Commonwealth Edison Company
Energy Efficiency/Demand Response Plan
Plan Year 1 (6/1/2008-5/31/2009)
Evaluation Report:
Residential Energy Star® Lighting

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Submitted To:
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Final Report

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E EXECUTIVE SUMMARY

E.1 Evaluation Objectives

The goal of this report is to present a summary of the findings and results from the evaluation of ComEd's 2008 (PY1) Residential Lighting program. The main goals of this lighting program are to increase the market penetration of energy efficient lighting within ComEd 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. The primary objectives of this evaluation are to quantify the gross and net energy impacts resulting from the Residential Lighting program and to assess program participants' prior awareness of CFLs and satisfaction with the program.

E.2 Evaluation Methods

Table 1 provides a summary of the data collection activities conducted as part of this evaluation. As this figure shows, the primary data collection activities for this evaluation were a series of three computer-aided telephone interviews (CATI) that were conducted with random samples of program participants (both coupon and upstream markdown) and nonparticipants. Data collected during these interviews were essential in calculating both the gross and net program impacts.

Table 1: Data Collection Activities

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Tracking Data Analysis	All Retail Coupon Participants	Coupon Tracking Database	-	All	Ongoing
	All Retail Markdown Participants	Tracking Database	-	All	Ongoing
In-depth Phone Interviews	ComEd Residential Lighting Program Staff	Contact from ComEd	Residential Lighting Program Manager	1	April 2009
	Residential Lighting program Implementers	Contacts from ComEd	1 representative from APT 1 representative from EFI	2	April & May 2009
CATI Phone Surveys	Residential Lighting Coupon Participants	Coupon Database	Random Sample of Coupon Participants	100	June 2009
	Residential Lighting Upstream Markdown Participants	Residential CIS	Random Sample. Survey questions used to identify Program Participants	56	September 2009
	ComEd Nonparticipating Customers	Residential CIS	Random Sample. Survey questions used to identify Program NonParticipants	175	September 2009

E.3 Key Findings

The goal of this program was to sell 2.6 million discounted CFLs to residential customers within ComEd service territory. A total of 3,001,367 CFL bulbs were sold as part of the program resulting in a program sales realization rate of 115%. Table 2 below provides both the program reported and evaluation verified key gross and net savings parameter estimates (displaced watts, average daily hours of use, installation rate and net-to-gross ratio), as well as the first-year gross and net energy savings estimates.

Table 2: PY1 Gross and Net Parameter and Savings Estimates

Gross and Net Parameter and Savings Estimates	Program Reported	Evaluation Verified		
	Overall	Coupon	Upstream	Overall
Program Bulb Sales	3,001,366	21,836	2,979,531	3,001,367
Average Displaced Watts (Delta Watts)	48.9[1]	48.7		
Average Daily Hours of Use[2]	2.34	2.34		
Gross kWh Impact per unit	41.8[1]	41.6		
Gross kW Impact per unit	0.05[1]	0.05		
Installation Rate	95%	79%	70%	70%
Peak Load Coincidence Factor	0.081	0.081		
Total First-Year Gross MWh Savings	**119,151[1]**	**87,917**		
Total First-Year Gross MW Savings	**139.5[1]**	**102.9**		
Total First-Year Gross Peak MW Savings	**11.3**	**8.3**		
Net-to-Gross Ratio (1-FR)	80%	69%		
Total First-Year Net MWh Savings	**95,321**	**60,789**		
Total First-Year Net MW Savings	**111.6[1]**	**71.2**		
Total First-Year Net Peak MW Savings	**9.0**	**5.8**		

The 2008 net claimed energy savings for this program were 95,321 MWh[3], resulting in a net saving realization rate of 64%. The two primary drivers for this realization rate include:

1. The *Installation Rate* which was found to be 70%; 25% lower than program plans (95%). The majority of these uninstalled bulbs are reportedly in storage and will be installed when another bulb burns out. The energy savings from these stored bulbs was not counted as PY1 savings, but savings resulting from these future installations will be estimated in PY2 and PY3 evaluations.
2. The *Net-to-Gross Ratio* was found to be 69% based on customer self-reports, which is 86% of the estimate that was used for program planning (80%).

[1] Evaluation team derived from program reported net savings and gross and net savings assumptions.
[2] Residential daily HOU estimates are taken from DEER.
[3] Original goals for the Residential Lighting program were 75,809 MWh and 7.2 MW.

It is important to keep in mind when reviewing these PY1 results that this analysis is restricted by the lack of presales data from participating retailers (of which none is currently available), customer lighting logger data (which will be collected as part of the PY2 evaluation but was not available for PY1), and the sample sizes of upstream program participants (which are limited due to the lack of participant contact information that results from the upstream program delivery method). PY2 and PY3 evaluations will also include in-store intercept surveys that will seek to identify upstream non-coupon program participants at the time of program purchase in order to increase the sample sizes within the upstream channel.

Additionally, in a predominantly upstream lighting program such as this, marking the bulbs as program bulbs, either at the manufacturer with a Smart Ideas logo on the bulb itself or at the retailer level with a sticker on the package, can help in identifying program bulbs during both phone and on-site surveys. It allows customers and/or field staff to confirm the bulbs are truly program bulbs by checking for this program identification. In the case of the stickers, it still may be impossible to confirm installed bulbs, however any bulbs in storage may be confirmed if the sticker is still in place.

Key Process Findings

1. The main marketing effort of the program was in-store activities and displays. A majority of coupon program participants learned of the program in the store, which was consistent with this approach. However, most markdown participants were unaware of the ComEd discount.

2. Awareness of CFLs is not a barrier to participation in the program or to greater CFL use. Eighty-six percent of ComEd customers have heard of CFLs without being offered a description of the bulbs. Another 10% say they have heard of CFLs once they have been described.

3. Knowledge of the benefits of CFLs is a barrier to greater CFL use. Those who have not purchased CFLs give reasons that suggest misinformation such as their high cost and lack of energy saving benefit. Many also are waiting for their incandescent bulbs to burn out rather than replace the still functioning bulbs with CFLs.

4. CFL usage has increased based on self-reported counts of CFLs installed last year compared to this year. However, there is still much that can be done to expand the CFL market in ComEd territory. Forty-four percent of ComEd customers purchased at least one incandescent bulb in the past year. Eighty percent of those purchasers bought the bulbs for use in a regular light fixture. Over one-third of program participants also purchased incandescent bulbs during the past year.

5. Program participants and other purchasers of CFLs appear to be more motivated by the money saved on their utility bills from using CFLs than the environmental benefits.

6. Concern about mercury and CFL disposal is not widespread and does not pose a significant barrier to CFL adoption. However, the flip side to this lack of concern is use of improper disposal methods. A majority of those who have already disposed of CFLs simply threw them away rather than disposing of them in an environmentally safe manner.

1 INTRODUCTION TO THE PROGRAM

1.1 Program Description

The Residential Lighting program provides incentives to increase the market share of Energy Star (ES) qualified compact fluorescent lamp (CFL) bulbs 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 Residential Lighting program accounts for more than one-third of the expected ex ante MWh impacts of ComEd's 3-year energy efficiency portfolio and thus the program is very important to meeting ComEd's energy efficiency goals.

The majority of the Residential Lighting program is delivered upstream (at the retailer level) which minimizes the burden on consumers, thus lowering barriers to participation, but making program participant identification (and thus evaluation) more difficult. A small portion of the CFL rebates were delivered via in-store coupons[4] that allowed for the capture of participant name and contact information, however due to the small proportion of the overall sales these coupon represent as well as the limited retail categories where these coupons were distributed (restricted to small hardware stores) customers who participated via the coupon channel cannot be deemed representative of the entire participant population.

The Residential Lighting program kicked-off in June 2008 with a Quick Start launch aimed at three of the ten retailers participating in this program and rebated specialty bulbs exclusively. The seven remaining retailers were brought on-line starting in September.

1.1.1 Implementation Strategy

Selection of and Roles of Implementation Contractors

ComEd selected APT and EFI to implement the ComEd Residential Lighting program. They were selected based on their wealth of experience implementing other ENERGY STAR residential lighting programs across the United States. They have jointly implemented programs in Washington, Colorado, New Mexico and Florida and have separately worked on programs in at least 16 other states.

APT serves as an advisory role to ComEd and is responsible for implementing the program in terms of the securing and maintaining the relationships with the retailer/manufacturer partners that are involved in the program. APT oversees the RFP process to recruit retailers and manufacturers to participate in the program, from reviewing the submitted proposals to suggesting SKU mixes for stores to negotiating the incentive levels to signing the Memorandum of Understanding (MOU). APT sends trained field representatives into the stores to educate retailer employees as well as customers about the program, makes sure the required POP materials are visible and does special events to help promote the program. APT is very involved in the day to day operations of the residential lighting program. It is the APT field

[4] Coupon sales account for less than 1% of program sales (traditional spiral bulbs only) and were the sole means of program participation at two of the eleven program retailers.

representatives that are the true face of the program because they are the ones that are interacting with the retail employees and customers on a frequent basis.

EFI is a subcontractor to APT that APT has utilized in about 90% of the programs they have implemented. Their primary role is processing incentive payments for the coupon and markdown program to industry partners. They collect all of the sales data that is required by ComEd for retailers to participate in the program and are responsible for paying retailers for their participation in the program. In the very beginning, EFI takes all of the information from the MOU (participating stores, program SKUS, incentive levels, etc) and loads it into their system so that when retailers submit sales data and invoices for payment, EFI can verify that the sales occurred at participating retailers, on program products, and at the right incentive level. EFI's goal is to make payments within three weeks of receiving sales data and has met that goal on nearly all records.

ComEd and APT have a very solid working relationship. They are in constant communication about the program and have not had any issues. The same is true for the relationship between APT and EFI. They have worked together on numerous lighting programs and have a very strong working relationship with clear channels of communication. Both teams bring a lot of experience to the ComEd Residential Lighting program and have proven to be very successful in helping ComEd greatly exceed their goal of selling 2.6 million bulbs.

Program Timeline

In order to get the program off of the ground quickly after APT was selected as the implementation contractor, a Quick Start phase of the program began on June 21, 2008 and ran through September 30, 2008. The retailers selected for the Quick Start (Phase 1) program were CostCo, Home Depot and Sam's Club. APT advised that these big box retailers would be key to creating a big presence immediately. During this phase of the program the only bulbs that were included were specialty CFLs. APT wanted to test the market and make sure that the stores did not sell through their allocations in a quick period of time. The goal of the program is to transform the market, which is facilitated by encouraging customers to try CFLs in fixtures they would normally consider as inappropriate for CFLs. During this phase, the program was active in about 90 retailer locations. Approximately 251,000 bulbs were sold through the Quick Start phase of the program.

The standard launch of the program (Phase 2) occurred on October 1, 2008 and lasted through December 31st. During this second phase, a wider range of CFLs were introduced, including spirals. Phase 3 started on January 1, 2009 and went through May 31, 2009. Some retailers sold more bulbs than had been expected during Phase 2 so APT was careful to monitor sales in Phase 3 to ensure that stores still had bulbs to sell as close to the end of Program Year 1 (May 31, 2009) as possible. Retailers were added throughout Phase 2 and Phase 3 of the program.

Program Delivery Mechanisms

In order to promote maximum retailer participation and the allow a variety of retailers to participate, the Residential Lighting program offered retailers two rebate delivery mechanisms, upstream markdowns and in-store coupons.

Upstream Markdowns

APT and ComEd prefer markdown partnerships because incentives are paid upon product sale, not upon product shipment, as is done with a buydown program. APT does not believe that an incentive should be paid upon shipment because there is no indication that the products are sold. With these partnerships,

discounted bulbs are listed at lower retail price on the shelves or automatically marked down at the register. There are signs indicating the bulbs are discounted through ComEd, but customers may still be unaware that they are purchasing bulbs discounted through the program. They are also not asked to provide any contact information for follow up.

In order to participate in the markdown program, retailers are required to have a centralized automated data system that shows POS (Point-of-Sale) data at the individual store level for submission to APT/EFI for incentive payment. These types of systems are typically found in big box national chain stores. For stores involved in the markdown program, the MOU is signed at the corporate retailer level. For example, all of the stores of a particular retailer that are in ComEd's territory are required to participate in the program and are listed in the MOU. If the retailer has this data pull capability, all of their stores are included in the markdown program. Retailers that have the data pull capability in a majority of its stores but not all are allowed to include the remaining stores in the coupon program. This was the case with one retailer in PY1.

In-Store Coupons

Customers purchasing bulbs at stores participating in the coupon program receive a discount on program bulb purchases by filling out and redeeming a coupon at time of purchase. The customer has to provide his or her name, address, and bulb information. Customers can purchase a maximum of 12 bulbs at a time (with a separate coupon required for each package). Coupon retailers then submit the completed coupons to EFI for reimbursement of rebate expenditures.

Stores participating in the coupon program do not have POS capability, are typically smaller in nature, and tend to be individually owned. These stores are the only ones that are eligible for the coupon program. For these retailers, the MOU is signed at the individual store level. This means that each individual store location decides whether or not to sign up for the program. The coupon portion accounts for a very small part of the entire program, less than 1% of program bulbs sold.

Retailer Recruitment

The retailers for the Quick Start (Phase 1) were proposed by APT as retailers already selling product SKUs they felt would work well to provide maximum exposure to the program without selling through too many bulbs too quickly. The retailers selected for the Quick Start program were CostCo, Home Depot and Sam's Club.

For Phase 2 through the end of the Program Year 1 (May 31, 2009), APT approached manufacturers and retailers to participate in the program. APT only considered existing manufacturer and retailer partnerships. APT would not consider a manufacturer that was not already selling product through a retailer. When retailers/manufacturers decide to participate in the program, all participating parties -- ComEd, the retailer and the manufacturer – sign a Memorandum of Understanding (MOU). The MOU includes information about the stores included in the program, the products and their price points. This is the case for both the coupon program and the markdown program. The retailer mix was developed to reach the widest demographic possible and to make sure that a variety of retailer store types across the entire ComEd territory sold program bulbs.

Retailer Participation

In total, there were 11 retail chains that participated in the Residential Lighting program which amounted to approximately 515 individual retail locations. Retailers were recruited by responding to an RFP issued by ComEd. Table 3 below lists the retailer categories that participated in the PY1 Residential Lighting

program, including the number and percentage of program bulbs and/or fixtures sold in each of the participating retailer categories, the number of storefronts within each of these categories, and the delivery method utilized by the category for program participation. As this table shows Big Box/DIY (Do It Yourself) stores were the largest category of participants accounting for 53% of the total program bulb sales. Grocery stores, while having the largest number of participating storefronts had the lowest overall program sales. This table also shows that overall more than 99% of the program bulbs were distributed through the markdown delivery channel.

Table 3: Retailer Participation

Retailer Category	CFLs Sold	% of CFLs Sold	Storefronts	Delivery Mechanism
Big Box/DIY	1,599,042	53%	136	Markdown
Warehouse	882,931	29%	33	Markdown
Grocery	115,664	4%	180	Markdown
Small Hardware	403,730	13%	166	Coupon/Markdown
Total Coupon	**21,836**	**0.7%**	**32**	**Coupon**
Total Markdown	**2,979,531**	**99.3%**	**483**	**Markdown**
Program Total	**3,001,367**	**100%**	**515**	**All**

Source: Evaluation team analysis of ComEd Tracking database

The Memorandums of Understanding (MOUs) that were negotiated with each of the program retailers set forth a specific number of bulbs that could be sold at the program discounted price. Some of the stores, especially in the grocery channel, had a much higher demand than anticipated and thus ran out of program bulbs by late January, four months before the program was scheduled to end. Another retailer had to start and stop the promotion due to higher than expected product sales and a fear of running out of the particular product. The program also encouraged a number of the retailers to bring in bulbs outside of their normal stocking mix.

Product selection

APT and ComEd work to ensure that a wide variety of independently tested, ENERGY STAR CFLs would be available for the ComEd Residential Lighting program. APT has advised the program to incentivize both spirals and specialty bulbs across a wide mix of wattages. The program is intended to transform customers lighting buying behavior, and part of that is exposing customers to different products that can be used in a variety of applications. For Program Year 1 APT, selected products that were successful in the "Quick Start" launches of other programs they had implemented.

APT uses a number of criteria to determine whether a retailer/manufacturer partnership is a good fit for the program. APT examines the proposed product mix to ensure it includes a variety of bulb types and wattages. A focus on a single wattage or on spiral CFLs excludes customers who need other wattages or a specialty CFL. Because more people have become aware of CFLs in recent years due to other information campaigns and programs, an emphasis on spiral CFLs could make it difficult for the program to achieve its net savings goals as a greater number of participants would have been likely to buy spiral CFLs than specialty bulbs without the program incentive. APT is also concerned about the number of bulbs in the packages sold through the program. APT tries to match the package size to the retailer type. For example, smaller packages sell better at grocery stores so APT does not allow grocery partnerships to sell packages containing more than four bulbs. Across all retailers, APT limits the number of SKUs sold that have large

package sizes. Packages with 10 or more bulbs typically have low installation rates with a number of bulbs ending up in storage.

After reviewing the proposed products, APT provides its recommendation for each retailer to ComEd and obtains approval for the products that will be included in the program as well as the negotiated incentives.

Table 4 shows the distribution of program bulbs sold in PY1 across the three bulb types (Standard, Specialty and Fixtures) and the products (wattage for standard and bulb type for specialty). As this table shows 68% of the bulbs sold through the program were standard CFLs, 32% were Specialty CFLs and less than 1% were Fixtures. Within the Standard CFL group the majority of bulbs sold (73%) were low-wattage CFLs (9-15 watt). The majority of the Specialty CFLs sold were Reflectors (70%) followed by Globes (16%).

Table 4: Distribution of Residential Lighting Program Sales

Bulb Type	Product	Bulb Sales	%	Bulb Type Sales	%
Standard	40 Watt Replacement	205,358	7%	2,026,706	68%
	60 Watt Replacement	1,288,078	43%		
	75 Watt Replacement	178,947	6%		
	>=100 Watt Replacement	354,323	12%		
Specialty	3-way Bulb	2,330	0%	964,633	32%
	A-bulb	120,056	4%		
	Globe	154,376	5%		
	Lamp Post	1,484	0%		
	Dimmable Reflector	11,941	0%		
	Reflector	674,446	22%		
Fixture	Fixture	10,028	0%	10,028	0%
All Residential Lighting		**3,001,367**	**100%**	**3,001,367**	

Source: Evaluation team analysis of ComEd Tracking data

Program Incentives

Table 5 below provides the average retail price, incentive, discounted price and resulting discount percentage across five bulb types. As this exhibit shows discounts for standard CFLs averaged less than $0.75 per bulb, whereas discounts on specialty bulbs averaged around $1.50 per bulb and those on fixtures were all $10 per fixture. The average discount across all bulbs was around 35% off retail prices, while on fixtures it was nearly half off retail prices.

Table 5: Average Pre and Post Incentive Prices by Bulb Type

Bulb Type Category	Average Retail Price	Average Incentive	Average Discounted Price	% Discount
High Wattage	$2.91	$0.99	$1.88	34%
Low Wattage	$1.82	$0.66	$1.20	37%
Reflector	$3.37	$1.03	$2.34	31%
Other Specialty	$4.71	$1.74	$3.01	37%
Fixtures	$22.38	$10.00	$13.38	43%

Source: Evaluation team analysis of ComEd Goals Tracking spreadsheet

Table 6 is similar to the table above but is broken down by store type rather than bulb type. This table is focused solely on bulbs and thus excludes fixtures. As this table shows, incentives were lowest at warehouse stores and were highest among the small hardware stores. The average incentive across all standard and specialty program bulbs was $0.99 which was on average a one-third reduction in price over the average non-discounted retail price.

Table 6: Average Pre and Post Incentive Prices by Store Type[5]

Retailer Category	Average Retail Price	Average Incentive	Average Discounted Price	% Discount
Big Box/DIY	$2.98	$1.05	$2.01	35%
Warehouse	$2.50	$0.77	$1.73	31%
Grocery	$3.01	$1.15	$1.86	38%
Small Hardware	$2.59	$1.17	$1.25	45%
Program Total[6]	**$2.80**	**$0.99**	**$1.83**	**35%**

Source: Evaluation team analysis of ComEd's "Goals Tracking" spreadsheet

The ComEd lighting program did not just discount pre-stocked lighting products. It was also responsible for bringing new products into the retail stores. Overall approximately 10% of bulbs sold through the program were SKUs new to the retailer and one-third of the fixtures sold were new SKUs as well.

Retailer Education and Outreach

Field representatives are at the heart of the ComEd Residential Lighting program and are trained to provide information about the program to the retailer partners. The training is usually one-on-one and will educate the employee on ENERGY STAR®, the features and benefits of CFL usage, a basic lesson on how the bulbs work, what types are available for different applications, educate them on mercury content and train the employee how to distribute this information to the customers in the store. There are

[5] Excludes Fixtures

[6] Excluding Fixtures

occasions where the field representative will be given the chance to present at all-store meetings, staff and store manager meetings.

Retailers are also given a manual with information about the program, for reference. The field representative goes through this manual with the store manager and lighting employees to give employees a good understanding about the program, how they need to put the point of sale materials up, etc.

Bulb Recycling

ComEd has sponsored bulb recycling efforts at the Home Depot and Ace Hardware locations in ComEd territory. For the recycling efforts at Home Depot, ComEd paid a onetime fee to have their logo placed on all of the recycling bins at the Home Depots in the ComEd territory. Home Depot's recycling program was already established, and ComEd did not assume any of the recycling costs or responsibilities.

For the recycling efforts at Ace Hardware, ComEd has partnered with the Illinois EPA and Ace Hardware to provide a recycling opportunity for customers in the stores in ComEd's territory. The recycling costs are split evenly between Ace Hardware, ComEd and the Illinois EPA. The program is supported by APT representatives and marketed through window signage in the stores. There are about 160 Ace Hardware locations participating in this recycling program.

1.1.2 Marketing Strategy

The marketing of the ComEd Residential Lighting program is done primarily through in-store promotions. The program has also been promoted through bill inserts, mention in the ComEd newsletter (Energy @ Home) and through a ComEd website that educates customers about ENERGY STAR® CFLs and participating retailers.

POP Materials

For the coupon program, ComEd uses signs to alert the customer to look for coupons for discounts on ENERGY STAR® qualified bulbs and also chipboards where the coupons are posted, that have the same color scheme, look and feel as the vertical beam sign.

For the markdown portion of the program, there are signs that display the "Smart Ideas" and ComEd logos that alert customers to the fact that the "special price" they are paying is made possible through ComEd. Other POP materials include magnets and special pricing stickers that tell customers how to save energy and alert customers that ComEd is sponsoring the markdown program.

APT Field Representatives

APT services each participating retailer through a field representative that comes in at least once every 4 to 6 weeks. Some stores, mainly big box retailers, are seen weekly. The field representative is responsible for making sure that the retailer is displaying the promotional materials that are required for participation in the program and that products are incentivized correctly. The field representatives are responsible for training the employees (lighting, electrical, cashiers, front end and department supervisors, as well as assistant managers) on the program and on the benefits of CFL usage.

The shelving area surrounding qualified products should be labeled with pricing signs identifying the sponsor (ComEd). When evaluating merchandising, the manager ensures that ComEd signage is only

associated with qualified products and is presented in a neat and professional manner. POP materials are assessed, including identifying any "missed opportunities" for signage.

Customer Outreach

The field representatives are required to do two customer outreach retail demonstrations in their territory, twice a month. In the first year of the program, the goal was 120. The goal for Program Year 2 is 225. These demonstrations usually include the representative setting up a table and educating customers about lighting. These special events are very important to the program because it is face time with the actual customer and ratepayer. Some promotional items for the in-store lighting demonstration include a tear-off sheet that explains how to choose which type of lighting and where to use it in your house, recycled money pens, CFL fans, ComEd key chains, etc. Other information cards and handouts are also available.

In addition to this process, there is daily contact between the field representative and program coordinator, so that the coordinator is aware of the field representative's activities and can answer any questions he or she may have. Field staff are required to fill out Daily Site Call Reports, posted to a proprietary APT Microsoft Access database system, in which they record all time, mileage and expenses occurred for each retailer visit they conduct. Additional store visits and ride-a-longs are completed by the program coordinator as well as other individuals involved in the program at APT.

1.2 Evaluation Questions

The evaluation sought to answer the following key researchable questions. Some of the researchable questions will be addressed in Program Years 2 and 3.

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, and how can it be reduced? What is the level of spillover associated with the program?
3. Did the program meet its energy and demand goals? If not, why not?

Process Questions:

1. Has the program as implemented changed from the plan filed on November 15, 2007? If so, how, why, and was this an advantageous change?
2. What is the effectiveness of the program implementation, design, delivery method, and the marketing efforts?
3. What is the customer experience and satisfaction with the program and program bulbs?
4. What are the market effects induced by the program?

2 EVALUATION METHODS

The process and impact evaluation of the Residential Lighting program will utilize numerous analytic methods, as well as data collection activities, over the course of the PY1 through PY3 evaluations. This section presents an overview of these analytic methods with additional detail provided for the methods used in this first year of the 3-year evaluation. It also provides details on the data collection activities implemented for PY1, including the data sources and sample designs used as a base for these data collection activities.

2.1 Analytical Methods

The analytic methods used for the evaluation of the Residential Lighting program were driven to a large extent by the data available for programs such as this that are delivered upstream at the retailer level. This delivery tactic, 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. Lack of participant contact information makes assessing participant satisfaction with the program and impacts attributable to the program much more difficult.

A secondary challenge encountered in the evaluation of the Residential Lighting program stems from the fact that there are many outside factors, such as global warming and the present economic condition, that are currently accelerating CFL adoption through the US. These factors are very difficult to control for and thus can present measurement challenges within dynamic markets such as this. As a result, a number of analytic methods will be applied over the course of this evaluation (spanning 3 Program Years: PY1, PY2 and PY3) to assess net program impacts. This allows for triangulation of results across the various methods to provide an estimate net program savings that is representative and robust for these dynamic and challenging market conditions.

2.1.1 Methods Used for PY1

Gross Program Savings

Gross energy and demand (coincident peak and overall) savings resulting from the PY1 Residential Lighting program were calculated using the following savings algorithms:

Per Unit kWh Savings = Delta Watts * HOU * Installation Rate

Where HOU = Hours of Use

Annual kWh Savings = Program bulbs * Per Unit kWh Savings

Per Unit kW Savings = Delta Watts/1000 * Installation Rate

Annual kW Savings = Program bulbs * Per Unit kW Savings

Per Unit Peak kW Savings = Per Unit kW Savings * Mean Load Coincidence Factor

Where Mean Load Coincidence Factor is calculated as the percentage of program bulbs turned on during peak hours (weekdays from 1 to 6 p.m.) throughout the summer.

Annual Peak kW Savings = Program bulbs * Per Unit Peak kW Savings

Table 7 below shows the data sources used to estimate the input parameters in the energy and demand savings algorithms for the Residential Lighting program. Each of these parameters is described in further detail below.

Table 7: Gross Savings Parameter Data Sources

Gross Savings Input Parameters	Residential Lighting program
Rebated Bulbs/Measures	Program Tracking Data
Delta Watts	Participant Phone Surveys / RMST[7] Report/DEER
Hours of Use	Participant Phone Surveys / DEER[8]/Mini Logging Study (PY2009)
Installation Rate	Participant Phone Surveys
Mean Load Coincidence Factor	DEER

Program Bulbs

The number of bulbs distributed through the program is a key parameter in the calculation of total gross and net program savings and is derived from the Residential Lighting tracking databases (upstream and coupon) provided to the evaluation team by ComEd.

Delta Watts

The delta watts parameter is a measurement of the wattage displaced by the newly installed program CFL. To estimate the number of watts displaced by the program bulb, surveyed participants were asked about the wattage of the program discounted CFL, about what type of bulb was replaced when the program CFL was installed (Incandescent, CFL, Halogen, other), and they were asked to estimate the wattage of the bulb that was replaced. Once these three items are known, the displaced watts (or delta watts) can be calculated as the difference between the wattage of the replaced bulb and the wattage of the new CFL.

Hours of Use (HOU)

In order to estimate the energy savings resulting from a newly installed CFL, it is necessary to understand the number of hours the lamp is turned on each day (which can then be annualized by multiplying the daily value by 365 days). Assuming you have two bulbs that have displaced the same number of watts, the lamp that is turned on for a greater percentage of time over the course of the year will yield a larger number of kilowatt hours saved. During the phone surveys, participants were asked to estimate the average number of hours per day each of their installed program bulbs was turned on. This data allowed

[7] RMST report refers to Itron Inc., *California Residential Efficiency Market Share Tracking: Lamps 2007*. Prepared for Southern California Edison, December 2008.

[8] DEER stands for *The Database for Energy Efficient Resources* and contains information on selected energy-efficient technologies and measures. It has been developed by the California Public Utilities Commission (CPUC) with funding provided by California ratepayers.

for the calculation of an average self-reported HOU estimate across all installed program bulbs. However as part of this study we reviewed a past lighting evaluation[9] that collected both self-reported HOU estimates collected on-site and metered hours of use. It found that self-reported estimates of hours of use can be highly inaccurate (in the case of this study the self-reported HOU were overestimated by a factor of one-third). Based on this concern with the inaccuracy of the self-reported data, it was decided to turn to a more reliable data source. Because the budget for this evaluation did not allow for conducting a lighting logger study in PY1, the HOU estimates used to calculate the ex post program impacts were based on the DEER HOU estimates[10] that were used to create the ComEd program plans and ex ante savings estimates.

Installation Rate

In order for a program bulb to receive credit for energy savings to the Residential Lighting program within a given program year, it must be installed within that program year. All surveyed customers were asked whether or not they had installed (and not since removed) all or a portion of the program CFLs they had purchased and their responses were used to calculate the PY1 installation rate for the Residential Lighting program.

Mean Load Coincidence Factor

The mean load coincidence factor allows for the estimation of the average demand savings that occur during ComEd's peak period (summer weekdays from 1 to 6 p.m.). It is calculated as the percentage of time customers self-reported their installed program bulbs were turned on during the peak period.

Energy Interactive Effects

Recent research has focused on the incremental electric savings and gas usage resulting from customers' adoption of CFLs. The cooler temperatures at which CFLs run can lead to decreased air conditioning loads during the peak summer months; however they also can lead to increased electric or gas heating during the winter months. Estimating these interactive effects on heating and cooling energy use was outside the scope of the PY1 evaluation; however it will be addressed in the PY2 study.

Net Program Savings

The primary objective of the net savings analysis for the Residential Lighting program is to determine the 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 (NTG) ratio that quantifies the percentage of the gross program impacts that can reliably be attributed to the program. The NTG ratio can be thought of as a metric of program influence.

As part of the PY1 Residential Lighting evaluation two methods were used to estimate the NTG ratio. The first and primary method was the customer self-report method, which uses data gathered during the two participant phone surveys to estimate what percentage of participant purchases can be attributed to

[9] KEMA, *CFL Metering Study*. Prepared for California's Investor-Owned Utilities (PG&E, SCE, SDG&E and SoCalGas), February 2005.

[10] The DEER HOU estimates are based on lighting logger studies conducted in California.

the program. The second method used was a comparison state method which uses data from non-program states to estimate monthly household CFL sales rates in regions where lighting programs are currently not active and compares these sales rates to the those within ComEd service territory. This method is based on the premise that all incremental sales above the non-program state sales rates can be attributed to the program. The comparison state method was applied, in part, because of its recent application in the evaluation of the Ameren Illinois Residential Lighting program and our desire to apply consistent methods between these two evaluations where possible. However, because of the major differences in customer demographics and other factors, we believed this method would be less reliable in the ComEd territory, and ultimately placed more credence on the results of the self-report method.

Estimating the NTG ratio using the self-report method requires the calculation of free-ridership and spillover (both participant and nonparticipant). Once these three parameters have been estimated the Net-to-Gross (NTG) ratio can be calculated as follows:

NTG Ratio = 1 – Free-ridership Rate + Spillover Rate (Participant and NonParticipant)

Free-Ridership

Free-ridership for this evaluation was calculated using a customer self-report method. This method calculates free-ridership using data collected during participant phone surveys concerning 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 is a multi-step process that calculates a Program Influence score and a No-Program score for each customer and then combines those two scores to come up with a customer-level free-ridership score. The Program Influence and No-Program scores can take values of 0 to 10 where a lower score indicates a higher level of free-ridership. Program-level free-ridership is then determined by taking a 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 0 to 10 where 0 equals not at all influential and 10 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? and
4) How likely is it (on a scale of 0 to 10 where 0 equals not at all likely and 10 equals very likely) that they would have bought the same CFLs in the absence of the program?

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.

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

Two types of spillover were estimated for this evaluation; Participant and Nonparticipant spillover. Spillover for both participants and nonparticipants 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.

The participant and nonparticipant surveys fielded as part of this evaluation gathered information on CFL lighting installations that were made by Program participants and nonparticipants for which they did not receive a Program rebate. The information collected included:

a) The quantity and type of the efficient lighting equipment installed without a rebate,

b) The degree of self-reported influence of the Program on the decision to purchase the efficient lighting equipment, and

c) Whether the customer received any rebates whatsoever for the installation or purchase of high efficiency lighting equipment (to confirm the measure was not rebated).

Lighting purchases were considered a spillover adoption if the following conditions were met:

a) The lighting product was energy efficient.

b) The degree of self-reported influence of the Program on the purchase of the energy efficient lighting equipment was sufficiently high to reasonably conclude that the adoption would not have occurred in the absence of the Program. Additionally for nonparticipants this required that the customer was aware of the Smart Ideas Lighting Program prior to making the purchase.

c) The customer did not receive any rebates whatsoever for the efficient lighting purchase.

The participant spillover rate was calculated by summing the spillover adoptions over all program participants and then dividing it by the total number of purchases made through the program. The nonparticipant spillover rate was calculated in a similar manner as participant spillover except the spillover adoptions were divided by the number of surveyed customers. This value then was applied to the appropriate population of nonparticipating customers to estimate the number of spillover adoptions occurring in that population.

Comparison State NTG Approach

The comparison state method uses data collected from states where lighting programs do not exist (non-program states) to estimate the monthly CFL sales rate that would occur in the absence of any lighting programs. When applying this method the monthly CFL sales rates between the program and non-program areas are compared and any increase in sales rate is attributed to the program. To estimate the NTG ratio one then multiplies this incremental sales rate by the length of the program and the number of residential customers within the service territory and divided by the total number of bulbs sold through the program.

2.1.2 Net Impact Methods to be Used in PY2 and PY3

As mentioned previously the methods used to estimate net program impacts will be expanded upon in PY2 and PY3. The additional methods to be used in these program years include:

1. *Supplier (Manufacturer/Retailer) Self-reports* – For PY2 and PY3 interviews with participating and nonparticipating retailers, and participating manufacturers will also be used to estimate CFL sales with and without the program rebates in order to estimate the net program impacts (accounting for both free-ridership and spillover).
2. *Demand Modeling* - Data will be collected from ComEd residential customers and lighting program participants in PY2 and PY3 in order to estimate a demand model that can accurately access the market-level impacts resulting from the Residential Lighting program. CFL adoption is likely causally related to CFL prices, CFL knowledge/awareness, CFL availability, and customer characteristics such as income levels, attitudes, and preferences. Demand models hold promise since program-induced changes in key adoption influences, such as retail prices, should translate into changes in consumer adoption. Data collected during the next two years will include items such as revealed preference data (on topics such as willingness to pay at specific price points for specific bulb types/characteristics), CFL and general EE awareness, various customer characteristics (such as pre-disposition for taking energy efficient actions, etc.)
3. *Per-capita Sales Comparison* – Per-capita sales comparisons can be done using either a comparison state with no rebate programs or pre-promotion CFL sales data from participating retailers to estimate non-program CFL sales. The PY1 evaluation attempted such a comparison using non-program state data from a California market effects study. However, due to limited data access and key differences in demographic characteristics and other aspects, this method did not produce meaningful results.

2.2 PY1 Data Collection Activities

The data collected for the evaluation of the PY1 Residential Lighting program was gathered during a number of activities including in-depth phone interviews with ComEd program staff and program implementers at APT and EFI, Computer Assisted Telephone Interviews (CATI) conducted with Residential Lighting program participants and nonparticipating ComEd residential customers, and ComEd tracking data analysis. Table 8 below provides a summary of these data collection activities including the targeted population, the sample frame, and timing in which the data collection occurred.

Table 8: Data Collection Activities

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Tracking Data Analysis	All Retail Coupon Participants	Coupon Tracking Database	-	All	Ongoing
	All Retail Markdown Participants	Tracking Database	-	All	Ongoing
In-depth Phone Interviews	ComEd Residential Lighting Program Staff	Contact from ComEd	Residential Lighting Program Manager	1	April 2009
	Residential Lighting program Implementers	Contacts from ComEd	1 representative from APT 1 representative from EFI	2	April & May 2009
CATI Phone Surveys	Residential Lighting Coupon Participants	Coupon Database	Random Sample of Coupon Participants	100	June 2009
	Residential Lighting Upstream Markdown Participants	Residential CIS	Random sample from the entire population. Survey questions used to identify Program Participants	56	September 2009
	ComEd Nonparticipating Customers	Residential CIS	Random sample from the entire population. Survey questions used to identify Program NonParticipants	175	September 2009

2.2.1 Data Sources

Tracking Data

The tracking data delivered for this evaluation consisted of four databases, three corresponding to the upstream lighting sales and one for the coupon sales. These databases included the following:

- *Residential Lighting Project Info Database* - This database was the primary upstream lighting database and contained a record for all 45,634 retail program bulb sales invoices (by model number and store). The key variables in this database included the retailer store name and address, the MOU number, the bulb description and model number, the number of program bulbs sold, the rebates paid for these program bulbs, and the date of invoice.
- *Residential Lighting Retailer Database* - This database contained the names of all participation program retailers, the retailer id assigned to the retailer, and the number of stores the retailer had participating in the program.
- *Residential Lighting Measure Lookup Database* - 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 both the wattage of the CFL and the wattage of its incandescent equivalent, the bulb's rated life, the number of bulbs included in the pack, and the bulb manufacture.
- *Residential Lighting Coupon Database* - This database contained a record for all 19,657 customers who purchased a program bulb using a ComEd coupon at one of three coupon retailers (small hardware stores). This database contained key information including the name, address and

phone number of the coupon participant, the model and manufacture of the program bulbs purchased, the store where the program bulbs were purchased, the wattage grouping of the bulbs purchased, the date of the program purchase and the number of bulbs in the program package.

The final tracking databases for this program were quite thorough and easy to use, although changes in the database layout and duplicate records were problematic in the early stages of the evaluation. A few inconsistencies were found and should be more accurately audited in future program years (such as the number of stores for a particular markdown retailer, the wattage and number of bulbs included in coupon rebated packages).

Program and Implementer Staff Interviews

Three in-depth interviews were conducted as part of this evaluation. One of these interviews was conducted with the ComEd Residential Lighting program Manager (Alicia Forrester), one with the APT Implementation Manger (Stan Mertz), and the third was completed with the EFI Fulfillment Manager (Brad Steele). These interviewers were completed over the phone in April and May of 2009. The interview with the Residential Lighting Program Manager focused on program processes to better understand the goals of the program, how the program was implemented, the perceived effectiveness of the program, and also verified evaluation priorities. The interview with the APT Implementation Manager explored the implementation of the program in more detail and also covered areas of data tracking and quality assurance. The interview with the EFI Fulfillment Manager also explored the program implementation and focused on payment processing and program tracking data. The interview guides used for these interviews are included in Appendix Section 5.1.1.

CATI Phone Survey

In total two CATI surveys were conducted with ComEd residential customers. These included:

- A 100-point survey with program participants who utilized one or more in-store coupons to purchase a discounted CFL at either three small hardware stores between August 1st, 2008 and February 28th, 2009.
- A 231-point general population survey with a random sample of ComEd residential customers. This survey yielded:
    - 56 completed surveys with program participants who purchased one or more discounted CFLs (standard twisters, specialty bulbs and/or CFL fixtures) at one of the other nine participating retail stores[11] between June 2008 and September 2009.
    - 175 completed surveys with ComEd residential customers who did not purchase a program discounted CFL between June 2008 and September 2009.

The two program participant surveys focused on questions to estimate the gross and net program impacts and to support the process evaluation. Specifically for the determination of net program impacts, data was gathered to calculate self-reported levels of free-ridership and participant spillover, as well as to assess

[11] Two customers who reported purchasing program bulbs at one of the small hardware stores were removed such that the sample was representative only of customers purchasing bulbs through the markdown channel.

baseline sales and usage levels for per-capita sales comparisons and levels of "green" preferences that can be used in future demand modeling activities. The general population survey sought to assess levels of self-report nonparticipant spillover as well as support the demand modeling and per-capita sales comparison activities mentioned previously that will take place in future evaluation years.

For the process evaluation, the surveys contained questions on awareness of the ComEd Residential Lighting program and sources of program awareness, satisfaction with the program, familiarity with and usage of CFLs, attitudes regarding CFLs, barriers to purchasing CFLs, and overall lighting purchase behaviors. All CATI surveys were administered by Opinion Dynamics Corporation (ODC).

Coupon Participant Survey

The coupon participant survey was directed towards customers who purchased program bulbs using coupons at three small hardware stores between August 2008 and February 2009. These surveys assessed all of the parameters necessary to calculate gross energy and demand impacts (installation rates, displaced wattages, hours of use including peak period usage) as well as free-ridership and spillover. Additional data was collected from these participants on topics such as program and bulb satisfaction for the process component of the evaluation and various other topics to support future demand modeling and per-capita sales comparison activities.

Sampling

The sample of coupon participants was selected from the Residential Lighting Coupon Tracking Database provided to the evaluation team on May 1st, 2009. This database contained 16,651 records, one for each qualifying coupon purchase between August 4th 2008 and February 15th 2009. A series of data cleaning steps was completed in order to aggregate the data to a level representing all coupon bulb purchases made by a unique ComEd residential customer (or household) at a participating retailer in a given month. This effort was complicated due to the fact that the customers hand filled out the rebate coupons at the retail store locations (and most likely at a rapid pace) and thus, there were many instances where the name, address or phone number were not data entered correctly into the coupon tracking database. This meant that there were cases where the individual records could not be easily collapsed using routine matching algorithms and instead had to be manually reviewed and aggregated. All records with missing or invalid phone numbers were removed from the sample (since these are necessary components for telephone surveys). In addition, instances where a unique residential customer purchased coupon bulbs either from multiple stores or on multiple shopping trips were reduced to one by selecting the retail transaction that accounted for the largest number of the program bulbs purchased by that customer. Although these records were removed from the coupon bulb sample they were included in the final impact analysis and results. The resulting sample frame contained 2,957 records which represent 15,507 bulbs sold through the program during the August to February time period.

Coupon Survey Disposition

Table 9 below shows the final dispositions of the 2,597 participants selected for the Residential Lighting coupon survey. As this figure shows, 100 surveys were completed with coupon participants and 61% of the sample was never contacted. The survey center was unable to make contact with 17% of customers in the sample for a variety of reasons such as that no one answered the phone, an answering machine picked up, or the phone line was busy. The phone numbers provided for 10% of the sample had problems such as being disconnected, blocked, an incorrect number, or a cell phone number/refusal.

Table 9: Coupon Survey Call Disposition

Call Disposition	Coupon Survey	%
Sample Pulled	2,597	100%
Completes	100	4%
Not Dialed	1,585	61%
Refusal	69	3%
Unable to Reach	436	17%
Language Barrier	19	1%
Phone Number Issue	266	10%
Appointment Scheduled[12]	122	5%

Source: ODC CATI Center

Profile of Coupon Survey Respondents

As Table 10 below shows, 86% of those we spoke with during the coupon survey indicated they owned their homes. All participants we spoke with reported that they paid their own electric bill.

Table 10: Home Ownership Status of Coupon Survey Respondents

Home Ownership Status	Percent of Respondents (n=100)
Own	86%
Rent	10%
Refused	4%

Source: Coupon Participant Survey

Table 11 below shows the distribution of both program participants and bulbs by the number of bulbs they purchased at a given store within a given month. As this table shows, 97% of program participants purchased 12 or fewer bulbs (the program maximum per residential account) which accounted for roughly 88% of all bulbs sold during the August to February timeframe. Although this leaves three percent of participants purchasing more than the allowable number of bulbs, this most often occurred when two individuals from the same residence (husband and wife perhaps) each filled out up to 12 rebate forms and thus the household bulbs purchased exceed the 12 bulb limit. The figure below also shows that 99% of participants purchased 24 or fewer bulbs (representing 94% of program bulb sales). The highest number of bulb sales connected to one ComEd residential phone number in this database was 55.

[12] Some customers indicated that they had been reached at a bad time. In these instances, ODC representatives asked for a better time to call back and recorded this time as an appointment. In many cases there was no need to call the customer back because the quota of completes had been reached.

Table 11: Distribution of Number Bulbs Sold per Participant through the Coupon Channel

Bulbs per Participant	Participants	%	Bulbs	%
1	604	22%	604	4%
2	510	19%	1,020	7%
3	246	9%	738	5%
4	265	10%	1,060	7%
5	158	6%	790	5%
6	175	6%	1,050	7%
7	49	2%	343	2%
8	60	2%	480	3%
9	25	1%	225	2%
10	70	3%	700	5%
11	26	1%	286	2%
12	450	17%	5,400	37%
13 - 24	75	3%	1,320	9%
25 or more	12	0%	440	3%
Total	**2,725**	**100%**	**14,456**	**100%**

Source: Coupon Tracking Database

Because we did not stratify the random sample of coupon participants, it was not necessary to weight the responses we received when analyzing the coupon data by itself. For all analysis activities where the coupon results were combined with the results from a portion or the entirety of the general population survey, one of two sets of weights were applied so the responses would be representative of the entire participant population or the residential customer population.

General Population Survey

The general population survey was directed towards a random sample of ComEd residential customers. The survey quickly classified customers into one or more of a series of customer disposition or user groups (those unaware of CFLs, Aware non-purchasers, CFL user non-program purchasers, CFL program purchasers) that were then used to stratify the sample. Program purchasers were identified as customers who purchased one or more qualifying bulbs at a participating retailer between June 2008 and September 2009. These surveys assessed all of the parameters necessary to calculate both gross and net energy and demand impacts and process-related issues for program participants (similar to the data collected on coupon participants as described above). Additional data was collected from both program participants and nonparticipants on various topics to support future demand modeling and per-capita sales comparison activities. This survey was fielded between September 17th and September 24th 2009.

Sampling

The sample used for the general population survey was pulled from the Residential CIS database provided to the evaluation team by ComEd. This database contained 2,987,066 records, one for each residential customer within ComEd service territory. All records with missing or invalid phone numbers and phone numbers that were included in either the coupon sample were removed from the sample, however, were counted in the final impact results.

Survey Disposition

Table 12 below shows the final disposition of the 5,000 ComEd residential customers selected for the General population survey. As this figure shows, contact with all but 23% of the sample was attempted at least once and these contacts resulted in 231 survey completes. The survey center was unable to make contact with 33% of customers in the sample for a variety of reasons such as that: no one answered the phone, an answering machine picked up, or the phone line was busy. The phone numbers provided for 19% of the sample had problems such as being disconnected, blocked, an incorrect number, or a cell phone number[13].

Table 12: General Population Survey Call Disposition

Call Disposition	General Population Survey	%
Sample Pulled	5000	100%
Completes	231	5%
Not Dialed	1134	23%
Refusal	285	6%
Unable to Reach	1641	33%
Language Barrier	61	1%
Phone Number Issue	962	19%
Appointment Scheduled	686	14%

Source: ODC CATI Center

Participant Identification

The General Population survey was created in such a way that each customer could be classified into one of five groups based on their responses to a number of the survey questions. Those groups are:

1. Customers who are Unaware of CFLs (Labeled "Unaware" in the tables below)
2. Customers who were aware of CFLs but had never purchased or been given CFLs (NonPurchasers)
3. Customers who have purchased or been given CFLs in the past but not since June 2008 (Prior Purchasers)
4. Customers who have purchased or been given CFLs since June 2008 but at a non-program store, a store outside of ComEd service territory or those who are unable to provide any information about these CFL purchases (Non-Program Purchasers)
5. Customers who have purchased CFLs since June 2008 (Likely Program Purchasers)

Only those in group 5 are classified as likely program participants.

[13] Some customers were reached on their cell phones and thus did not want to complete the survey.

Table 13 below shows the initial classification of the General Population survey respondents across these five categories.

Table 13: Initial General Population Survey Customer Classification

Customer Classification	Customers	%
Unaware	11	5%
NonPurchasers	54	23%
Prior Purchasers	46	20%
Non-Program Purchasers	44	19%
Likely Program Purchasers	76	33%
All General Population Survey Respondents	231	100%

Source: General Population Survey

Only 30% of the customers flagged as likely program participants reported recalling that the bulbs they purchased were discounted.

After the General Population survey was completed, the data was reviewed record by record so that respondents who had been flagged as likely program participants could either be verified as program participants or rejected (in which case they were re-classified as non-program purchasers). In some cases the purchases made by survey respondents could be easily classified (i.e. respondent indicated they purchased a 10-pack of CFLs at a store in which all program bulbs were single packs and thus the purchase was rejected as a program purchase). In other cases, the purchases were more difficult to verify or reject (i.e. customer reported purchasing a 5-pack of CFLs at a particular retailer but the program bulbs sold at that retailer were all 4-packs). To allow for a slight amount of customer recall error the rejection reasons were set up to with recall bounds as specified in the square brackets below. Respondent purchases were rejected as program purchases for the following reasons:

1. The bulbs were purchased prior to June 2008 (or September 2008 for all non-specialty bulbs) [plus or minus one month][14]
2. The bulbs purchased at a particular retailer were not discounted as part of the program [The following bulb types were treated as equal since they may be the same in a customer's mind: Reflector/Flood Lights, A-lamps/Post/Globes, 3-Way/Dimmables. For example, if a customer reported they had purchased a dimmable bulb at a store that only offered 3-way bulbs through the program (and not dimmable bulbs) the purchase was still treated as a program purchase.]
3. The pack size of the bulbs purchased were not discounted as part of the program at the retail store in which they were purchased [plus or minus 2 bulbs]
4. The bulbs were purchased via the coupon delivery mechanism[15]

[14] The surveys did not occur until mid to late September and thus any purchases that occurred between June 1st, 2009 and the date of the survey were still considered program purchases if they met all of the remaining program bulb criteria.

[15] Two such customers were identified and removed from the surveyed population such that the responses were attributable to the upstream component of the program.

Table 14 below shows the final customer classification that resulted after the detailed respondent purchase verification was completed. As this table shows when participant verification was complete we were left with 56 customers that we believe bought program bulbs:

Table 14: Final General Population Survey Customer Classification

Customer Classification	Customers	%
Unaware	11	5%
NonPurchasers	54	23%
Prior Purchasers	47	20%
Non-Program Purchasers	63	27%
Likely Program Purchasers	56	24%
All General Population Survey Respondents	231	100%

Source: General Population Survey after Evaluation team analysis

As one might expect, we did find that the percent of customers that recalled the bulbs they purchased were discounted increased slightly after the program participant population was refined (from 30% to 34%, however this difference is not statistically significant). However not all of these customers could be used for the NTG analysis since some of them reported that it was the bulbs they purchased at non-program stores (such as Wal-mart) that were discounted and thus although they may have been discounted bulbs there were not ComEd discounted bulbs.

Profile of Survey Respondents

As Table 15 below shows, 75% of those we spoke with during the General Population survey indicated they owned their homes. As one might expect, this is significantly lower than for the coupon survey since all coupon participants are program bulb purchasers (and 86% owned their own homes). If we look just at General Population surveyed customers that were program participants we find that 86% are homeowners (the same percentage as for the coupon surveyed population) indicating homeowners are more likely to purchase CFLs. Ninety-eight percent of those contacted as part of the General Population survey reported that they paid their own electrical bill.

Table 15: Home Ownership Status of General Population Survey Respondents

Home Ownership Status	Percent of Respondents (n=231)
Own	75%
Rent	24%
Refused	1%

Source: General Population Survey

2.2.2 Sampling Error

Table 16 below provides the estimated population level sampling errors associated with the participant-level and bulb-level samples selected for the Residential Lighting CATI surveys, as well as for the sample of self-reported installed program bulbs. As this table shows, the samples selected for this data collection activity (both coupon and markdown) achieve better than a 90/10 confidence interval/precision level for

each of these populations except the Upstream Markdown Participants. Initial participant identification through the General Population Survey had indicated close to 80 participating customers, however further review of these likely program participants rejected some as program participants and thus we were left with only 56 program participants which is why the error was greater than 10%. The sampling errors were calculated assuming the data to be normally distributed with a coefficient of variation 0.5 (which is a worst-case estimate) and all data points to be independent and identically distributed (IID). We recognize the IID assumption may not be the case in situations where a customer installed all three program bulbs in a single location connected to a single light switch. Under these data assumptions, the minimum number of data points required to achieve a 10% level of precision is 68 which in most cases won't be achieved on a segment level (such as bulb type or installation room location) for more than a segment or two.

Table 16: PY1 Sample Size and Population Level Sampling Error[16]

Population	Population Size (N)	Sample Size (n)	Sampling Error (90% CI)
In-Store Coupon Participants	3,466	100	8.2%
Upstream Markdown Participants	472,941	56	11.0%
ComEd Non-Participants	2,510,941	175	6.2%
Total Residential Customers	2,987,066	331	4.5%

2.2.3 Analysis Weights

The weights used for this evaluation are participant weights and correspond to the population of residential lighting program participants. They serve to weight the participants surveyed back to the overall program participant population, however they can also be used uniformly across all customers surveyed since the population of coupon participants is less than 1% of the overall participant population and thus a set of general population weights would be nearly identical. These weights can be used directly to analyze process evaluation items such as program and bulb satisfaction, awareness of the Energy Star label, and customer demographics (such as income or education level), as well as net program impact-related questions such as program influence. Once items such as installation rate or free-ridership have been estimated separately for the two surveys (program delivery methods), these weights can also be used to estimate the overall participant installation or free-ridership rates.

The sum of these weights multiplied by the participants surveyed (across both surveys) equals the overall estimated population of ComEd customers participating in the PY1 Residential Lighting program. Similarly, when these weights are multiplied by the number of participants surveyed and the average annual program bulbs purchased per participant, the result is the total number of program bulbs distributed through the PY1 Residential Lighting program.

Table 17 below provides the weights calculated for the coupon and General Population surveys. As this table shows, the weights assigned to the General Population Survey respondents are significantly larger than those assigned to the coupon respondents since the upstream bulb sales (identified through the

[16] This assumes a normal distribution with a coefficient of variation of 0.5 (upper bound) and the data points are independent and identically distributed (IID).

General Population survey) account for more than 99% of the overall program bulb sales but 64% of the participants surveyed. The estimated average number of program bulbs per participant (6.3 bulbs) was exactly the same across the two delivery methods. The table also shows that the estimated number of PY1 participants is 476,407, which is approximately 16% of ComEd's residential customer population[17]. This differs only slightly from the estimated percentage of program participants derived directly from the General Population Survey respondent classification mentioned above which was 19% (56 participants out of 231 surveyed customers). This relationship provides confidence that the appropriate participant population was identified through the General Population survey.

Table 17: Evaluation Weights (Coupon and General Population Surveys)

Population	Participants Surveyed (n)	% of Participants Surveyed	Annual Program Bulbs Purchased	Avg Bulbs per Participant	Total Program Bulbs	Estimated Program Participants (N)	%	Weight
Coupon Survey	100	64%	630	6.3	21,836	3.466	1%	34.7
General Population Survey	56	36%	353	6.3	2,979,531	472,941	99%	8,445
All Participants	156	100%	983	6.3	3,001,367	476,407		

[17] Based on the Residential CIS dataset provided to the Evaluation team by ComEd.

3 PROGRAM LEVEL RESULTS

This section presents the results of the impact and process evaluations of the Residential Lighting program.

3.1 Impact Evaluation Results

3.1.1 Verification and Due Diligence

This section provides the results of the evaluation of ComEd's Verification and Due Diligence of the Residential Lighting program. Under this task, we explored the quality assurance and verification activities currently carried out by program and implementation staff. We compared these activities to industry best practices[18] for similar residential and C&I programs to determine:

1. If any key quality assurance and verification activities that should take place are currently not being implemented.
2. If any of the current quality assurance and verification activities are biased (i.e., incorrect sampling that may inadvertently skew results, purposeful sampling that is not defendable, etc.).
3. If any of the current quality assurance and verification activities are overly time-consuming and might be simplified or dropped.

Data Collection

This assessment primarily relied on in-depth interviews with program and implementation staff and documentation of current program processes, where available.

Results

Coupon Accuracy and Eligibility

The coupon fulfillment process is handled by Energy Federation Incorporated (EFI). The coupon asks the customer to provide, customer name, address, phone, email, home type, ENERGY STAR qualified light bulb package model #, manufacturer, number of bulbs in package, wattage, and date of purchase. EFI performs checks on the coupon to ensure that it is filled out accurately and completely. If forms are incomplete, illegible or are for non-qualified bulbs, the program implementer, Applied Proactive Technologies (APT) is notified. APT contacts the specific retailer having quality control issues and retrains retail staff on what to look for when accepting coupons.

EFI processes the coupon forms and enters the information into their system. A supervisor conducts inspections of the coupons, to ensure the data entered into the system matches the coupon form. There are

[18] See the Best Practices Self Benchmarking Tool developed for the Energy Efficiency Best Practices Project: http://www.eebestpractices.com/benchmarking.asp.

also electronic quality control checks to make sure that the incentive levels are accurate and that the number of bulbs on the coupon form correspond with the number of bulbs for that particular model number. EFI has the ability to run variance checks on the data to determine if there are customers who have submitted more than 12 coupons at any one given time, but it is unclear as to how EFI handles these customers for the ComEd program. For other programs where this has been an issue, EFI has called customers to determine the reason why they have purchased so many CFLs to ensure that the bulbs are going to the target market and are not being purchased for resale.

The coupon requires customers to state they are ComEd customers, but at this time, it is nearly impossible to ensure that only ComEd customers purchase rebated program bulbs. EFI currently provides participant information to APT and ComEd, who can only determine eligibility after the rebate has been paid to the customer. It is unclear if customer eligibility is determined for the coupon program.

Assessment: The quality control procedures in place for the coupon verification are sufficient given the size of the coupon portion of the Residential Lighting program. If the program were to expand, we recommend that EFI establish a formal quality control procedure to verify the data entry of coupon information. Further, we recommend developing formal documentation of all of the quality assurance/quality control checks that occur when dealing with coupon data. We do not recommend instituting an in-store check to ensure that only ComEd customers are able to redeem a coupon as such a check would be expensive to implement and could lead to issues with data privacy and security.

Upstream Program Sales Data Verification:

Retailers are required to submit audited point of sale data by SKU and store location to EFI on a weekly basis. EFI uses a database that includes the pre-conditions of the Memorandum of Understanding (MOU) to conduct electronic checks so incentives are only paid for program bulbs sold at the appropriate price. The data is by SKU so EFI can pick out ineligible SKUs. Another data check ensures that sales data for a particular date range has only been submitted once for incentive payment. EFI also runs other reports that compare cumulative sales with allocation of program bulbs. Any discrepancies are reported to APT.

Assessment: Data verification for the upstream program is sufficient. The numbers come from audited sales data and have sufficient checks in place to ensure that only eligible retail locations selling program bulbs receive incentives. We recommend developing formal documentation of all of the quality assurance/quality control checks that occur in processing upstream data.

Field Representative Quality:

Field representatives are at the heart of the ComEd Residential Lighting program and are trained to provide information about the program to the retailer partners. As part of each representative's review there are formal procedures in place for a Quality Assurance/Quality Control (QA/QC) Manager to verify a field representative's work in three retail locations.

The verification involves a store visit and a ride-a-long with the field representative. Before the store visit, the QA/QC manager meets with the APT program manager to discuss the three retailer locations the QA/QC manager will be evaluating and to review the POP materials that should be present in each store. The program manager also discusses any other issues that should be evaluated during the visits. The program manager places a courtesy call to the retail store to make them aware of the upcoming visit and then the QA/QC manager visits the store to conduct the evaluation. The QA/QC manager also completes a ride-a-long with the field representative to further evaluate their performance.

During the visit to the retailer location, the representative is graded on a "Quality Assurance/Quality Control Score Sheet" across three different categories: merchandising, training of store associates, and relationships with store associates. For each location, there is a possibility of 40 merchandising points, 16 training points and 24 relationship points for a total of 80 possible points per store.

Merchandising

The shelving area surrounding qualified products should be labeled with pricing signs identifying the sponsor (ComEd). When evaluating merchandising, the manager ensures that ComEd signage is only associated with qualified products and is presented in a neat and professional manner. POP materials are assessed, including identifying any "missed opportunities" for signage.

Training

For this category, the manager evaluates whether the field representative has communicated accurate and current program information to the store representatives and has made the retailer manual available as an additional resource to answer questions about the program. The following table shows the assessment criterion, along with the point allocation.

	Training	Maximum Score Possible
1	Is store associate's name on training roster?	2
2	Does store have a Retailer Manual?	5
3	Does the store associate know about the manual?	5
4	Is the Manual up to date?	2
5	Has the field representative reviewed the Manual with the Associate?	2

Relationships

For the third and final category, the manager evaluates the relationship between the field representative and the store associate to see how well the representative is known and make sure there are no outstanding issues. The following table shows the assessment criterion, along with the point allocation.

	Relationships	Maximum Score Possible
1	Has store associate met the field representative?	5
2	Does the store associate know the field representative's name?	2
3	What is the estimated frequency of visits?	2
4	Is the field representative considerate of the store associate's time?	5
5	Field representative's level of knowledge (scale of 1-5)	5
6	Overall level of satisfaction with field representative	5

In addition to this process, there is daily contact between the field representative and program coordinator, so that the coordinator is aware of the field representative's activities and can answer any questions he or she may have. Field staff are required to fill out Daily Site Call Reports, posted to a proprietary APT Microsoft Access database system, in which they record all time, mileage and expenses occurred for each retailer visit they conduct. Additional store visits and ride-a-longs are completed by the program coordinator as well as other individuals involved in the program at APT.

Assessment: The program has detailed and well-documented review and verification procedures for field representatives. If the MOUs allow, ComEd should consider more unannounced retailer visits by either

the field representative or the Quality Assurance/Quality Control manager to assess placement and visibility of point-of-purchase materials.

Relationship between APT and Industry:

In order to assess the relationship between APT and manufacturers and retailer partners, ComEd evaluates APT on several Key Performance Indicators (KPIs). One of the Key Performance Indicators is industry satisfaction with APT, which ComEd assesses through an annual 10 minute in-depth interview with each of the four manufacturers in the program. These interviews are conducted during the first and second quarters of the year. Interviews are conducted with TCP (Home Depot), Feit (Costco), GE (Sam's Club) and Sylvania. If any major issues are revealed, ComEd will consider completing an additional survey before the second quarter of the following year. Another KPI is the turnaround time of invoices and payments to industry. Currently, ComEd expects APT to process payments within three weeks.

Assessment: In order to get a more well-rounded picture of APT's performance, ComEd should continue with their plans to conduct similar interviews with each of the retail partners for Program Year 2.

Summary and Recommendations

Table 18 summarizes the quality assurance and verification activities currently carried out by the Residential Lighting program. It also features recommended changes to current procedures, as well as suggestions regarding additional activities that ComEd could implement to enhance current quality assurance and verification. Overall, ComEd's quality assurance and verification procedures for the Residential Lighting program are strong and in accordance with best practices for such a program. In particular, the program is strongest in tracking and monitoring of field activities and systems for tracking program sales data. Suggested improvements focus on documentation of existing procedures.

Table 18: Summary of Quality Assurance Activities in Place and Recommendations

Quality Assurance Activities in Place	Recommended Change
Measures to ensure coupon data accuracy	Formal Documentation
Measures to ensure upstream data accuracy	Formal Documentation
Quality Assurance/Quality Control manager visits to field representative's assigned retailer locations to assess field representative's actions	None
In-Depth interviews with manufactures to assess satisfaction with APT	Continue with plans to survey retailer partners

Source: Program manager interviews conducted in April and May 2009. Program documentation

3.1.2 Gross Program Impact Parameter Estimates

As mentioned above there are five key parameters necessary to calculate gross energy and demand savings estimates for the Residential Lighting program. These include:

1) Number of discounted bulbs (Rebated bulbs) sold through the program (both via the Coupon and Markdown program delivery methods),

2) Average Displaced Watts (Delta Watts) across all installed program bulbs,

3) Average Hours of Use (HOU) per Day across all installed program bulbs,

4) Installation Rate (Install Rate) across all installed program bulbs, and

5) Mean Load Coincidence Factor.

These parameter estimates will be used to calculate gross energy and demand (coincident peak and overall) savings using the following savings algorithms:

Annual kWh Savings = Program bulbs * Delta Watts/1,000 * Annual HOU * Installation Rate
Annual kW Savings = Program bulbs * Delta Watts/1,000 * Installation Rate
Annual Coincident Peak kW Savings = Annual kW Savings * Mean Load Coincidence Factor

The calculations used to estimate each of these parameter estimates is described in detail below.

Program Bulb 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.

Because the savings analysis for this evaluation is completed by delivery mechanism (in-store coupon and upstream markdown), we have broken down the program bulbs sales by these two delivery mechanisms. Table 19 below provides the total number of CFLs bulbs (including standard and specialty CFLs and CFL fixtures) by retailer category and delivery mechanism. It also provides the average number of bulbs sold at each of the retailer categories. This data is based on the coupon and upstream tracking databases provided to the evaluation team by ComEd.

Table 19: Rebated Bulbs Sold by Retailer Category and Delivery Mechanism

Retailer Category	CFLs Sold	% of CFLs Sold	Storefronts	Delivery Mechanism
Big Box/DIY	1,599,042	53%	136	Markdown
Warehouse	882,931	29%	33	Markdown
Grocery	115,664	4%	180	Markdown
Small Hardware	403,730	13%	166	Coupon/Markdown
Total Coupon	**21,836**	**0.7%**	**32**	**Coupon**
Total Markdown	**2,979,531**	**99.3%**	**483**	**Markdown**
Program Total	**3,001,367**	**100%**	**515**	

Source: Residential Lighting Tracking Data

As the table above shows the majority of the program is distributed via the upstream markdown approach (99%) and the Big BOX/DIY stores are responsible for more than 53% of all program sales.

Table 20 below compares the distribution of PY1 CFL sales from ComEd's implementation plan to the actual program sales. As this table shows, participants purchased a greater number of lower wattage twisters and specialty bulbs and fewer CFL fixtures than planned.

Table 20: Comparison between Planned and Actual Program Bulb Sales

Bulb Type	Product	Planned Sales	Actual Sales
Standard	40 Watt Replacement	0	205,358
	60 Watt Replacement	1,670,626	1,288,078
	75 Watt Replacement	417,656	178,947
	>=100 Watt Replacement	417,656	354,323
Specialty	3-way	0	2,330
	A-bulb	0	120,056
	Globe	0	154,376
	Post	0	1,484
	Dimmable Reflector	0	11,941
	Reflector	0	674,446
Fixture	Fixture	94,038	10,028
All Residential Lighting		**2,599,976**	**3,001,367**

Source: Residential Lighting Tracking Data and ComEd EEDR plan

Table 21 below provides the total number of CFLs sold through the program by bulb wattage. More than three-quarters of the program bulbs sold were low-wattage bulbs (less than 17 watts). This data is based on the Residential Lighting Tracking data provided to the evaluation team by ComEd.

Table 21: Distribution of Program Bulbs by Wattage Group

Program Bulb Wattage Group	Incandescent Equivalent	Bulbs Sold	% of Program Sales
< 13 Watt	40 Watt	364,731	12%
14-17 Watt	60 Watt	1,991,596	66%
18-20 Watt	75 Watt	178,947	6%
22-27 Watt	100 Watt	452,896	15%
29-42 Watt	150 Watt	12,768	0%
Total		**3,000,938**[19]	**100%**

Source: Residential Lighting Tracking Data

[19] 429 coupon bulbs were excluded from this table since the type of bulb and wattage were not provided on the in-store coupon.

Table 22 below provides the distribution of program bulbs by bulb type. More than 68% of the program bulbs sold were standard twister bulbs, followed by 22% of program bulbs that were Reflectors.

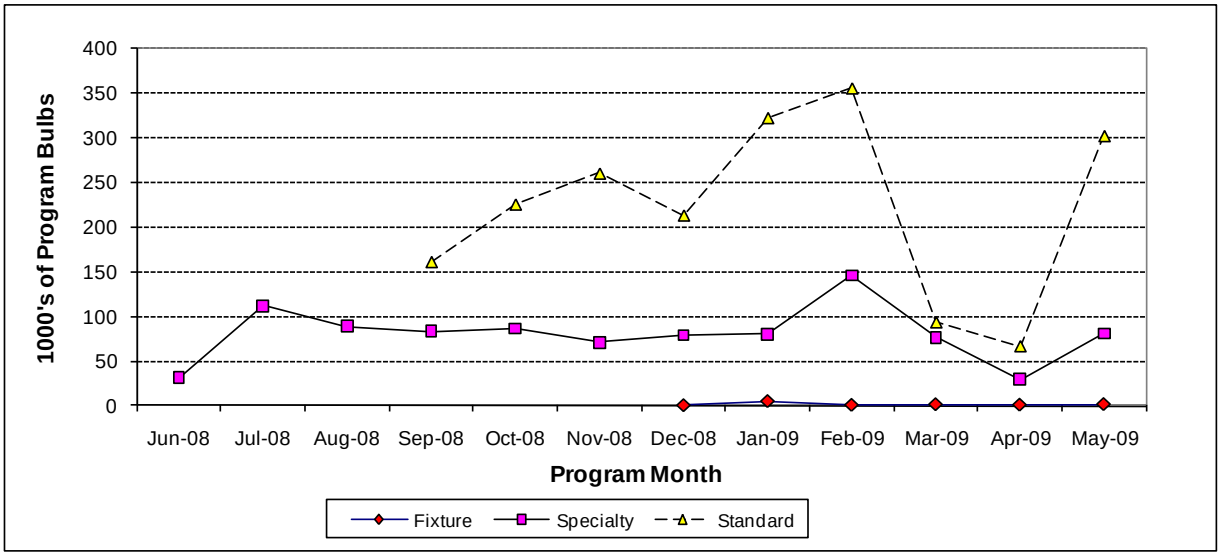
Table 22: Distribution of Program Bulbs by Bulb Type

CFL Bulb Type	Bulbs Sold	% of Program Sales
Standard	2,026,706	68%
3-way	2,330	0%
A-bulb	120,056	4%
Globe	154,376	5%
Post	1,484	0%
Dimmable Reflector	11,941	0%
Reflector	674,446	22%
Fixture	10,028	0%
Total	**3,001,367**	**100%**

Source: Residential Lighting Tracking Data

Figure 1 below presents the distribution of program bulbs sales by month and bulb type (Standard, Specialty and Fixtures). Only specialty bulbs were offered during the first 3 months of the program (Quick Start launch) and then in September 2008, standard bulbs were added to the mix. In December 2008, the program expanded further to include fixtures. In addition, sales of all products dropped off in March and April 2009, and then rebounded in May 2009[20].

Figure 1: Program Bulb Sales by Month and Type



Source: Residential Lighting Tracking Data

[20] This rebound was likely due to a 4-pack SKU sold through one of the DIY stores that was not discounted for a 5-week period in the spring due to its high sales rate which would have caused them to burn through the entire bulb allocation before the end of the program year.

Installation Rate

The ex ante program savings estimates were based on the assumption that 90% of the bulbs purchased were installed.

The evaluation estimate of installation rates for CFLs purchased as part of the PY1 Residential Lighting program were calculated based on data gathered during the participant telephone surveys (both coupon and upstream markdown). The questions asked of participants included:

- How many of the discounted CFLs did you install in your home?
- Where are the discounted CFLs that you did not install?
- How many are in storage?

Based on the responses to these questions we were able to calculate the installation rate as the number of bulbs installed over the total number of bulbs sold. The overall program level installation rate is weighted using the weights described above. Table 23 below shows the installation rate calculated for the in-store coupon and the upstream markdown delivery approaches as well as the overall installation rate for the Residential Lighting program. As this figure shows, the installation rate for the in-store coupon component was 9% higher than for the upstream markdown component, although this difference is not statistically significant. Across both delivery channels, the estimated installation rate for all program bulbs was 70%. The 90 percent confidence bounds on this estimate are 68% to 73%.

Table 23: Current Status of Program Bulbs

Program Bulb Status	In-Store Coupon		Upstream Markdown		Overall	
	Bulbs	%	Bulbs	%	Bulbs	%
Installed	17,202	79%	2,098,425	70%	2,115,627	70%
In Storage	4,178	19%	649,236	22%	653,414	22%
Other/Don't Know	456	2%	231,870	8%	232,326	8%
All	**21,559**	**100%**	**2,979,531**	**100%**	**3,001,367**	**100%**

Source: Coupon and General Population Participant Surveys

The installation rate above accounts for bulbs that respondents indicated had been installed at their residence but had since been removed. Across both surveys, roughly 5% of the bulbs installed had reportedly been removed. The primary reasons given for the removal of these bulbs were that they had burned out or stopped working. Many fewer were removed due to bulb satisfaction reasons such as they took too long to start up, they were not bright enough or they did not like the color of light they produced.

This is slightly less than the installation rate found for ComEd's 2007 ComEd Change A Light (CAL) program was of 78%, which could be result from a different distribution in pack sizes sold through the two promotions.

Table 24 below provides the self-reported future plans for the program bulbs currently in storage. As this exhibit shows approximately 20% of respondents indicated they planned on installing their stored CFLs when another CFL burned out (thus eliminating any savings for these program bulbs). Roughly half of respondents reported they would install the program bulbs when an incandescent burns out. This may be an indication that the program could do more to educate customers on the savings resulting from changing

out incandescent bulbs prior to burn out. The energy savings from these stored bulbs was not counted as PY1 savings, but future savings resulting from these bulbs will be estimated in future evaluations.

Table 24: Future Plans for Bulbs in Storage

Plan to Install CFL when…	In-Store Coupon	Upstream Markdown
	%	%
… an incandescent bulb burns out	52%	54%
… a CFL bulb out	19%	17%
… any light bulb burns out	19%	29%
Other	7%	0%
Undecided	4%	0%

Source: Coupon and General Population Participant Surveys

Installation Location

Table 25 below shows the distribution of the locations in which program bulbs were installed (when recalled and self-reported by program participants). As this exhibit shows, the most common location for program bulb installation was the living room, followed closely by the bedroom. All locations where less than 10 bulbs were reportedly installed (across all respondents) were collapsed into the "Other rooms" category. Sixteen percent of participants surveyed were unable to recall where their program bulbs were installed. This distribution of bulbs installation location across the two delivery channels was used to estimate hours of use (HOU).

Table 25: Distribution of Bulb Installation Location

CFL Location	Coupon		Upstream		Overall		
	n	%	n	%	n	%	Normalized[21] %
Living Room	70	14%	40	22%	110	16%	21%
Bedroom	68	14%	32	18%	100	15%	19%
Kitchen	47	10%	20	11%	67	10%	13%
Family Room	39	8%	17	9%	56	8%	11%
Bathroom	25	5%	17	9%	42	6%	8%
Basement	30	6%	9	5%	39	6%	7%
Halls/Entry	25	5%	3	2%	28	4%	5%
Dining Room	17	3%	4	2%	21	3%	4%
Exterior	9	2%	8	4%	17	3%	3%
Closet	7	1%	7	4%	14	2%	3%

[21] Room distribution was normalized across all known room locations (don't knows removed).

CFL Location	Coupon		Upstream		Overall		
	n	%	n	%	n	%	Normalized[21] %
Garage	10	2%	0	0%	10	1%	2%
Other Rooms	18	4%	3	2%	21	3%	4%
Don't Know	70	14%	40	22%	110	16%	Na
Total	**490**	**100%**	**181**	**100%**	**671**	**100%**	**100%**

Source: Coupon and General Population Participant Surveys

Delta Watts

In order to estimate the watts displaced by installing program bulbs it is necessary to know the wattage of the program bulb as well as the wattage and type of bulb that was installed prior to the program bulb. The ex ante delta watts estimates were calculated based on the planned distribution of program wattages and estimates of replacement wattages taken from DEER. The evaluation estimated delta watts in two ways, using customer self-reports and using the results of other studies. Due to several factors that affected the likely accuracy of the self-report calculation we selected the secondary research method as the most appropriate method at this time.

Self-Report. For customers that participated via the in-store coupon channel, the exact wattage of the program bulb is known (from the coupon database). However for upstream markdown program participants the wattage of the program bulbs was not known and thus an attempt was made during the General Population Survey to collect this data from participants. The CATI phone survey also collected other information essential to the delta watts calculation, such as the type of bulb installed prior to the program bulb, the wattage of the prior bulb and the location where the new CFL was installed (and from where the prior bulb was removed), from both coupon and upstream markdown participants. From findings from both participant phone surveys (both coupon and upstream) the displaced watts (delta watts) were then calculated based on self-reported differences between the prior bulb wattage and program bulb wattage.

Respondents were only able to provide pre-wattage estimates for three-quarters of the newly installed bulbs (118 bulbs of the 158 installed). For the remaining one-quarter of program bulbs where the pre-wattage was unknown, the pre-wattage was backfilled using typical CFL to Incandescent wattage equivalents from DEER (Table 26 below) if the prior bulb was reported to be an incandescent and zero if the prior bulb was reported to be a CFL.

Table 26: DEER CFL to Incandescent Wattage Equivalents

CFL Wattage	Incandescent Wattage	Delta Watts
13 or less	40	27-31
14-17	60	43-46
18-20	75	55-57
22-27	100	73-78
29-42	150	108-121
30/39 pin-based	120	81-90

Source: Itron Inc., 2004-2005 Database for Energy Efficiency Resources (DEER) Update Study. Final Report. Prepared for Southern California Edison, December 2005

As Table 27 below shows, the majority of program bulbs (91%) were reported to replace an existing incandescent bulb and only 2% were reported to replace another CFL. The remaining bulbs replaced a Halogen (3%) or an unknown bulb type (4% of participants could not remember the previous bulb type or stated 'other' but did not specify what it was). In order to apply these results to the population of known bulbs, we normalized them to include only the incandescent, halogen (which was grouped with incandescent since typically results in similar delta watts estimates) and CFLs. The normalized figures resulted in 98% of program bulbs replacing incandescent/halogens and 2% replacing other CFLs.

Table 27: Distribution of Prior Bulb Type

Prior Bulb Type	In-Store Coupon		Upstream Markdown		Overall	
	Bulbs	%	Bulbs	%	Bulbs	%
Incandescent	336	92%	140	88%	476	91%
Halogen	5	1%	9	6%	14	3%
CFL	9	2%	0	0%	9	2%
Other	6	2%	7	4%	13	2%
Don't Know	8	2%	4	3%	12	2%
Total	**364**	**100%**	**160**	**100%**	**524**	**100%**

Source: Coupon and General Population Surveys

Table 28 below show the average self-reported delta watts estimates for program bulbs by room location based on the data collected during the coupon and General Population surveys.

Table 28: Average Self-Reported Delta Watts by Location and Program Delivery Method

Room Location	In-Store Coupon		Upstream Markdown		Overall	
	n	Delta Watts	n	Delta Watts	n	Delta Watts
Living Room	68	49.7	36	60.1	104	53.3
Bedroom	61	47.4	23	46.6	84	47.2
Kitchen	42	43.4	16	45.1	58	43.9
Family Room	31	44.0	12	50.6	43	45.8
Bathroom	21	40.7	15	45.7	36	42.8
Basement	25	49.0	4	68.3	29	51.7
Halls/Entry	21	40.9			21	40.9
Dining Room	13	44.4	1	64.0	14	45.8
Exterior	6	56.3	3	49.0	9	53.9
Closet	5	39.0	5	43.0	10	41.0
Garage	8	46.8			8	46.8
Other Rooms	17	40.7	6	49.0	23	42.9

Source: Coupon and General Population Participant Surveys

To calculate an overall self-reported delta watts estimate across all installed program bulbs the average delta watts estimates for each room location from the table above were weighted to represent the distribution (normalized) of locations where program bulbs were reportedly installed (Table 25 above). As Table 29 below shows, the average self-reported delta watts estimate across all installed bulbs was 47.3 watts. This estimate was then applied to 98% of the program population (the self-reported estimate of program participants that used their program CFL to replace an incandescent bulb) and 0 watts was applied to the 2% of the population who reported using the program CFL to replace another CFL. The resulting average self-reported delta watts estimate was 46.4 watts.

Table 29: Average Self-Reported Delta Watts Weighted by Installation Location

Room Location	Installation Location	Overall
	%	Delta Watts
Living Room	21%	53.3
Bedroom	19%	47.2
Kitchen	13%	43.9
Family Room	11%	45.8
Bathroom	8%	42.8
Basement	7%	51.7
Halls/Entry	5%	40.9
Dining Room	4%	45.8
Exterior	3%	53.9
Closet	3%	41.0
Garage	2%	46.8
Other Rooms	4%	42.9
Room Weighted Average	**100%**	**47.3**
% of Incandescent replacements	98%	47.3
% of CFL replacements	2%	0
Adjusted Program Average	**100%**	**46.4**

Source: Coupon and General Population Participant Surveys

Secondary Research. To cross-check this self-reported estimate, we re-estimated delta watts across all program bulbs using the typical CFL to Incandescent Wattage Equivalents provided in Table 26 above. This resulted in an estimate of 49.5 watts which when applied to 98% of the program population who used their program bulbs to replace an incandescent bulb resulted in a delta watts estimate of 48.7 watts. This is approximately 2 watts higher than the self-reported estimate provided in Table 29 above.

Table 30: Estimation of Delta Watts based on DEER Typical Bulb Equivalencies[22]

Program Bulb Wattage Group	Incandescent Equivalent	Bulbs Sold	Delta Watts
9-11 Watt	40 Watt	364,731	30.5
13-17 Watt	60 Watt	1,991,596	46.1
18-20 Watt	75 Watt	178,947	55.8
22-27 Watt	100 Watt	452,896	76.2
29-42 Watt	150 Watt	9,347	111.3
30/39 Watt Pin-Based	120 Watt	3,421	87.4
Total		**3,000,938**	**49.5**
% of Incandescent replacements		98%	49.5
% of CFL replacements		2%	0
Adjusted Program Average		**100%**	**48.7**

Due to the difficulty customers can have recalling the exact wattage of the bulb that was installed prior to the program bulb and the closeness between the self-report method and the DEER standard equivalency method, the evaluation team decided to use the later estimate of 48.7 watts to calculate ex-post program impacts.

Table 31 below compares the delta watts estimates resulting from a variety of methods. The first result presented below, was based on using the standard incandescent equivalents found in DEER and resulted in an average delta watts estimate of 48.7 across all program bulbs. This was the method used to calculate the final ex post savings estimates. The second result was calculated using the CFL watts and base watts estimates found in the tracking data. This result is nearly identical (off by 0.02%) to the first since ComEd used the 2005 DEER equivalents in their program tracking data. The small discrepancy resulted from a set of 982 fixtures (39-Watt) sold through the program that had a base wattage of 150 watts in the program tracking data and 120 watts in the 2005 DEER tables. The third result shown below was from the self-report method presented above in Table 29. This result was 5% smaller than the recommended ex post result. The fourth result below was estimated using the DEER recommended 2.53 power reduction factor that was included in the 2008 DEER update. The CFL wattage reduction for this method is calculated as the CFL rated power (wattage) times 2.53 (the power reduction factor). This method resulted in delta watts estimates that were 22% lower than the recommended ex post.

[22] 429 coupon bulbs were excluded from this table since the type of bulb and wattage were not provided on the in-store coupon.

Table 31: Estimated Delta Watts based on Various Methods

Result	Delta Watts Calculation Method	Delta Watts Estimate	Ex Post Difference
1	DEER Equivalents (Ex Ante)	48.7	0%
2	Ex Ante[23]	48.7	0%
3	Self-Report	46.4	-5%
4	DEER 2008 Update Power Reduction Factor[24] (2.53)	38.0	-22%

Hours of Use

Average daily hours of use (HOU) is a key parameter in the estimation of both gross and net program impacts. During our survey of program participants (both coupon and upstream markdown), we asked respondents to estimate the number of hours the program CFLs they had installed within various rooms of their homes were turned on each day (both in the summer and in the winter) and during the peak summer hours.

Table 32 and Table 33 below show the self-reported HOU estimates for program bulbs during the summer and winter seasons, respectively, by room location based on the data collected during the coupon and General Population surveys.

[23] This ex ante estimate is slightly different from the program reported value presented in Table 37 below (48.9 watts). This is because these numbers were derived in slightly different fashions. The estimate in Table 37 was derived based on the reported net savings estimate and the program savings assumptions, whereas this result was based on the program tracking data and discounted to account for bulbs that replaced CFLs. We are aware that these numbers do not match, however were unable to reconcile the differences with the program reported figures.

[24] *2008 DEER Update – Summary of Measure Energy Analysis Revisions*, Version 2008.2.05 for 2009-2011 Planning/Reporting. December 2008. Page 15.

Table 32: Average Self-Reported Summer HOU by Location and Program Delivery Method

Room Location	In-store Coupon		Upstream Markdown		Overall	
	n	Average Daily Hours of Use	n	Average Daily Hours of Use	n	Average Daily Hours of Use
Living Room	18	4.4	12	3.5	30	4.0
Bedroom	13	2.3	9	3.0	22	2.6
Kitchen	10	3.6	5	2.0	15	3.1
Family Room	9	4.1	6	1.7	15	3.0
Bathroom	6	1.5	2	1.5	8	1.5
Basement	4	5.5	1	3.0	5	4.1
Halls/Entry	6	8.2	1	1.0	7	7.3
Dining Room	2	2.0	2	0.8	4	1.4
Exterior			2	8.0	2	8.0
Closet	1	4.0	2	0.3	3	1.1
Garage	1	3.0			1	3.0
Other Rooms	2	2.5	1	1.0	3	1.4

Source: Coupon and General Population Participant Surveys

Table 33: Average Self-Reported Winter HOU by Location and Program Delivery Method

Room Location	In-store Coupon		Upstream Markdown		Overall	
	n	Average Daily Hours of Use	n	Average Daily Hours of Use	n	Average Daily Hours of Use
Living Room	20	6.4	12	6.2	32	6.3
Bedroom	13	3.1	9	2.7	22	2.9
Kitchen	11	6.6	4	3.4	15	5.8
Family Room	9	4.1	6	2.2	15	3.3
Bathroom	4	3.4	1	2.0	5	2.8
Basement	3	6.8	1	3.0	4	4.3
Halls/Entry	7	8.7	1	1.0	8	7.8
Dining Room			2	2.0	2	2.0
Exterior			2	8.0	2	8.0
Closet	2	3.0	2	4.4	4	3.9
Garage	1	5.0			1	5.0
Other Rooms	3	7.3	1	1.5	4	3.8

Source: Coupon and General Population Participant Surveys

To come up with an overall self-reported HOU estimate across all installed program bulbs, the average HOU estimates by room location from the tables above were weighted to represent the distribution (normalized) of locations where bulbs were installed (presented above in Table 25 above). As Table 34 below shows, the average self-reported HOU across all installed bulbs was 3.3 hours in the summer and 4.6 hours in the winter.

Table 34: Average Seasonal Self-Reported HOU Weighted by Installation Location

Room Location	Installation Location	Summer	Winter
	%	HOU	HOU
Living Room	21%	4.0	6.3
Bedroom	19%	2.6	2.9
Kitchen	13%	3.1	5.8
Family Room	11%	3.0	3.3
Bathroom	8%	1.5	2.8
Basement	7%	4.1	4.3
Halls/Entry	5%	7.3	7.8
Dining Room	4%	1.4	2.0
Exterior	3%	8.0	8.0
Closet	3%	1.1	3.9
Garage	2%	3.0	5.0
Other Rooms	4%	1.4	3.8
Room Weighted Average	**100%**	**3.3**	**4.6**

Source: Coupon and General Population Participant Surveys

As mentioned previously, a review of past evaluations found that self-reported estimates of hours of use can be highly inaccurate[25]. Given this uncertainty and because the budget for this evaluation did not allow for a lighting logger study of program bulbs in PY1, the evaluation team believes there is insufficient data to alter the ex ante HOU estimate of 2.34 hours/day to calculate the ex post program energy savings. The PY2 evaluation includes a small logger study during which more robust data can be collected on a population of ComEd participants to determine whether an update to the ex ante HOU estimate is warranted. This logger study, and a California report that is due out later this year, will also look further into the question of whether the difference between the bulb saturation levels in CA and IL make using CA HOU estimates less applicable to ComEd's service territory.

Mean Load Coincidence Factor

The mean load coincidence factor measures the percentage of time that the program bulbs were turned on during ComEd's peak time period (1 to 6 p.m. on summer weekdays). To estimate this, surveyed respondents were asked approximately how many hours the CFLs installed in various room locations were turned on during the peak time period. Unfortunately due to a miscommunication, the peak period asked about in the survey was from 3 to 6 p.m. on summer weekdays rather than the PJM peak from 1 to 6 p.m. and thus, the analysis in this section is based on this incorrect 3-hour peak period.

[25] KEMA, *CFL Metering Study*. Prepared for California's Investor-Owned Utilities (PG&E, SCE, SDG&E and SoCalGas), February 2005.

Table 35 below presents the average percent of time program bulbs were reported to be in use during the 3 to 6 p.m. period by room location. As this table shows, bulbs located in kitchens, family rooms and hallways were turned on most often[26] during the peak period and bulbs located in bedrooms, outside locations and closets were turned on the least.

Table 35: Average Peak Usage[27] by Location

Room Location	In-store Coupon		Upstream Markdown		Overall	
	n	HOU during Peak	n	HOU during Peak	n	HOU during Peak
Living Room	17	0.1	12	0.4	29	0.3
Bedroom	14	0.2	9	0.2	23	0.2
Kitchen	9	1.2	5	0.7	14	1.0
Family Room	9	0.2	6	0.6	15	0.4
Bathroom	4	0.6	1	0.4	5	0.5
Basement	3	0.6	1	1.0	4	0.9
Halls/Entry	7	1.4	1	1.0	8	1.4
Dining Room	1	0.0	2	0.3	3	0.1
Exterior			2	0.0	2	0.0
Closet	2	0.0	2	0.3	4	0.2
Garage	1	1.0			1	1.0
Other Rooms	3	0.0	1	0.0	4	0.0

Source: Coupon and General Population Surveys

To estimate the overall self-reported peak period usage across all installed program bulbs, the average peak usage estimates by room location (from the table above) were weighted to represent the distribution (normalized) of locations where bulbs were installed (presented above in Table 25 above). As Table 36 below shows, the average self-reported peak usage across all installed bulbs was 0.5 hours or 16% of the 3 – 6 p.m. period.

[26] Locations where less than 5 bulbs were installed all grouped into the "Other" category for this analysis.

[27] Please note the peak period referred to here is from 3 to 6 p.m. on summer weekdays, not the PJM peak from 1 to 6 p.m.

Table 36: Average Self-Reported Peal Usage Weighted by Installation Location

Room Location	Installation Location	Peak Period
	%	HOU during Peak
Living Room	21%	0.3
Bedroom	19%	0.2
Kitchen	13%	1.0
Family Room	11%	0.4
Bathroom	8%	0.5
Basement	7%	0.9
Halls/Entry	5%	1.4
Dining Room	4%	0.1
Exterior	3%	0.0
Closet	3%	0.2
Garage	2%	1.0
Other Rooms	4%	0.0
Room Weighted Average	**100%**	**0.5**

Source: Coupon and General Population Participant Surveys

The ex ante peak period usage estimate was 0.081 (or 8%) which was taken from DEER. Again due to the uncertainty that surrounds self-reported light usage estimates and the fact that the incorrect peak period was discussed in the survey, the evaluation team believes there is insufficient data to alter the ex ante peak coincidence factor estimate of 0.081. The small logger study planned for the PY2 evaluation will also allow for a thorough review of peak period usage within the ComEd participant population to determine whether an update to the ex ante peak usage estimate is necessary.

Energy Interactive Effects

Recent research has focused on the incremental electric savings and gas usage resulting from customers' adoption of CFLs. The cooler temperatures at which CFLs run can lead to decreased air conditioning loads during the peak summer months; however they also can lead to increased electric or gas heating during the winter months. Estimating these interactive effects on heating and cooling energy use was outside the scope of the PY1 evaluation, however it will be addressed in the PY2 study and possibly included in PY2 savings estimates.

3.1.3 Gross Program Impact Results

Based on the gross impact parameter estimates described in the previous section we were able to estimate the gross program impacts resulting from PY1 Residential Lighting program. The results are provided in Table 37 below.

Table 37: Gross Parameter and Savings Estimates

Gross Parameter and Savings Estimates	Program Reported	Evaluation Verified		
	Overall	Coupon	Upstream	Overall
CFLs Distributed through the Program	3,001,366	21,836	2,979,531	3,001,367
Average Displaced Watts (Delta Watts)	48.9[28]	48.7		
Average Daily Hours of Use[1]	2.34	2.34		
Gross kWh Savings per unit	41.8	41.6		
Gross kW Savings per unit	0.05	0.05		
Installation Rate	95%	79%	70%	70%
Peak-Load Coincidence Factor	0.081	0.081		
Total First-Year Gross MWh Savings	**119,151 MWh**	**87,917 MWh**		
Total First-Year Gross MW Savings	**139.5 MW**	**102.9 MW**		
Total First-Year Gross Peak MW Savings	**11.3 MW**	**8.3 MW**		

The evaluation verified gross energy savings shown in the table above are 74% of the program reported gross energy savings. This difference is nearly entirely driven by the installation rate of 70%, which is 74% of the ex ante installation rate of 95%. All other ex post gross savings parameters (hours-of-use, delta watts, peak-load coincidence factor and bulbs sold through the program) had little or no change from the ex ante estimates.

3.1.4 Net Program Impact Parameter Estimates

Once gross program impacts have been estimated, net program impacts are calculated by multiplying the gross impact estimate by the Program Net-to-Gross (NTG) ratio. The program assumed a NTG of 80%. As mentioned above, the primary method of estimating the NTG ratio for the PY1 Residential Lighting program was to use a customer self-report approach. This approach relied on responses provided by program participants during the two CATI phone survey to determine the fraction of CFL installations that would have occurred by participants in the absence of the program (free-ridership) and incremental non-program CFL installations influenced by the program (spillover).

Once these parameters have been estimated, the PY1 NTG ratio can be calculated as:

NTG Ratio = 1 – Free-ridership + Spillover (Participant and Nonparticipant)

A secondary method implemented to estimate the NTG ratio for this evaluation was the comparison state method. This method did not produce usable results however it is presented below to illustrate the challenges of applying it in ComEd's service territory.

[28] Evaluation team derived from program reported net savings and gross and net savings assumptions.

Self-Report Method

Free-ridership

The primary method of calculating free-ridership for PY1 is the customer self-report method. This method uses participant phone survey data to assign the following two scores:

1) *Program Influence Score* - The degree of influence the program had on the customers' decision to install CFLs, and
2) *No-Program Score* - What actions the customer would have taken on their own if the program did not exist.

Once these two scores have been calculated, customer-level free-ridership is equal to:

Customer-level Free-Ridership = 1 – (Program Influence Score + No-Program Score)/20

Using the NTG scoring algorithm, customers fall into one of three free-ridership levels: Full, Partial, or Non Free-rider. A customer was classified as a *Full Free-rider*[29] if they reported that the program was not a critical factor in their decision to install CFLs as opposed to standard efficiency bulbs and that they would have purchased CFLs at the same time to install in their residence even if the program did not exist. Conversely, a customer was defined as a *Non Free-rider*[30] if they reported that the program was a critical factor in their decision to install CFLs and that it would have been highly unlikely that they would have purchased the same CFLs on their own without the program. Between these two extremes, customers were classified as Partial Free-riders[31] and the free-ridership score that was assigned to them reflected their reported influence of the program and what they would have done in its absence.

Table 38 below shows the distribution of surveyed customers across these three free-rider levels by the program delivery method. It also shows that the free-ridership for those purchasing their bulbs using in-store coupons and those participating through the upstream markdown channel had very similar free-ridership estimates (0.38 and 0.39, respectively). Due to the limited number of upstream program participants that were identified through the General Population Survey that could recall the ComEd discount there were only 18 customers included in the free-ridership analysis for this channel (compared with 99 from the coupon channel). As a result, we recommend using an unweighted bulb average of these results such that the all bulbs are treated equally in the calculation of the overall free-ridership score (as opposed to a channel weighted average of these results where coupon bulbs carry only a fraction of the weight of upstream bulbs). The resulting overall self-reported free-ridership estimate for the PY1 Residential Lighting program is 0.38.

[29] Full Free-rider: Free-ridership score of 1.0 and NTG score of 0.

[30] Non Free-rider: Free-ridership score of 0.0 and NTG score of 1.

[31] Partial Free-rider: Free-riders score > 0 and < 1, NTG score > 0 and < 1.

Table 38: Free-Rider Distribution

Free-Ridership Level	In-Store Coupon			Upstream Markdown			Overall		
	Bulbs	%	Avg FR Score	Bulbs	%	Avg FR Score	Bulbs	%	Avg FR Score
Full Free-rider	27	4%	1	18	12%	1	45	6%	1
Partial Free-rider	429	69%	0.49	84	58%	0.46	513	67%	0.48
Non Free-rider	166	27%	0	43	30%	0	209	27%	0
Missing			-			-			-
Total	**622**		**0.38**	**145**		**0.39**	**767**		**0.38**

Source: Coupon and General Population Surveys

An additional question that was asked of all RDD survey respondents that went through the free-ridership battery was, "If the CFLs had been $1.00 more per bulb would you still have purchased the CFLs or would you have purchased incandescent light bulbs?" Sixty-five percent of the customers identified as program participants responded that they still would have bought the bulbs if they were $1.00 more a bulb, 17% reported they would not have purchased them and 17% were unsure if they would have still purchased them. As reported earlier, the average discount per program bulb was $0.99, and thus the response to this question is another indication of the free-ridership that exists amongst these program participants.

Free-ridership was estimated for the 2007 CAL program and was found to be 34% using a retail representative self-report method.

Participant Spillover

As mentioned previously, participant spillover was calculated by asking survey respondents (both coupon and General Population survey likely participants) about efficient lighting products they had purchased since their program purchase that were not rebated and were highly influenced by their participation in ComEd's Residential Lighting program. These spillover purchases were then summed and extrapolated to estimate the number of spillover purchases across all program participants. This figure was then divided by the total number of program bulbs to estimate the total participant spillover rate. Spillover purchases were only counted for customers that were not free-riders.

The General Population Survey participant spillover battery was initially asked of the 23 customers who were identified as "likely" program purchasers and who recalled that the bulbs they purchased since June 2008 were discounted[32]. After the program bulb verification was completed, only 19 of these 23 respondents remained. Of these 19, three, or 16%, responded that they had purchased and installed an efficient lighting product at regular retail price in the time since they purchased their "program" bulbs. However, two of these three were unable to remember how many non-rebated bulbs they had purchased

[32] Participant spillover can only be asked of survey respondents who could recall they had purchased CFLs that were discounted as part of a promotion, since respondents who didn't recall the discount could not be asked about the influence the promotion had on their decision to purchase the additional non-program bulbs. Within the RDD survey only 34% of those believed to be program participants recalled the bulbs they purchased were discounted.

(a key factor in the calculation of spillover) and the remaining third gave a low ranking to the influence ComEd's program had on their non-rebated bulb purchases and thus cannot be classified as spillover. Because we didn't have an estimate of the number of spillover bulbs these two customers had actually purchased, a decision was made to backfill the estimated spillover bulbs purchased with the average from the upstream markdown channel (6.3 bulbs). The coupon survey participant spillover battery was asked of all 100 surveyed participants. Of these 100, 12 reported purchasing spillover bulbs and the average number of spillover bulbs purchased was 4.3.

Table 39 below shows the estimated participant spillover rate for the Residential Lighting program by program delivery channel and overall. These results were program bulb weighted since we believe participant spillover is likely different between the two delivery channels. This assumption, which was backed up by participant survey data, is based on the fact that the coupon channel was only operational for a portion of the program year (August through February), whereas the upstream program was in place for a longer portion of the program year, and thus coupon participants reported purchasing non-program bulbs because they had tried the program bulbs and liked them but later returned to the store to find the coupons were no longer available and decided to buy the bulbs regardless.

Table 39: Participant Spillover Assessment

Participant Spillover	In-Store Coupon			Upstream Markdown			Overall
	n	Bulbs per Purchase	Extrapolated Bulbs	n	Bulbs per Purchase	Extrapolated Bulbs	Extrapolated Bulbs
Spillover Purchases	12	4.3	1,802	2	6.30	106,412	108,214
Program Purchases	100	6.3	21,836	56	6.30	2,979,531	3,001,367
Spillover Rate			**8.3%**			**3.6%**	**3.6%**

Source: Coupon and General Population Participant Surveys

Calculating participant spillover was attempted as part of the 2007 ComEd Change-A-Light (CAL) program using a retail representative self-report approach, however due to data issues the results could not be used and thus the estimate from the 2006 CAL evaluation (5%) was used as an estimate.

NonParticipant Spillover

Nonparticipant spillover is calculated in much the same manner as participant spillover except the number of spillover adoptions was divided by the number of surveyed customers and then applied to the estimated population of nonparticipating customers within ComEd service territory to estimate the number of spillover adoptions occurring in the population. Table 40 below shows that of the 175 nonparticipants surveyed as part of the General Population survey, only 1 customer reported purchasing an efficient lighting product that they did not receive a rebate for and that was influenced by the Residential Lighting program. This customer reported purchasing 8 bulbs and stated they purchased them despite the rebate since the rebated had ended but their discounted CFLs were very influential to their decision. To extrapolate this across the nonparticipating customer population the 8 spillover bulbs were multiplied by the estimated number of nonparticipating ComEd residential customers (~2.5 M) and divided by the total number of nonparticipants surveyed (175). This resulted in an estimated nonparticipant spillover rate of 3.8%. This analysis could only be performed using the General Population Survey data since all customers contacted via the coupon survey were program participants.

Table 40: NonParticipant Spillover Estimation

NonParticipant Spillover	General Population Survey		
	n	Bulb/ Purchase	Total Bulbs
NP Spillover Purchases	1	8	8
Population Extrapolated NP Spillover Purchases	14,347	8	114,773
Program Bulbs			3.001,367
NonParticipant Spillover Rate			**3.8%**

Source: General Population Survey

Nonparticipant spillover was not estimated as part of the 2007 CAL evaluation.

Self-Reported Net-to-Gross Ratio

Based on the estimates of Free-ridership and Spillover (participant and nonparticipant) provided above, the program-level NTG ratio for the PY1Residential Lighting program is calculated as:

NTG Ratio = 1 – Free-ridership + Participant Spillover + NonParticipant Spillover

= 1 – 0.38 + .036 + .038 = .69 = 69%

Comparison State Method

The comparison state method uses data collected from states where lighting programs do not exist (non-program states[33]) to estimate monthly CFL sales that occur in the absence of lighting programs. The comparison state method was applied, in large part, because of its recent application in the evaluation of the Ameren Illinois Residential Lighting program and our desire to apply consistent methods between these two evaluations where possible.

To apply this method the monthly CFL purchase rates from the non-program states are compared to the monthly CFL purchase rates estimated as part of this evaluation (based on self-reported data from the General Population survey) to determine whether any incremental sales occurred which can then theoretically be attributed to the program. If incremental sales exist, these sales can be multiplied by 12 months (the length of ComEd's lighting program) and the total number of ComEd residential customers to estimate the number of CFLs purchased as a result of the program. This figure, when divided by the total number of bulbs sold through the program yields the comparison state methods NTG ratio estimate.

During the General Population survey all customers who reported having purchased CFLs for their household at some point previously were asked how many CFLs they had purchased since June 2008 and in the past 3 months. Asking separately about these two time frames allowed us to calculate not only the

[33] The non-program states used for this analysis included Kansas, Pennsylvania and Georgia and were selected as part of the California Market Effects evaluation. The data on these three states was used since it was the only data currently available for this analysis. The ComEd PY3 budget has funds set aside to collect similar data on non-program states that are more representative of ComEd's customer base if so desired.

average monthly CFLs per household within these periods, but the delta between the two sales figures allowed us to estimate the sales during the PY1 period (June 2008 through May 2009). Table 41 below provides the total number of CFL sales (both program and non-program) for each of the three time frames (3, 12 and 15 months) and the average monthly bulb sales per household.

Table 41: Monthly CFL Sales

Time Frame	CFL Sales Reported	Surveyed Households[34]	Average Monthly Bulb Sales Per HH
15 Months	1,111	218	0.34
3 Months	210	218	0.32
12 Months[35]	901	218	0.34

Source: General Population Survey

As the table above shows, ComEd customers purchased on average 0.34 bulbs per month during the PY1 period. The average number of bulbs purchased per month in the comparison state area was 0.4[36]. Because the average number of bulbs purchased per month within ComEd service territory was less than the average number of purchases per month in the non-program comparison areas the resulting program induced sales is negative thus resulting in a negative NTG estimate. Table 42 below presents a summary of the comparison state calculation that was completed. This is presented for information purposes only as we do not believe the resulting NTG ratio.

Table 42: Summary of Comparison State NTG Calculation

Time Frame	Monthly Bulb Sales		Program Induced Sales			Program Bulbs	NTG
	ComEd	Comparison State	Monthly	Program Year	ComEd Res Customers		
15 Months	0.34	0.4	-0.06	-0.72	-2,159,457	3,001,367	-72%
3 Months	0.32	0.4	-0.08	-0.95	-2,828,121	3,001,367	-94%
12 Months	0.34	0.4	-0.06	-0.67	-1,992,291	3,001,367	-66%

Source: General Population Survey

We believe there are a number of issues with the comparison state method both as it was performed for this evaluation and in general. Specifically for this evaluation, we believe that the results are not valid for a number of reasons, including, but not limited to, the following issues with the comparison state data:

- Not weighted to be representative of ComEd customers – As stated above the raw data was not publicly available and thus, could not be adjusted to account for differences between the

[34] 13 households were dropped from this analysis since they were unable to estimate the number of bulbs purchased for their households during these two periods.

[35] Imputed from the two rows above.

[36] This figure was taken from the California Public Utilities Commission: Compact Fluorescent Lamps Market Effects Draft Final Report. October 9, 2009. Prepared by The Cadmus Group, Inc. It is important to keep in mind that because the comparison state data is not yet publically available it could not be reanalyzed and/or weighted to make it more representative of ComEd's customer base.

comparison states and ComEd service territory with respect to hours of daylight, multi-family/single family home type distributions, home-ownership classification (owners versus renters), CFL socket saturation levels, etc.

- Limited baseline sales data available - The non-program state baseline sales were only available to one significant digit which, due to the sensitivity of this method to the average program sales figures, leads to a high degree of variation in the results.
- Survey timing – Previous studies have found lighting sales follow a seasonal pattern of increased sales in the fall months and decreased sales in the summer months. Additional other economic factors can alter the sales of CFLs. As a result, to insure comparable results we feel that the comparison state surveys need to be conducted at the same as the program state survey. This was not the case for the data collected for this analysis (the comparison state survey was conducted in the late fall/early winter of 2008 and the ComEd General Population survey was completed in September of 2009).
- Error bounds on results - Another overall issue we find with this method relates to the extreme sensitivity of this method to the inputs which all have rather large error bands that surround them.

3.1.5 Net Program Impact Results

Once the NTG ratio was calculated, net program impacts were derived by multiplying gross program savings by the estimated NTG ratio. Table 43 below provides the program-level evaluation-adjusted net impact results for the PY1 Residential Lighting program. As this figure shows, the ex post program-level first-year net energy saving estimate resulting from this evaluation is 60,789 MWh and the net demand savings estimates are 71.2 MW and 5.8 MW during peak.

Table 43: Net Parameter and Savings Estimates

Net Parameter and Savings Estimates	Program Reported	Evaluation Verified
Total First-Year Gross MWh Savings	**119,151**	**87,917**
Total First-Year Gross MW Savings	**139.5**	**102.9**
Total First-Year Gross Peak MW Savings	**11.3**	**8.3**
Net-to-Gross Ratio (1-FR+SO)	80%	69%
Total First-Year Net MWh Savings	**95,321**	**60,789**
Total First-Year Net MW Savings	**111.6**	**71.2**
Total First-Year Net Peak MW Savings	**9.0**	**5.8**

Table 44 below provides a comparison of ComEd's Program Goals and Reported savings estimates to the Evaluation-Adjusted savings estimates. As this table shows, the impact evaluation team found that the PY1 Residential Lighting program realized 74% of their gross Program-Reported energy savings and 64% of their net Program-Reported energy savings.

Table 44: Comparison of Program Goals and Reported Savings versus Evaluation Adjusted Savings Estimates

Savings Estimates	Residential Lighting Program			
	Energy (MWh)	Demand (MW)	Peak (MW)	% of Program-Reported MWh Savings Achieved
Gross Program Savings Goals	**94,761**	**111.1**	**9**	
Net Program Savings Goals	**75,809**	**88.9**	**7.2**	
Gross Program-Reported Savings	119,151	139.5	11.3	
Net Program-Reported Savings	95,321	111.6	9.0	
Gross Evaluation-Adjusted Savings	**87,917**	**102.9**	**8.3**	**74%**
Net Evaluation-Adjusted Savings	**60,789**	**71.2**	**5.8**	**64%**

The PY1 net savings claimed savings for this program were 95,321 MWh, resulting in a net energy savings realization rate of 64%. There were two primary drivers for this realization rate, they include:

1. The *Installation Rate* of program bulbs was estimated to be 70% based on participant phone surveys, which was 25% lower than the installation rate used to calculate program reported savings (95%).

2. The self-reported *NTG ratio* was found to be 69%, which is 11% lower than was used for program planning (NTG of 80% assumed in program plans).

It is important to keep in mind when reviewing these PY1 results that this analysis is restricted by the lack of presales data from participating retailers (of which none is currently available), customer lighting logger data (which will be collected as part of the PY2 evaluation but was not available for PY1), and the sample sizes of upstream program participants (which are limited due to the lack of participant contact information that results from the upstream program delivery method). PY2 and PY3 evaluations will also include in-store intercept surveys that will seek to identify upstream non-coupon program participants at the time of program purchase in order to increase the sample sizes within the upstream channel.

3.2 Process Evaluation Results

The process evaluation component of the Residential Lighting Evaluation focused on awareness of the ComEd Residential Lighting program, sources of program awareness, satisfaction with the program, familiarity with and usage of CFLs, attitudes regarding CFLs, barriers to purchasing CFLs, and overall lighting purchase behaviors.

Data sources for the process evaluation include the Coupon Participant CATI survey (n=100) and the General Population (Purchaser and Non-Purchaser) Telephone Survey (n=231). The evaluation of the Residential Lighting program process will present results from each survey individually as well as combined. The surveys contained some identical questions but also a number of different questions due to the different means of participating in the program. In addition, the General Population survey can be used to evaluate the state of the CFL market in ComEd service territory.

The following is a guide to the types of tables presented in the process evaluation:

1. Tables that contain a weighted program total and results by markdown and coupon participants are used to evaluate the program overall and identify differences between the two means of participating.

2. Tables that only contain coupon participants are used to assess features that are unique to that component of the program.

3. Tables that present results from the General Population Survey only and with a "total" column are used to assess the state of the CFL market in ComEd territory.

4. The General Population Survey tables typically also include comparisons between the respondent types present in the General Population Survey. That is, markdown participants, non-program purchasers, CFL purchasers prior to June 2008, respondents who have never purchased a CFL, and respondents who are unaware of CFLs. These comparisons allow us to compare markdown participants with other ComEd customers to better understand CFL purchasing behavior and the role of the ComEd program.

3.2.1 Program Theory and Logic Model

This section contains the program theory, logic model, and performance indicators of the Residential Lighting program. We created this model based on discussions with program management and implementers as well as program documentation. The program theory and logic model is to be used:

- As a communication tool by
  - allowing the implementer to show reasoning to other stakeholders
  - bringing common understanding between implementer and evaluator
- As an evaluation tool to
  - Focus evaluation resources
  - Clearly show what evaluation will do and expected answers from evaluation
  - Provide a way to plan for future work effort

The logic model (LM) is a graphic presentation of the intervention – what occurs and clear steps as to what change the activities undertaken by the intervention are expected to bring about in the targeted population. Logic models can be impact or implementation oriented. An impact model is sparse in terms of how the programs works, but clearly shows the outputs of the program and what they are aimed at affecting. Outcomes are changes that could occur regardless of the program and should be written as such. The implementation model is how the program works and typically resembles a process flow chart. The attached model is an impact model.

We use numbered links with arrows between each box in the logic model. These numbers allow us to:

- Clearly discuss different areas of the model
- Describe why moving from one box to the other brings about the description in the later box
- Set up hypotheses for testing of specific numbered links
- Explicate what we will and will not be testing within the evaluation

The program theory (PT) is a description of why the intervention is expected to bring about change. It may reference theories of behavioral change (e.g., theory of planned behavior, normative theory) or be based on interviews with the program managers as they describe their program.

Creation of the Logic Model

There are several different "looks" to logic models. For this evaluation, we are using a multi-level model that has a generic statement about resources in the header, activities in the first row, outputs of those activities in the second row, and outcomes in the third (proximal) and fourth (distal) rows. External factors are shown on the bottom of the diagram.

When we created the boxes in the logic model, we used the following "road-map."

Activities

These are discrete activities that roll up to a single "box" that is shown in the model. It separates out activities that may be performed by different groups. Each activity typically has an output. We used program documentation (implementation plans) and/or discussion with program managers to determine activities.

Outputs

These are items that can be counted or seen. It may be the marketing collateral of a marketing campaign, the audits performed by a program, or the number of completed applications. All outputs do not need to lead to an outcome. We used the same sources as for activities to determine outputs.

Proximal Outcomes

These are changes that occur in the targeted population that the program directly "touches." Multiple proximal outcomes may lead to one or more distal outcomes.

Distal Outcomes

These are changes that are implicitly occurring when the proximal outcome occurs. For example, an energy efficiency program may use marketing to bring about changes in Awareness, Knowledge, or Attitudes as a proximal outcome, which leads to the distal outcomes of: intent to take actions, which leads to actual installation of EE equipment, which leads to energy impacts.

External Factors

These are known areas that can affect the outcomes shown, but are outside of the programs influence. Typically, these are big areas, such as the economy, environmental regulations, codes/standards for energy efficiency, weather, etc. Sometimes these can arise from our discussions with the program managers, but often they were thought about and included based on our knowledge.

Expanding the Impact Logic Model

Once the impact logic model was drafted, a table was created that describes the links, the potential performance indicators that could be used to test the link, the potential success criteria that would indicate the link was successful, and potential data sources of the link.

When thinking about how to write each of the performance indicators, we asked ourselves "What would we look at to judge whether the link description actions are occurring" and wrote the answer as the performance indicator.

Success criteria were created by us and are thought to be reasonable.

Figure 2: Preliminary Logic Model

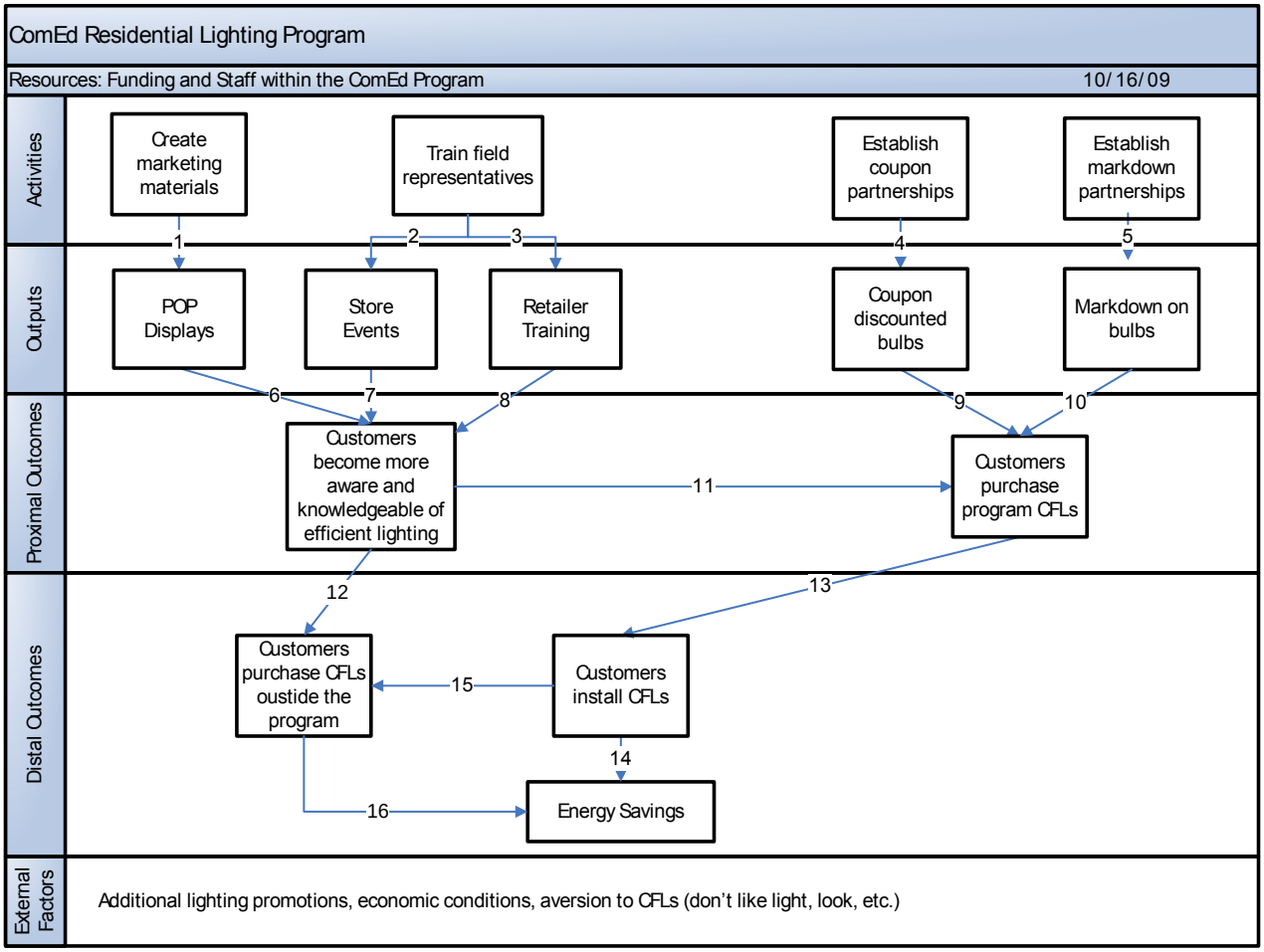


Table 45: Performance Indicators Table

Link	Description of Link	Potential Performance Indicator	Potential Success Criteria for Performance Indicator	Evaluator Data Collection Activities Associated with Link
1	In order to ensure that the ComEd brand is properly displayed, APT has trained ENERGY STAR Field representatives that perform site visits to all retail partners. The field staff makes sure that the qualified products have accurate signage and pricing and that there are no "missed opportunities" to promote either ENERGY STAR or the ComEd program (via end-caps, or other displays.)	1. Number of store visits by field representative 2. Percentage of stores that have taken advantage of all signage opportunities, correct pricing	1. Store visit to each retailer at least once every 6 weeks. 2.90% of retailers take advantage of all POP material opportunities.	1. Review of Program Materials (QA/QC reports) 2. In Store efforts (Year 2).
2	In order to get the program message out to more customers, field representatives conduct store events to showcase CFLs and demonstrate how much energy savings is possible by using CFLs. The representatives already have a strong working relationship with the retailers, so setting up visits is easy and can be scheduled.	1. Number of store visits per year per retailer	225 store events per year; 2 per month, per representative	1. Review of Program Materials
3	Store employees have the biggest opportunity to educate customers about the program when the field representative is not available. For this reason, the field staff will work with each participating retailer to train store sales employees so that customers can easily be made aware of the program.	1. Number of store visits by field representative 2. Amount of recall about information about ENERGY STAR products, program information, information about the representative, etc. (from retail employee)	1. Store visit to each retailer at least once every 6 weeks. 2. 90% score on the QA/QC field sheet that takes into account recognizing the representative's name, questions on training, etc., 90% of employees can correctly answer questions about ENERGY STAR and about the ComEd program	1. Review of Program Materials
4	Coupon partnerships are established with stores that that do not have the sales tracking capabilities that other retailers have. This allows for smaller retailers to also participate in the program, and works to create a balance of local and national retailers that are participants in the program.	1. Number of partnerships formed for coupon program 2. Number of program bulbs sent to coupon partners	1. Sufficient coupon partnerships formed with retailers across ComEd territory so that all ComEd customers have opportunity to purchase program bulbs	1. Review of Program Materials
5	Markdown partnerships are established with stores that are able to track sales of different products on a daily basis. The stores that will participate are primarily big box stores and typically have a lot of foot traffic, which will expose the program to a very large number of people.	1. Number of partnerships formed for markdown program 2. Number of program bulbs sent to markdown partners	1. Sufficient markdown partnerships formed with retailers across ComEd territory so that all ComEd customers have opportunity to purchase program bulbs	1. Review of Program Materials
6	Through the use of POP displays, customers become more knowledgeable about the types of energy efficient lighting available and also the reasons why people should use them.	1. Participant awareness of CFLs and benefits of using them	1. Increase the number of ComEd customers who are "very" or "somewhat familiar" with CFLs by 25% during each program year.	1. Participant survey
7	Through the store events put on by the retailers, customers become more knowledgeable about the benefits of energy efficient lighting and the types of energy efficient lighting available.	1. Number of store events per year/per representative 2. Growing awareness of CFLs and their benefits among ComEd customers.	1. 225 store events per year; 2 per month, per representative 2. Increase the number of ComEd customers who are "very" or "somewhat familiar" with CFLs by 25% during each program year.	1. Review of program materials 2. Participant survey

Link	Description of Link	Potential Performance Indicator	Potential Success Criteria for Performance Indicator	Evaluator Data Collection Activities Associated with Link
8	After receiving training from the field representative, retailer employees are able to answer questions from customers about CFLs, and when possible, educate customers on CFLs as well as the program offerings, thus increasing customer awareness of energy efficient lighting.	1. Participant awareness of CFLs and benefits of using them	1. Increase the number of ComEd customers who are "very" or "somewhat familiar" with CFLs by 25% during each program year.	1. Participant survey
9	When a (coupon) retailer is participating in the program, POP materials are delivered, field representatives visit and customers have the opportunity to buy program bulbs. This translates to a number of energy efficient bulbs purchased (# of coupons submitted).	1. Number of coupon submissions	1. All bulbs allocated to coupon retailers are sold	1. Review of sales tracking data
10	When a (markdown) retailer is participating in the program, POP materials are delivered, field representatives visit and customers have the opportunity to buy program bulbs. This translates to a number of energy efficient bulbs purchased (sales numbers for program bulbs submitted).	1. Number of bulbs sold via markdown program	1. All bulbs allocated to markdown retailers are sold	1. Review of sales tracking data
11	When customers see the benefits of using CFLs and see the bulbs are sold at a discount, customers are more inclined to purchase program bulbs.	1. Number of program bulbs sold	1. 3.0 million bulbs sold in year 1, savings of 95,321 MWh	1. Review of sales tracking data
12	Customers see the benefits of using CFLs and purchase non-program CFLs	1. Number of bulbs purchased outside the program	1. 10% of nonparticipants who report seeing literature on CFLs purchase them outside the program	1. Nonparticipant survey
13	CFLs fit sockets and are installed. Customers like how the lamps work (e.g., color of the light), and the lamps are kept in the sockets.	1. Installation rate of CFLs 2. Persistence of CFL installation	1. 90% of program CFLs are installed 2. 95% of installed lamps remain installed	1. Participant survey
14	Installing the CFLs will lead to energy savings because the CFLs replace incandescent bulbs.	1. Type of bulb that the CFL replaced	1. 95% of CFLs installed replaced an incandescent bulb	1. Participant survey
15	After installing program CFLs, customers experience the benefits of the bulbs and purchase additional CFLs outside the program	1. Number of bulbs purchased outside the program	1. 15% of participants purchase additional bulbs outside the program	1. Participant survey
16	Installing the CFLs will lead to energy savings because the CFLs replace incandescent bulbs.	1. Type of bulb that the CFL replaced	1. 95% of CFLs installed replaced an incandescent bulb	1. Participant survey

3.2.2 Awareness of Marketing Activities and Satisfaction with Program

Awareness of Marketing Activities

The two CATI surveys conducted as part of this evaluation asked several questions about customers' awareness of the ComEd Residential Lighting program to assess the influence of the program marketing activities. General Population Survey respondents who had heard of CFLs were asked whether they had ever heard of the "ComEd Smart Ideas Program, which offers cash incentives for installing energy efficiency lighting" in their homes. As shown in Table 46, just over one in five of these ComEd customers had heard of the program (22%). ComEd customers who had purchased CFLs, whether it was through the program or in some other way, were not significantly more likely to be aware of the Smart Ideas program than those who had never purchased CFLs.

Table 46: Aware of ComEd's Smart Ideas Program

Aware of Program	Total (n=220)	Markdown (n=56)	Non-Program (n=63)	Prior to June 2008 Purchaser (n=47)	Never Purchased CFLs (n=54)
	A	B	C	D	E
Aware	22%	16%	22%	26%	24%
Unaware	78%	84%	78%	74%	76%

Source: General Population Survey

ComEd customers who had purchased program CFLs were asked whether they could recall the ComEd discount and where they had first learned of it. Only 19 of the 56 people who we identified as purchasing program bulbs through the markdown program were aware that the bulbs were discounted. Of these, only 8 could recall where they had first learned of the program discount. The responses were a mix of in-store displays, activities, and mailing, but the number of responses is too few to make inferences to the larger population of markdown program participants.

Because coupon participants have to take the extra step of filling out the coupon to receive the discount, the survey assumed all coupon participants were aware of the discount program and simply asked where they first learned of the program. Coupon participants generally found out about ComEd's coupon program through promotional materials found in the store (41%) or through store employees (12%). This is in line with ComEd's marketing strategy of primarily utilizing in-store marketing. These findings imply that most customers were not aware of the discount before visiting the store.

Table 47: Where Participant First Learned of Coupon Program

How customer first found out about discount	Coupon Survey (n=100)
Saw coupon/marketing materials in store	41%
Store employee gave coupon	12%
Discount advertised in mailing (store circular/bill inserts)	15%
Discount advertised in newspaper	13%
Word of mouth	3%
Other	1%
Don't know	15%

Source: Coupon Survey

Familiarity with Energy Star® Label and Influence on Purchases of CFLs

The General Population survey asked respondents about their awareness of the ENERGY STAR® label and its influence on their purchasing decisions. ENERGY STAR® has a fairly high awareness rate among ComEd customers. Over two-thirds of customers are aware of the ENERGY STAR® label on household products. Customers who have never purchased or heard of CFLs are more likely to be unaware of the ENERGY STAR® label than those who have purchased CFLs. Markdown participants are significantly more likely to be aware of the label than those who purchased CFLs prior to June 2008.

Table 48: ENERGY STAR® Awareness[37]

Aware of ENERGY STAR®	Total (n=231)	Markdown (n=56)	Non-Program (n=63)	Prior to June 2008 Purchaser (n=47)	Never Purchased CFLs (n=54)	Unaware of CFLs (n=11)
	A	B	C	D	E	F
Yes, aware of label	76%	89% DE	83% E	77% E	61%	36%
No, unaware of label	23%	11%	14%	21%	39% BCD	64% BCD

Source: General Population Survey

Customers who are aware of the ENERGY STAR® label were asked how familiar they were with the label on a 0 to 10 scale where 0 represents not at all familiar and 10 very familiar. Just over three-quarters of ComEd customers were at least somewhat familiar with the label (43% very familiar, 33% somewhat). Customers who have never purchased CFLs were significantly less likely to be familiar with the label than those who have purchased CFLs at some point in the past. No significant difference was found between program, non-program and prior CFL purchasers.

[37] Superscript letters indicate which results are significantly different.

Table 49: Familiarity with ENERGY STAR®

Level of Familiarity with ENERGY STAR®	Total (n=175)	Markdown (n=50)	Non-Program (n=52)	Prior to June 2008 Purchaser (n=36)	Never Purchased CFLs (n=33)	Unaware of CFLs (n=4)
	A	B	C	D	E	F
Very Familiar (9,10)	43%	50% [E]	48% [E]	44% [E]	24%	25%
Somewhat Familiar (6,7,8)	33%	28%	37%	31%	36%	25%
Neutral (5)	12%	16%	8%	8%	18%	--
Somewhat Unfamiliar (2,3,4)	10%	4%	6%	17% [B]	12%	50% [BC]
Very Unfamiliar (0,1)	2%	2%	2%	--	6%	--

Source: General Population Survey

During the General Population Survey respondents were asked whether the ENERGY STAR® label would have a positive influence on their CFL purchase decisions for those who were aware of the label. As Table 50 shows, a slight majority of ComEd customers say the ENERGY STAR® label would have a positive influence on them. The label has the greatest influence on non-program CFL purchasers. Markdown program purchasers are significantly more likely than non-program purchasers to say the label would not positively influence their purchasing behavior. The label has the least influence on customers who have never purchased CFLs with 59% saying that even though they are aware of the label, it doesn't influence them.

Table 50: Influence of ENERGY STAR® Label on CFL Purchase Decisions

Influence of ENERGY STAR® on CFL Purchase Decisions	Total (n=175)	Markdown (n=50)	Non-Program (n=52)	Prior to June 2008 Purchaser (n=36)	Never Purchased CFLs (n=33)	Unaware of CFLs (n=4)
	A	B	C	D	E	F
Would positively influence	57%	56% [E]	71% [E]	67% [E]	30%	25%
Would not positively influence	40%	44% [C]	27%	33%	59% [CD]	75% [CD]
Don't know	3%	--	2%	--	11%	--

Source: General Population Survey

These results indicate that additional benefits could come by more marketing on the meaning of the ENERGY STAR® label to increase its influence among ComEd customers. That the markdown customers are less likely to be influenced by the label than other purchasers indicates a missed educational opportunity. There is also an opportunity to promote the ENERGY STAR® label to those who have never purchased CFLs so they are wise consumers when they make their first purchase of bulbs.

Satisfaction with Coupon Program

Customers who participate in the rebate program must fill out their coupons in the store and give them to the cashier at the front of the store. Most customers are very satisfied with the process for redeeming the ComEd coupons (70% of customers report being very satisfied giving it a rating of 9 or 10 on a scale if 0

to 10). A few customers reported being dissatisfied with the process because it was either too confusing or difficult to redeem the coupon.

3.2.3 Awareness and Use of CFLs

CFL Awareness

Nearly all ComEd customers are familiar with CFLs. Unaided, 86% have heard of CFLs. When offered a description of the bulbs, another 10% said they are familiar with the bulbs.

Table 51: Awareness of CFLs*

Awareness of CFLs	Total – General Population Survey (n=231)
Yes – unaided	86%
Yes – aided	10%
No	5%

Source: General Population Survey
**Does not sum to 100% due to rounding.*

Of the ComEd customers who are aware of CFLs, approximately one-third say they are very familiar with them while a similar number say they are somewhat familiar (see Table 52). Those who have purchased CFLs in the past year, either markdown program customers or non-program customers are most familiar with the bulbs. The General Population Survey suggests that additional educational campaigns could have an impact because a majority of customers who have never purchased a CFL are only slightly familiar or not at all familiar with CFLs. Furthermore, 11% have not purchased a CFL though they are very familiar with the bulbs. These customers could have misinformation or are unaware of the advances made in CFL technology over recent years.

Table 52: Familiarity with CFLs

Familiarity with CFLs	Total (n=220)	Markdown (n=56)	Non-Program (n=63)	Prior to June 2008 Purchaser (n=47)	Never Purchased CFLs (n=54)
	A	B	C	D	E
Very Familiar	34%	41% [E]	51% [E]	30% [E]	11%
Somewhat Familiar	36%	36%	37%	43%	30%
Slightly Familiar	22%	21%	11%	19%	37% [BCD]
Not at all familiar	8%	2%	2%	9%	22% [BCD]

Source: General Population Survey

Nearly three-quarters of customers who report purchasing specialty CFLs say they are very familiar with CFLs (73%), compared to just over one-third who report purchasing standard spiral CFLs (36%). These results suggest that information and knowledge is key to the growth of the specialty CFL market.

Both markdown and coupon customers were asked about their knowledge of CFLs prior to their purchase. The combined total, presented in Table 53, is weighted to reflect the far greater number of markdown customers than of coupon customers. Overall, just over one-quarter of lighting program participants were

very familiar with CFLs prior to making their purchase (27%). However, comparing coupon with markdown customers shows that customers who purchased CFLs through the coupon program were more likely to be very familiar with CFLs before their purchase than the markdown customers.

Table 53: Familiarity with CFLs before purchase of bulbs

Familiarity with CFLs	Weighted Total (n=155)	Markdown (n=55)	Coupon (n=100)
	A	B	C
Very Familiar	27%	27%	56% [B]
Somewhat Familiar	29%	29%	25%
Slightly Familiar	34%	35% [C]	14%
Not at all familiar	9%	9%	5%

Sources: General Population Survey and Coupon Survey

CFL Purchases and Usage

Approximately three-quarters (76%) of ComEd customers have at some point in the past purchased a CFL for their home. As shown in Table 54, nearly 40% of these customers purchased their first CFL prior to 2008, before the ComEd lighting program was in place. Only one in five markdown customers bought their first CFL prior to 2008 indicating they are fairly new to CFLs.

Table 54: Year of First CFL Purchase

Year	Total (n=166)	Markdown (n=56)	Non-Program (n=63)	Prior to June 2008 Purchaser (n=47)
	A	B	C	D
2009	12%	18% [D]	14% [D]	2%*
2008	34%	48% [D]	35% [D]	17%
Prior to 2008	39%	21%	40% [B]	57% [BC]
Other	1%	-	-	2%
Don't know	15%	13%	11%	21%

Source: General Population Survey
**This response is likely a respondent recall error as this respondent said they had not purchased CFLs since June 2008 on an earlier question.*

We saw earlier that coupon customers were more familiar with CFLs prior to their purchase than markdown customers. Table 55 shows that familiarity may have come from greater prior experience with CFLs. Forty-two percent of markdown customers did not have any CFLs installed prior to their purchase compared to 16% of coupon participants. Customers who participate in the coupon program are also significantly more likely to already have CFLs in most sockets (26%) than those who are purchasing markdown program bulbs (14%). However, the weighted total is more a reflection of program participants as a whole, which shows that prior to the program purchase, a majority had few or no sockets with CFLs.

Table 55: Number of CFLs In Screw-In Sockets Before Current Purchase

Number of Bulbs	Weighted Total	Markdown (n=50)	Coupon (n=95)
	A	B	C
All of the sockets	6%	6%	5%
Most of the sockets	13%	14%	26% [B]
About half of the sockets	11%	12%	22%
A few of the sockets	22%	24%	29%
None of the sockets	37%	42% [C]	16%
Don't know	2%	2%	1%

Sources: General Population Survey and Coupon Survey

Purchasers of CFLs were asked how many CFLs they had installed this year and also asked how many CFLs they had installed last year. Purchasers have, on average, 8 CFLs installed this year, which is 2.4 more than last year (Table 56). Recent purchasers not only had more installed last year than those purchasing prior to June 2008, but they installed even more over the past year.

Table 56: Mean Number of CFLs Installed in Home by Respondent Type

Year	Total (n=150)	Markdown (n=49)	Non-Program (n=42)	Prior to June 2008 Purchaser (n=33)
	A	B	C	D
Installed Last Year	5.6	6.8[D]	5.4	4.4
Currently Installed	8.0	9.7[D]	8.7[D]	5.1
Difference	2.4	2.9[D]	3.2[D]	0.6

Source: General Population Survey.

The General Population Survey also shows that more ComEd customers have purchased CFLs (52%) since June 2008 than have purchased an incandescent bulb (44%). When we look more closely at the results in Table 57, we see that CFLs were bought exclusively by just one-third of ComEd customers (32%) while slightly fewer only bought incandescent bulbs (24%). One-fifth purchased both types of bulbs (20%) while one-fourth bought neither type (24%).

Table 57: Bulb Types Purchased Since June 2008

Bulb Purchases	Total (n=175)	Markdown (n=56)	Non-Program (n=63)	Prior to June 2008 Purchaser (n=47)	Never Purchased CFLs (n=54)	Unaware of CFLs (n=11)
CFLs Only	32%	68%	57%	0%	0%	0%
Incandescents Only	24%	0%	0%	43%	61%	73%
Neither CFL or Incand.	24%	0%	0%	57%	39%	27%
Both CFL and Incand.	20%	32%	43%	0%	0%	0%

Source: General Population Survey.

3.2.4 Attitudes Regarding CFLs

Why Purchase CFLs

ComEd customers who have purchased CFLs were asked why they did so. The most frequent reasons given were to save money on energy bills and to decrease energy use. Looking at program purchasers, both coupon and markdown customers are more likely to purchase CFLs to save money on their electric bill than customers who have not purchased a CFL since June 2008. These more recent CFL buyers may have been encouraged to try CFLs because of higher energy costs.

Table 58: Reasons why Customers Purchase CFLs (multiple response)

Reason	Total* (n=166)	Markdown (n=56)	Coupon (n=63)	Non-Program (n=63)	Prior to June 2008 Purchaser (n=47)
	A	B	C	D	E
Save money on electric bill	41%	48% [E]	52% [E]	41%	32%
Decrease energy use	40%	34%	23%	48% [C]	36%
Last longer than incandescent	29%	34%	25%	27%	26%
Help the environment	14%	20%	12%	14%	8%
Better lighting quality than incandescent	10%	11%	7%	13% [E]	4%

Sources: General Population Survey and Coupon Survey
**The total is based on the General Population Survey only and represents the opinions of CFL purchasers in ComEd territory.*

Respondents who said they purchased CFLs to decrease their energy use were asked whether they were more motivated by a desire to save money or the environment. Table 59 indicates that both reasons are important for 43% of respondents. But those who were motivated by one reason were more likely to say it was saving money. Combined with the results from Table 58, a message that focuses on the monetary savings from CFLs would likely resonate with the most people.

Table 59: Reasons Why Customers Want to Decrease Energy Use

Reason	Total* (n=65)	Markdown (n=19)	Coupon (n=23)	Non-Program (n=30)	Prior to June 2008 Purchaser (n=16)
	A	B	C	D	E
Good for the environment	23%	16%	9%	23%	31% [C]
Save money	32%	26%	26%	43% [E]	19%
Both	43%	58% [D]	65% [D]	33%	44%
Other	2%	--	--	--	6%

Sources: General Population Survey and Coupon Survey
**The total is based on the General Population Survey only and represents the opinions of CFL purchasers in ComEd territory.*

Green Preferences

Respondents to the General Population Survey were asked several questions that dealt with their attitudes on environmental issues. They were read several statements and asked to rate their agreement with each using a 0 to 10 scale where 0 represented strongly disagree and 10 strongly agree. The results, shown in Table 60, indicate that ComEd customers are only moderately motivated by environmental concerns. Here again, saving money on energy is as much, if not more, of a motivator for taking energy saving actions. The only statistically significant difference between those who have purchased CFLs and those who have not is on willingness to spend more to save energy to protect the environment with CFL purchases being more willing. These results reinforce the findings presented earlier that messages promoting CFL use should promote cost saving first and environmental benefits second.

Table 60: Green Preferences

Issues	Total (n=231)	Markdown (n=56)	Non-Program (n=63)	Prior to 06/08 Purchasers (n=47)	Never Purchased CFLs (n=54)	Unaware of CFLs (n=11)
	A	B	C	D	E	F
I am willing to spend more money on products/services that save energy to protect environment	7.3	7.5[E]	7.8[E]	7.4[E]	6.1	8.6
I believe the global warming is a real phenomenon and that human's activities on this earth are speeding it up.	6.7	6.6	7.1	6.5	6.7	6.9
Saving money on electric bills by cutting usage is **less important** than cutting energy use to protect the environment	5.8	5.5	6.1	5.9	6.0	5.1
Cutting energy use to save money is **more important** than cutting energy use to protect the environment	5.7	5.6	5.7	5.4	5.7	6.3
I actively participate in or provide financial support to organizations whose main mission is to raise awareness of environmental issues and/or protect the environment	3.9	4.2	4.3	3.9	3.3	2.8

Source: General Population Survey.

Satisfaction with CFLs

Respondents who had purchased CFLs since June 2008 were asked how satisfied they were with those bulbs on a 0 to 10 scale. As Table 61 shows, coupon participants were the most satisfied with their bulbs followed by markdown purchasers and then non-program purchasers. However, a majority of each group were very satisfied with their bulbs. Only a handful of purchasers were dissatisfied. The main reasons given for being dissatisfied dealt with the delay when the light turns on and the quality of the light.

Table 61: Satisfaction with CFLs Purchased Since June 2008

Agreement	Markdown (n=56)	Coupon (n=100)	Non-Program Purchaser (n=50)
	A	B	C
Very satisfied (9,10)	61%	71% [C]	50%
Somewhat satisfied (6,7,8)	25%	19%	36% [B]
Neutral (5)	5%	3%	2%
Somewhat Dissatisfied (4,3,2)	5%	3%	2%
Strongly Dissatisfied(1,0)	4%	1%	6%
Mean	8.1	9.0 [AC]	7.9

Sources: General Population Survey and Coupon Survey

Future CFL Purchasing Intentions

General Population Survey respondents were asked what they would do when their next incandescent bulb burns out. A majority of ComEd customers (58%) would replace it with another incandescent, either with one they have in storage (42%) or with one they would purchase (16%). Just over one in four would replace their burnt out incandescent with a CFL (16% from storage, 14% purchased). ComEd customers who have never purchased a CFL are the ones who are most likely to stick with an incandescent replacement by getting one from storage (59%) or buying one (27%). Still, even CFL purchasers are as or more likely to replace an incandescent with an incandescent. Most come from storage so it is possible they will gradually move to CFLs as their stocks of incandescent bulbs become depleted.

Table 62: Action Taken When Next Incandescent Burns Out

Action Taken	Total (n=176)	Markdown (n=41)	Non-Program (n=50)	Prior to June 2008 Purchaser (n=34)	Never Purchased CFLs (n=44)	Unaware of CFLs (n=7)
	A	B	C	D	E	F
Replace with incandescent from storage	42%	37%	36%	35%	59%BCD	0%
Buy incandescent to replace	16%	2%	14%B	15%B	27%B	59%BCD
Replace with CFL from storage	16%	17%	30%	21%	0%	57%
Buy CFL to replace	14%	24%	18%	18%	5%	0%
Depends on bulb location	6%	15%CD	4%	6%B	2%	14%
Don't know	6%	5%	6%	6%	7%	7%

Source: General Population Survey.

3.2.5 Barriers to CFL Use

In order to understand why ComEd customers who are aware of CFLs are still not using them, we asked those who have never purchased CFLs why they have not done so. A variety of reasons were given with the top ones being that CFLs are too expensive (17%), they are waiting for a current bulb to burn out (17%) or they do not like CFLs light quality. Collectively, most of the reasons listed have to do with misinformation about CFLs rather than a dislike of the light quality. Most of these reasons could be addressed through information and marketing campaigns.

Table 63: Reasons Why Customers Do Not Purchase CFLs

Reason	Never Purchased CFLs (n=53)
Too expensive	17%
Waiting for current bulbs to burn out	17%
Do not like light	17%
Unsure of quality	6%
Never thought of buying CFLs	6%
Bulbs given to me/already in apartment	6%
Problems disposing due to mercury	6%
CFLs don't fit into fixtures	4%
Do not believe they save much energy	4%
Unaware of CFLs	4%
Have not seen CFLs in stores	4%
General dislike of CFLs	4%
Don't know	13%

Source: General Population Survey.

As reported earlier, a large percentage of ComEd customers are still purchasing incandescent light bulbs (44% in the past year). It is possible that the people purchasing incandescent bulbs instead of CFLs are buying them for specialty light fixtures that do not work with a standard CFL or that they believe do not work with a CFL. The General Population Survey asked incandescent purchasers whether they had purchased the incandescent for a regular or specialty light fixture. A large majority bought incandescent bulbs for a regular light fixture (80%) while only one-third bought them for specialty fixtures.

Table 64: Intended Use of Incandescent Bulbs Purchased

Use	Purchased Incandescent Bulb During Past Year* (n=101)
Regular Fixture	80%
Specialty Fixture	32%
Don't Know	5%

Sources: General Population Survey and Coupon Survey
**Totals sum to greater than 100% because people bought more than one bulb for more than one use.*

Disposal of CFLs

A concern about CFLs that could pose a barrier to their adoption is concern regarding the mercury in CFLs and how to properly dispose of them when they burn out. The General Population Survey asked ComEd customers who were aware of CFLs whether they had any concerns with the disposal of CFLs, and if so, what those concerns were. Table 65 shows that a majority of customers do not have any concerns relating to the operation of CFLs (60%). Customers with concerns cite the mercury contained in bulbs (15%), but more mention the related disposal problems but do not tie it to mercury specifically (26%). There is little difference in level or type of concern between program and non-program purchasers or those who have never purchased a CFL.

Table 65: Concerns about Disposal of CFLs

CFL Disposal Concerns	Total (n=220)	Markdown (n=56)	Non-Program (n=63)	Prior to June 2008 Purchaser (n=47)	Never Purchased a CFL (n=54)
	A	B	C	D	E
No Concerns	60%	63%	51%	66%	61%
Mercury contained in bulbs	15%	14%	16%	13%	17%
Requires special disposal/Must be Recycled	26%	25%	35%[E]	21%	20%
Don't know	4%	--	5%	--	11%

Source: General Population Survey

Few CFL purchasers actually have experience with the disposal of a CFL. Only 30% have ever disposed of a CFL (Table 66). Non-program purchasers are more likely to say that they have disposed of a CFL than those that have not purchased a CFL since June 2008.

Table 66: Prior Disposal History

Disposed of a CFL?	Total (n=166)	Markdown (n=56)	Non-Program (n=63)	Prior to June 2008 (n=47)
	A	B	C	D
Yes	30%	27%	40%[D]	21%
No	66%	71%	59%	70%
Don't know	4%	2%	2%	9%

Source: General Population Survey

Though few ComEd customers have disposed of CFLs, many who have are not choosing an environmentally safe method. Nearly two-thirds of purchasers who have disposed of a CFL reported throwing them away in the trash (Table 67). Just over one-quarter of customers took the CFL to a hazardous waste center or a retailer to properly dispose of the bulb.

Table 67: CFL Disposal Methods

How CFL was disposed of?	Total (n=50)	Markdown (n=15)	Non-Program (n=25)	Prior to June 2008 (n=10)
	A	B	C	D
Threw away in trash	64%	73%	56%	70%
Recycled/dropped off at hazardous waste center	16%	20%	12%	20%
Recycled/dropped off at retail store	12%	7%	20%	--
Other	2%	7%	--	--
Don't know	8%	--	12%	10%

Source: General Population Survey

Disposal issues do not appear to be a barrier to CFL use for most people, but lack of knowledge about proper disposal methods for CFLs may be related and a cause for concern. More outreach is necessary to educate customers on the proper disposal of CFLs due to mercury content and the disposal sites that ComEd has worked to provide.

Lighting Purchase Behavior

Just over half of ComEd customers report that they tend to purchase lighting when a bulb burns out (Table 68). Customers who purchased lighting through the coupon program were more likely to buy their lighting in bulk than those who purchased bulbs through the markdown program, those who purchased non-program bulbs, or those who haven't purchased bulbs since June 2008.

Table 68: Customer Lighting Purchase Behavior

Timing of Lighting Purchases	Total (n=231)	Markdown (n=56)	Coupon (n=100)	Non-Program (n=63)	Prior to June 2008 (n=47)	Never Purchased a CFL (n=54)	Unaware of CFLs (n=11)
	A	B	C	D	E	F	G
When a bulb burns out	52%	52%[C]	33%	54%[CF]	53%[C]	44%	64%
Buy lighting in bulk	12%	11%	27%[BDE]	6%	11%	20%	9%
Buy lighting when on sale	26%	25%	30%	27%	26%	26%	27%
Buy lighting on a schedule	4%	2%	4%	8%	--	6%	--
Buy bulk lighting on a schedule	4%	7%	5%	5%	2%	2%	--
Other	2%	2%	--	--	6%	2%	--
Don't know	1%	2%	1%	--	2%	--	--

Source: General Population Survey and Coupon Survey.

ComEd customers purchase most of their lighting from either from large hardware stores (40%) or mass merchandise stores (29%) (Table 69). Customers who purchased bulbs through the markdown program were more likely to purchase their bulbs at large hardware stores while coupon customers were more likely to purchase the majority of their lighting at small hardware stores. Mass merchandise stores, like Wal-Mart or Target, are popular places to purchase lighting for ComEd customers who did not purchase program CFLs.

Table 69: Where Customers Purchase Lighting Products

Primary Lighting Purchase Location	Total (n=231)	Markdown (n=56)	Coupon (n=100)	Non-Program (n=63)	Prior to June 2008 (n=47)	Never Purchased a CFL (n=54)	Unaware of CFLs (n=11)
	A	B	C	D	E	F	G
Large Hardware Store	40%	63%^{CDEFG}	37%^{F}	38%^{F}	38%	24%	18%
Mass Merchandise Store	29%	13%	6%	37%^{BC}	26%^{BC}	39%^{BC}	36%^{C}
Small Hardware Store	12%	14%	32%^{BDEFG}	10%	13%	11%	9%
Drug Store	5%	2%	5%	3%	6%	7%	9%
Grocery Store	7%	2%	1%	5%	9%^{C}	9%^{BC}	18%
Club Store	3%	--	4%	5%	4%	4%	--
Convenience Store	2%	4%	1%	3%	2%	--	--

Source: General Population Survey and Coupon Survey
**The total is based on the General Population Survey only and represents the opinions of CFL purchasers in ComEd territory.*

3.3 Cost-Effectiveness Analysis

This section addresses the cost effectiveness of the Residential Energy Start Lighting Program. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. The TRC test is defined in the Illinois Power Agency Act SB1592 as follows:

> *" 'Total resource cost test' or 'TRC test' means a standard that is met if, for an investment in energy efficiency or demand-response measures, the benefit-cost ratio is greater than one. The benefit-cost ratio is the ratio of the net present value of the total benefits of the program to the net present value of the total costs as calculated over the lifetime of the measures. A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and the participant in the delivery of those efficiency measures, to the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side program, to quantify the net savings obtained by substituting the demand-side program for supply resources. In calculating avoided costs of power and energy that an electric utility would otherwise have had to acquire, reasonable estimates shall be included of financial*

costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases."[38]

ComEd uses DSMore™ software for the calculation of the TRC test.[39] The DSMore model accepts information on program parameters, such as number of participants, gross savings, free ridership and program costs, and calculates a TRC which fits the requirements of the Illinois legislation.

One important feature of the DSMore model is that it performs a probabilistic estimation of future avoided energy costs. It looks at the historical relationship between weather, electric use and prices in the MISO region and forecasts a range of potential future electric energy prices. The range of future prices is correlated to the range of weather conditions that could occur, and the range of weather is based on weather patterns seen over the historical record. This method captures the impact on electric prices that comes from extreme weather conditions. Extreme weather creates extreme peaks which create extreme prices. These extreme prices generally occur as price spikes and they create a skewed price distribution. High prices are going to be much higher than the average price while low prices are going to be only moderately lower than the average. DSMore is able to quantify the weighted benefits of avoiding energy use across years which have this skewed price distribution.

Table 70 summarizes the unique inputs used in the DSMore model to assess the TRC ratio for the Residential Energy Star Lighting program in PY1. Most of the unique inputs come directly from the evaluation results presented previously in this report. Measure life estimates and program costs come directly from ComEd. All other inputs to the model, such as avoided costs, come from ComEd and are the same for this program and all programs in the ComEd portfolio.

Table 70. Inputs to DSMore Model for the Residential Lighting Program

Item	Value Used
Measure Life	9 years
Participants (bulb count)	3,001,367
Annual Gross Energy Savings	87,917 MWh
Gross Coincident Peak Savings	102.9 MW
Net-to-Gross Ratio	69%
Utility Administration Costs	$268,352
Utility Implementation Costs	$1,775,347
Utility Other Costs	$251,297
Utility Incentive Costs	$3,240,497
Participant Contribution to Incremental Measure Costs	$3,962,784

Based on these inputs, the TRC for this program is 3.77 and the program passes the TRC test.

At this time, additional benefits related to reduction of greenhouse gas emissions have not been quantified in the calculation of the TRC. These additional benefits would increase the given TRC benefit/cost ratio.

[38] Illinois Power Agency Act SB1592, pages 7-8.

[39] Demand Side Management Option Risk Evaluator (DSMore) software is developed by Integral Analytics.

4 CONCLUSIONS AND RECOMMENDATIONS

This section highlights the findings and recommendations from the evaluation of the Residential Lighting program. The primary objectives of this evaluation were to quantify the gross and net energy impacts resulting from discounted bulbs sold through the Residential Lighting program. Below are the key conclusions and recommendations.

4.1 Conclusions

The Residential Lighting evaluation team completed surveys with 156 program participants and 175 nonparticipants in support of this evaluation. The following conclusions were drawn from these surveys.

4.1.1 Marketing Approach

The marketing approach used by ComEd emphasizes in-store activities and displays. The field representatives do a good job conducting these activities. There are also numerous quality checks in place to ensure materials are properly displayed and the discount, courtesy of ComEd, is represented.

Despite these efforts, the General Population Survey suggests that most program participants are not being influenced or educated by the program. Most markdown participants were unaware of the discount. In addition, just over one-fifth of ComEd customers have heard of the ComEd Smart Ideas program. Customers who had purchased program bulbs were no more likely to have heard of the program than other ComEd customers.

Awareness of the ENERGY STAR® label is relatively high, with three-quarters of ComEd customers reporting they had heard of it. Just over half would be positively influenced by the label when making lighting purchases. Program participants are no different than non-program participants suggesting that the ENERGY STAR® label was not a major driver of their participation in the program.

4.1.2 Adjusted Gross Program Savings

Delta Watts

The average number of watts displaced by program bulbs (delta watts) was estimated to be 48.7 watts which was nearly identical to the ex ante estimate. The average difference in the estimated pre-program bulb wattage between self-reports and those based on standard incandescent equivalents was approximately 2 watts. The majority of program bulbs were reported to replace an existing incandescent bulb and less than 2% were reported to replace another CFL.

Hours of Use

The ex ante estimate of hours of use was 2.34 hours per day (854 hours/year). This estimate was taken from the 2005 DEER and is based on a 2005 California metering study conducted of residential homes. Preliminary discussion of yet to be published recent research seems to point to a relationship between residential socket saturation (which one would expect to be higher in California than in ComEd service territory due to the long history of lighting programs in California) and HOU. This research, as well as ComEd specific data collected during on-site surveys and a small logger study, will be explored further in

PY2, however the evaluation team feels that currently there is not data to support altering the ex ante HOU estimate.

Installation Rate

The ex ante installation rate was assumed to be 95%. The evaluation-calculated an overall installation rate of 70% for program bulbs delivered through the coupon and upstream delivery channels (these two channels had statistically significantly different installation rates of 79% and 70% respectively). This decrease in the installation rate leads to a reduction in the gross annual kWh savings of 74%. The good news is that the majority of survey respondents indicated that the program bulbs that are not installed are in storage and that they plan to install these bulbs when a currently installed burns out. The energy savings from these stored bulbs was not counted as PY1 savings, but savings resulting from these future installations will be estimated in PY2 and PY3 evaluations.

4.1.3 Adjusted Net Program Savings

Net-to-Gross Ratio

The ex ante estimate of the NTG ratio was 80%. The evaluation calculated a NTG ratio of 69%, which was 86% (or 11% lower) than the estimate that was used for program planning. This estimate was based on self-reported estimates calculated using participant phone survey data. Twenty percent of the upstream program participants surveyed indicated that all or most of the screw-in sockets in their home were filled with CFLs prior to purchasing their program bulbs and another 12 percent indicated that approximately half were filled. These high levels of prior usage support a free-ridership rate that is greater than 30% (evaluation found it to be 38%).

4.2 Recommendations

The following recommendations apply to future rollouts of the Residential Lighting program or other programs that use similar program delivery methods.

- The program was successful in meeting its goals in terms of number of bulbs sold. Multi-year programs should have flexible marketing strategies that can be altered over time to attempt to reach people who have never purchased CFLs and not just increase the number installed in existing CFL homes. Over one-quarter of ComEd customers have never purchased a CFL. Most have heard of the bulbs, but there is less awareness of their benefits and the improvements that have been made in recent years. Part of this outreach would be to expand the program to mass merchandise stores (which is planned for PY2), which are popular location to buy lighting for the 25% of customers who have not purchased CFLs. Promotional displays in these stores advertising the benefits of CFLs are important, but marketing outside the stores may be required. Increased bill inserts and newsletter articles could be effective.
- A barrier to the adoption of CFLs is their higher cost. Greater advertisement of the program outside the stores may be helpful to attract these customers. Even most markdown participants, many of whom had purchased CFLs in the past, were unaware of the discount despite the in-store displays.
- A barrier to CFL adoption for customers who have never purchased a CFL is the desire to wait for their incandescent to burn out before they replace them with CFLs. Program materials could be enhanced to emphasize the savings that can be achieved by replacing existing inefficient lights *before they burn out*.

- Program participants and other purchasers of CFLs appear to be more motivated by the money saved on their utility bills by using CFLs than by the environmental benefits. Though both messages are important, program materials should place greater emphasis on monetary savings, particularly the long-terms savings over the entire life of the bulb.
- Promote and invest in proper disposal of CFLs. Currently, concerns over mercury, are not widespread. Careful promotion of a CFL recycling program will reassure people and take away the burden of disposal rather than heighten concerns.

5 APPENDICES

5.1 Data Collection Instruments

The data collection instruments used in this evaluation consisted of in-depth interview guides for the ComEd program manager and the APT and EFI program implementers, and CATI phone survey instruments for a coupon channel program participant survey and a general population survey.

5.1.1 In-Depth Interview Guides for ComEd Staff and Program Implementers

Program Staff In-Depth Interview Guide

ComEd Residential Lighting Depth Interv

ComEd Residential Lighting Interview Guide – Implementer – APT

ComEd Resdiential Lighting Depth Interv

ComEd Residential Lighting Interview Guide – Implementer - EFI

ComEd Resdiential Lighting Depth Interv

5.1.2 Coupon Participant Survey Instrument

Microsoft Office Word 97 - 2003 Docu

5.1.3 General Population Purchaser and Non-Purchaser Survey Instrument

Microsoft Office
Word 97 - 2003 Docu

5.1.4 Free-ridership Scoring Algorithm

/* Data Cleaning for NTG Calculation */

```
if QFR14 > 10 then QFR14 = .;
if QFR15 > 10 then QFR15 = .; [RDD Only]
if QFR12 > 10 then QFR12 = .;
```

/* Calculation of Program Influence Score */

The Program Influence Score is based on a significance ranking that surveyed participants give to the discounted purchase price or the program materials (RDD Only). The PI score is cut in half if the surveyed respondents report that they were already planning on purchasing light bulbs when they heard about the discounted CFLs.

```
if QFR2A = 1 then PIScore = max(QFR14,QFR15) / 2;
      else PIScore = max(QFR14,QFR15);
```

/* Calculation of No-Program Score */

The first step in the calculation of the No-Program score is to calculate NPScore_1 which is equal to "Yes" if the respondent indicated that they WOULD have bought CFLs in the absence of the program.

```
if QFR2a = 1 (or QFR4 = 1 or QFR5 = 1)[Coupon Only]
then NPScore_1 = "Yes";
```

The next step is to calculate NPScore_2 which is equal to a proxy for the number of months in the future the respondent indicated they would have purchased the light bulbs in the absence of the program [At the same time (0), Within a few months (3), Within a year (9) or more than a year (12)].

```
if QFR6 = 1 then NPScore_2 = 0;
else if QFR6 = 2 then NPScore_2 = 3;
else if QFR6 = 3 then NPScore_2 = 9;
else if QFR6 = 4 then NPScore_2 = 12;
```

The third step is to calculate NPScore_4 which is a discounted inverse purchase likelihood score (QFR12 is the how likely is it that you would have bought the same CFLs in the absence of the program, where 10 means very likely and thus also very likely to be a free-rider and 0 means not at all likely and thus also not likely to be a free-rider). By subtracting the purchase likelihood from 10 we get the inverse purchase likelihood (where 0 means respondent is very likely to purchase and 10 means they are very unlikely to purchase). Furthermore, in this calculation of NPScore_4, the purchase likelihood is "discounted" to account for the fact that the program may have accelerated the CFL purchase (NPScore_4, as shown in

the step below, is only used if respondent indicated their purchase would have occurred more than 7 months later). So a respondent who claims it is very likely (10) that they would have purchased the bulbs in the absence of the program but this purchase would not have occurred until the next year would get an inverse purchase likelihood of 1.44 rather than 0 (which would be the score assigned to someone who states they definitely would have bought the bulbs at the same time or within 3 months).

```
NPScore_4 = 10 - QFR12 * (1 - ((NPScore_2 - 6)*0.024));
```

Next NPScore_3 (the adjusted inverse purchase likelihood score) is calculated as the inverse of the purchase likelihood (if the purchase would have been made in the next 6 months), else it is equal to NPScore_4 (the discounted inverse purchase likelihood)

```
if NPScore_2 < 7 then NPScore_3 = 10 - QFR12;
else NPScore_3 = NPScore_4;
```

Finally, if NPScore_1 (Would have bought bulbs in the absence of the program) is Yes then the NoProgram score = NPScore_3 (the adjusted inverse purchase likelihood), else it is equal to 10 (meaning they are not a Freerider)

```
if NPScore_1 = "Yes" then NPScore = NPScore_3;
            else NPScore = 10;
```

/* Calculation of Free-ridership Estimate */

Once the PIScore and the NPScore have been calculated they are used to calculate the Free-ridership score. In some cases the Program Influence score is missing and thus the Free-ridership score is calculated based solely on the NoProgram score.

```
FRScore = 1 - (PIScore + NPScore)/20;
If PIScore = . then FRScore = 1 - NPScore/10;
```