiction with the bulb description or model number. A general quality control check should be performed on the Energy Star data if it is to be used as the primary source of bulb information for future evaluations.

Regarding the discrepancies between program tracking and the Goals Tracker, ComEd has indicated they are working on developing a more robust data reconciliation process going forward.

3.1.3 Gross Program Impact Parameter Estimates

Table 3-1. below provides the parameter estimates used to calculate the PY4 Verified Gross Savings.

Table 3-1. Verified Gross Savings Parameter Estimates

Verified Savings Parameter	Standard	Specialty	CFL Fixtures	LEDs	LED Fixtures	Coupons	Total
Total Bulb Sales	11,419,752	1,097,670	84,539	24,919	16,551	5,599	12,649,030
Delta Watts	48.7	39.6	57.8	48.9[24]	40.3	48.7[25]	47.9
Residential Installs	95%	95%	95%	95%	95%	95%	95%
HOU – Res / NonRes	2.74 / 12.23	2.74 / 12.23	2.57 / 12.23	2.74 / 12.23	2.57 / 12.23	2.74 / 12.23	2.74 / 12.23
Peak CF – Res / NonRes	0.10 / 0.66	0.10 / 0.66	0.10 / 0.66	0.10 / 0.66	0.10 / 0.66	0.10 / 0.66	0.10 / 0.66
Energy IE – Res / NonRes	1.03 / 1.14	1.03 / 1.14	1.03 / 1.14	1.03 / 1.14	1.03 / 1.14	1.03 / 1.14	1.03 / 1.14
Demand IE – Res / NonRes	1.09 / 1.24	1.09 / 1.24	1.09 / 1.24	1.09 / 1.24	1.09 / 1.24	1.09 / 1.24	1.09 / 1.24
Realization Rate	0.73	0.80	0.89	0.80	0.89	0.73	0.74

Source: Navigant Evaluation Team Analysis of Tracking Data and Deemed Savings Review

3.1.4 Gross Program Impact Results

Table 3-2. below provides the PY4 Verified Gross Savings estimates for bulbs installed in Residential and Non-Residential locations and overall.

Table 3-2. Verified Gross Savings Estimates

Savings Estimate	Res vs. NonRes Segment	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Unadjusted Gross	All	642,616	-	-
Ex Post Unadjusted Gross	Res	531,197	578.9	59.0
	NonRes	112,538	27.5	18.0
	All	701,430	606.3	77.1
Ex Post Adjusted Gross	Res	439,934	426.1	47.7
	NonRes	93,228	20.2	14.6
	All	533,162	446.3	62.3

Source: Navigant Evaluation Team Analysis

[24] Delta watts for LEDs were not deemed in PY4 and thus delta watts were determined based upon the recommended PY4 lumen and bulb-type mappings.

[25] Because precise coupon data was not readily available and due to the extremely low volume of coupon bulb sales (less than 0.4%) the evaluation team used the average delta watts across all standard bulb as a proxy for coupon bulb delta watts. This differs from Goals Tracker which assumed all coupon bulbs were 14 watt CFLs. The limited coupon data available suggest coupon bulb wattages ranged from 11-40 watts.

3.1.5 Net Program Impact Parameter Estimates

Table 3-3 below provides the parameter estimates used to calculate the Verified Net Savings.

Table 3-3. Verified Net Impact Parameter Estimates

Verified Savings Parameter	Standard	Specialty	CFL Fixtures	LEDs	LED Fixtures	Coupons	Total
NTGR	0.58	0.80	0.58	0.80	0.58	0.58	0.60

Source: Navigant Evaluation Team Analysis of Tracking Data and Deemed Savings Review

3.1.6 Verified Net Program Impact Results

Table 3-4 below provides the PY4 Verified Net Savings estimates for bulbs installed in Residential and Non-Residential locations and overall.

Table 3-4. Verified Net Savings Estimates

Savings Estimate	Res vs. NonRes Segment	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Net	All	284,494	-	-
Ex Post Net	Res	263,421	255.1	28.6
	NonRes	55,822	12.1	8.7
	All	319,243	267.2	37.3

Source: Navigant Evaluation Team Analysis

3.1.7 PY4 Carryover Savings Estimate

This section discusses the estimation of PY4 Residential CFL energy and demand savings included from bulbs that were purchased during PY2 and PY3 but were found to not have been installed during those program years. As documented in a memo to ComEd and the ICC[26] the evaluation team recommends estimating the savings resulting from the installation of prior year program bulbs using the impact parameter estimates (HOU, DW, NTGR) from the program year of sale and with an assumed installation rate of 100%. Table 3-5

Table 3-5 below shows the net energy savings in PY4 attributable to the approximately 2.7 million bulbs sold but not installed during PY2 and PY3, resulting in an additional 99,888 MWh of net energy savings attributable to PY4.

[26] Memo to ComEd and ICC Residential Lighting Program Interested Parties Re: Calculation of CFL Carryover Savings. September 18th, 2012, from Navigant Evaluation Team.

Table 3-5. PY4 Late Installs Gross and Net Energy Savings Estimation

Verified Gross and Net PY4 Carryover Savings Estimate	PY2 Program Bulbs	PY3 Program Bulbs	Total PY4 Carryover
Program Bulbs Installed During PY4	1,076,143	1,596,986	2,673,129
Average Delta Watts	49.2	48.1	n/a
Average Daily Hours of Use	3.48	2.98	n/a
Gross kWh Impact per unit	62.5	52.4	56.5
Gross kW Impact per unit	0.05	0.05	0.05
Installation Rate	100%	100%	100%
PY4 Carryover Gross Energy Savings (MWh)	67,223	83,712	150,936
PY4 Carryover Gross Demand Savings (MW)	52.9	76.9	129.8
Energy Interactive Effects	1	1.02	n/a
Net-to-Gross Ratio	0.58	0.71	0.66
PY4 Carryover Net Energy Savings (MWh)	39,275	60,613	99,888
PY4 Carryover Net Demand Savings (MW)	30.9	54.4	85.3

Source: Navigant Consulting Team Analysis

3.1.8 Evaluation Research PY5 Carryover Savings Estimate

Based on PY3 and PY4 sales and installation rates, it is also possible at this time to estimate and begin to document the net energy savings resulting from late installs that will be counted in PY5. As mentioned above the net energy savings resulting from these late installations are calculated based on the evaluation verified impact parameters estimates from the program year when the bulbs were sold and thus are in no way dependent upon the results of the PY5 program evaluation.

Table 3-6 below shows that the net savings from more than 3.3 million bulbs sold in either PY3 or PY4 that can be claimed in PY5, resulting in an estimated 116,192 MWh of net energy savings.

Table 3-6. PY5 Evaluation Research Late Installs Net Energy Savings Estimation

Evaluation Research PY5 Carryover Savings Estimate	PY3 Program Bulbs	PY4 Program Bulbs	Total PY5 Carryover
Program Bulbs Installed During PY5	1,596,986	1,777,471	3,374,457
Average Delta Watts	48.1	48.8	n/a
Average Daily Hours of Use	2.98	3.17	n/a
Gross kWh Impact per unit	52.4	56.4	54.5
Gross kW Impact per unit	0.05	0.05	0.05
Installation Rate	100%	100%	100%
PY4 Carryover Gross Energy Savings (MWh)	83,712	100,335	184,047
PY4 Carryover Gross Demand Savings (MW)	76.9	86.7	163.6
Energy Interactive Effects	1.02	1.03	n/a
Net-to-Gross Ratio	0.71	0.54	0.62
PY4 Carryover Net Energy Savings (MWh)	60,613	55,579	116,192
PY4 Carryover Net Demand Savings (MW)	54.4	46.5	100.9

Source: Navigant Consulting Team Analysis

3.1.9 Verified Gross and Net Savings Results across Program Years

Table 3-7 below provides a comparison of the Verified Savings (and key parameter estimates) across the four program year evaluations. As this table shows bulb sales have quadrupled since the first program year and gross and net MWh Verified Savings have also steadily climbed from year to year.

Table 3-7. Comparison of Verified Savings Parameters across Program Years

Verified Savings Estimates	PY1	PY2	PY3	PY4
Bulb Sales	3,001,367	8,284,376	11,197,862	12,649,030
Realization Rate	70%	74%	71%	74%
Gross Installed MWh Savings	87,917	341,398	423,677	519,937
Net-to-Gross Ratio	0.69	0.58	0.71	0.60[27]
Net MWh Savings	60,769	199,560	299,788	311,324
Net MWh Savings from Carryover Bulbs	0	12,973	48,193	99,888

Source: Navigant Evaluation Team Analysis

[27] This is the average NTGR across all bulb types (Standard, CFL Fixture, LED Fixture NTGR = 0.58, Specialty and LED bulbs NTGR = 0.80).

3.2 *Process Evaluation Results*

The process evaluation of the PY4 Residential ES Lighting Evaluation assessed the impact of program processes (e.g., the mechanics of how the program was implemented) on residential lighting consumers who participated in the program. For these consumers, we examined the reach of program marketing, usage of CFLs and purchasing decisions, awareness of bulb types, federal regulatory changes, and program discounts, and barriers to purchasing CFLs. The primary data sources for the process evaluation were the in-store intercept surveys (n=719) and the in-store shelf surveys (n=10). For the past three program years, telephone surveys were also part of the data collection; however these phone surveys were not conducted in PY4. While some former telephone survey questions were carried over to the intercept survey in PY4, direct comparisons are difficult as the surveyed population is substantially different.

Table 3-8 below shows the distribution of in-store intercept respondent's bulb purchases by retailer type. This table is at a bulb level so a respondent bulb purchases, both program and non-program, are included in the table below. As this table shows, nearly 50% of the bulbs that respondents were buying were standard CFLs and 30% were incandescent. Sixty-five percent of in-store intercept surveys were conducted at DIY stores, while 21% were at Warehouse stores and 14% occurred at Big Box stores. It is interesting to note the significantly different distributions of light bulbs sales between the various retailer types[28]. While nearly 70% of Big Box respondent purchases were incandescent light bulbs, 74% of Warehouse respondent purchasers were standard CFLs. LEDs were purchased most frequently by survey respondents at Warehouse stores (e.g., 5% of respondent bulb sales) and halogen bulbs made up 7% to 8% of survey respondent bulb sales at DIY and Warehouse stores.

Table 3-8. Distribution of In-store Intercept Respondent Bulb Purchases by Retailer Type

Retailer Type	CFL				Incandescent		LED		Halogen		Other		Totals
	Standard		Specialty										
	bulbs	%	bulbs	%	bulbs	%	bulbs	%	bulbs	%	bulbs	%	bulbs
Big Box	111	28%	3	1%	272	69%	2	1%	8	2%	0	0%	396
DIY	1,180	44%	241	9%	949	35%	56	2%	211	8%	60	2%	2,697
Warehouse	675	74%	118	13%	2	0%	50	5%	66	7%	0	0%	911
Overall	1,966	49%	362	9%	1,223	31%	108	3%	285	7%	60	1%	4,004

Source: In-Store Intercept Survey (PY4)

Table 3-9 below 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 (6.0 per respondent) and DIY stores (5.3), as compared to Big Box stores. A key finding is that at both DIY and Big Box stores the average number of standard CFLs purchased per respondent was very similar to the average number of incandescent bulbs purchased[29]. One could interpret this as an

These differences are likely driven by the bulb stocking patterns of the various retailers.

[29] The average number of incandescent bulbs purchased per respondent at Warehouse stores was based on a single incandescent bulb purchaser and thus this lack of incandescent bulb does not allow us to make any meaningful conclusions about incandescent purchases. Many warehouse stores appear to be phasing out incandescent bulbs entirely from their store shelves.

indication that customers do not tend to stock up on CFLs in any higher quantities than incandescent bulbs. An attempt was made to compare the average number of bulbs purchased by intercept respondents in PY4 to those in PY3. A straightforward comparison is meaningless due to the varied distribution of retailers where intercepts were conducted and bulb types[30] sold between program years. Comparing retailer by retailer, the average number of bulbs purchased at the Big Box retailer remained fairly consistent between PY3 and PY4 (3.7 bulbs per respondent in PY3 versus 3.9 bulbs per respondent in PY4). The average number of bulbs purchased per respondent at the DIY retailer decreased in PY4 (from 7.4 to 5.3), however that was largely driven by instructions given to the surveyors in PY4 to spend more time in the lighting aisle (as opposed to elsewhere in the store next to a pallet of $0.99 4-packs as one interviewer did in PY3) which resulted in a more diversified bulb purchasing selection but fewer of the highly discounted 4-packs being purchased. In PY3, the Warehouse retailer only sold CFL bulbs. In PY4, this retailer also sold LED and Halogen bulbs, which, combined with fewer CFLs purchased per respondent (12.9 in PY3 versus 7.3 in PY4) added to the overall reduction in the number of bulbs purchased per respondent at Warehouse stores (12.9 in PY3 versus 6.0 in PY4). In both years the majority of bulbs purchased across all retailers were CFLs and incandescent bulbs, however in PY4 a higher percentage of respondents purchased incandescent bulbs (31% in PY4 compared to 10% in PY3). In PY3 surveyors were instructed to prioritize surveys with CFL purchasers to maximize the number of CFL purchaser completes. In PY4, due to a changing marketing in the wake of EISA 2007 and the addition of LEDs to the program, surveyors were instructed to randomly select lighting purchasers.

Table 3-9. Average Number of Bulbs Purchased per Intercept Respondent by Retailer Type

Retailer Type	CFL				Incandescent		LED		Halogen		Other		Totals	
	Standard		Specialty											
	Avg bulbs	n	Avg bulbs	n	Avg bulbs	n	Avg bulbs	n	Avg bulbs	n	Avg bulbs	n	Avg bulbs	n
Big Box	3.7	30	3.0	1	4.3	64	1.0	2	2.0	4	0	0	3.9	100
DIY	6.1	193	3.6	67	5.9	160	2.2	25	4.1	52	5.5	11	5.3	470
Warehouse	7.3	92	4.4	27	2.0	1	2.5	20	5.5	12	0	0	6.0	149
Overall	6.2	315	3.8	95	5.4	225	2.3	47	4.2	68	5.5	11	5.3	719

Source: In-Store Intercept Survey (PY4)

3.2.1 Program Implementation Strategy

The implementation strategy for the PY4 Residential ES Lighting Program has not changed significantly from previous program years. Implementation details on items that have remained static over the course of the last program year include roles of the implementation contractors (APT and EFI), program delivery mechanisms and marketing strategies, and retail recruitment, education and outreach, see the PY2 report.[31]

[30] In PY4, due to both EISA and the changing lighting market, there were significantly more LED and Halogen bulbs sold than in PY3.

[31] Navigant Consulting, 2010. *Energy Efficiency/Demand Response Plan Year 2 Evaluation Report: Residential Energy Star Lighting*. Prepared for Commonwealth Edison Company, December, 2010.

3.2.2 Program Bulbs

In PY4, APT and ComEd have continued to work to ensure that a wide variety of independently tested ES CFLs are available for the ComEd Residential ES Lighting program. The only major change in product availability is that a limited number of LED bulbs and LED fixtures were offered through the program in PY4. Table 3-10 shows the distribution of program bulbs sold in PY4 across the five bulb types and within specific product subcategories (base wattages for standard bulbs[32] and bulb type for specialty bulbs, LEDs, and fixtures). As this table shows, in PY4 90% of the bulbs sold through the program were standard CFLs, 9% were specialty CFLs, 1% were CFL fixtures, and LED lamps and fixtures combined comprised less that 1% of sales (~0.3%). Within the standard CFL group, the majority of bulbs sold continued to be low-wattage CFLs (13 and 14 watts, with lumens equivalent to a 60 watt incandescent). In PY3 these 60 watt replacement lamps comprised 72% of program bulb sales, and in PY4 they increased to 76% of total program bulb sales. Consistent with PY3, most of the specialty CFLs sold in PY4 were reflectors. The second highest selling specialty bulb type changed from A-lamps in PY3 to globes in PY4. Sales of standard CFLs in PY4 increased 9% over PY3 while specialty bulb sales decreased by 19%. Approximately 10% of this decrease in specialty bulb sales can be explained by a transition to LED lamps.

Table 3-10. Distribution of PY4 Residential ES Lighting Program Sales across Bulb Types

Bulb Type	Product	PY4 % of Bulbs Sold	PY4 % of Bulbs Sold
Standard	40 Watt Replacement	4%	90%
	60 Watt Replacement	76%	
	75 Watt Replacement	4%	
	>=100 Watt Replacement	7%	
Specialty	Reflector	5%	9%
	A-bulb	1%	
	Globe	1%	
	Other Specialty	1%	
LED	Lamp	0.2%	0%
CFL Fixture	Fixture	1%	1%
LED Fixture	Fixture	0.1%	0%
Residential ES Lighting Program		**100%**	**100%**

Source: Evaluation Team analysis of PY4 ComEd Tracking data

The process evaluation of the PY4 Residential ES Lighting Evaluation assessed the program processes impacting residential lighting consumers who participated in the program. For these consumers, we examined the reach of program marketing, usage of CFLs and purchasing decisions, awareness of bulb types, federal regulatory changes, and program discounts, and barriers to purchasing CFLs. The primary data sources for the process evaluation include the in-store intercept surveys (n=719) and the in-store

[32] Base wattages were determined using the Energy Star lumens based method described in Section 3.

shelf surveys (n=10). For the past three program years, telephone surveys were also part of the data collection, however these phone surveys were not conducted in PY4. While some former telephone survey questions were carried over to the intercept survey in PY4, direct comparisons are difficult as the surveyed population is substantially different.

3.2.3 Prior Usage of CFLs

Again in PY4 intercept respondents who were purchasing program CFLs for their homes were asked whether or not they currently had any CFLs installed in their home. In PY4, 87% of respondents indicated they did have CFLs installed in their homes, which was slightly higher than reported in PY3 (83%). This again shows the vast majority of program-bulb purchasers have some experience with CFLs. Respondents who were purchasing CFLs were also asked whether any of the new CFLs they were purchasing would replace an incandescent bulb that still worked. As Table 3-11 below shows, 39% of CFL purchasers planned to remove a working incandescent in order to start saving energy sooner (this was slightly higher than the 36% who stated this in PY3, but not significantly so). Customers purchasing bulbs at Warehouse stores were significantly more likely to do so than those purchasing bulbs at DIY or Big Box stores. This could be a result of the fact that Warehouse survey respondents, on average, purchased more CFLs than customers at either DIY or Big Box retailers.

Table 3-11. Planning to Replace Working Incandescent with CFL

	Overall	Warehouse	DIY	Big Box
Yes	39%	52%	34%	32%
No	60%	45%	66%	68%
Don't Know	1%	3%	0%	0%
N	402	118	253	31

Source: In-Store Intercept Survey (PY4)

3.2.4 Effectiveness of Program Marketing

In PY4, all in-store intercept respondents were asked if they knew that the store where they were being surveyed was selling CFLs discounted through a ComEd lighting program. As shown in Table 3-12 below, the majority of respondents (87%[33]) were unaware of the discounts offered by ComEd. Respondents purchasing ComEd discounted bulbs were slightly more likely to be aware than respondents who were not purchasing program bulbs (e.g., 15% and 12%, respectively). Table 3-12 below also shows that awareness of the ComEd discounts was highest at Warehouse stores and lowest at Big Box stores. Approximately half of those who were aware their bulbs were discounted did not know that ComEd had provided the discount. Forty percent of customers who had knowledge that the CFLs they were buying were ComEd discounted bulbs reported coming to the store specifically to buy the ComEd discounted bulbs (n=30).

[33] This was not statistically different from the PY3 finding that 85% were unaware of the ComEd discount.

Table 3-12. Awareness of ComEd Discounted CFLs

	Overall	Warehouse	DIY	Big Box
Yes	13%	18%	12%	9%
No	87%	82%	88%	88%
Don't Know	1%	0%	0%	3%
N	719	149	470	100

Source: In-Store Intercept Survey (PY4)

The most common self-reported source of ComEd discounted lighting awareness was utility bills[34], followed by in-store marketing materials. Respondents purchasing program bulbs were more likely to have heard about the program via their friends (e.g., 17% vs. 6% who were not purchasing discounted bulbs) or seeing a sticker on the package (e.g., 15% vs. 4%), while those not purchasing program bulbs reported higher rates of program awareness via an internet source (17% vs. 4%). Only four of the 122 respondents reported they learned about the program via a program retailer employee, and all four of these respondents were purchasing their program bulbs from a DIY store. This is shown in Table 3-13.

Table 3-13. Respondents Self-Reported Method of Learning about ComEd Discounts

Source of ComEd Discount Awareness	Overall	Purchasing Discounted Bulbs	Not Purchasing Discounted Bulbs
Utility Bill	28%	25%	30%
In-store Marketing Materials	26%	25%	26%
Friend	12%	17%	6%
Website/Online	11%	4%	17%
ComEd sticker on the package	10%	15%	4%
Newspaper/TV/Radio	7%	6%	6%
Work in the Industry	4%	2%	6%
Store Employee	2%	4%	0%
Don't know	2%	2%	2%
Saw a retail lighting demonstration	1%	0%	2%
N	92	48	47

Source: In-Store Intercept Survey (PY4)

In-store Marketing materials were nearly as good a source of program awareness for program bulb purchasers and non-program bulb purchasers. Looking at this source of awareness by retailer type, we found that significantly more DIY respondents (40%) provided it as a primary source of awareness compared to Warehouse and Big Box retailer respondents (7% and 11%, respectively).

[34] There was a significant increase in customers reporting they learned about it through their utility bills from PY3.

All in-store intercept respondents were asked whether or not they had seen any information or displays about CFLs in the store. Table 3-14 below shows that most respondents (86%) reported they had not seen any in-store information about CFLs. This rate was a little lower (78%) for those who shopped at a DIY store, indicating CFL materials may have been more apparent in those retailers. Forty-five percent of customers who saw CFL information in the store reported that it was provided by ComEd, 32% reported it was sponsored by the retailer, and 7% reported it was from a bulb manufacturer. The remaining 18% did not know who sponsored the CFL information. It is interesting to note that two-thirds of respondents who reported they had seen CFL informational materials in the store were not aware the store was selling ComEd discounted CFLs.

Table 3-14. Respondents Self-Reported Awareness of CFL In-Store Materials

	Overall	Warehouse	DIY	Big Box
Yes	14%	3%	20%	3%
No	85%	96%	78%	97%
Don't Know	1%	1%	1%	0%
N	719	149	470	100

Source: In-Store Intercept Survey (PY4)

Table 3-15 below shows that the majority (60%) of respondents who saw CFL information or displays in the store and were buying standard program bulbs, reported that materials were extremely influential. This is in contrast to the 50% of respondents who were buying specialty CFLs and stated the informational materials were not very influential.

Table 3-15. Influence of CFL In-Store Materials

	Overall	Standard	Specialty
Not Very Influential (0 to 3)	38%	35%	50%
Moderately Influential (4 to 6)	6%	5%	13%
Extremely Influential (7 to 10)	56%	60%	38%
N	48	40	8

Source: In-Store Intercept Survey (PY4)

3.2.5 Customer Purchasing Decisions

The influence of in-store marketing materials can also be seen by comparing customers' purchase plans against their eventual purchases. Table 3-16 shows that almost three-quarters of the in-store intercept survey respondents reported that they had planned to buy light bulbs when they came to the store. Just over one-third of these were planning on buying CFLs exclusively, half planned to buy only non-CFLs, while another 5% planned to buy a combination of CFLs and another bulb type. Nearly all who intended to purchase CFLs exclusively at the time they entered the store ended actually purchased such CFLs. This fact was not reflected of customers who intended to purchase other types of bulbs, either exclusively or in combination with CFLs. Most customers who changed their purchasing plans purchased CFLs; this

possibly suggests that the in-store marketing materials may have had an influence on their purchasing decision.

Table 3-16. CFL Purchase Intentions and Actual Purchases

Purchasing Intentions	(n=719)
Planned on purchasing light bulbs prior to entering the store	71%
Of them, planned on purchasing…	**(n = 512)**
CFLs only	38%
CFLs and another type of bulb	5%
Bulbs other than CFLs	52%
Don't know	4%
Ended up purchasing what they intended…	**(n = 512)**
CFLs Only	96%
CFLs and another type of bulb	27%
Bulbs other than CFLs	85%

Source: In-Store Intercept Survey (PY4)

PY4 intercept respondents purchasing CFLs were asked why they were purchasing CFLs rather than another bulb type. As seen in past years, customers continue to report that they select CFLs over other bulb types primarily to lower their utility bills. This response was provided by nearly half of CFL purchasers. Customers also frequently reported selecting CFLs because of the low price, their prior experience with CFLs, and for environmental reasons.

Another interesting survey finding is 86% of respondents purchasing standard CFL opted for ComEd discounted program bulbs, while only 63% of respondents purchasing specialty CFLs selected program bulbs. The majority of specialty CFL purchasers indicated they did not purchase program CFLs because they did had no knowledge of the discount (49%). Other reasons provided included having prior experience with another model (20%) and not finding any discounted CFLs in the specialty type they needed (11%).

As mentioned in previous sections of this report, in addition to the in-store intercept survey, the evaluation team conducted shelf surveys of lighting products at a number of program retail stores. The shelf surveys the team conducted at program stores show that in-store ComEd marketing materials are present and tend to be highly visible. All ten stores had marketing and signage about CFL bulbs from ComEd with seventy percent also accompanied with signs by manufacturers and/or retailers. Only one store out of the ten reviewed stores had any EISA regulations signage and that store had very low visibility. Four stores had signs on proper CFL disposal. Nine stores had signage on CFL discounts by ComEd, with one store accompanied by a sign from the manufacturer. Despite the presence of promotional materials, five of the ten stores did not note the ComEd discount on or near the price tag and only showed the final discounted price. This might explain why some customers were unaware that they were purchasing discounted CFLs.

As part of the customer surveys conducted during PY3 and PY4, respondents were asked to choose from a list of factors they considered when selecting which wattage CFLs to purchase (they were allowed to report more than one factor). Table 3-17 below shows the percentage of respondents in each program year who indicated their purchasing decisions was based on the following criteria: incandescent equivalency, lumen output, price, and CFL wattage.

PY4 results suggest that purchasing decisions are still based largely on incandescent equivalents, and use of lumens (40%) or CFL wattages (48%) is relatively low. In comparison, PY3 purchases revealed the fact that only 75% of respondents indicated they consider incandescent equivalent wattage and 85%consider CFL wattage seemed to indicate that CFL purchasers were getting more comfortable with the light levels associated with the CFL wattages as opposed to having to rely entirely on the equivalent incandescent wattage.

Table 3-17. Customer Self Report CFL Selection Criteria

Selection Criteria	PY3 GenPop	PY4 Intercept
Incandescent equivalent wattage printed on the CFL package	75%	88%
Lumen output of the CFLs	42%	40%
Price of the CFL	78%	85%
CFL wattage	85%	48%

Source: In-Store Intercept Survey (PY4)

While some customers are becoming more familiar with CFL wattages, the ENERGY STAR program and most manufacturers are promoting the technology neutral lumens metric so that consumers will be have a good sense of light output regardless of bulb type. Both PY3 and PY4 survey results indicate that familiarity with lumens remains quite low. In PY3, customers who stated they used both incandescent equivalent wattages and lumens to select the wattage of the CFLs they were purchasing were asked which of these criteria was more important to them. The net result of this analysis is that customers seemed to rely on incandescent equivalent wattages about three times more often than they relied on lumens. PY4 customer intercept interviews found that only 40%of CFL purchasers were somewhat or very familiar with the concept of lumens.

3.2.6 Barriers to CFL Use

Forty-three percent of the customers completing an in-store intercept survey (all of whom were purchasing light bulbs) were not purchasing CFL bulbs. The majority of these respondents (85%) reported that they had not considered purchasing any CFLs during their current shopping trip. Table 3-18 below shows the various self-reported reasons these customers gave for why they chose not to buy CFLs. The most widely cited reason in PY4 was the need for another type of specialty bulb (41%), which suggests that possibly more could be done to educate purchasers about the various types of specialty CFLs that are available. One-third of respondents cited their dislike for light quality (17%) or the way the CFL looked in fixtures (16%), as reasons for not purchasing CFLs. In PY4 only 6% of respondents cited mercury as a reason for not purchasing CFLs, compared to 35% of PY3 general population survey respondents who ranked mercury as a "very important" reason for not purchasing CFLs. The question posed in PY3 was not directly comparable to the PY4 mercury question; however the low level of

reported concern over mercury in PY4 may be an indication that customers perceptions of the danger is decreasing. This is shown in Table 3-18.

Table 3-18. Barriers to CFL Purchase

	Overall	Warehouse	DIY	Big Box
Needed other specialty bulb	41%	40%	43%	36%
Dislike the light quality/color of CFLs	17%	33%	16%	10%
Don't like the way CFLs fit or look in fixtures	16%	37%	13%	17%
CFLs take too long to reach full brightness	9%	20%	8%	6%
Already have some/Don't need any	9%	3%	10%	6%
Accustomed to incandescent bulbs	9%	3%	9%	10%
Mercury/Dangerous	6%	7%	4%	9%
CFLs burn out too quickly	5%	7%	4%	4%
Not aware of CFLs before today	4%	0%	5%	1%
CFLs are too expensive	4%	0%	2%	10%
LEDs preferred	3%	7%	4%	0%
Don't know enough about CFLs	3%	0%	2%	4%
Don't Know	2%	3%	2%	1%
Couldn't find needed CFL on shelf	1%	0%	1%	0%
N	307	30	208	69

Source: In-Store Intercept Survey (PY4)

3.2.7 EISA 2007

EISA raises the energy efficiency standards for incandescent lighting over time and will impact consumer lighting purchase behavior, but exactly how the public will react has largely been a matter of speculation. During the intercept survey, respondents were asked a series of questions aimed at shedding light on this question in order to assist planning for the future of ComEd's lighting program.

Survey respondents were first provided with a brief description of EISA and were asked whether or not they had heard of the new standards. Over half (53%) said they were aware of the law with 77% of respondents who had heard of EISA saying they were somewhat or very familiar with the new law. This is a significant increase in awareness over PY3 when only 35% reported being aware of the law. We then read all respondents an explanation[35] of how the law has affected 100-watt bulbs in 2012 so they could be asked a series of questions about their likely actions in response to this change.

In PY3, the most likely action forecasted by customers was to stockpile existing 100-watt incandescent bulbs (e.g., 45% of respondents reported this was a likely action), followed by 35% of customers who indicated they would likely purchase new lower wattage incandescent bulbs. The results from the PY4 intercept survey, conducted four to five months after the new standards went into effect show a different result playing out. As shown in Table 3-19 below, 91% of respondents stated they had not stocked up on extra incandescent 100-watt bulbs in anticipation of stores selling out and more than three-quarters of

[35] Respondents were read the following description, "This year, the law affects 100 watt incandescent light bulbs. Once stores sell through their existing inventory of standard 100 watt incandescent bulbs, you will no longer be able to purchase them."

respondents (77%) had not even heard of the new EISA compliant incandescent bulbs that were available. When asked what type of bulb respondents would buy the next time a 100-watt light bulb is needed, 31% said they would buy a 100-watt equivalent CFL, 35% said they would buy a new EISA compliant incandescent bulb, and 9% said they would buy a different wattage incandescent bulb. The table below also shows that Big Box shoppers were much more likely to purchase a new efficient incandescent bulb and much less likely to purchase a 100-watt equivalent CFL.

Table 3-19. Respondent Self-Reported 100W Purchasing Plans Post EISA

What Will You Purchase Next Time You Need a 100W Bulb?	Overall	Warehouse	DIY	Big Box
100 watt equivalent CFL	31%	23%	37%	15%
New efficient incandescent bulb	35%	43%	28%	55%
A higher wattage standard incandescent	1%	1%	1%	0%
Lower wattage standard incandescent	8%	3%	8%	20%
Don't Know	25%	30%	27%	10%
N	718	149	469	100

Source: In-Store Intercept Survey (PY4)

As mentioned previously, the PY4 shelf surveys focused primarily on 75 and 100-watt standard incandescent equivalent bulbs. Dimmable and A-lamp CFLs were also included in the shelf surveys since, while they are considered specialty bulbs from a CFL perspective, they are CFL types equivalent to standard incandescent bulbs. The table below shows some key findings from the PY4 shelf surveys. Across the stores surveyed, standard, a-lamp and dimmable CFLs (program and non-program) accounted for 50% of the bulbs on the shelves. Incandescent bulbs made up 42% of available bulbs, 53% of which were 100-watt incandescents, and halogens made up the remaining 8%. The average price of an incandescent bulb was $0.77, compared to the average halogen which was $2.48 and the average CFL twister which was $2.01 if a program twister and $3.27 if a non-program twister. The price of dimmable CFLs, program and non-program, are still significantly more expensive than incandescent and halogen bulbs (they are nine times more expensive than incandescents which are also dimmable) which is likely dissuading many non-freeriding customers from purchasing them.

Table 3-20. Distribution of Available Bulbs to Replace 75 and 100-Watt Incandescent Bulbs

Bulb Type	Program	n	Bulbs	Average Price	% of Shelf Survey
CFL Twister	Yes	72	3,742	$2.01	39%
CFL Dimmable		7	81	$6.64	
CFL A-lamp		2	158	$2.69	
CFL Twister	No	25	1,087	$3.27	11%
CFL Dimmable		4	32	$6.43	
Incandescent	No	45	4,272	$0.77	42%
Halogen	No	26	814	$2.48	8%
Total	Both	181	10,186	$1.73	100%

Source: ComEd Shelf Surveys Survey (PY4)

3.2.8 LED Usage and Awareness

LEDs are often mentioned as the next alternative lighting technology and a potential direction for utility lighting programs. We asked some questions during the in-store intercept survey to gauge ComEd lighting purchaser's current awareness level and usage of LEDs. Overall, a moderate level of familiarity with LEDs was observed with 58% of respondents either purchasing some LEDs that day or reporting that they were familiar with LEDs that could be installed in their home to replace a standard light bulb. Seventy-seven percent of those who were purchasing LEDs (n=47) at the time of the intercept survey, reported having used LEDs in the past. Of those customers who were not purchasing LEDs, 55% reported being familiar with the technology and 23% reported having installed an LED in their home. In total, 28% of those surveyed were either purchasing a LED or indicated they had installed an LED bulb in their home. This is a very high percentage considering the current price of LED bulbs and the current level of LED awareness (approximately 50% of those who were familiar with LEDs had one installed in their home). When customers were asked what has kept them from purchasing LEDs for their home the most common response was that the price was too high (38%) or that the customer was unfamiliar with the new technology (22%).

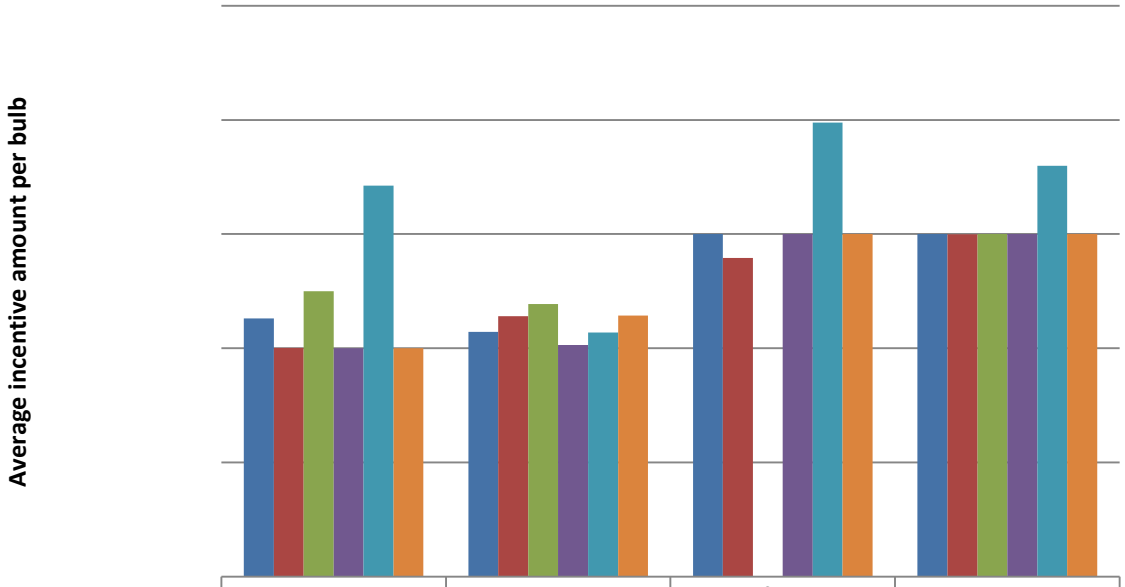
Data from the shelf surveys completed as part of this evaluation also indicated that overall LED availability in the 75 to 100-watt incandescent equivalent range is still quite limited. A total of 15 packages of LEDs were inventoried across the 10 shelf surveys completed. Fourteen of these packages were found at DIY stores, one was found at a Big Box retailer and none were found at Warehouse stores. All of these packages were single packs of LED flood lamps (no LED standard incandescent bulbs were found in the 75 to 100-watt range), and thus as stated above LEDs are not currently a replacement option for the 75 or 100-watt standard incandescent bulbs that are impacted by the EISA standards in 2012 and 2013. The average lumen output for a 75-watt reflector lamp was 850 (versus a 75-watt incandescent bulb which was 1,040 lumens and an average 75-watt equivalent spiral CFL which was 1,200 lumens) and the average lumen output for a 90-watt reflector lamp was 1,020. The average price of these lamps, including incentives where applicable, was approximately $35.

3.2.9 Shelf Stocking Practices and Program Incentives

Program Incentives

Figure 3-1 and Figure 3-2 show the average incentive amounts paid per bulb by retailer category and bulb category. Within a given bulb type, there is little variation in incentive amount across retailer categories. The one notable exception to this is that for high wattage standard and all specialty bulbs, small hardware stores offered considerably higher incentives on average. Across bulb types, standard and specialty bulbs have considerably lower incentives than LEDs and fixtures.

Figure 3-1. Average Incentive Amount by Retail and Bulb Category – Standard and Specialty[36]

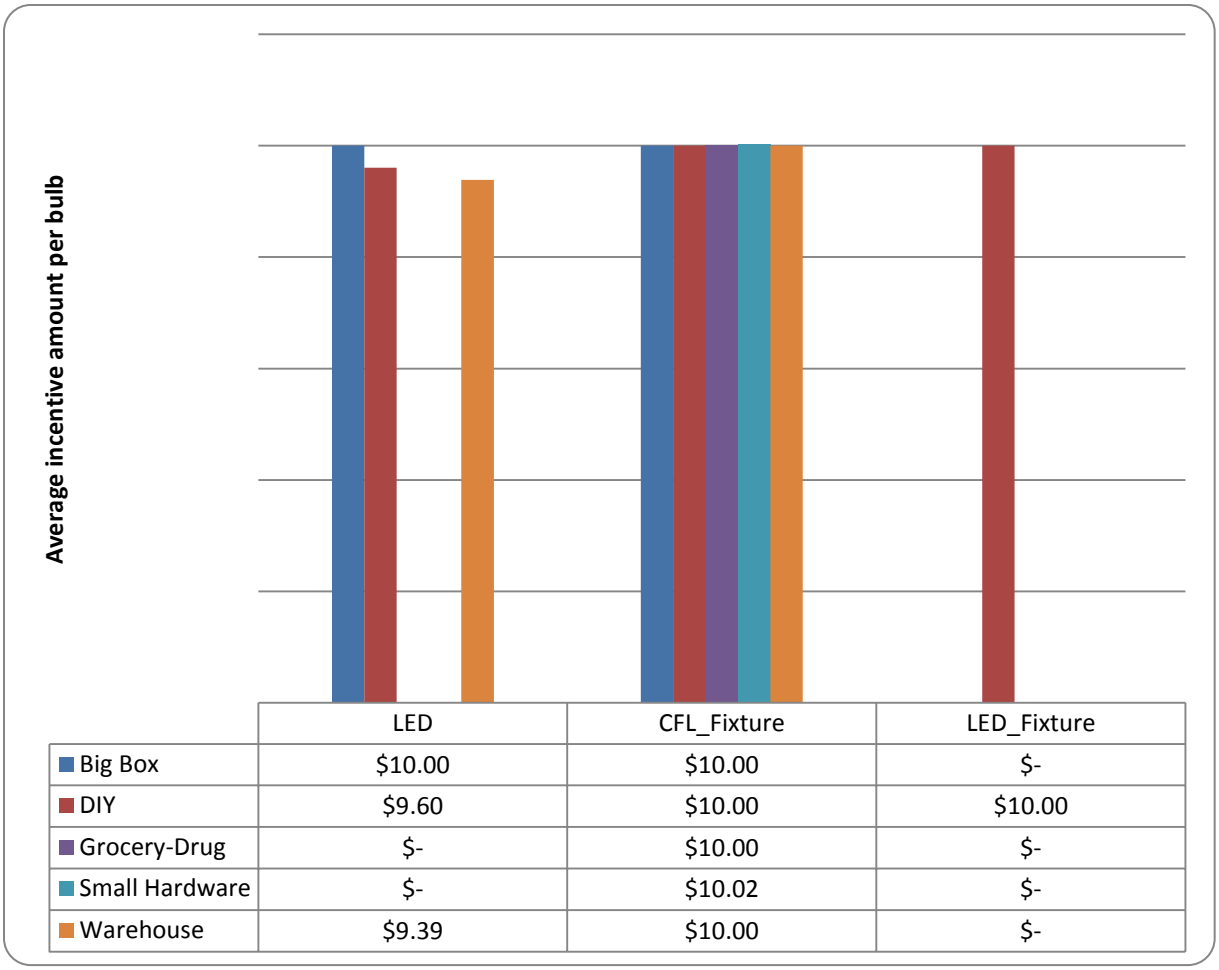


	High Wattage	Low Wattage	Reflector	Other Specialty
Big Box	$1.13	$1.07	$1.50	$1.50
DIY	$1.00	$1.14	$1.40	$1.50
Dollar Store	$1.25	$1.19	$-	$1.50
Grocery-Drug	$1.00	$1.01	$1.50	$1.50
Small Hardware	$1.71	$1.07	$1.99	$1.80
Warehouse	$1.00	$1.14	$1.50	$1.50

Source: Evaluation Team analysis of PY4 ComEd Tracking data

[36] Standard bulbs are included in the table below in the High Wattage (>=23 watts) and Low Wattage (< 23 watts) categories.

Figure 3-2. Average Incentive Amount by Retail and Bulb Category – LEDs and Fixtures



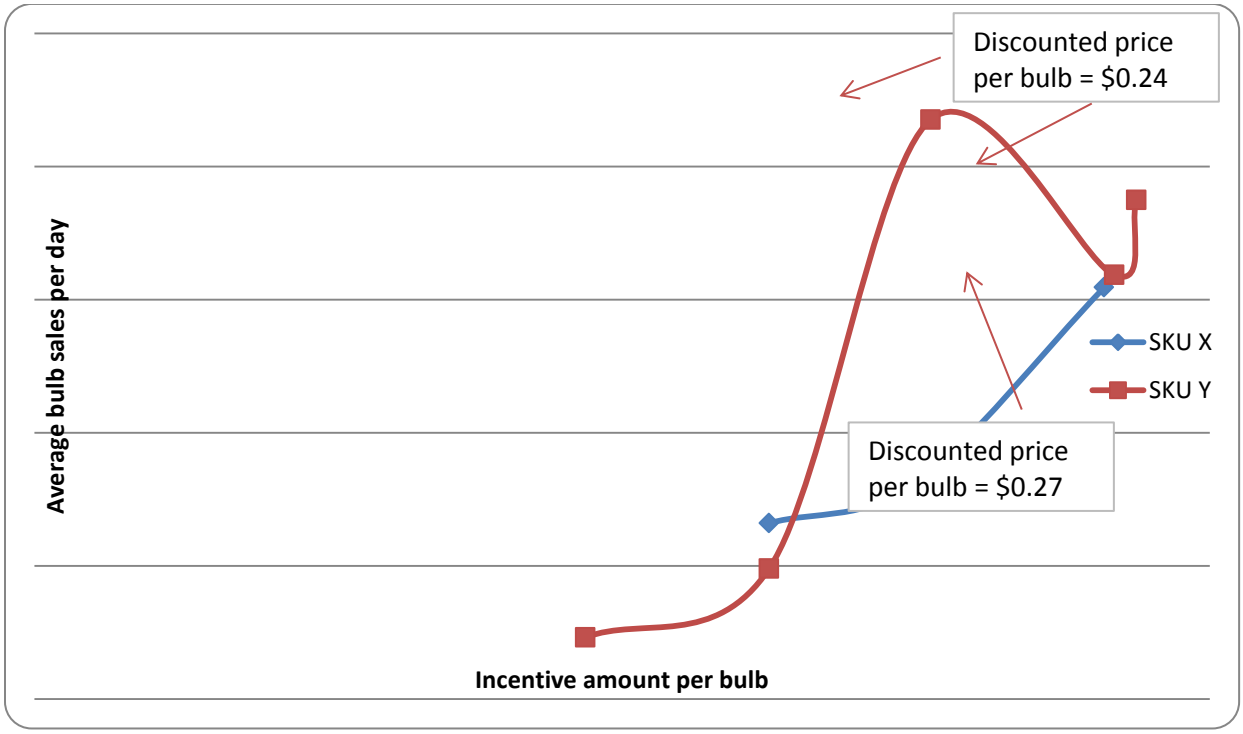
	LED	CFL_Fixture	LED_Fixture
Big Box	$10.00	$10.00	$-
DIY	$9.60	$10.00	$10.00
Grocery-Drug	$-	$10.00	$-
Small Hardware	$-	$10.02	$-
Warehouse	$9.39	$10.00	$-

Source: Evaluation Team analysis of PY4 ComEd Tracking data

Program Incentives – Extra Deep Discounts

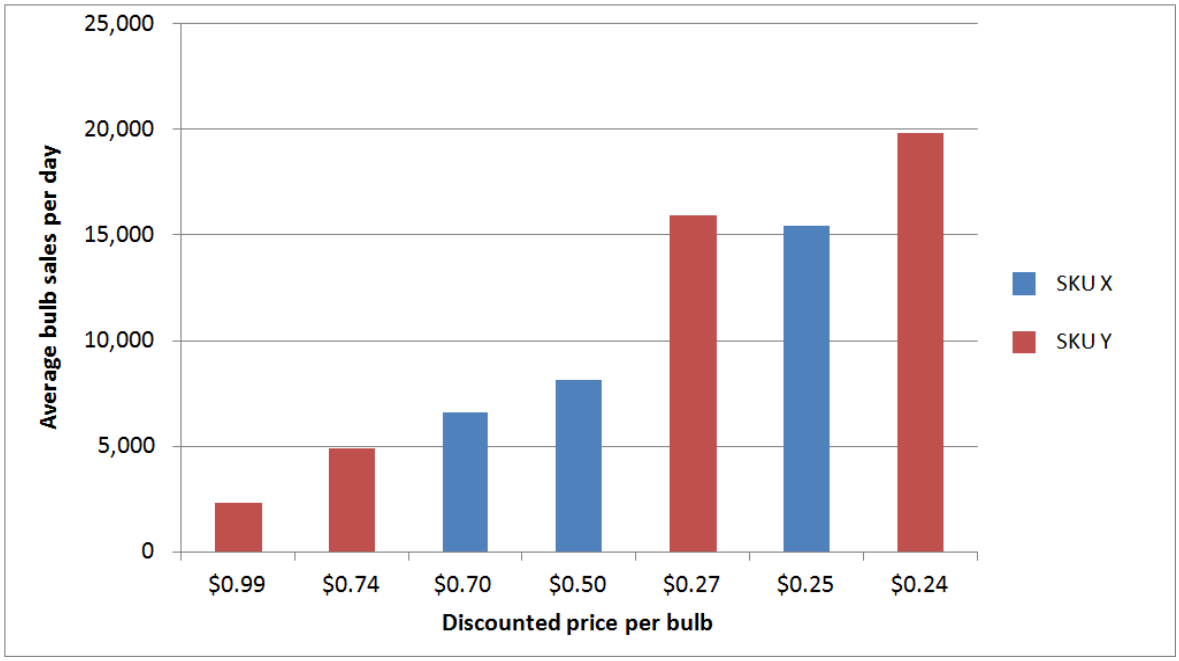
For a number of standard program bulb models, the incentive amount was varied considerably over the course of the program year. While there are a number of factors that may affect when and why consumers decide to purchase lighting products, these "extra deep discounts" provide a good opportunity to examine the relationship between incentive amount, final retail bulb price, and sales rate. This analysis focuses on the two top selling models in the program (Warehouse Club SKU X and DIY SKU Y). Over the course of the program year SKU X was incentivized at three levels (from $1.00 to $1.46 per bulb) and SKU Y was offered at five incentive levels (from $0.75 to $1.50 per bulb). For both models, Figure 3-3 shows the general trend that average bulb sales per day increases with increasing incentive amount. However, SKU Y does not follow the trend at the highest incentive amounts. This may be due to consumers making purchasing decisions based on final discounted bulb price rather than incentive amount. Figure 3-3 shows that average bulb sales per day are highest for SKU Y when the incentive amount is $1.22 per bulb. At this time, the regular retail price was $1.46 per bulb resulting in a final discounted price of $0.24 per bulb. Average bulb sales per day are lower when the incentive increases to $1.47 per bulb, but the retail price was also higher during this time period ($1.74 / bulb) resulting in a slightly higher final discounted price of $0.27 per bulb. Figure 3-4 shows a steady trend of increasing average sales per day with decreasing final discounted bulb price.

Figure 3-3. Extra Deep Discounts - Average Sales per Day by Incentive Amount



Source: Evaluation Team analysis of PY4 ComEd Tracking data

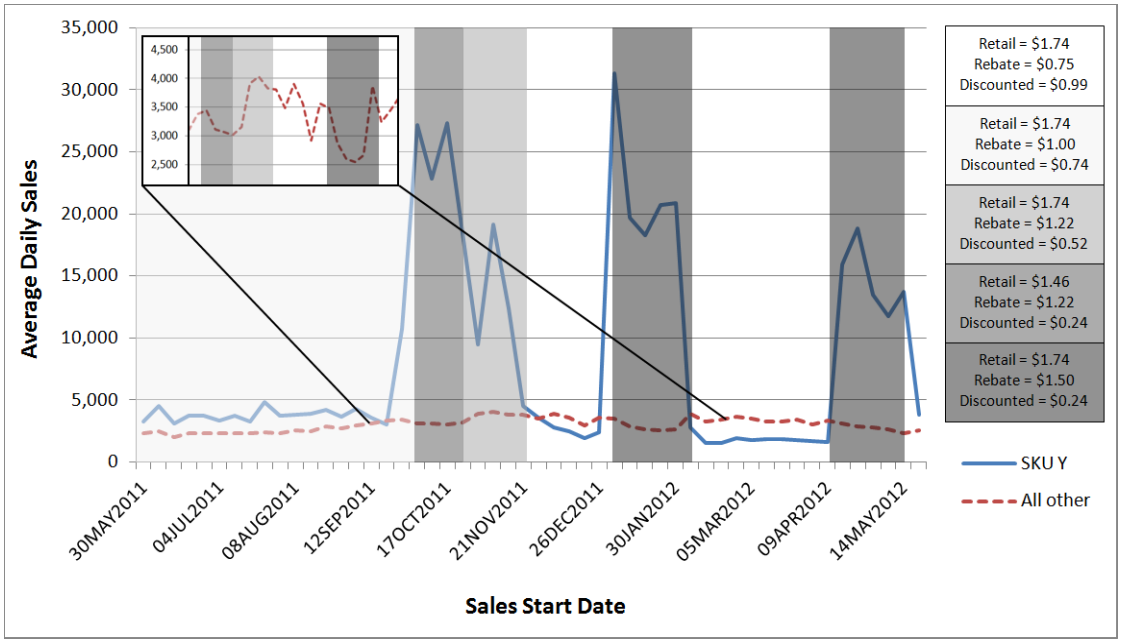
Figure 3-4. Extra Deep Discounts - Average Sales per Day by Retail Price per bulb



Source: Evaluation Team analysis of PY4 ComEd Tracking data

Figure 3-5 average daily sales for SKU Y and all other similar program bulbs sold at the same retailer over the course of PY4.[37] The weighted average retail price of all other similar bulbs sold throughout PY4 was $1.95 per bulb and the weighted average rebate was $1.06 per bulb, resulting in a final discounted retail price of $0.89 per bulb. From the end of May through the beginning of October, when the discounted price of SKU Y was $0.74 per bulb, it is seen that SKU Y accounts for approximately 60% of average daily sales while all other bulbs make up about 40%. In November and December and February through April, when all other standard bulbs are slightly cheaper than SKU Y, those sales percentages are reversed. This finding alone suggests that customer purchasing decisions have a strong sensitivity to final discounted price. The extra deep discounts have much more dramatic impacts on sales as final discounted retail price approaches $0.50 and below. During these periods, average daily sales increase from less than 5,000 bulbs per day to 10,000 to 30,000 bulbs per day. The magnified breakout for all other bulb sales shows that during the periods of extra deep discounts for SKU Y, all other bulb sales appear to decrease on the order of 500 to 1,000 bulbs per day. Despite the small negative impact on the sales of other program bulbs, it is clear that the extra deep discounts on SKU Y resulted in dramatically positive net sales of program bulbs at this retailer.

Figure 3-5. Extra Deep Discounts - Average Daily Sales throughout the Year

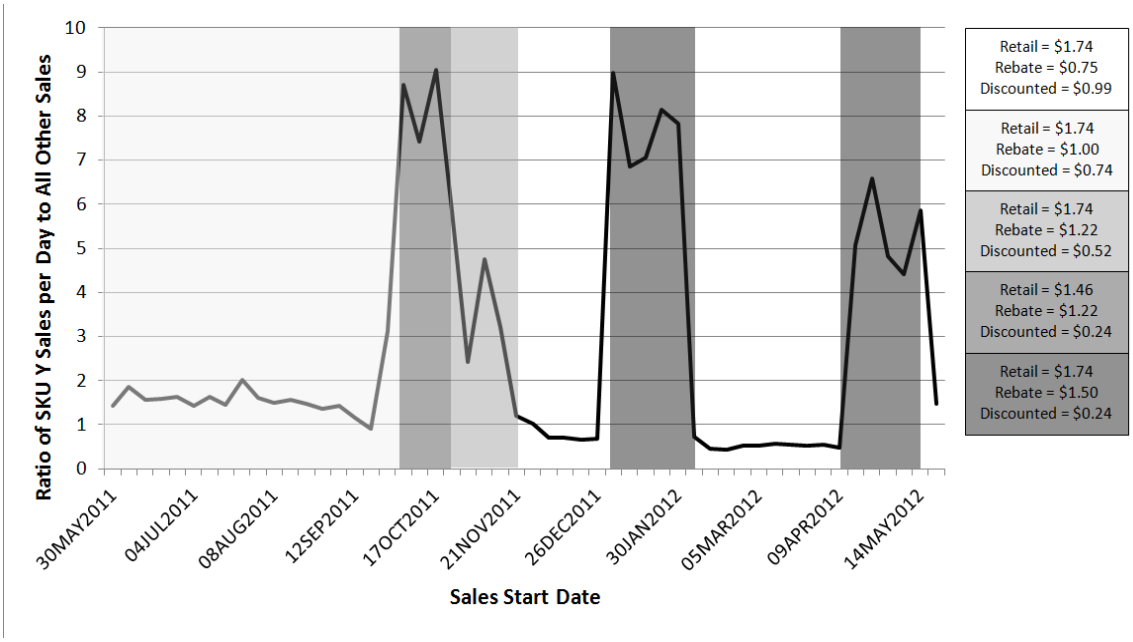


Source: Evaluation Team analysis of PY4 ComEd Tracking data

To account for any seasonal variations not evident in Figure 3-5, Figure 3-6 plots the ratio of the average daily sales of model SKU Y to the average daily sales of all other similar bulbs. All things being equal, we would expect this ratio to be relatively constant throughout the year. For instance, if the prices of all bulbs were constant throughout the year, there may be spikes in sales corresponding to periods of high shopper volume (such as a holiday season). However, we would expect these seasonal factors to affect all similar bulbs in a similar fashion so that the ratio of sales should remain constant. In Figure 3-6, the substantial increase in the ratio of sales corresponding to the extra deep discount periods provides strong evidence that the increase in sales of SKU Y is a result of the extra deep discount and not some external factor.

[37] SKU Y is a 14 watt standard twist CFL. "All other similar bulbs" refers to all other standard twist CFLs less than 23 watts sold at the same retailer.

Figure 3-6. Extra Deep Discounts – Relative Sales per Day of All Similar Bulbs



Source: Evaluation Team Analysis of PY4 ComEd Tracking data

A similar analysis was performed for the other top selling model with extra deep discounts, SKU X. However, while there were several other similar bulb models sold at the same retailer as SKU Y, the retailer selling model SKU X only offered one bulb model falling into the same bulb category. This bulb was a 10-watt standard twist CFL with very low sales. Additionally, the retailer only reported sales monthly, whereas the retailer of SKU Y reported weekly sales. Because there were not significant sales of similar bulbs at the retailer for SKU X and the reporting increment was not as granular, the analysis produced spurious results.

4. Findings and Recommendations

4.1 *Key Impact Findings and Recommendations*

The following list summarizes the key impact findings from the PY4 evaluation:

- **Residential versus Non-Residential Split:**
  Finding. Currently there is no deemed Residential versus Non-Residential (also referred to as "Res/NonRes") installation location split, nor is such a split included in the PY5 Technical Resource Manual (TRM)[38] for Residential Lighting. The evaluation findings from the last three program evaluation years have found the Res/NonRes split to be 90/10, 97/3 and 95/5, resulting in a three year program sales weighted average of 94/6.
  Recommendation. The evaluation team believes that due to the large impact this Res/NonRes split has on the resulting program impact estimates and the relatively stable split from year-to-year, this parameter should be a deemed parameter (94/6) that is evaluated each year to ensure its continued appropriateness.
- **Interactive Effects – WHFd[39]:**
  Finding. The algorithm used to estimate the Demand Interactive Effects (WHFd) in the IL TRM, which goes into effect in PY5, includes a factor to account for the Peak CF[40] of the AC system (0.466). This factor is multiplied by the lighting Peak CF of 0.095 which assumes these two systems (lighting and heating) are effectively independent within the peak window. An argument could be made that whenever the lighting is on during the summer peak window, the AC system is also likely to be on (i.e. when the occupants are home), and that therefore these two factors are not independent.
  Recommendation. The evaluation team has recognizes that there are many factors influencing the interaction between lighting and HVAC system load. The algorithm in the forthcoming Illinois TRM is the most informed approach that we have seen aside from the highly differentiated DOE-2 based building energy simulation approaches used in California (DEER) and secondarily in New York. The evaluation team recommends that the approach seen in the Illinois TRM be regarded as a lower bound on likely demand savings, which is appropriate given unknown factors about time delays between lighting waste heat and realized HVAC load, waste heat leakage through the building envelope, and occupant behavior factors such as thermostat operation. Because this factor has a significant range in magnitude across the different engineering approaches seen in various state TRMs, the evaluation team recommends that ComEd consider participating in a collective primary data collection effort among multiple program administrators aimed at bracketing the size of this effect across a range of climate conditions and housing configurations (discussion for such a study are currently in preliminary phases). Such an approach could maximize the value of the effort while moderating the cost. The current WHFd was estimated to be 1.10 across all PY4 bulbs which means that program demand savings get a 10% increase as a result of applying this factor. The true value of this WHFd factor

[38] The Illinois TRM was developed through a joint effort of all the members of the Illinois Stakeholder Advisory Group (SAG) and is filed for approval by the Illinois Commerce Commission (ICC) as of the filing of this report as a jointly agreed to TRM.
[39] WHFd = Waste heat factor for demand to account for cooling savings from efficient lighting in cooled buildings is provided in the Illinois TRM in Section 6.5.
40 CF = Summer Peak Coincidence Factor for measure is provided in the Illinois TRM in Section 6.5.

is likely between 1 and 1.20 which means current demand savings estimates could be off by plus or minus 10%.

- **Tracking Data Issues:**
  Finding. Three separate datasets were provided that contained model specific bulb information necessary for the evaluation. All three datasets contained missing and / or inaccurate information for some bulb models, and all three had model number formats that differed from the tracking data. These factors made it difficult to establish critical bulb parameters for all program bulbs.
  Recommendation. Future evaluations would benefit greatly from a single, consistent model key that linked the tracking data (both regular program and coupon) with both the Goals Tracker and the bulb information table (Energy Star or similar lighting tables). Additionally the "Lookup Measure Res Lighting" table, the Energy Star table, and the Goals Tracker provided in PY4 each had missing or inaccurate bulb information on lumens, wattage, and manufacturer base wattage for some bulb models. All of these variables are critical to the evaluation process and should be verified for accuracy. While the evaluation team recognizes that it is not feasible to capture the retail price and date of sale for all program bulbs sold, making sure that these details are available for all increased incentive promotions will allow for a more robust analysis of consumer purchasing decisions based on bulb cost.
- **Delta Watts Estimation:**
  Finding. The PY4 deemed delta watts approach utilizes a single lumen to base wattage mapping regardless of program bulb type.
  Recommendation. The evaluation team recommends switching to a bulb type lumen mapping (such as the one presented within the evaluation research report results in Appendix 5.2 that is based on the new Energy Star draft specification for lamps[41]). Using a lumen-based method that also relies on bulb shape provides a more robust means of establishing base wattage equivalents across all bulb types, especially specialty CFLs and LEDs. Because lumen output is a measure of the total light produced in all directions from a source, bulbs such as reflectors (and LEDs in general) that focus light in a single direction require a different lumen mapping than a standard CFL. The TRM that goes into effect in PY5 assigns base-wattages using lumen bins that are not differentiated by bulb type and thus this issue continues under the PY5 TRM.
- **Coupon Data Collection:**
  Finding. While the evaluation team recognizes that the accuracy of the coupon tracking dataset is dependent on the information supplied by retailers, there were a large portion of bulbs in the coupon database that have bulb wattage incorrectly assigned.
  Recommendation. Efforts should be made to increase retailer awareness of the importance of this information.
- **Goals Tracker Impact Estimation:**
  Finding. The evaluation team discovered an issue in the Goals Tracker spreadsheet, which is used by ComEd to estimate gross and net program reported savings, which resulted in an overestimation of program savings by approximately 5%. The issue was caused by a setting in Excel that cut-off all non-displayed significant digits from the impact estimation calculations.
  Recommendation. The evaluation team recommends that this advanced setting ("Use Precision as Displayed") be removed going forward.
- **Realization Rate:**
  Finding. ComEd's PY4 program reported savings estimates applied the Residential Lighting

[41]http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/lamps/V1.0_Draft_2_Specification.pdf?4749-8e30

realization rate (RR) to the gross impact estimates (along with the NTGR) to estimate program savings. Starting in PY5 the IL TRM applies the Installation Rate (the only component of the RR addressed in the TRM) to estimate gross program savings. ComEd should be aware of this upcoming change and open up discussion with the appropriate parties if they disagree with this change.

- **Retailer Evaluation Participation:**
  Finding. Again in PY4 the evaluation team was unable to conduct in-store intercepts in all program retail stores due to the lack of cooperation from a number of participating retailers.
  Recommendation. The evaluation team continues to recommend that both ComEd and APT encourage, or even require, retailers to participate in program evaluations as a condition of eligibility for participation.

4.2 Key Process Findings and Recommendations

The following list summarizes the key process findings from the study:

- **Program Awareness:** Awareness of ComEd's Residential Lighting program and program discounts continues to be quite low with the vast majority (87%) of intercept survey respondents reporting they were unaware of the ComEd discounts. This includes 85% of customers purchasing ComEd discounted bulbs who reported to be unaware of the program. Utility bills were the most common self-reported source of program awareness, followed by in-store marketing materials (86% of respondents reported not seeing any in-store marketing materials). Only 4 of the 122 respondents reported learning about the program from a retail employee, and all four of these respondents were purchasing their program bulbs from a DIY store.
- **Specialty Bulb Market Findings:** The PY4 evaluation found that there is still more that can be done to get consumers to purchase and install specialty CFLs. The most widely cited barrier to purchasing CFLs in PY4 was the need for another type of specialty bulb (41%), which suggests that possibly more could be done to educate customers about the various types of specialty CFLs that are available. Another interesting survey finding was that 86% of respondents who purchased standard CFLs bought program bulbs, while only 63% of specialty CFL purchases were program bulbs. The majority of specialty CFL purchasers who did not buy program bulbs reported that they were unaware of the discount (49%). In-store marketing materials appear to be more influential to standard CFL purchasers (56% ranked them as extremely influential) than to specialty CFLs purchasers (50% ranked them as not very influential).
  In PY4, specialty CFLs had higher than average gross impacts which were driven by larger estimated delta watts (which will continue to be larger since they are not affected by the EISA standards) and higher bulb installation rates. On the flip side, specialty CFLs had smaller than average net impacts due to the high level of free-ridership that continues to exist. As the evaluation team has pointed out in years past, we believe specialty bulbs experience higher levels of free ridership due to their higher initial cost[42] which continues to dissuade many consumers from purchasing them. Increasing incentives on specialty bulbs may increase the quantity of program bulbs sold, decrease free ridership and help make up for the program savings that will be lost due to the implementation of EISA for standard bulbs.

[42] The PY4 shelf surveys found that program dimmable CFLs are nine times more expensive than incandescent bulbs (which are also dimmable). This is in contrast to program standard CFLs which are approximately $1 more per bulb than incandescents.

- **State of the LED Market:** Our analysis of the current LED market found moderate familiarity with LED technology (58%) and relatively high usage (26%), considering that familiarity level. Cost was still the primary hurdle for most lighting purchasers (which is understandable at an average price of $35 per bulb), followed by lack familiarity with the technology. Increased incentives and increased LED in-store information, either from ComEd or provided by the manufacturers on the packages themselves, may be necessary to assist customers in overcoming these barriers that exist. The shelf surveys also indicated that at the current time LEDs are not a replacement option for 75 or 100-watt standard incandescent bulbs as none were found at the retailers surveyed.
- **75 and 100-watt Replacement Lamp Availability:** PY4 shelf surveys of 75 and 100-watt standard incandescent equivalent bulbs led to some interesting findings. Across the stores surveyed, standard, a-lamp and dimmable CFLs (program and non-program) accounted for 50% of the bulbs on the shelves. Incandescent bulbs made up 42% of available bulbs, 53% of which were 100-watt incandescents, and halogens made up the remaining 8%. The average price of an incandescent bulb was $0.77, compared to the average halogen which was $2.48 and the average program CFL twister which was $2.01 (non-program twisters averaged $3.27).
- **Bulb Storage Patterns:** ComEd's Residential Lighting program does not appear to be encouraging customers to stock up on CFLs in any greater quantity than they stock up on incandescent bulbs. The average number of standard CFLs purchased per respondent was nearly identical to the average quantity of incandescent bulbs purchased (excluding Warehouse stores which seem to be phasing out incandescent bulbs entirely).

5. Appendix

5.1 Glossary

High Level Concepts

Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 to May 31, 2009, EPY2 is June 1, 2009 to May 31, 2010, etc.
- GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 to May 31, 2012, GPY2 is June 1, 2012 to May 31, 2013.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY4/GPY1 ComEd's deemed parameters were defined in its filing with the ICC. The Gas utilities agreed to use the parameters defined in the TRM, which came into official force for EPY5/GPY2.
Application: When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retrocommissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.
Application: When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retrocommissioning), the Research Findings are to be in the body of the report as the only impact findings. (However, impact findings may be summarized in the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports‡	Application†	Definition	Otherwise Known As (terms formerly used for this concept)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ "Energy" and "Demand" may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.

† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.

§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the "Terms to be Used in Reports" column).

Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

Deemed Value – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM or ComEd's approved deemed values. Values that are based upon a deemed measure shall use the superscript "D" (e.g., delta watts^{D}, HOU-Residential^{D}).

Non-Deemed Value – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM or ComEd's approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript "E" for "evaluated" (e.g., delta watts^{E}, HOU-Residential^{E}).

Default Value – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript "DV" as in X^{DV} (meaning "Default Value").

Adjusted Value – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript "AV" as in X^{AV}

Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012[43].

Evaluation: Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification*, *measure level research*, and *program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

Synonym: **Evaluation, Measurement and Verification (EM&V)**

> **Measure Level Research**: An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

[43] IL-TRM_Policy_Document_10-31-12_Final.docx

Program Level Research: An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

Savings Verification: An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

Measure Type: Measures are categorized into two subcategories: custom and prescriptive.

Custom: Custom measures are not covered by the TRM and a Program Administrator's savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator's business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

Prescriptive: The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithm and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

Fully Deemed: Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

Partially Deemed: Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

Customized basis: Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings, consistent with Section 3.2.

5.2 Detailed Evaluation Research Findings

5.2.1 Summary of non-deemed estimate of ex post net program-level savings

The goal of the Residential ES Lighting program for PY4 was to sell 12.1 million discounted CFL and LED bulbs and fixtures to residential customers within ComEd's service territory. A total of 11,425,351[44] standard CFL bulbs, 1,097,670 specialty CFL bulbs, 24,919 LED bulbs, 84,539 CFL fixtures, and 16,551 LED fixtures were sold as part of the program for a grand total of 12,649,030 bulbs.
Table 5-1
Table 5-1 below provides the Evaluation Research estimated gross and net savings parameter estimates (displaced watts, average daily hours of use, in-service rate, lighting-HVAC interactive effects, peak load coincidence factor, and net-to-gross ratio), as well as the first-year gross and net savings estimates. The Evaluation Research savings estimates are derived from the evaluator's independent evaluation of these parameters, developed using data collected in the current evaluation and information derived from reviews of other studies. The values in this table are overall averages across all bulb types (standard, specialty and fixtures) and include an adjustment for bulbs believed to have been installed in non-residential locations.

[44] This assumes all coupon bulbs are standard bulbs.

Table 5-1. PY4 Impact Evaluation Research Ex-Post Program Savings

Gross and Net Parameter and Savings Estimates	PY4 Evaluation Verified		
	Res	NonRes	Total
CFLs Distributed through the Program	12,075,757	573,273	12,649,030
Average Displaced Watts (Delta Watts)	48.8	48.8	48.8
Average Daily Hours of Use	2.74	12.23	3.17
Gross kWh Impact per unit	48.8	217.8	56.4
Gross kW Impact per unit	0.05	0.05	0.05
Total First-Year Research Findings Gross MWh Savings	**589,169**	**124,844**	**714,013**
Total First-Year Research Findings Gross MW Savings	**589.2**	**28.0**	**617.2**
Realization Rate (Install Rate * Leakage)	0.68	0.68	0.68
Energy Interactive Effects	1.03	1.03	1.03
Demand Interactive Effects	1.10	1.10	1.10
Peak-Load Coincidence Factor	0.10	0.66	0.13
Total Installed First-Year Research Findings Gross MWh Savings	**412,942**	**87,508**	**500,450**
Total Installed First-Year Research Findings Gross MW Savings	**399.9**	**19.0**	**418.9**
Total Installed First-Year Research Findings Gross Peak MW Savings	**44.8**	**13.7**	**58.4**
Net-to-Gross Ratio (1-FR+SO)	0.54	0.54	0.54
Total First-Year Research Findings Net MWh Savings	**221,126**	**46,860**	**267,986**
Total First-Year Research Findings Net MW Savings	**214.2**	**10.2**	**224.3**
Total First-Year Research Findings Net Peak MW Savings	**24.0**	**7.3**	**31.3**

Source: ComEd PY4 Tracking Database, and Navigant Evaluation Team Analysis

Table 5-2 below provides the PY4 bulb sales, net MWh savings estimates and resulting realization rates for the Program Target, the Program Reported, Verified Savings and Evaluation Research Findings. This table excludes the estimated savings attributable to PY4 resulting from the PY2 and PY3 delayed installations (carryover savings). As this table shows the PY4 program reported ex ante net energy savings for this program, excluding carryover, was estimated to be 284,494 MWh. The verified net savings were estimated to be 319,243 MWh[45] resulting in a net energy saving realization rate on the program reported savings of 112% for the bulbs sold and installed in PY4.

[45] Excluding PY2 and PY3 carryover savings.

Table 5-2. PY4 Bulb Sales and Net MWh Savings Comparison[46]

PY4 Estimate	PY4 Bulb Sales	Net MWh Savings Estimate
Program Target	12,102,000	181,601
Program Reported	12,638,349	284,494
Verified Savings	12,649,030	319,243
Research Findings	12,649,030	267,986

Source: Navigant Evaluation Team Analysis

5.2.2 Evaluation Research Gross Savings Parameters

Program Bulb Sales and Distribution

The number of bulbs distributed through the program is a key parameter in the calculation of gross and net program impacts and is used to extrapolate the per-bulb savings estimates to the program level. Program bulb sales estimates were derived from the PY4 tracking databases provided by ComEd to the evaluation team. The total number of bulbs sold during the PY4 Residential Lighting Program is estimated to be 12,649,030, which is a 13% increase over the bulbs sold in the third program year (PY3) and a 53% increase over the second program year (PY2) bulbs. Ninety percent of these were standard bulbs, 9% were specialty bulbs, and the remaining 1% was comprised of LED lamps, LED fixtures, CFL fixtures, and coupon bulb sales. Table 5-3, below, shows that the large majority of standard and specialty bulbs were sold in multi-packs, while, in comparison, LED lamps, LED fixtures, and CFL fixtures were sold primarily as single packs.

Table 5-3. PY4 Sales of Single Pack vs. Multi-Packs

Single vs. Multi Pack	Standard	Specialty	LED	CFL Fixture	LED Fixture	Coupon	Total	
Single Pack	332,348	114,762	22,901	84,539	16,551	3,430	574,531	5%
Multi Pack	11,087,404	982,908	2,018	-	-	2,169	12,074,499	95%
PY4 Total Sales	11,419,752	1,097,670	24,919	84,539	16,551	5,599	12,649,030	100%
PY4 Total %	90%	9%	0%	1%	0%	0%	100%	

Source: Evaluation Team analysis of ComEd Tracking database

Table 5-4 below provides the total number of bulbs sold in PY4 by bulb type and retailer category. Across all bulb types, more than 85% were sold at Do-It-Yourself (DIY) or Warehouse stores. When sales were disaggregated by bulb type, standard and specialty bulbs had approximately the same proportional sales distribution across retailer types as total bulb sales. Approximately two thirds (65%) of LED lamps were sold at Warehouse stores, and 100% of LED fixtures were sold at DIY stores. Although only 1% of total sales were at Grocery stores, more than 50% of CFL fixture sales occurred at these retailers.

[46] This table excludes savings from PY2 and PY3 carryover bulbs.

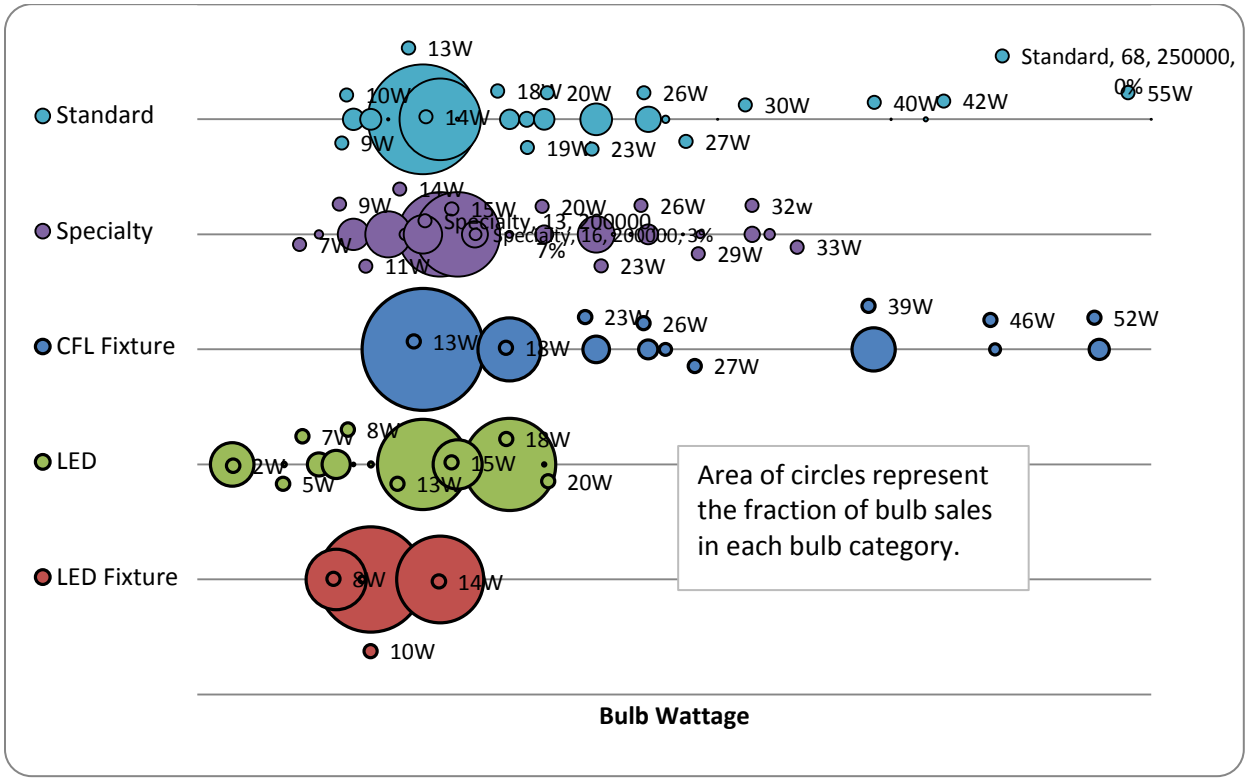
Table 5-4. Bulb Sales by Type of Retailer

Retailer Type	Standard	Specialty	LED	CFL Fixture	LED Fixture	Coupon	Total	
Big Box	1,044,947	97,453	149	1,797	-	-	1,144,346	9%
DIY	6,061,264	578,322	8,361	20,387	16,551	-	6,684,885	53%
Dollar Store	108,881	2,867	-	-	-	-	111,748	1%
Grocery	131,456	15,302	-	45,646	-	-	192,404	2%
Pharmacy	3,580	-	-	-	-	-	3,580	0%
Sm.Hrdware	361,034	34,451	-	6,764	-	5,599	407,848	3%
Warehouse	3,708,590	369,275	16,409	9,945	-	-	4,104,219	32%
PY4 Total	11,419,752	1,097,670	24,919	84,539	16,551	5,599	12,649,030	100%

Source: Evaluation Team analysis of ComEd Tracking database

Figure 5-1 below provides the distribution of bulbs and fixtures sold through the program by bulb wattage. Overall, 85% of program bulbs were 14 watts or less, including 88% of standard bulbs, 66% of CFL fixtures, 51% of LEDs, and 100% of LED fixtures. Approximately 86% of the specialty bulbs sold through the program was 15-watts or less. The single largest-selling wattage for standard CFLs in PY4 was 13 watts, which constituted 54% of total standard bulb sales (50% of total bulb sales). This was up from 52% in PY3 and 46% in PY2. The single largest-selling wattage for LEDs was 18 watts, all of which were PAR lamps.

Figure 5-1. Distribution of Bulb Sales by Wattage and Bulb Type



Source: Evaluation Team analysis of ComEd Tracking database

Table 5-5 below provides the distribution of PY4 program bulbs by bulb type. Over 90% of the program bulbs sold in PY4 were standard twister bulbs, which is similar to the proportion sold in PY3. As in PY2 and PY3, specialty reflectors comprised the next largest component of total bulb sales (5%). Each of the other bulb types made up 1% or less of total bulb sales.

Table 5-5. Distribution of PY4 Program Bulbs by Bulb Type[47]

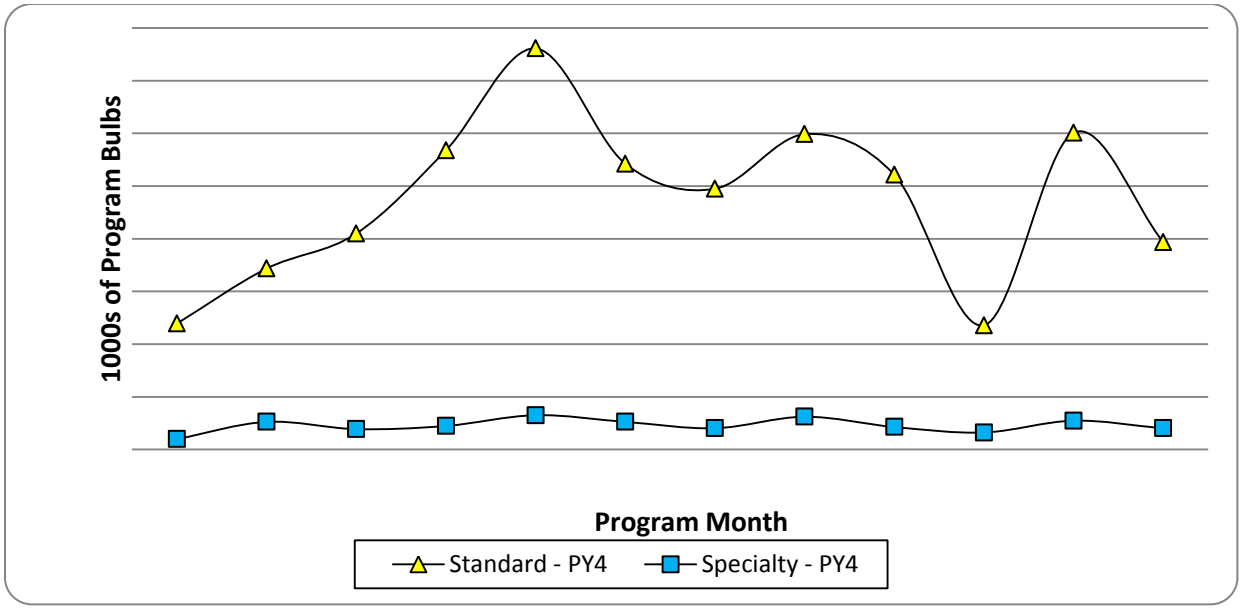
CFL Bulb Type	Bulbs Sold	% of Program Sales
Standard	11,419,752	90%
Dimmable Twist	24,284	0%
3-way	20,907	0%
A-bulb	119,197	1%
Globe	155,984	1%
Post	5,025	0%
Dimmable Reflector	14,125	0%
Reflector	665,786	5%
Candelabra	92,362	1%
LED	9,630	0%
Dimmable LED	15,289	0%
CFL Fixture	84,539	1%
LED Fixture	16,551	0%
Total	**12,643,431**	**100%**

Source: Residential Lighting Tracking Data

Figure 5-2 and Figure 5-3 below present the distribution of PY4 program bulbs sales by month and bulb type. While there is considerable variability in bulb sales that may have multiple contributing factors (e.g., seasonal consumer purchasing trends, special promotions, advertising, etc.), there does appear to be several seasonal trends. As we have seen in past years, there appears to be a distinct spike in standard bulb sales in October and fixture sales are lower in the second half of the program year, resulting from a distinct spike in sales in August. One possible explanation for this is that August marks the start of the fall "lighting season," during which program bulbs and fixtures typically receive more exposure on end caps and register displays. LED sales in the last six months of PY4 were over 165% higher than sales in the first six months.

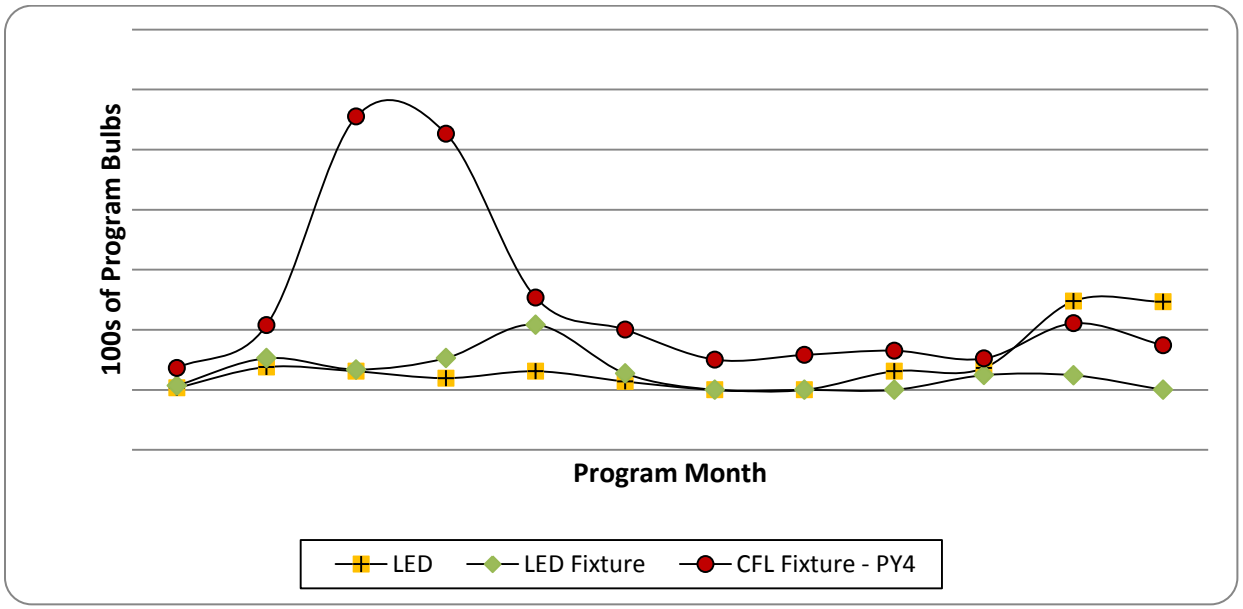
[47] Excludes coupon bulbs.

Figure 5-2. Standard and Specialty Bulb Sales by Month



Source: PY4 Residential Lighting Tracking Data

Figure 5-3. LED and Fixture Sales by Month



Source: PY4 Residential Lighting Tracking Data

Research Findings Gross Realization Rate (RR)

The Research Findings Gross Realization Rate for PY4 was calculated as follows:

RR = Installation Rate * Leakage Rate

Table 5-6 presents the Research Findings gross realization rate estimates across all program bulb types. As this table shows the overall average was estimated to be 68%, down by 4% relative to the PY3 value of 71%. By bulb type the gross realization rates were estimated to be 67% for standard bulbs, 73% for specialty bulbs and 96% for LEDs and fixtures. This differentiation between bulb type realization rates is entirely driven by the installation rate as the leakage rate applied was consistent across bulb types. Further details on the Evaluation Research estimates of Installation Rate and Leakage are presented below.

Table 5-6. Research Findings Gross Realization Rate Estimates

Parameter	Standard	Specialty	CFL Fixtures	LEDs	LED Fixtures	Coupons	Total
Installation Rate	70%	75%	100%	100%	100%	70%	70%
Leakage	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%
Realization Rate	0.67	0.73	0.96	0.96	0.96	0.67	0.68

Source: Navigant Consulting Team Analysis of In-Store Intercept Survey (PY4)

Installation Rate

The overall retail sales weighted installation rate (IR) across bulb types and retailer types based on the PY4 in-store intercepts was estimated to be 70%. This estimate is slightly lower than the PY3 evaluation-based installation rate of 71%, and 4% lower than the PY2 evaluation-based estimate of 74%. The PY3 evaluation-based value was derived from the PY3 General Population telephone survey and the PY2 evaluation-based value, since the installation rate of 49% from the PY3 intercepts appeared to be distorted downward by question wording that stressed how many program bulbs the respondent expected to install "right away." In PY4, questions related to this point were changed to ask for the number of standard or specialty program CFLs the respondent expected to install in the next 6 months (which is the average amount of time a program year purchaser has to install the program bulbs within the program year).

As one might expect, the installation rate for specialty CFLs was found to be slightly higher (75%) than the installation rate of standard CFLs (70%)[48]. An installation rate of 100% was assumed for LED bulbs and fixtures (both LED and CFL). Since standard CFLs represent 91% of program bulb sales in PY4, the overall PY4 installation rate (across all bulb types) was effectively equal to the standard CFLs IR.

Table 5-7 below shows installation rate analysis broken out for standard and specialty CFLs[49] across a variety of factors:

- Retailer type (Big Box, DIY, Warehouse),
- Bulb type (Standard, Specialty)[50],
- Influence (self-reported) of the CFL price on decision to purchase CFLs (0-10 scale),
- Total number of CFLs purchased,

[48] These results are retailer sales-weighted results meaning the intercept survey results were weighted back by retailer type to the overall retailer type distribution of the population of program bulbs sold.
[49] This table does not include CFL fixtures or LED products (bulbs or fixtures).
[50] Customers purchasing program fixtures were not included in the in-store intercept surveys since program fixtures were not located in the same aisle with program bulbs in many of the retailers where the surveys were conducted.

- Top two selling program bulb models[51] vs. all other program bulb models

On average, customers purchasing program bulbs from DIY stores reported installation rates that were modestly higher than customers who purchased program bulbs from Warehouse stores, and installation rates for program bulbs sold at Big Box stores fell in the middle. The degree to which price influenced the customer's decision to purchase standard CFLs appears to have no significant effect on the installation rate of standard bulbs. For specialty CFLs, there was a higher installation rate (87%) for those saying price had a low influence than for those saying price had a high influence on the decision to purchase CFLs (71%). With respect to the total number of CFLs purchased, there was a clear trend across bulb types that the fewer the number of bulbs a customer purchased, the higher their reported installation rate. Respondents purchasing 2 to 4 CFLs reported an average installation rate of 80%, whereas those purchasing more than 10 CFLs had an installation rate of 64%.

In PY4 there were two program bulb models that were deeply discounted, and the sales of these two models accounted for approximately 43% of total PY4 program bulb sales. The two top-selling models were standard CFLs sold in multi-packs; one was an 8-pack of standard CFLs and sold through a Warehouse store, and the other was a 4-pack of standard CFLs and sold through a DIY store. The average discount per bulb for these two models was $1.18, which was slightly larger than the average discount for all other standard CFL models in the program, at $1.06. Also, based on information in the Goals Tracker, the average pre-incentive retail price per bulb prior to the program discount for these two models was $1.72, compared with $1.84 for all other standard CFL models in the program and $2.05 across all CFL bulbs in the program. The net result of these differences is that the discounted price per CFL for the top two models was approximately $0.53, compared with $0.78 for all other standard CFLs in the program. Across all PY4 CFLs, the average discounted price per bulb was $0.89. In PY3 the average non-discounted retail price across all program CFLs was $2.10, and the average discounted price was $0.98.

The evaluation team looked at installation rates specifically for these top-selling models, as well as for all other bulbs excluding these top-selling models, and found that installation rates for the top-selling models were approximately 10% lower than for the other models in the program. This makes sense, given that customers appear to be motivated by deep discounts on these models and may not have immediate plans to install them.

[51] These two "top-selling" models made up approximately 43% of total PY4 bulb sales

Table 5-7. In-store Intercept Installation Rates Analysis

Population		In-store Intercept Installation Rate		
		Standard	Specialty	All CFLs
Overall Non-Weighted		70%	75%	70%
Retailer Type	Big Box	71%	33%	70%
	DIY	73%	80%	73%
	Warehouse	64%	72%	66%
	Retailer Sales Wt'd	70%	75%	70%
Price Influence	Low (0-4)	71%	87%	75%
	High (5-10)	69%	71%	69%
Total CFLS Purchased	1	100%	100%	100%
	2-4	78%	86%	80%
	5-10	65%	79%	67%
	> 10	69%	20%	64%
Top sellers	Top 2 Models	66%	--	66%
	Exclude Top 2 Models	75%	75%	75%

Source: Navigant Consulting Team Analysis of In-Store Intercept Survey (PY4)

In PY4, none of the in-store intercept data collection coincided with in-store demo events being conducted by the program implementation team. As such, the effect of the presence or absence of a demo event on installation rate cannot be calculated for PY4. However, the PY4 intercept data may be more reflective of the overall program since the absence of a demo event reflects the typical condition in a store.

Leakage

Dividing the number of program bulbs that intercept respondents said they would be installing outside of ComEd service territory by total program bulbs purchased and weighting the results by retailer type yields an overall PY4 leakage rate of just less than 4%[52]. This represents an increase from the PY3 value of less than 1%. It is worth noting that the PY4 leakage rate is increased largely by six purchasers of eight or more program CFLs who responded that they were installing them in their homes that were located outside of ComEd service territory. Only two of these six purchasers provided a contact phone number to the intercept interviewer[53] and both of these phone numbers had a Minnesota area code. As stated earlier, bulbs purchased by customers who reside within ComEd service territory and have a supplier other than ComEd, but are still billed by ComEd, are not considered leakage bulbs. The Evaluation Research estimates of leakage by retailer category are provided in Table 5-8 below.

[52] The 90/10 confidence interval on the leakage estimate based on the intercept surveys is a lower bound of 2% and an upper bound of 5.5%.

[53] All respondents were asked for a contact phone but many did not comply.

Table 5-8. Leakage Estimates by Retailer Category

Retail Category	Intercept Completes	Program Bulb Sales	Leakage
Big Box	25	9%	0%
DIY	187	53%	7%
Warehouse	111	32%	0%
Total	323	94%	4%

Source: Navigant Consulting Team Analysis of In-Store Intercept Survey (PY4)

Delta Watts

In PY4 delta watts were deemed based on CFL lumen output, resulting in average delta watts of 47.9. The PY4 Evaluation Research based delta watts estimate was calculated using a lumen-based mapping that also takes into account the bulb shape and type (omni-directional, globes, directional, decorative). The bulb type lumen mapping for PY4 Evaluation Research is taken from the new Energy Star draft specification for lamps[54] and results in an average delta watts estimate of 48.8, which is 2% higher than the deemed DW estimate. Going forward the evaluation team recommends using the lumen-based mapping that relies on bulb shape since it provides a more robust means of establishing incandescent equivalent wattage across all bulb types, especially specialty CFLs and LEDs. Because lumen output is a measure of the total light produced in all directions from a source, bulbs such as reflectors (and LEDs in general) that focus light in a single direction require a different lumen mapping than a standard CFL.

In order to estimate the watts displaced by installing a program bulb, it is necessary to know the wattage of the program bulb and the approximate wattage of the bulb that it is replacing (the base watts). For each program bulb, delta watts were calculated as the difference between the program bulb wattage and the estimated base wattage for that particular bulb. As described previously, three separate methods were used to estimate the incandescent base wattage.

Table 5-9 below shows the average delta watts value across all program bulbs and by program bulb type based on the three base wattage approaches. Across all bulb types, the variation in delta watts resulting from the four methods is only 2%. However, this figure masks larger differences between the approaches for some lamp types. The largest portion of bulb sales (standard) has very little variation between the various methods (<~0.2%). The other bulb types show much higher variation across the delta watts calculations, with the tracking data approach yielding the highest delta watts value in each case. The differences are very apparent for both LED lamps and LED fixtures, where delta watts from the tracking data approach are 18% and 37% higher, respectively, than the values from the PY4 deemed approach. Specialty CFL delta watts values vary by 21% and CFL fixtures values vary by 6%.

[54]http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/lamps/V1.0_Draft_2_Specification.pdf?4749-8e30

Table 5-9. Average Delta Watts Estimates by Bulb Type

Delta Watts Estimates	Standard[55]	Specialty	LED	CFL Fixture	LED Fixture	PY4 Bulbs
Bulbs Sold	11,425,351	1,097,670	24,919	84,539	16,551	12,649,030
Average Program Bulb Wattage	14.3	15.0	13.9	17.6	11.0	14.4
Avg Delta Watts - Original Tracking Data	48.7	50.1	51.4	61.2	48.6	48.9
Avg Delta Watts – PY4 Deemed	48.7	39.6	42.0[56]	57.8	30.5	48.0
Avg Delta Watts – ES Lumen Based	48.6	50.0	48.9	57.7	40.3	48.8

Source: Evaluation Team analysis of ComEd Tracking database

It is interesting to see that the PY4 deemed approach differs so substantially from incandescent equivalencies claimed by the manufacturer. Because many consumers still rely heavily on incandescent equivalencies in their purchasing decisions, manufacturers should have strong incentive to accurately reflect the performance of their bulbs using this metric.[57] The evaluation team closely examined the cause of the variation between methods and, as described below, found that the variation was primarily due to bulb type and function (i.e. directional vs. non-directional).

For specialty CFLs, the PY4 deemed method was largely consistent with manufacturer claims except for 3-way bulbs, post bulbs, and reflector bulbs. While the differences in manufacturer base wattage and PY4 deemed base wattage estimates observed for 3-way bulbs and post bulbs are not negligible (e.g., an average 40 watts higher and 10 watts lower, respectively[58]), the 21% variation seen in the table above is primarily explained by CFL reflector bulbs, which account for approximately 60% of specialty bulb sales. For LED lamps, the PY4 deemed approach was consistent with manufacturer base wattages for up to 60 watt equivalents for non-reflector LEDs. Above 60 watt equivalent, lumen based watts are consistently lower than manufacturer based watts. Additionally, approximately 25% of all LED bulb sales were 60 watt equivalent reflector lamps, which map to 40 watts using the current lumen based approach.

[55] Coupon bulbs included in this table with standard bulbs.
[56] Although the PY4 Deemed method did not address LEDs specifically, the method was developed to be technology neutral and thus was applied to LED bulbs and fixtures as well.
[57] Preliminary analysis of PY4 in-store intercepts indicates approximately 88% of respondents considered incandescent base wattage in their purchasing decision.
[58] The difference seen for post bulbs resulted from an error in goals tracker where the manufacturer base wattage for GE bulb #85384 was listed as 40 W. Internet research indicated that this bulb had an actual manufacturer base wattage of 60 W. For 3-way bulbs, all of the bulb models had upper CFL wattages of 28-33 W. Eleven of the 15 models had manufacturer base wattages of 150 W and 4 had base wattages of 100 W. Using the PY4 deemed method, all but one of these models mapped to a base wattage of 100 W, which explains the lower lumen based value. All base wattage estimates and lumen values in Goals Tracker for 3-way bulbs were based on the highest output setting. From an evaluation standpoint, it may make more sense to establish incremental wattages for 3-way bulbs based on the middle setting. Because 3-way bulbs are only a small part of the portfolio, this issue is negligible in the overall evaluation.

The variation in lumen based equivalencies due to directionality prompted the evaluation team to recommend the adoption of the Energy Star lumen based approach as the PY4 evaluation based estimate of delta watts. Using the Energy Star established lumen ranges results in delta watts values that align much more closely to the original tracking data method. This is no surprise as all program bulbs are Energy Star qualified, which means that they must adhere to the Energy Star lumen equivalencies. The remaining differences are likely due to a number of reasons. First, the lumen ranges used in this analysis are based on the draft version of the new, technology neutral Energy Star specification for lamps. These lumen ranges are not exactly the same as the existing, separate specifications for CFLs and LEDs.

Second, not all program bulbs fit neatly into the lumen bins provided by Energy Star. For bulbs with lumens that were higher or lower than the Energy Star ranges for that bulb type, linear regression was used to estimate incandescent base watts. Third, the lumen ranges provided by Energy Star are for CFL and LED lamps, not fixtures. For the Energy Star lumen based approach, the evaluation team calculated base wattage for CFL fixtures and LED fixtures based on the bulb type that would fit that fixture. This may explain the 17% variation seen for LED fixtures shown in Table 5-9.[59]

Residential versus Non-Residential Installation Location

Based on the primary data collected as part of the PY4 evaluation, 5% of program bulbs are estimated to be installed in non-residential locations. Bulbs installed within non-residential locations have, on average, HOU and Peak CF estimates which are much higher than residential HOU and Peak CF estimates. As a result the overall HOU and CF estimates used to estimate both the Verified and the Evaluation Research Findings savings are based on a residential/non-residential bulb weighted split. The resulting residential and non-residential weighted HOU estimate is 3.17 hours per day, and the Peak CF estimate is 0.13.

The percentage of program bulbs being installed in residential versus non-residential locations was estimated to be 95/5[60] in PY4 based on data collected during the in-store intercept surveys. This is a higher proportion of non-residential installations than the PY3 evaluation-based estimate of 97/3, but lower than the PY2 estimate of 90/10.

Table 5-10 below shows the self-reported installation location by retailer category. As this table shows, the percentage of respondents reporting that they planned to install the program bulbs in a business location showed a modest amount of variation by retailer category in PY4.

[59] Energy Star has also developed a technology neutral standard for fixtures, but it provides no guidance on lumen to incandescent equivalents.

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

Table 5-10. Self-Reported Installation Location by Retailer Category

Installation Location	Retailer Category			
	DIY	Warehouse	Big Box	Weighted Total
Home	96%	93%	100%	95%
Business	4%	7%	0%	5%
% of Program Bulbs Sold	**53%**	**33%**	**9%**	

Source: Navigant Consulting Team Analysis of In-Store Intercept Survey (PY4)

Looking at the residential and non-residential division by bulb type, standard CFLs appear to be more likely to be installed in residential locations (97/3) than specialty CFLs (86/14), however this result was not statistically significant and thus the evaluation report used the 95/5 ratio to estimate PY4 savings. Sample size for the standard CFL calculation is 258 respondents, of whom 11 respondents said they would be installing bulbs in commercial locations. Sample size for the specialty CFL calculation is 55 respondents, of whom two respondents said they would be installing program bulbs in commercial locations.

Hours of Use and Peak Coincidence Factor

The PY4 Verified Savings and the Evaluation Research Findings HOU and Peak CF estimates are based on the PY3 metering study. The average overall HOU estimate from this study was 2.74[61] hours per day and the average overall Peak CF estimate from this study was 0.102.

As noted above, during the in-store intercept survey a small percentage of program bulb purchasers indicated they would be installing their program bulbs in a commercial location. Commercial locations tend to have significantly higher HOU and Peak CF and thus it was necessary to come up with parameter estimate for these bulbs. Respondents who indicated they would be installing their program bulbs in their business location were also asked what type of business this was. The majority of respondents (53%) reported the bulbs were for an apartment building, followed by office buildings, retail stores, public assembly locations, and hotel/motel.[62] Table 5-11 below shows the distribution of commercial building types reported by respondents and the estimated HOU and Peak CF of these commercial locations based on the PY4 KEMA non-residential workpapers created for ComEd. This table also presents the overall bulb weighted average HOU and Peak CF of the respondents.

[61] This was an overall average for bulbs installed in interior and exterior locations. Bulbs installed in interior locations had an HOU of 2.57. Because the fixtures sold through this program are for interior use, 2.57 HOU was used for all program fixtures.

[62] It should be noted that this is based on a relatively small number of customers (n = 13) who reported they planned to install program bulbs in their business.

Table 5-11. Respondent Reported Business Type and Associated HOU and Peak CFs

ComEd Business Type[63]	n	Bulbs	Annual HOU	Daily HOU	Peak CF
Apartments – Common Areas[64]	9	44	5,950	16.30	0.75
Office Building	4	63	3,911	10.72	0.65
Retail	2	12	3,881	10.63	0.68
Public Assembly	1	8	4,473	12.25	0.63
Hotel/Motel	1	8	1,497	4.10	0.18
Bulb Weighted Average	**17**	**135**	**4,463**	**12.23**	**0.66**

Source: In-store Intercept Surveys and KEMA Operations Manual

Weighting the overall HOU and CF values for residential and commercial installations by the proportion of program bulbs going into each of these building types yields an overall program wide HOU of 3.17 and Peak CF of 0.13, as shown in Table 5-12.

Table 5-12. Weighted Overall HOU and CF Values

Sector	% of installs	HOU	CF
Residential	95%	2.74	0.10
Non-Residential	5%	12.23	0.66
Overall	**100%**	**3.17**	**0.13**

Source: Navigant Consulting Team Analysis

Interactive Effects

To estimate interactive effects between the reduction in waste heat from more efficient lighting and the resulting changes in HVAC system demand, Waste Heat Factors for summer peak demand savings (WHFd) and energy savings (WHFe) were developed using the Illinois Technical Reference Manual (TRM) and data from the U.S. DOE EIA Residential Energy Consumption Survey (RECS) 2009.

The RECS 2009 data indicates that 69% of homes in Illinois are single family homes, and 31% are multi-family. The evaluation team then used the ComEd PY3 lighting onsite inventory data to estimate the proportion of program bulbs that are installed in interior (93%) and exterior (7%) locations. Applying the dwelling type distribution and interior/exterior distribution yielded a weighted average WHFd of 1.09.

Cooling energy savings factors for single family and multi-family homes were taken from the Illinois TRM. To populate the electric heating penalty algorithm for ComEd service territory, it was necessary to

[63] The HOU and Peak CF estimates for Apartments, Public Assembly and Missing business types were set equal to the Miscellaneous HOU and Peak CF estimates from the Operations Manual.

[64] Respondents who reported their program bulbs were installed within private spaces (in-unit) at an apartment complex were treated as residential installations.

develop estimates for the proportion of single family and multi-family homes with electric heating, and then within those proportions, the relative distribution of resistance heating and heat pump heating (by vintage) to develop a weighted average heating COP. The evaluation team developed these estimates using ComEd estimates of the proportion of single family and multi-family homes with electric heating, and using the RECS 2009 dataset for the East North Central Census Division (IL, IN, MI, OH, WI) for the distributions of resistance heating and heat pump heating by vintage (there was insufficient data representation in the Illinois RECS dataset to develop parameter values at the necessary level of specificity by heating technology and vintage). As shown in Table 5-13 below, 1.5% of single family homes in ComEd territory have electric heat, while 13.2% of multi-family homes have electric heat. For both single family and multi-family homes, the large majority of electric heating systems are electric resistance technologies, and the small percentage of homes with electric heat pumps tend to have systems built more recently than 2006. The weighted average COP from these technology distributions is 1.27 for single family homes and 1.02 for multi-family homes.

Table 5-13. Assumptions Used to Electric Heating Penalties

Bulb Location	Dwelling Type	Electric Heat	Electric Resistance Heat	Heat Pump >2006	Heat Pump <2006	Heater COP, Wgtd Avg
Single family	69%	1.5%	1%	0.3%	0.1%	1.27
Multi-family	31%	13.2%	13%	0.2%	0%	1.02

Source: Evaluation Team Analysis

These values, when applied to the electric heating penalty algorithm in the TRM, yielded electric heating penalty factor values of 0.99 for single family homes (i.e., small electric heating penalty indicated by small difference from a value of 1.0) and a moderately larger heating penalty factor of 0.94 for multi-family homes. As shown in Table 5-14, when the electric cooling savings factors and electric heating penalty factors are combined for each dwelling type, the net result is a slight energy savings factor for single family homes at 1.05, a small penalty for multi-family homes at 0.98, and a weighted overall average of 1.03. That is, the electric heating penalty is less than the cooling energy savings benefit.

Table 5-14. Assumptions Used to Derive WHFe

Bulb Location	Cooling Benefit Factor	Electric Heating Penalty	Overall WHFe
Single family	1.06	0.99	1.05
Multi-family	1.04	0.94	0.98
All Dwelling Types	1.05	0.98	1.03

Source: Evaluation Team Analysis

The overall average of 1.03 is driven by a few key factors. Although a smaller percentage of homes have electric heating than have central AC systems, the percentage of light savings that must be heated (49%) is higher than the percentage of lighting savings that result in reduced cooling loads (27%), according to the REMRate modeling underlying the IL TRM values. These values are based on modeling results of several different configurations and IL locations of homes. Also, the average COP for heating systems (1.02-1.27) is considerably lower than that for cooling systems (2.8), which effectively means that heating systems have to expend more energy to replace a "lost" kWh of lighting waste heat than cooling systems would have to expend to remove that same kWh, so changes in lighting waste heat are effectively more.

To estimate interactive effects between the reduction in waste heat from more efficient lighting and the resulting changes in HVAC system demand, Waste Heat Factors for summer peak demand savings (WHFd) and energy savings (WHFe) were developed using the forthcoming Illinois Technical Reference Manual (TRM) and data from the U.S. DOE EIA Residential Energy Consumption Survey (RECS) 2009. To develop the overall WHFd estimate, the evaluation team first developed an interior WHFd estimate by dwelling type and then added an adjustment factor for the proportion of program bulbs installed in exterior locations, for which energy and demand interactive effects do not apply. The RECS 2009 data for Illinois indicate that 69% of homes in Illinois are single family homes, and 31% are multi-family. The evaluation team applied these proportions to the single family and multi-family WHFd factors from the TRM to yield a total interior WHFd of 1.10, as shown in Table 5-15. The evaluation team then used the ComEd PY3 lighting onsite inventory data to estimate the proportion of program bulbs that are installed in interior (93%) and exterior (7%) locations. Applying a neutral WHFd factor of 1.0 to these exterior bulbs yielded overall WHFd factors for single family and multi-family of 1.10 and 1.07, respectively. Weighted across dwelling types, these yielded an overall WHFd factor for all program bulbs of 1.09.

Table 5-15. Assumptions Used to Derive WHFd

Bulb Location	Dwelling Type	Interior Cooling Demand Factor, IL TRM	% Exterior Bulbs, Cooling Factor 1.0	Overall WHFd
Single family	69%	1.11	7%	1.10
Multi-family	31%	1.07	7%	1.07
All Dwelling Types	100%	1.10	7%	1.09

Source: Evaluation Team Analysis

Program bulbs reported to be installed in commercial location were assigned Energy and Demand Interactive Effects(IE) in the same manner reported above for HOU and Peak CF. Table 5-16 below shows the distribution of commercial building types reported by respondents and the estimated Energy and Demand IE of these commercial locations based on the PY4 KEMA non-residential workpapers created for ComEd. This table also presents the overall bulb weighted average Energy and Demand IE of the respondents.

Table 5-16. Respondent Reported Business Type and Associated Energy and Demand IEs

ComEd Business Type[65]	n	Bulbs	Energy IE	Demand IE
Apartments – Common Areas[66]	9	44	1.04	1.07
Office Building	4	63	1.02	1.45
Retail	2	12	1.20	1.27
Public Assembly	1	8	1.20	1.41
Hotel/Motel	1	8	1.22	1.47
Bulb Weighted Average	**17**	**135**	**1.14**	**1.24**

Source: In-store Intercept Surveys and KEMA Operations Manual

Weighting the overall Energy and Demand Interactive Effects residential and commercial installations by the proportion of program bulbs going into each of these building types yields an overall program wide Energy IE of 1.03 and Peak CF of 1.10, as shown in Table 5-17.

Table 5-17. Weighted Overall Energy and Demand Interactive Effects

Sector	% of installs	Energy IE	Demand IE
Residential	95%	1.03	1.09
Non-Residential	5%	1.14	1.24
Overall	**100%**	**1.03**	**1.10**

Source: Evaluation Team Analysis

5.2.3 Evaluation Research Findings Gross Savings Results

Based on the gross impact parameter estimates described in the previous section, the Evaluation Research Findings gross program impacts resulting from PY4 Residential ES Lighting program were developed. The results are provided in Table 5-18 below.

[65] The HOU and Peak CF estimates for Apartments, Public Assembly and Missing business types were set equal to the Miscellaneous HOU and Peak CF estimates from the Operations Manual.

[66] Respondents who reported their program bulbs were installed within private spaces (in-unit) at an apartment complex were treated as residential installations.

Table 5-18. Evaluation Research Findings Ex-Post Gross Parameter and Savings Estimates

Gross Parameter and Savings Estimates	PY4 Evaluation Research Findings						
	Standard CFLs	Specialty CFLs	CFL Fix-tures	LED Bulbs	LED Fixtures	Coupon	All PY4
CFLs Distributed through the Program	11,419,752	1,097,670	24,919	84,539	16,551	5,599	12,649,030
Average Displaced Watts	48.6	50.0	57.7	48.9	40.3	48.6	48.8
Average Daily Hours of Use[67]	3.17	3.17	3.17	3.17	3.17	3.17	3.17
Gross kWh Impact per unit	56.3	57.8	53.7	66.8	44.2	56.3	56.4
Gross kW Impact per unit	0.05	0.05	0.05	0.06	0.04	0.05	0.05
Peak-Load Coincidence Factor	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Total 1st-Year Research Findings Gross MWh Savings	**642,482**	**63,498**	**1,337**	**5,648**	**732**	**315**	**714,013**
Total 1st -Year Gross MW Savings	**555.3**	**54.9**	**1.2**	**4.9**	**0.7**	**0.3**	**617.2**
Total 1st –Year Research Findings Gross Peak MW Savings	**70.6**	**7.0**	**0.2**	**0.6**	**0.1**	**0.0**	**78.4**
Realization Rate (IR * Leakage)	0.67	0.73	0.96	0.96	0.96	0.67	0.68
Energy Interactive Effects	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Demand Interactive Effects	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Total Installed 1st -Year Evaluation Research Gross MWh Savings	**444,918**	**47,641**	**1,329**	**5,616**	**727**	**218**	**500,450**
Total Installed 1st -Year Evaluation Research Gross MW Savings	**372.3**	**39.9**	**1.2**	**4.7**	**0.6**	**0.2**	**418.9**
Total Installed 1st -Year Evaluation Research Gross Peak MW Savings	**51.9**	**5.6**	**0.2**	**0.7**	**0.1**	**0.0**	**58.4**

Source: Evaluation Team Analysis

5.2.4 Evaluation Research Findings Net Savings Parameters

The Net-to-Gross Ratio is a measure of the proportion of gross program impacts that can reliably be attributed to the program. The NTGR can be thought of as a metric of program influence. The Evaluation Research PY4 net-to-gross ratio (NTGR) was estimated to be 0.54 (shown in Table 5-19 below), This PY4

[67] Average of Residential and Non-Residential estimates.

estimate was calculated as the retailer sales-weighted average of in-store intercept self-report results. It represents a decrease of 25% from the PY3 recommended NTGR of 0.71 and a decrease of 9% from the PY2 NTGR of 0.58. The decrease relative to the PY3 value was observed consistently across bulb types and across retailer types. Separate NTGR ratios were also calculated for standard and specialty bulbs. NTGR was estimated to be 0.55 for standard bulbs and 0.44 for specialty bulbs. Because General Population surveys were not conducted in PY4 and PY4 estimates of spillover were carried over from the PY3 evaluation (based on the PY3 General Population surveys).

Table 5-19 below also provides NTGR estimates for standard and specialty CFLs, which were estimated separately for the first time in PY4. As the table shows, the NTGR estimate for standard CFLs was 0.55, and the NTGR estimate for specialty CFLs was 0.44. Within standard CFLs, the NTGR for the two highest selling models, which accounted for 43% of overall PY4 sales (described in the installation rate section above), was significantly higher, at 0.59, than the estimate for the remaining standard CFL models, at 0.47. Due to the limited number of LED bulbs and CFL and LED fixtures sold through PY4 program (<1% of program sales), the evaluation team was unable to estimate NTGR for these bulb types. As a result the sales weighted average NTGR of the standard and specialty bulbs (0.54) was applied to these products.

Table 5-19. PY4 Net-to-Gross Ratios by Bulb Type

Program Bulb Type		Free Ridership	Spillover	NTGR
Standard CFLs	Overall	0.47	0.02	0.55
	Top Two Models	0.43	0.02	0.59
	Remaining Models	0.55	0.02	0.47
Specialty CFLs	Overall	0.58	0.02	0.44
Overall[68]		0.48	0.02	0.54

Source: Evaluation Team Analysis

As mentioned previously, free ridership for the PY4 evaluation was estimated using the customer self-report method. This method uses in-store intercept data to determine the fraction of CFL installations that would have occurred by participants in the absence of the program. Calculating free-ridership using the customer self-report method requires using collected survey data to assign the following two scores:

1) *Program Influence Score* (PI) - 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) - This score reflects a customer's self-reported stated purchasing plans if the ComEd incentive had not been offered and the bulbs had been more expensive.

Once these two scores have been calculated, free-ridership is calculated as:

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

[68] This program sales weighted average NTGR estimate will also be applied to LED bulbs and all fixtures sold through the Residential Lighting program. It should be noted that this weighted average is sub-optimal and does not reflect an actual estimate of NTGR for these program bulb types, however due to the lack of LED and fixture specific data it is the best proxy available.

Table 5-20 below shows the average Program Influence and No-Program scores for PY3 and PY4 by bulb type. As this table shows, both of these scores dropped significantly between PY3 and PY4, which resulted in a significant increase in the level of free ridership in PY4.

Table 5-20. Mean Free Ridership Score Components

FR Score Breakdown	PY4 Standard	PY4 Specialty	PY3
Program Influence Score	6.7	5.1	7.8
No-Program Score	4.0	3.4	6.5
FR Score	0.47	0.57	0.29

Source: Evaluation Team Analysis

Breaking down free ridership into its two components allows for an exploration into what is driving the differences between the PY3 and PY4 results.

Program Influence Score

As stated above, the program influence score seeks to capture the degree of influence the program has on a customer's decision to purchase and install CFLs. The primary sources of influence the Residential Lighting Program provides come from the program incentive (e.g., price) and the program information materials. During the intercept surveys, respondents were asked to rank the influence of each of these factors (on a scale of zero to 10) on their decision to purchase the program bulbs. Table 5-21 below shows the mean self-reported influence of these factors by program year (and bulb type for PY4).

Table 5-21. Mean Self-Reported Influence Levels

Mean Reported Influence (0-10 scale)	PY4 Standard	PY4 Specialty	PY3
Price	8.3	6.9	9.0
Program Materials	6.8	6.2	9.1

Source: Evaluation Team Analysis

As the table above shows, program participants reported significantly lower levels of influence in PY4 than in PY3 for both the incentive and the program materials. The actual incentive levels offered for program bulbs were very similar in P3 and PY4, and thus this finding may indicate the customers aren't as influenced by program incentives as they have been in past years. This table also shows that in PY4 the mean influence of the incentive for specialty CFL purchasers was significantly lower than for standard CFL purchasers. A possible explanation for this result is that the discount may not push the bulb price into a range that qualitatively changes the way customers relate to purchasing the bulbs; therefore, people purchasing specialty CFLs may be more aware of CFLs, more intent on purchasing them, and more prepared to pay a higher price for them, so there's less impulse buying at the store based on seeing a discount. The intercept data appear to bear this out.

Customers also indicated much lower influence levels for the in-store program materials in PY4 than in PY3. The evaluation team is currently analyzing shelf survey data and reaching out to program

implementation staff to see whether there have been any significant changes in the in-store marketing materials that may be correlated with this decline.

Another factor in the calculation of the program influence score is the customer's self-reported light bulb purchasing intentions at the time they entered the program retailer on the day of the intercept survey. These intentions are significant since customers who reported that they planned on buying non-programs CFLs when they entered the store point to a lower level of program influence. Table 5-22 below shows that in PY4 a significantly larger proportion of program bulb purchasers planned to buy light bulbs when they entered the store that day. This difference was the most striking for PY4 specialty bulb purchasers, 80% of whom indicated that planned on purchasing bulbs when they entered the store, and the majority of these indicated they planned on purchasing CFLs. As this table also shows, the number of customers who planned to purchase ComEd program CFLs when they entered the store remained very low and consistent from PY3 to PY4.

Table 5-22. Purchasing Intentions upon Entering the Store

Purchasing Intentions Upon Entering Store	PY4 Standard	PY4 Specialty	PY3
Planned to buy bulbs	62%	80%	50%
Planned to buy CFLs	50%	51%	41%
Planned to buy ComEd CFLs	3%	5%	3%

Source: Evaluation Team Analysis

Table 5-23 below illustrates the relationship between a customer's light bulb purchase intentions and their level of free ridership. As this table shows, customers who planned on purchasing CFLs when they entered the store had significantly higher levels of free ridership.

Table 5-23. PY4 Purchasing Intentions vs. Free Ridership Score

Planning to purchase light bulbs upon store entry?	Type of bulb planning to buy?	Specialty		Standard	
		n	FR	N	FR
Don't know		1	0.5	1	0.25
No	--	10	0.51	98	0.33
Yes	Non-CFL	17	0.45	29	0.35
	CFL	28	0.63	129	0.62

Source: Evaluation Team Analysis

No-Program Score

The no-program score seeks to quantify the actions the customer would have taken on their own if the program did not exist. As shown in Table 5-20above the mean no-program score fell by around 40% between PY3 and PY4. One of the key drivers of the no-program score is a customer's self-reported stated[69] purchasing plans if the ComEd incentive had not been offered and the bulbs had been more

[69] For this question we had to rely on the stated plans, as opposed to revealed actions.

expensive. As one might expect, free ridership was closely associated with the proportion of intercept respondents who expressly said they would have purchased fewer or no program bulbs if the bulbs had been more expensive (cost $1 more per bulb for standard CFLs and $1.50 more per bulb for specialty CFLs). As shown in Table 5-24 below, in PY4 only 11% of standard CFL purchasers and 10% of specialty CFL purchasers indicated they would not have bought any program bulbs if the incentive had not been offered. This is compared with 45% of PY3 respondents who claimed they would not have bought any program CFLs in the absence of the program. The table below also indicates that many more specialty CFL purchasers would have continued to purchase the program CFLs without the incentive than standard CFL purchases. This is consistent with the higher free ridership calculated for specialty CFLs than for standard CFLs.

Table 5-24. Number of Bulbs Purchased Based Upon Price Increase

Number of Bulbs Purchased if Price Increased	PY4 Standard	PY4 Specialty	PY3	PY2
The Same Number	37%	48%	22%	53%
Fewer	41%	25%	32%	24%
None	11%	10%	45%	19%
Don't Know	10%	17%	1%	2%

Source: Evaluation Team Analysis

It is worth noting that, consistent with PY3, the questions regarding what the respondent believes they would have purchased if the bulbs cost more included the incremental price of the multi-pack (size of package being purchased * incentive per bulb) for customers purchasing multi-packs. In PY4 the average multi-pack size was 4.2 for standard CFLs and 3.0 for specialty CFLs. This means that on average multi-pack purchasers understood that the packages they purchased would be $4 more (for standard bulbs) or $4.50 more (for specialty bulbs).

The PY3 and PY4 in-store intercept data and resulting free ridership estimates were analyzed from numerous angles to determine whether any additional factors besides those addressed above could be leading to an increase in free ridership in PY4. The outcome of this analysis is detailed below.

- Standard vs. Specialty Bulb Mix - In PY4 the percentage of Standard bulbs increased slightly (from 88% in PY3 to 91% in PY4). The PY4 analysis indicated that free ridership is lower for standard bulb purchasers and thus an increase in standard bulb sales should have resulted in a decline in free ridership in PY4 rather than the increase that was observed.

- Retailer Type - In PY3 intercept surveys were performed at 5 program retailers, whereas in PY4 they were conducted at a subset of 3 of these 5 program retailers. The two stores where intercepts were conducted in PY3 (but not in PY4 due to retailer lack of willingness to participate) had the lowest levels of free ridership in PY3. Free ridership was recalculated for PY3 excluding the results from these 2 retailers and the PY3 program sales weighted free ridership increased from 0.31 to 0.37. In PY4, program retailers where intercepts were not performed were included in the overall sales weighted free ridership average by being assigned a free ridership score by retailer type (Warehouse, DIY or Big Box). While this is the best proxy available to estimate free ridership

in the absence of primary data collection, it is realized that it has limitations as the level of free ridership does vary within a retail sales channel.

Table 5-25 below shows PY4 free ridership estimates by retailer type and standard bulb type (top two models vs. remaining standard CFL models). As this table shows, free ridership was higher in PY4 for Big Box stores, at 0.58, than it was for DIY and Warehouse stores, at approximately 0.47. Focusing on the top-selling models sold at DIY and Warehouse stores, sales weighted free ridership remains relatively consistent around 0.43. For standard models excluding the top sellers, free ridership is highest at Big Box stores (0.58) and lowest at Warehouse stores (0.53).

Table 5-25. PY4 Free ridership by Retailer and Standard CFL Type

Retailer Type	Top Two Models	Remaining Standard Models	All Models
Big Box	N/A	0.58	0.58
DIY	0.42	0.55	0.48
Warehouse	0.43	0.53	0.47
All	0.43	0.54	0.49

Source: Evaluation Team Analysis

- Top Selling Models - As mentioned above, the top selling standard CFL models, where the average price per CFL was lower than the overall program average, demonstrated lower levels of free ridership (0.43 vs. 0.55) than the remaining standard CFL models. This is to be expected as the program plays a bigger role in moving large quantities of these top selling products. This same result was also found in PY3. In PY4 the two top selling models accounted for 43% of overall program sales, whereas in PY3 they accounted for only 22% of overall program sales. One would have expected that increasing the sales of these top selling models in PY4 would have led to an overall downward impact on the level of free ridership, when in reality the opposite was observed.

- Package Size - In PY4 96% of program bulbs were sold in multi-packs compared to PY3 in which 92% of bulbs were sold in multi-packs. The PY4 intercept data was analyzed by single versus multi-pack sales and while the data indicated that customers purchasing program bulbs in multi-packs had a lower average rate of free ridership, the sample of single pack purchasers was quite small and thus the results were not statistically significant.

- EISA Awareness - NTGR was looked at in relationship to a customer's self-reported awareness of the 2007 EISA standards. Customers who purchased standard program CFLs and reported being aware of these new light bulbs standards showed slightly lower levels of free ridership (0.44 versus 0.49) which may be a sign that the program increased their awareness of the EISA regulations. These differences, however, were not found to be statistically significant.

5.2.5 Evaluation Research Findings Net Savings Results

Based on the gross impact parameter estimates described in the previous section, evaluation research net program impact results from PY4 Residential ES Lighting program were developed. The results are provided in Table 5-26 below.

Table 5-26.Evaluation Research Net Parameter and Savings Estimates

Net Parameter and Savings Estimates	PY4 Evaluation Research Findings						
	Standard CFLs	Specialty CFLs	CFL Fixtures	LED Bulbs	LED Fixtures	Coupon	All PY4
Net-to-Gross Ratio (1-FR+SO)	0.55	0.44	0.54	0.54	0.54	0.55	0.54
Total 1st-Year Research Findings Net MWh Savings	242,554	21,198	713	3,012	390	119	267,986
Total 1st -Year Research Findings Net MW Savings	202.99	17.74	0.63	2.52	0.34	0.10	224.32
Total 1st -Year Research Findings Net Peak MW Savings	28.32	2.47	0.09	0.35	0.05	0.01	31.29

Source: Evaluation Team Analysis

5.2.6 Comparison for Top Selling Models in PY4

An additional analysis completed in PY4 looked specifically at a few high-selling models of standard CFLs that represented a large portion of the PY4 Residential ES Lighting Program sales. These two high selling models were standard CFLs sold in multi-packs; one was a an 8-pack of standard CFLs and sold through a Warehouse store, and the other was a 4-pack of standard CFLs and sold through a DIY store. These two top selling models accounted for approximately 43% of total PY4 program bulb sales. Table 5-27 below shows the PY4 impact parameters calculated separately for these top-selling models, standard CFLs excluding these two models, all standard CFLs, and all program bulbs.

Table 5-27. Comparison of Evaluation Research Findings Impact Parameters for Top Selling Models

Program Savings Parameters	Top 2 Standard CFL Models	All Other Standard CFL Models	All Standard CFL Models	All Program Bulbs
Program Bulb	5,462,432	5,962,919	11,425,351	12,649,030
Delta Watts	46.5	50.6	48.6	48.8
Installation Rate	65%	75%	70%	70%
Residential Installations	98%	95%	97%	95%
Free Ridership	0.43	0.55	0.47	0.48

Source: Navigant Evaluation Team Analysis

The analysis of the top two selling program models in comparison with all other program models yielded two main conclusions. First, the installation rate for the top selling models was approximately 13% lower than installation rate for the other program models. Given that stored bulbs are typically installed over the course of the following two program years, and that these two models represent a significant proportion of total program sales, these two models were responsible for approximately half the carryover savings that will be applied to PY5 and PY6 from PY4 sales. Second, the NTGR[70] for these top selling models (0.59) was approximately 25% higher than it is for all other standard CFL models (0.47). This indicates that the Program had a particularly large effect moving these larger packs of extra deep discounted bulbs. This observation corroborates feedback received from lighting manufacturers during the PY3 supplier self-report NTG interviews that there may be a kind of threshold price below which customers see these packs as an irresistible deal.

These top selling models illustrate the inverse relationship that exists between the installation rate associated with program bulbs and the program influence in the decision to purchase the bulbs. If ComEd aims to decrease free-ridership, focusing program resources on a few top sellers is an option, however in doing so they will likely be encourage over-purchasing and hence storage, which will delay accrual of program savings.

5.3 Detailed Evaluation Research Impact Methodology

Wherever possible in PY4, the lighting energy and demand savings parameters described below were calculated separately for standard CFLs and specialty CFLs. This process included designing the in-store intercept survey sample to provide a sufficient number of completed intercepts with purchasers of each bulb type to enable statistically significant independent calculation of parameter values. Because LED lamps, CFL fixtures, and LED fixtures are a comparatively small part of the program (collectively representing just 1% of total program sales), it was not possible to identify a sufficient number of purchasers of these bulb types to develop independent savings parameter values for these bulb types. The parameter descriptions below note how savings parameter values were developed for standard and specialty CFLs, as well as for the other three program bulb types.

5.3.1 Evaluation Research Findings Gross Program Savings

The Research Findings Gross and Net energy and demand (coincident peak and overall) savings resulting from the PY4 Residential ES Lighting Program were calculated using the same algorithms as the Verified Savings (and presented in Section 3.2 above):

Per Unit kWh Savings = Delta Watts/1000 * HOU * Realization Rate * Energy Interactive Effects
Annual kWh Savings = Program bulbs * Per Unit kWh Savings

Where:
Delta Watts = Difference between Baseline Wattage (incandescent wattage) and CFL Wattage
HOU = Annual Hours of Use
Realization Rate = Installation Rate * Leakage Rate

[70] Including spillover (estimated to be 0.02).

Per Unit kW Savings = Delta Watts/1000 * Realization Rate
Annual kW Savings = Program bulbs * Per Unit kW Savings

Per Unit Peak kW Savings = Per Unit kW Savings * Mean Load Coincidence Factor
Annual Peak kW Savings = Program bulbs * Per Unit Peak kW Savings

Where: Mean Load Coincidence Factor is calculated as the percentage of program bulbs turned on during peak hours (weekdays from 1 to 5 p.m.) throughout the summer.

Table 5-28 below shows the data sources used to estimate the Evaluation Research input parameters in the energy and demand savings algorithms for the Residential ES Lighting Program. Each of these parameters is described in further detail below.

Table 5-28. Evaluation Research Findings Savings Parameter Data Sources

Gross Savings Input Parameters	Residential ES Lighting Program
Rebated Bulbs (Measures)	PY2/PY3/PY4 Program Tracking Data
Delta Watts	ES Standard Equivalency Tables / Lumen-based Incandescent Equivalents
Hours of Use	PY3 ComEd Metering Study
Peak Load Coincidence Factor	PY3 ComEd Metering Study
Installation Rate	In-store Intercept Surveys
Lighting-HVAC Interactive Effects	Forthcoming PY5 Illinois TRM / Literature Review
Leakage	In-store Intercept Surveys
Residential versus Non-Residential Installations	In-store Intercept Surveys

5.3.2 Program Bulbs

The number of bulbs distributed through the program during PY4 is a key parameter in the calculation of total gross and net program savings and in PY4 was derived from the Residential Lighting tracking databases (upstream and coupon) provided to the evaluation team by ComEd. PY4 bulb sales numbers include a small number of bulbs sold during PY3 (prior to May 31st 2010) that were invoiced after the PY3 sales cutoff date (and thus were not counted as PY3 sales in the Year 3 evaluation).

5.3.3 Delta Watts

In PY4, three different methods were used to estimate the Evaluation Research Delta Watts estimates. These three methods included two methods employed during the PY3 evaluation and an additional lumen based method that also relies on the bulb type and shape. Each of these methods differed only with respect to the source from which the base wattage (incandescent equivalent wattage) was derived.

For all methods, the program bulb wattage was established from the PY4 Goals Tracker and was subtracted from the calculated base wattage.[71]

The three methods and the source of their base wattage estimates are the following:

- The "Original Tracking Data" method established base wattage from the Goals Tracker.[72]
- The "PY4 Deemed" method was initially developed in PY2 and mapped the lumen output ranges (from the Goals Tracker spreadsheet) to a corresponding incandescent base wattage value. These ranges were based on communication with technical experts at GE and Sylvania.
- A new PY4 method, "ES Lumen Based" also mapped bulb lumen output ranges to a corresponding incandescent base wattage value. This method has different lumen output ranges dependent upon the bulb shape and type (omni-directional, globes, directional, decorative)

The new ES Lumen Based method was added in PY4 to improve upon the previous lumen mapping for all bulb types. The evaluation team believes this method is a more robust means of establishing incandescent equivalent wattage across all bulb types, especially specialty CFLs and LEDs. Because lumen output is a measure of the total light produced in all directions from a source, bulbs such as reflectors that focus light in a single direction require a different lumen mapping than a standard CFL. It is important to note that while lumens are becoming a more universal metric for light output across bulb types, industry experts suggest that lumens alone are not adequate to fully characterize the performance of directional lamps.[73] This lumen method adds greater depth to our review of bulb light output, and it is the most detailed method currently available. The bulb type lumen mapping recommended for PY4 is taken from the new Energy Star DRAFT[74] specification for lamps.[75] Table 5-29 below shows the lumen to incandescent equivalencies for directional and non-directional bulbs from this ES specification. While this specification differentiates the lumen ranges, or "lumen bins" for identifying incandescent equivalencies for directional versus non-directional bulbs, it is technology neutral in the sense that lumen to incandescent mappings apply to all lamps in a given category, regardless of type (i.e. CFL or LED).

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[71] Program bulb wattages were established from the Goals Tracker, rather than the main tracking database, because the tracking data table that contains bulb wattages, bulb base wattages, lumen output, and other bulb information (Lookup_measure_res_lighting) has not been updated for PY4 and is missing a large number of bulb models.

[72] The goals tracker base wattage estimates were changed for a small percentage of program bulbs (~0.4%). There were two bulb models that listed the same wattage for both the actual bulb wattage and the base wattage. Internet research indicated that the base wattage was incorrect and was subsequently modified. Additionally, there were eight models (mostly LEDs and specialty CFLs) which listed a base wattage of zero. Base wattages for these models were established through internet research where possible. Approximately 23,000 bulbs (0.2% of sales) were excluded from this analysis because no manufacturer base wattage was identified.

[73] The Lighting Research Center notes that "Most lamp manufacturers do not publish lumen output ratings for MR16 lamps or other reflectorized lamps in their catalogs. Instead, they publish beam angle and [Center Beam Candle Power], which provide more accurate information about the performance characteristics of the lamp." Similarly, Sylvania reports that "Requests are often received for the lumen output values for aluminum reflector or AR-type lamps. Usually, this is a meaningless specification; candlepower is the appropriate value for a reflector lamp since they are used for accent and display lighting. "
http://www.lrc.rpi.edu/programs/nlpip/lightingAnswers/mr16/performance.asp
http://assets.sylvania.com/assets/documents/faq0007-0297.cb5b8f25-05ee-463d-8d0c-c60912a4adf7.pdf

[74] It is important to keep in mind this specification is still DRAFT and under review of many parties. The evaluation team will continue to monitor the status of this specification and will update ComEd on any significant changes or alterations.

[75]http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/lamps/V1.0_Draft_2_Specification.pdf?4749-8e30

None of the base wattage calculation methods formally incorporates the changing federal lighting efficiency requirements under the Energy Independence and Security Act (EISA 2007) that came into effect for traditional 100W incandescent bulbs in January 2012. These requirements will yield a shift in the baseline wattage used for calculating savings as of June 1, 2012, and as such, are not applied to program bulb sales in PY4.

Table 5-29. Lumen and Incandescent Equivalents

Light Output (Lumens)						
Standard Incand. Base Wattage	Omni Direction (except Globe)	Globe	Directional (R, BR, and ER)[76]	Directional R20	Directional Larger than R20	Decorative
10						≥ 70
15						≥ 90
25	≥ 250	≥ 250	≥ 250			≥ 150
40	≥ 450	≥ 350	≥ 400			≥ 300
45			≥ 450	≥ 630	≥ 750	
50			≥ 500	≥ 720	≥ 850	
60	≥ 800	≥ 500	≥ 600			≥ 500
65			≥ 650	≥ 1010	≥ 1190	
75	≥ 1,100	≥ 575	≥ 750	≥ 1210	≥ 1420	
90			≥ 900	≥ 1520	≥ 1790	
100	≥ 1,600	≥ 650	≥ 1200	≥ 1740	≥ 2050	
120			≥ 1000	≥ 2190	≥ 2580	
125	≥ 2,000		≥ 1250			
150	≥ 2,550	≥ 1100	≥ 1500	≥ 2910	≥ 3430	

Source: ENERGY STAR V1.0 Draft Specification for Lamps[77]

5.3.4 Annual Hours of Use (HOU)

In order to estimate the energy savings from a newly installed CFL, it is necessary to understand the average number of hours the lamp is turned on each day (which can then be annualized by multiplying the daily value by 365 days). As in PY3, the evaluation research overall PY4 HOU estimate was developed by first calculating separate HOU values for residential and non-residential installations, then calculating overall weighted estimates based on the proportions of program bulbs installed in residential and non-residential settings according to the in-store intercepts data.

As part of the PY3 evaluation a metering study was conducted at a sample of ComEd residential customers' homes. The results from this metering study were utilized within both the PY4 Verified and

[76] The DRAFT specification calls for two sets of criteria for Directional (R, BR and ER lamps). The column shown here is only to be applied to the following lamps: - 65 watt BR30, BR40 and ER40 lamps, BR30, ER30, BR40 andER40 lamps ≤ 50 W, R20 lamps ≤ 45 W, Lamps ≤ 40 W, and Lamps smaller than 2.25" diameter. The specification directs that all other directional lamps shall be greater than or equal to that of the referenced lamp in the other "Directional" columns. In PY4 the evaluation team found there were very few (~10,000) directional lamps that fell outside of this range (and most of those were PAR lamps which were not included in this mapping) and the guidelines given in the draft specification result in a very non-intuitive lumen to wattage mapping (i.e. a BR40 bulb with a lumen output of 650 gets mapped to a 65 watt bulb but a BR40 with a lumen output in the range of 651 – 1009 would get mapped to a lower wattage bulb). As a result of this the evaluation team carried out the lumen requirement of 10x the wattage for this whole category which is in line with what the manufacturers are not reporting on CFLs packages.

[77] http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/lamps/V1.0_Draft_2_Specification.pdf?4749-8e30

Evaluation Research Findings evaluation. The PY3 metering study involved installing lighting loggers on 527 randomly selected CFLs that customers had installed in their homes (67 unique households), which allowed for the direct measurement of on/off usage patterns and enabled the modeling of an annual HOU estimate for each loggered CFL. On average the loggers were left in place for approximately 7.5 months. Complete details on the PY3 residential lighting metering study can be found in the PY3 evaluation report.[78]

To develop the non-residential HOU value, the evaluation team applied commercial building type-specific HOU and Peak CF values from workpapers created by KEMA for the ComEd prescriptive program[79] to the distribution of specific commercial building types into which program bulbs were being installed.

5.3.5 Peak Load Coincidence Factor

The peak load coincidence factor (CF) allows for the estimation of the average demand savings that occur during ComEd's peak period (summer weekdays from 1 to 5 p.m.[80]). As with HOU, the evaluation team used the results of the PY3 residential lighting metering study to estimate residential Peak CF. Logger data from the period between June 24th and August 31st 2011 was used to estimate the Peak CF, and all loggers having at least 11 days' worth of data during this period were included in the analysis dataset (325 loggers, 536 lamps loggered).

5.3.6 Installation Rate

In order for a program bulb to receive credit for energy savings in the Residential ES Lighting Program within a given program year, it must be installed within that program year. For PY4, the installation rate was calculated from the in-store intercept surveys. Because six months is the average amount of time remaining in the program year for a person purchasing a program bulb in PY4, the question that most directly targeted installation rate was phrased as follows:

"Of the [Number] standard/specialty CFLs that you are purchasing today, how many do you expect to install within the next 6 months?"

The installation rate was calculated as the number of bulbs expected to be installed within the next 6 months divided by the total number of bulbs sold. Installation rates were calculated by bulb type, then weighted by retail channel sales to yield the overall estimates. CFL fixtures, LED fixtures, and LEDs were all assumed to have a 100% installation rate due to their relatively high purchase price, as only one intercept was completed with a program LED purchaser, and none were completed with program fixture purchasers.

5.3.7 Leakage

When program bulbs are sold through an upstream channel, as is done for the Residential ES Lighting Program, it is possible for program bulbs to be purchased at program stores and then installed in areas

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[78] Navigant Consulting, 2012. *Evaluation Report: Residential ENERGY STAR® Lighting – Plan Year 3*. Prepared for Commonwealth Edison Company. May 2012. http://www.icc.illinois.gov/downloads/public/edocket/323818.pdf. Also available on Illinois Commerce Commission website here: http://www.icc.illinois.gov/docket/Documents.aspx?no=11-0593

[79] KEMA. *Appendix A* of the *KEMA Operations Manual*. Prepared for Commonwealth Edison Company, August, 2009.

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

outside of ComEd service territory (therefore negating any ComEd energy savings from the installation of these bulbs). This phenomenon is referred to as "leakage". Again in the PY4 Evaluation Research, leakage was estimated by asking all in-store intercept survey respondents who were purchasing program bulbs if they received their electrical service from ComEd. In cases where respondents indicated they intended to install some or all of the program bulbs at their business, they were asked if ComEd supplies electrical service to their business location. In cases where intercept respondents indicated they do not receive their electricity from ComEd, they were asked a follow-up question about whether they receive a bill from ComEd. Bulbs purchased by customers who reside within ComEd service territory and have a supplier other than ComEd, but are still billed by ComEd, are not considered leakage bulbs. This provided the data necessary to estimate the percentage of program bulb that are leaving ComEd's service territory. Estimates of leakage by retailer type from the intercept surveys were weighted by overall program bulb sales for that retailer type to generate the final leakage estimate.

5.3.8 Energy Interactive Effects

Complete details on Energy Interactive Effects are provided in Section 5.1.2 above.

5.3.9 Residential versus Non-Residential Installation Locations

The Residential ES Lighting Program assumes that all program bulbs will be installed in residential locations. This assumption was initially tested as part of the PY2 evaluation, and then tested again as part of the PY3 and PY4 evaluations via the in-store intercept surveys. All surveyed ComEd customers who were purchasing program bulbs were asked whether they intended to install the bulbs in their home, their business, or a combination of each. The bulbs purchased by customers who reported that they planned to install the bulbs they were purchasing in both home and business locations were divided evenly between these two locations.

Those responding that said they intended to install the bulbs at their business were also asked to specify what type of business this was. Those who indicated they planned on installing the program bulbs they were purchasing in their business, and that this business was either an apartment building or a hotel/motel were asked an additional follow up question regarding whether these program bulbs would likely be installed within a common area of the building or within an individual unit/room[81]. Those reporting that the program bulbs would be installed within an individual unit/room were classified as residential installations and therefore residential HOU and CF estimates were used to calculate the program impacts from these bulbs. All of the collected data regarding installation location were then used to estimate the percentage of program bulbs that are installed in residential versus non-residential locations, and the gross impact parameters (HOU and CF) were adjusted to account for these non-residential installations.

5.3.10 Net Program Savings

Net savings analyses seek to determine a program's net effect on customers' electricity usage. This requires estimating what would have happened in the absence of the program. Thus, after gross program impacts have been assessed, net program impacts are derived by estimating a net-to-gross ratio (NTGR) that quantifies the percentage of the gross program impacts that can reliably be attributed to the program.

[81] Three respondents reported the bulbs they were purchasing for their business (which was an apartment building) would be installed both in individual units and in common areas. In these instances, the number of bulbs the customer purchased were divided equally between these two types of locations.

For the PY4 Residential ES Lighting program evaluation the only method employed to estimate the net program savings was the customer self-report method based on the in-store intercept surveys. The PY4 intercept instrument included questions regarding free ridership, but did not include questions regarding spillover. Free-ridership refers to program bulb purchases that would have taken place anyway in the absence of the program, and spillover refers to positive impacts of the program on sales of non-program energy efficient lighting products. The in-store intercept data was used to estimate the level of PY4 free ridership and the PY3 General Population survey data was used to estimate spillover. Once these two parameters were estimated NTGR was calculated as follows:

NTGR = 1 – Free-ridership Rate + Spillover Rate (Participant and Non-Participant)

Free-Ridership

The calculation of free-ridership using the customer self-report method relies on customer survey questions addressing the following two items:

1. The degree of influence the program had on the customer's decision to install CFLs (Program Influence Score); and

2. What actions the customer would have taken on their own in the absence of the program (No-Program Score).

The calculation of free-ridership combines the Program Influence score and the No-Program score for each customer to come up with a customer-level free-ridership score. The Program Influence and No-Program scores can take values of zero to ten, where a lower score indicates a higher level of free-ridership. Program-level free-ridership is then determined by taking a program bulb-weighted average of the individual customer-level free-ridership scores.

The Program Influence score was estimated based on the self-reported influence level the program had (on a scale of zero to ten, where zero equals not at all influential and ten equals very influential) on the customers' decision to install CFLs instead of standard efficiency bulbs. The No-Program score was based on a number of factors including:

1. Would the customer have purchased CFLs in the absence of the program?

2. Would they have purchased the CFLs at the same time?

3. Would they have purchased the same number of CFLs?

4. How likely is it (on a scale of zero to ten, where zero equals not at all likely and ten equals very likely) that they would have bought the same CFLs in the absence of the program?[82]

The algorithm used to calculate the No-Program score adjusts the score assigned to customers upward if they indicate that they would have purchased and installed the CFLs on their own in the absence of the program, but that the program either accelerated their CFL installation or led them to install a greater number of CFLs.

[82] This specific question was only asked as part of the General Population survey. However, a combination of similar questions was used as a proxy for this question in the intercept survey.

Once these two scores have been calculated, the customer-level free-ridership is equal to:
Customer-level Free-Ridership = 1 – (Program Influence Score + No-Program Score)/20

Spillover

Spillover for both participants and non-participants includes all adoptions of energy efficient lighting measures that are influenced by the program, but are not done through the program (i.e., are not rebated). It is reasonable to expect that the program, by providing information on the benefits of energy efficient lighting and experience with such technologies, motivates customers to install energy efficient lighting without the program rebate. Spillover was not estimated as part of the PY4 evaluation. Thus the PY3 spillover estimates for participants and non-participants were carried into PY4.

5.4 Recommendations for TRM Updates

The evaluation team recommends the following update to the IL TRM:

- **Delta Watts:** The evaluation team recommends switching to a bulb type lumen mapping (such as the one presented within the Evaluation Research section in Appendix 5 that is based on the new Energy Star draft specification for lamps[83]). Using a lumen-based method that also relies on bulb shape provides a more robust means of establishing base wattage equivalents across all bulb types, especially specialty CFLs and LEDs. Because lumen output is a measure of the total light produced in all directions from a source, bulbs such as reflectors (and LEDs in general) that focus light in a single direction require a different lumen mapping than a standard CFL. The TRM that goes into effect in PY5 assigns base-wattages using lumen bins that are not differentiated by bulb type and thus this issue continues under the PY5 TRM.

The proposed mapping update to the TRM for used in PY4 to estimate the Evaluation Research Base wattage mappings are delta watts are included in Table 5-30, Table 5-31, and Table 5-32.

[83]http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/lamps/V1.0_Draft_2_Specification.pdf?4749-8e30

Table 5-30. Lumen and Incandescent Equivalency Mapping – Standard Bulbs

Bulb Type – Standard	Lower Lumen Range	Upper Lumen Range	Watts Base	Effective Date
Twist	250	309	25	
	310	749	40	effective until 5/31/2014
	310	749	29	effective starting 6/1/2014
	750	1049	60	effective until 5/31/2014
	750	1049	43	effective starting 6/1/2014
	1050	1489	75	effective until 5/31/2013
	1050	1489	53	effective starting 6/1/2013
	1490	2600	100	effective until 5/31/2012
	1490	2600	72	effective starting 6/1/2012
	2601	2999	150	
	3000	5279	200	
	5280	6209	300	

Source: Evaluation Analysis.

Table 5-31. Lumen and Incandescent Equivalency Mapping – Specialty Bulbs – Non-Reflectors

Bulb Type - Specialty Non-Reflector	Lower Lumen Range	Upper Lumen Range	Watts Base	Effective Date
A-lamp, Post, Dimmable Twist	250	309	25	n/a
	310	749	40	effective until 5/31/2014
	310	749	29	effective starting 6/1/2014
	750	1049	60	effective until 5/31/2014
	750	1049	43	effective starting 6/1/2014
	1050	1489	75	effective until 5/31/2013
	1050	1489	53	effective starting 6/1/2013
	1490	2600	100	effective until 5/31/2012
	1490	2600	72	effective starting 6/1/2012
	2601	2999	150	n/a
	3000	5279	200	n/a
	5280	6209	300	n/a
3-Way, and CFL Fixtures	250	449	25	n/a
	450	799	40	n/a
	800	1099	60	n/a
	1100	1599	75	n/a
	1600	1999	100	n/a
	2000	2549	125	n/a
	2550	2999	150	n/a
	3000	5279	200	n/a
	5280	6209	300	n/a
Globe	90	179	10	n/a
	180	249	15	n/a
	250	349	25	n/a
	350	499	40	n/a
	500	574	60	n/a
	575	649	75	n/a
	650	1099	100	n/a
	1100	1300	150	n/a

Bulb Type - Specialty Non-Reflector	Lower Lumen Range	Upper Lumen Range	Watts Base	Effective Date
Candleabra	70	89	10	n/a
	90	149	15	n/a
	150	299	25	n/a
	300	499	40	n/a
	500	699	60	n/a
	800	900	100	n/a

Source: Evaluation Analysis.

Table 5-32. Lumen and Incandescent Equivalency Mapping – Specialty Bulbs – Reflectors

Bulb Type - Specialty Reflector	Lower Lumen Range	Upper Lumen Range	Watts Base
R20	300	399	30
	400	449	40
	450	719	45
	720	1009	50
	1010	1209	65
	1210	1519	75
	1520	1739	90
	1740	2189	100
	2190	2909	120
	2910	3640	150
R30 and R40	400	749	40
	750	849	45
	850	1189	50
	1190	1419	65
	1420	1789	75
	1790	2049	90
	2050	2579	100
	2580	3429	120
	3430	4270	150

Bulb Type - Specialty Reflector	Lower Lumen Range	Upper Lumen Range	Watts Base
ER30	500	1189	50
	1190	1419	65
	1420	1789	75
	1790	2049	90
	2050	2579	100
	2580	3429	120
	3430	4270	150
BR30, BR40, and ER40	200	299	20
	300	399	30
	400	499	40
	500	599	50
	600	649	60
	650	1419	65
	1420	1789	75
	1790	2049	90
	2050	2579	100
	2580	3429	120
	3430	4270	150

Source: Evaluation Analysis.

5.5 Data Collection Instruments

5.5.1 In-Store Intercept Survey Instrument

COMED LIGHTING INTERCEPT SURVEY

- Field Staff Name _____
- Date _____
- Store Name, Address and City_____
- Start and End time of Interview_____
- Promotional Period at Store (Y/N)

Customer Bulb Inventory

(ALWAYS START WITH THE PACKAGE WITH THE HIGHEST NUMBER OF BULBS. AFTER THAT, RANDOMLY SELECT UPTO 4 UNIQUE PACKAGES TO INVENTORY)

Q1. Bulb Type? *(CHECK TYPE)*

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

Q2. Number of bulbs in the package? *(RECORD NUMBER)*

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

Q3. Bulb shape? *(CHECK SHAPE)*

Bulb Type	**Package 1**	**Package 2**	**Package 3**	**Package 4**
Twister/Spiral				
A-lamp				
Flood Light				
Globe				
Candelabra				
Post				
Ceiling Fan Bulb				
Other				
Unable to identify				

Q3a. Is the bulb dimmable or a 3-way bulb? *(CHECK DIMMABLE OR 3-WAY)*

	Package 1	Package 2	Package 3	Package 4
Dimmable				
3-way				
Don't Know				

Q4. Bulb Wattage? *(RECORD WATTAGE)*

	Package 1	Package 2	Package 3	Package 4
WATTAGE				

Q5. Model number? *(RECORD MODEL NUMBER)*

	Package 1	Package 2	Package 3	Package 4
MODEL NUMBER				

Q6. How many of these packages are they purchasing? *(RECORD # PACKAGES)*

	Package 1	Package 2	Package 3	Package 4
# OF PACKAGES				

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

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

Customer Intentions and History

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

1. Yes
2. No **(SKIP TO Q11)**
3. Don't know **(SKIP TO Q11)**

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 MULTIPLE TYPES OF BULBS – CFLS, LEDS, INCANDESCENT, HALOGEN)

Q11. Why are you buying a mix of bulb types? **(DO NOT READ- ACCEPT MULTIPLE)**

1. Price of the bulbs
2. Bulbs were on sale
3. Use in different rooms
4. Use in different fixture types
5. Dislike CFL fit in fixtures
6. Dislike CFL look in fixtures

7. Need dimmable bulbs
8. Need 3-way bulbs
9. New to trying CFLs, so buying a small number
10. CFLs were not available for all applications I need
11. Want to compare performance of multiple bulb types
12. Other_____
13. Don't Know

IF BUYING CFLS READ:
"Going forward we are going to be asking you a number of questions corresponding to either the CFLs you are purchasing today."

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

IF BUYING <u>SPECIALTY</u> CFLS READ:
"When I refer to Specialty CFLs I am talking about CFLs that either have a special shape (such as a globe or candelabra bulb) or special feature (such as dimmable or floodlights)."

(IF PURCHASING STANDARD CFLs)
Q12stan. Have you ever purchased or been given any **<u>STANDARD</u>** CFLs before today?
1. Yes
2. No
3. Don't know

(IF PURCHASING SPECIALTY CFLs)
Q12spec. Have you ever purchased or been given any **<u>SPECIALTY</u>** CFLs before today?
1. Yes
2. No
3. Don't know

(IF PURCHASING LEDs)
Q13. Have you ever purchased or been given any LEDs before today?
1. Yes
2. No
3. Don't know

(IF PURCHASING PROGRAM STANDARD CFLS)
Q15stan. Where are you planning to install the **<u>STANDARD</u>** CFLs you are buying today - in your home, a business, or both?
1. Home
2. Business
3. Both
4. Don't know

(IF PURCHASING PROGRAM SPECIALTY CFLS)
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 ANY OF THE BULBS WILL BE INSTALLED IN A BUSINESS)
Q16. What type of business is it?

1. Apartment Building
2. Office
3. Restaurant
4. Grocery/Liquor
5. Retail
6. Warehouse, refrigerated
7. Warehouse, non-refrigerated
8. Hospital
9. Health care, other than hospital
10. School, K-12
11. College
12. Hotel/Motel
13. Public assembly, e.g. church/theater/conference
14. Industrial/agriculture
15. Other _____
16. Don't Know

(IF THE BULBS IN Q16 ARE FOR A HOTEL, MOTEL, OR APARTMENT)
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

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

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

(IF ANY OF THE BULBS WILL BE INSTALLED IN A BUSINESS)

Q19. Does ComEd provide electricity to your business?

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

(If NO TO Q19)

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 in not in this area/Illinois
4. Don't know

(IF THE PROGRAM BULBS ARE FOR A HOME)

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

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

(IF THE PROGRAM BULBS ARE FOR A HOME)

Q21. Does ComEd provide electricity to your home?

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

(IF NO TO Q21)

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

(IF NOT PURCHASING ANY CFLS SKIP TO Q30)

Q22. Why are you purchasing CFLs today instead of purchasing (only) some other type of light bulb such as incandescent?

1. The price (CFLs are inexpensive/price is low) ……First mention
   ☐ Other mention ☐
2. To save money (CFLs cost less to use) ……First mention
   ☐ Other mention ☐

3. To save energy **(PROBE: Why?)** - lower utility bills .....First mention ☐ Other mention ☐
4. To save energy **(PROBE:Why?)**- environmental reasons …First mention ☐ Other mention ☐
5. CFLs are good for the environment ……First mention ☐ Other mention ☐
6. Recommended by friends/family ……First mention ☐ Other mention ☐
7. Saw CFL advertisement outside store ……First mention ☐ Other mention ☐
8. Saw CFLs advertised in store/saw display in store ……First mention ☐ Other mention ☐
9. Prior good experience with CFLs ……First mention ☐ Other mention ☐
10. Don't know ……First mention ☐ Other mention ☐
11. Other_____ ……First mention ☐ Other mention ☐

(IF PURCHASING PROGRAM STANDARD CFLS)
Q23stan. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was **price** in your decision to purchase **Standard** CFLs today?

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

(IF PURCHASING PROGRAM SPECIALTY CFLS)
Q23spec. Using a scale of 0 to 10 where 0 means not at all influential and 10 means extremely influential, how influential was price in your decision to purchase **Specialty** CFLs today?

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

(IF PURCHASING PROGRAM STANDARD CFLS)
Q25stan. How many of the **Standard** CFLs you are purchasing today do you expect to install in the next 6 months?

1. Record Number _____
2. Don't Know

(IF PURCHASING PROGRAM SPECIALTY CFLS)
Q25spec. How many of the **Specialty** CFLs you are purchasing today do you expect to install in the next 6 months?

1. Record Number _____

2. Don't Know

Q29. Do you plan to use any of the CFLs you are purchasing today to replace incandescent bulbs that still work?

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

(IF CUSTOMER IS NOT PURCHASING ANY CFL BULBS DISCOUNTED BY COMED)

Q30. Do you know that THIS STORE is selling CFLs that are discounted through a program by ComEd?

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

(IF YES)

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

1. ComEd sticker on the package
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 NON-DISCOUNTED CFLS)

Q32. The bulbs you are buying are NOT discounted by ComEd. Why did you choose these CFLs instead of the discounted ones? **(DO NOT READ, CIRCLE ALL MENTIONED)**

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

(IF CUSTOMER IS PURCHASING 1 OR MORE CFLS DISCOUNTED BY COMED, ASK Q33. OTHERWISE, SKIP TO Q32a)

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

1. Yes
2. No **(SKIP TO Q36)**
3. Don't know **(SKIP TO Q36)**

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

1. Yes
2. No **(SKIP TO Q37stan)**
3. Don't know **(SKIP TO Q37stan)**

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

1. ComEd sticker on the package
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. Other_____
9. Don't know

(IF CUSTOMER IS PURCHASING NON-DISCOUNTED CFLS AND KNEW ABOUT THE COMED DISCOUNT)

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

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

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

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

NOTE: REASSURE INTERVIEWEE THAT SURVEY IS ALMOST COMPLETE.

(IF PURCHSING STANDARD CFLS DISCOUNTED BY COMED)

Q37stan. I see you are buying **Standard** CFLs that are discounted by ComEd. If the ComEd discount had not been offered, and these CFL(s) had instead cost $**1** more per bulb, 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

(IF SOME OR NONE)

Q38stan. Would you have purchased a different type of light bulb instead of the CFLs if they weren't discounted? Or, would you have purchased fewer bulbs?
(DO NOT READ: IF OTHER TYPE OF BULB, PROBE FOR TYPE. MULTIPLE RESPONSES)

1. Would have purchased incandescent bulbs instead
2. Would have purchased halogen bulbs instead
3. Would have purchased LED bulbs instead
4. Would have purchased a mix of bulb types instead
5. Would have purchased fewer bulbs
6. Don't know

(IF PURCHSING SPECIALTY CFLS DISCOUNTED BY COMED)
Q37spec. I see you are buying **Specialty** CFLs that are discounted by ComEd. If the ComEd discount had not been offered, and these CFL(s) had instead cost **$1.50** more per bulb, 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

(IF SOME OR NONE)
Q38spec. Would you have purchased a different type of light bulb instead of the CFLs , or would you have purchased fewer bulbs?
(DO NOT READ: IF OTHER TYPE OF BULB, PROBE FOR TYPE. MULTIPLE RESPONSES)

1. Would have purchased incandescent bulbs instead
2. Would have purchased halogen bulbs instead
3. Would have purchased LED bulbs instead
4. Would have purchased a mix of bulb types instead
5. Would have purchased fewer bulbs
6. Don't know

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

1. Yes
2. No **(SKIP TO Q41stan)**
3. Don't know **(SKIP TO Q41stan)**

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

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

(IF PURCHASING STANDARD CFLS DISCOUNTED BY COMED AND SAW INFO OR DISPLAYS)

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

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

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

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

(IF NOT PURCHASING CFLs)
Q42. Did you consider purchasing any CFLs today?

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

Q43. Why didn't you? **(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. CFLs burn out too quickly
6. Dislike the light quality/color of CFLs
7. Need dimmable or 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. Prior experience with this incandescent model
13. Other _____
14. 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?

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

(IF YES)

LED2. Have you ever installed an LED bulb in your home?

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

(IF NO OR DON'T KNOW)

LED3. What has kept you from purchasing LED bulbs for your home?

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

EISA 2007 QUESTIONS

LAW1. In 2007, Congress passed a law to set higher energy standards for light bulbs. The law phases out 40 to 100 watt standard incandescent light bulbs over the next three years. Have you heard of these new light bulb standards before today?

1. Yes
2. No **(SKIP TO LAW3)**
3. Don't know **(SKIP TO LAW3)**

(IF LAW1 = 1)

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

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

LAW3. This year, the law affects 100 watt incandescent light bulbs. Once stores sell through their existing inventory of standard 100 watt incandescent bulbs, you will no longer be able to purchase them. Have you stocked up on extra 100-watt bulbs in anticipation of this change?

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

LAW4a. There is a new type of incandescent bulb that looks like a traditional incandescent light bulb, produces the same amount of light, but uses about one-third less energy. The news bulbs cost about $1.25 more per bulb than a traditional light bulb, but about $1.20 less per bulb than a CFL. Have your heard about or seen this new light bulb?

1 Yes
2 No
3 Don't know

LAW4b. The next time you need to buy a 100 watt light bulb, will you buy one of these new efficient incandescent light bulbs, a 100 watt equivalent CFL, or buy a lower wattage traditional incandescent, such as a 75 watt bulb, which is still available?

1 Lower wattage standard incandescent
2 100 watt equivalent CFL
3 New efficient incandescent bulb
4 Don't know

LUMEN QUESTIONS

Lumen1. How familiar are you with the concept of lumens?

1. Very Familiar
2. Somewhat Familiar
3. Not at all Familiar
4. Don't Know

(IF VERY OR SOMEWHAT FAMILIAR)

Lumen2. Approximately how many lumens do you believe a 100-watt incandescent bulb gives off? **(DO NOT READ)**

1. More than 1800
2. Between 1400 - 1800
3. Less than 1400
4. Don't Know

(IF THE CUSTOMER IS PURCHASING OR HAS EVER PURCHASED CFL BULBS)

WATT1a-d. When you are deciding which CFLs to purchase have you considered…

Watt1a. - The incandescent equivalent wattage printed on the CFL package?

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

(IF THE CUSTOMER IS FAMILIAR WITH THE CONCEPT OF LUMENS)

Watt1b. – Have you considered the lumen output printed on the CFL package?

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

Watt1c. – Have you considered the price of the CFL package?

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

Watt1d. – Have you considered the wattage of the CFL?

1. Yes

2. No
3. Don't Know

READ TO CUSTOMER:

Thank you for your time today. Here is a $5 gift card for this store which may be used today. May I have your contact information for our records? This information is strictly confidential and may only be used to verify your answers in a follow up call if necessary. It will not be sold or shared.

Name: _____
Zip: _____
Phone:_____

(IF THE CUSTOMER ASKS WHY WE NEED THEIR PHONE NUMBER, READ: "Phone numbers are being requested for a follow-up lighting study that will occur within the next year. Customers will be paid $100 for their participation in this follow-up study.")

SURVEY ENDING TIME:_____

Locate: Where in the store was this interview completed?

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

5.5.2 Shelf Survey Instrument

COMED PY4 RESIDENTIAL LIGHTING SHELF SURVEY

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

SS1. **What types of lighting information materials are present?** [CHECK ALL THAT APPLY. Please take a photograph of any materials present]

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

SS2. **Are there any end-cap lighting displays?** (If no, skip to SS3.)…… …..
Yes ☐ No ☐

a. Are CFL bulbs featured in the end-cap displays? …… ……..
Yes ☐ No ☐

b. Are ENERGY STAR® CFL bulbs featured in the end-cap displays? …….

Yes ☐ No ☐

c. Are ComEd-discounted CFL bulbs featured in the end-cap displays?…….

Yes ☐ No ☐

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

☐ By promotional materials on the end cap that showed ComEd as sponsor

☐ By consulting my shelf inventory sheet to see which bulbs were discounted

☐ Other (Please describe):_____

d. Are EISA compliant bulbs featured in the end-cap displays? ……..

Yes ☐ No ☐

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

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

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

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

5 Other (Describe)

_____

SS4a. **Is the retailer currently running other CFL promotions? (Discounted CFLs in addition to ComEd discount) If so, describe promotion:**

_____
_____
_____
_____

SS4b. **Is the retailer currently running promotions on any EISA compliant bulbs? If so, describe promotion:**

_____
_____
_____

[IF STORE SELLS CFLs AND OTHER TYPES OF LIGHT BULBS]

SS9. **Are the CFLs located in the same aisle/location in the store as the rest of the light bulbs? [CIRCLE ONE]**

1 CFLs always located with other types of bulbs near them

2 Some of the CFLs are located near other bulbs, and some CFLs are located on their own

3 All of the CFLs are located on their own with no other bulbs near them
4 Store sells no other types of light bulbs (store sells only CFLs)

SS10. **Where are the ComEd-discounted CFLs located? [CIRCLE ALL THAT APPLY.]**

1 In the same aisle with other CFLs
2 In the same aisle with other light bulbs
3 In a different aisle or location from all other bulbs (e.g., display near cash register)
Describe:
_____
4 Other location
Describe:
_____

SS11. **Do one or two particular CFL models (such as a 4-pack of GE Spiral bulbs) dominate inventory (i.e. make up more than 50% of total inventory)?**

1 Yes
2 No

If yes, provide manufacturer, style and wattage:

Manufacturer _____ Style_____ EStar?_____ #Bulbs/pkg _____ Watts_____

Manufacturer _____ Style_____ EStar?_____ #Bulbs/pkg _____ Watts_____

Also describe degree of dominance (e.g., 100+ packages of this model, 4 or 5 packages of each other model)**:**

_____
_____
_____
_____
_____
_____
_____
_____

Inventoried Products:

ComEd CFL Inventory (C)

- **(CS) Spiral Bulbs –** Please inventory all ComEd standard spiral CFLs that are of equivalent brightness to 75W-100W incandescent bulbs (typically 18W-30W CFLs, but use packaging as guide)

- **(CA) A-Lamp Bulbs –** Please inventory all ComEd A-Lamp CFLs that are of equivalent brightness to 75W-100W incandescent bulbs (typically 18W-30W CFLs, but use packaging as guide)
- **(CD) Dimmable Bulbs –** Please inventory all ComEd dimmable CFLs that are of equivalent brightness to 75W-100W incandescent bulbs (typically 18W-30W CFLs, but use packaging as guide)

Non-ComEd CFL Inventory (N)

- **(NS) Spiral Bulbs –** Please inventory all non-ComEd standard spiral CFLs that are of equivalent brightness to 75W-100W incandescent bulbs (typically 18W-30W CFLs, but use packaging as guide)
- **(NA) A-Lamp Bulbs –** Please inventory all non-ComEd a-lamp CFLs that are of equivalent brightness to 75W-100W incandescent bulbs (typically 18W-30W CFLs, but use packaging as guide)
- **(ND) Dimmable Bulbs –** Please inventory all non-ComEd dimmable CFLs that are of equivalent brightness to 75W-100W incandescent bulbs (typically 18W-30W CFLs, but use packaging as guide)

Incandescent Inventory (I)

- **(IS) Standard Incandescent Bulbs –** Please inventory all 75W-100W watt incandescent bulbs

Halogen Bulb Inventory

- **(H) Halogen Bulbs –** Please inventory all non-reflector Halogen bulbs that are of equivalent brightness to 40W to 100W incandescent bulbs

Bulb Inventory:

Model Number	Manufacturer	Type	2 letter code	CFL Wattage	Incand Equiv Wattage	Lumens	Qty in Pack	Location A=Aisle E=End-cap O=Other	Approx # of Packs [1-10, 11-25, 26+]	Retail Price	Original Retail Price (if on sale)	Discounted? U = Utility R=Retailer O=Other	Dimmable	Energy Star?
												☐U ☐R ☐O	☐	☐
												☐U ☐R ☐O	☐	X
												☐U ☐R ☐O	☐	X
												☐U ☐R ☐O	☐	☐
												☐U ☐R ☐O	X	☐
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												☐U ☐R ☐O	☐	☐
												☐U ☐R ☐O	☐	X