Final Report

Prepared for:

Sacramento Municipal Utility District

Prepared by:

RLW Analytics, Inc.
1055 Broadway
Sonoma, CA 95476
707-939-8823

Table of Contents

List of Figures

List of Tables

1 EXECUTIVE SUMMARY

This is the final report of the evaluation of the fall 2005 campaign of SMUD's Residential ENERGY STAR Lighting Program. This report provides a verification of the annual energy and peak load savings, the number of compact fluorescent lamps (CFLs) purchased, the installation and retention rates, summer-peak coincidence and operating hours, and an assessment of free rider and spillover impacts. Additionally, the report contains some recommendations to improve program effectiveness resulting from a brief process evaluation.

The SMUD Residential ENERGY STAR Lighting Program encourages lighting efficiency improvements by SMUD residential customers, and aims to transform the residential lighting market to one characterized by sustained demand for energy-efficient lighting products. The theory is that, given an increased availability of quality CFLs and CFL fixtures at reduced prices at retailers, SMUD customers will increasingly purchase them to replace incandescent lamps and fixtures. SMUD's current promotion of CFLs offers reduced prices through utility and manufacturer incentives, supported by manufacturer, retailer, and utility marketing.

1.1 Objectives

The study objectives are to verify the annual-energy and peak-load savings, number of CFLs and fixtures purchased, installation and retention rates, summer-peak coincidence and operating hours, and free-ridership and spillover.

This study evaluates SMUD's Residential ENERGY STAR Lighting Program Fall 2005 campaign. The primary objectives of this study are as follows:

1. Verify the annual-energy and peak-load savings as compared to the projected savings.
2. Verify the number of CFLs and fixtures purchased.
3. Determine installation and retention rates.
4. Determine summer-peak coincidence and operating hours.
5. Assess free rider and spillover impacts.

1.2 Approach

RLW used a combination of in person and telephone surveys along with results from previous and ongoing studies to evaluate the program. The majority of the data collection was done through the in-person and telephone surveys, augmenting and refining the results with secondary research. The secondary research consisted of the review of and use of data from relevant studies such as the residential survey of SMUD territory homes for the 2005 California Lighting and Appliance Saturation Study (CLASS) and the 2005 Kema CFL Metering Study.

Actual energy savings are realized by the actions of the CFL purchasers. Surveying end-users is thus the only effective way to evaluate this program. Because the program has no direct interaction with consumers, acquiring consumer behavior data was critical to completing the evaluation.

1.3 Data Collection Methodology

All retail customers who purchase SMUD incented CFLs or fixtures receive an instant discount at the register, even if they are not a SMUD customer. The evaluation is based on 202 point of sale surveys at 10 retailers and 165 telephone follow-up surveys with these customers. We called 196 customers to complete the 165 surveys, resulting in a conversion rate of 84%. Refer to Table 7 for a complete listing of all survey dispositions.

A major focus of this study was the collection of consumer behavior data. RLW stationed surveyors inside stores near the CFLs to capture information from the consumers. This method, conducted in stores such as Home Depot, Costco, Albertson's, and ACE Hardware, achieved response rates exceeding 90%.

The point-of-sale survey approach also enhances the effectiveness of *free-ridership* questions, which are best asked when the end-user is making the purchasing decision. Follow-up surveys performed 3 months later address participant spillover, satisfaction, usage, lamp replacements, and retention.

1.4 Key Impact Findings

This chapter of the report summarizes the program kWh and kW savings evaluation results. The program tracking data are first summarized, and then the program assumptions are discussed and compared to the EM&V findings. The final sections of this chapter present the actual impact evaluation findings.

Table 1 provides a summary of the ex-ante planning assumptions. The table also presents the ex-post calculated values for each variable. The average wattage reduction for the verified lamps is significantly lower than that of the ex-ante estimate, at 41 watts compared to the program assumption of 57 watts (based upon final lamp wattage distribution). This difference in watts is a difference of 28%. The ex-post replaced wattages were taken directly from the CLASS study in which incandescent lamp wattages were inventoried by room, fixture, and lamp type. The ex-ante replaced wattages are based upon typical replacement wattages.

The daily hours of use and the coincidental load factor from the ex-post analysis are 18-19% higher than the ex-ante estimates. This indicates that the verified CFLs were installed in rooms of the house with longer operating hours than the average operating hours for CFLs (ex-ante estimate).

The District assumed that 79% of the CFLs and fixtures purchased would be installed and remain in place for the anticipated 9.5 year life of the measures. RLW calculated the proportion of purchased lamps that were installed by the time of the follow-up call, or the installation rate, as 70%. We acknowledge that the installation rate may be higher after a few more months, when people have more time to install the lamps. We can conclude that nearly one third of the potential program savings are not achieved immediately after purchase. A follow-up study

could be performed to recalculate a revised installation rate to better understand how the installation rate changes over time.

Variable	Ex-Ante	Ex-Post	% Change
Wattage Reduction	57	41	-28%
Daily Hours of Use	2.3	2.7	18%
Peak Coincidental Load Factor	0.126	0.150	19%
Installation Rate	79%	70%	-11%
Net-to-Gross Ratio	1.00	0.97	-3%

Table 1: Comparison of Ex-Ante Planning Assumptions to Ex-Post Findings

Table 2 shows the summary kWh savings estimates by wattage group. Note that the sample did not contain any lamps in the lowest wattage group, the 7-11 watt group. Therefore the savings for this group were estimated based upon the lamps in the 13-16 watt group. Those two groups are aggregated in the following tables. Column 2 shows the ex-ante GWh savings for the actual number of lamps incented in the program. Column 3 shows the EM&V measured ex-post *gross* GWh savings for the same number of lamps.

Column 4 shows the gross realization rates, which is computed as the ex-post savings divided by the ex-ante savings. In other words, the gross realization rate is the amount of estimated savings realized by the program *before* accounting for free-ridership and spillover. The gross realization rate estimated for the program is 75.4% with a relative precision of 23.2%. The relative precision is higher than anticipated since we found that the hours of operation were highly variable, especially for outdoor lights, which were self-reported estimates of hours of use. The business with outdoor lights with self-reported hours of operation also added to the variation in the savings estimates since they purchased a large quantity of lamps, installed them outdoors, and ran them for 12 hours per day all year long. There were three customers in the sample that purchased lamps to be used in their business. Additionally, we originally estimated that the average number of lamps purchased per person would be between 2-4 lamps. Instead we found that the average is 9 lamps, with large variation around that average.

Column 6 shows the net-to-gross ratio for the program at 0.97. This includes both free-ridership and spillover. A net-to-gross ratio of 1.0 indicates that free-ridership and spillover are balancing each other out. The loss in savings from the lamps that would have been purchased anyway without the incentive are balanced out by the added savings from the additional *full price* lamps that people purchased after participating in and learning from their program experience. The free-ridership rate is 22%, or the net-to-gross ratio is 78% before spillover is added to the net savings. Applying the spillover rate of 19% raises the net-to-gross ratio to 0.97. It should be noted that only participant spillover was assessed. This evaluation did not attempt to measure non-participant spillover (additional purchase of qualifying lamps outside program tracking, resulting from additional product orders by retailers and purchases by additional consumers resulting from program marketing or "word of mouth" by program participants). This additional spillover would further raise the net-to-gross ratio.

Column 7 displays the net realization rate, or the product of the gross realization rate and the net-to-gross ratio. The net realization rate is the amount of estimated savings realized by the

program *after* accounting for free-ridership and spillover. The overall net realization rate is 73%.

Column 8 shows the EM&V measured ex-post *net* GWh savings for the actual number of lamps incented in the program.

1	2	3	4	5	6	7	8
Wattage Groups	**Ex-Ante GWh Savings**	**Ex-Post GWh Savings**	**Gross Realization Rate**	**Relative Precision**	**Net-to-Gross Ratio**	**Net Realization Rate**	**Ex-Post NET GWh Savings**
7-16 W	11.09	12.03	108.5%	32.3%	0.81	87.9%	9.75
18-20 W	3.34	1.89	56.6%	28.1%	0.73	41.1%	1.37
23-30 W	10.17	4.61	45.4%	16.2%	1.50	68.1%	6.92
Overall	**24.60**	**18.54**	**75.4%**	**23.2%**	**0.97**	**73.4%**	**18.05**

Table 2: kWh Savings Estimates, Realization Rates, and NTG Ratio

Table 3 displays information similar to the previous table, except Table 3 summarizes the program kW reduction instead of kWh savings. The realization rates and net-to-gross ratio are very similar across tables. However, note that the relative precision is much better in this table at 10% since kW does not factor in the highly variable hours of operation, causing less variation in the reduction estimates.

Wattage Groups	**Ex-Ante MW Reduction**	**Ex-Post MW Reduction**	**Gross Realization Rate**	**Relative Precision**	**Net-to-Gross Ratio**	**Net Realization Rate**	**Ex-Post NET MW Reduction**
7-16 W	1.69	1.70	100.7%	10.6%	0.81	81.8%	1.38
18-20 W	0.51	0.29	57.3%	39.2%	0.79	45.5%	0.23
23-30 W	1.55	0.73	47.0%	14.1%	1.49	70.2%	1.09
Overall	**3.75**	**2.72**	**72.6%**	**10.2%**	**0.99**	**72.0%**	**2.70**

Table 3: kW Reduction Estimates, Realization Rates, and NTG Ratio

1.5 Key Process Findings

Over 80% of the participants did not know about the SMUD program before entering the store. The large majority (76%) of the participants had purchased CFLs in the past. This indicates that the participants were familiar with the technology. SMUD should try to target markets where CFL penetration is lower. The less penetrated markets would likely include customers that would install the CFLs at a higher rate, and also have lower rates of free-ridership.

Overall, it appears that participants are satisfied with the CFL technology, as the percent of participants that stated they were 'satisfied' with the light output, shape/size of lamp, and the startup speed was around 80%. Participants are less satisfied with the amount of energy savings realized by the lamps, with only 60% reporting satisfaction with this aspect of CFLs. The participants were most satisfied with the color of the lamps, with over 95% of the respondents stating that they were satisfied with the color.

SMUD should provide uniform, large marketing signs to ensure that customers are aware that the CFLs are discounted by SMUD. The SMUD labeling will help customers to understand that the product has been heavily discounted by SMUD, and will serve to ensure that the product is of good quality, and is not simply a closeout item that is of lesser quality. The incented product should always be placed on an end-cap or near other household goods, where customers typically shop for incandescent lamps.

1.6 Observations and Recommendations

Several observations were made about the program through the course of conducting this evaluation. Some of these observations have resulted in recommendations for the program. Detailed specifics for each observation are articulated in the report section entitled "Observations and Recommendations". Our major observations are:

Use more targeted marketing to improve installation rate. As mentioned in the report, the verified installation rate was 70%, compared to the SMUD assumption of 79%. The program will be more effective if it is able to precisely target the customers who would otherwise not be able to afford to purchase CFLs, those who would be more likely to install the lamp rather than keep it on a shelf as a backup, and those who would be replacing incandescent lamps with the incented CFLs, as opposed to replacing failed CFLs with new CFLs. SMUD should consider a follow-up study with the sampled customers to understand if the installation rate improves over time.

Provide standardized marketing material to stores to ensure that the products are uniformly signed. Visit the stores shortly after the lamps have been delivered to ensure that the lamps are properly signed and the signage is placed near the product. Include the SMUD logo on the signage so customers understand that SMUD is providing the lowered pricing. Include both the reduced and original price on the signs to show the dollar savings. Recommend that the lamps/fixtures be placed on high visibility end-caps near the household goods.

Ensure that all products have a uniform SMUD sticker on the package. Some of the products we encountered during the in-store visits did not have SMUD stickers on the package, making the identification of the incented product difficult for both the evaluators and the consumers.

In-store surveys are an effective way to evaluate POS programs. Retailers were very cooperative in allowing RLW to perform the in-store surveys on their sales floor. This approach yielded an overall response rate of 84%. The retailer cooperation was largely due to the fact that the retailers had a favorable view of SMUD.

2 METHODOLOGY

2.1 Program Overview

The Program is designed to encourage lighting efficiency improvements by SMUD residential customers, and to transform the residential lighting market to one in which there is sustained demand for energy-efficient lighting products.

The overarching theory of the program is that, given an increased availability of quality CFLs and CFL fixtures at reduced prices at retailers in SMUD territory, SMUD customers will increasingly purchase them and install them in their homes where incandescent lamps and fixtures are currently in use. The evaluation was kicked off on Tuesday, September 6, 2005 at SMUD offices.

SMUD has promoted the use of energy-efficient compact fluorescent lighting for about 15 years. Since 2002, SMUD's promotion of energy-efficient compact fluorescent lighting has taken the form of "marketing partnerships," in which the utility seeks proposals from lighting manufacturers, distributors, and retailers for cooperative efforts that encourage the purchase of compact fluorescent products by the District's 500,000 residential customers.

Through these marketing partnerships, the District offers monetary incentives to be matched by contributions from the manufacturers and retailers. All of this is designed to raise consumer awareness of the benefits of compact fluorescents, reduce their cost, and encourage their purchase by consumers. Most of the monetary incentives have been utilized as "manufacturer buydowns," in which manufacturers reduce the wholesale cost they charge retailers for the targeted products.

In early fall 2005, the program team approved MOUs for 55 partnerships, amounting to $736,630 in incentives for about 446,672 CFLs and 3,725 fixtures. The portion of the program budget amounting to $236,630 was funded by public-goods charges. District management allocated another $500,000 towards the program's rebate budget for the fall campaign. This additional allocation is funded through saved power-purchase costs; i.e., it is considered a cost-effective demand-side resource procured through the District's integrated-resource planning (IRP) process. The two funding sources (BP/IRP and the program budget) are transparent in the program implementation. There is no way, nor reason, to distinguish between the two in terms of savings achieved. Therefore this program evaluation will include projects funded by both IRP and public-goods charges. RLW will apply the ratio of IRP funding to total fall funding to the total kW and kWh reductions to determine the IRP budget induced savings.

Program Tracking Data

The program tracking data contain information from MOUs for each combination of manufacturer and retailer of the CFLs in the program. Greenlite, Feit Electric, Sunrise Ltd and TCP are some predominant manufacturers in the program. The retailers, on the other hand, include both national and local retailers such as the 99 Cents Store, CW Bargain Outlet, Ace Hardware, Emigh Hardware, Walmart, and Costco. The associated number of stores for each

retailer and the current status of each project – approved or cancelled, are also reported in the data.

The data also contain information on the time period the promotion was offered and the associated PARTNER and SMUD cost shares. Other descriptions of the CFLs, such as information on wattages and product types (e.g. 13W/ELS-M) and units/pkg, are reported in terms of the quantities and the proposed unit prices. The data also distinguish between CFLs and fixtures. The kWh savings, based on anticipated purchases can be computed from the available information. Finally, the date of the MOU, the maximum allowable dollar amount and the maximum permitted CFL quantities are also reported.

2.2 Sampling Plan

RLW developed an approach to sample design for point of sale surveys that proved to be effective for evaluating the program. The approach used is a three-stage sample design with the following stages:

1. Make a list of all retailers, quantify the expected sales of CFLs for each retailer using the tracking data, develop a suitable stratified sampling plan by expected sales, and select a sample of retailers selling CFLs.
2. Randomly select one or more stores from each sample retailer.
3. Select one or more random times during weekdays and weekends to do point of sale surveys within each selected store and interview a specified number of buyers.

We factored the expected number of units per buyer for a given retailer into the formula for selecting the appropriate sample size per store. For example, we expected a buyer to purchase an average of four CFLs from a membership discount store since they are sold in multi-packs, but only two CFLs from the smaller retailers that sell CFLs individually. We assumed that the savings would be proportional to the number of units purchased per buyer, and used California Evaluation Framework[1] principles of sample design to calculate the appropriate number of buyers to interview at each retailer to provide an unbiased and efficient estimate of results for all CFL buyers at all stores in the population of all retailers.

The first step in the sampling plan was the acquisition and assessment of the program sales tracking data. SMUD program managers provided RLW the quantity of lamps (and fixtures) contracted for each retailer. These data were used as a sampling frame for selecting retailers and the final version of these data are used to extrapolate savings for the program. The retailer list was stratified by the total number of expected lamp sales to select the retailers that were included in the sample.

One research question that the study aimed to answer is how many of the program CFLs are installed in SMUD territory (92%). There is a high likelihood that retail outlets near the border of SMUD territory will have a different rate of in-territory installation than those outlets that are in the heart of SMUD territory. The retailers were randomly selected within the SMUD territory

[1] TecMarket Works Team, The California Evaluation Framework, Chapter 13: Sampling, authored by RLW

and it was verified that they were well distributed from the geographical center of the SMUD territory.

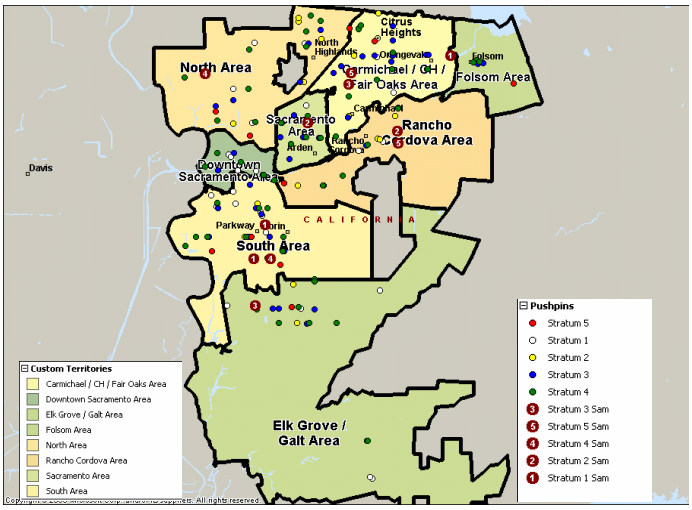


Figure 1: Geographic Location of Stores in Program

CFL Fixtures

CFL fixtures account for less than 1% of program savings. We thought we might happen upon a purchaser or two of CFL fixtures, but the likelihood of getting a representative sample of fixture purchasers was not great. Therefore, the CFL fixture element was evaluated with secondary research of fixture type wattage from the current CLASS study and expected usage from KEMA's CFL Metering Study.

Planned Sample Size

RLW planned to obtain information on 271 individual CFLs for an expected relative precision of +/-10% at the 90% level of confidence if we assume that there is independence among the bulbs. We planned the sample using an error ratio of 1.0.

With a goal of 271 CFL load shapes, and an estimate of 3 CFLs purchased per person, we expected to obtain surveys from at least 90 purchasers. Sixty-eight surveyed purchasers with an assumed coefficient of variation of 0.5 results in a relative precision of +/-10% at the 90% level of confidence.

RLW obtained a tracking data extract on September 19, 2005 that included a list of the current allocation of CFLs and fixtures by manufacturer and retailer. In this original extract there were 46 retailers and 160 stores that received the discounted CFLs. The total number of lamps in the fall program in that extract was approximately 494,129. RLW used the three-stage sample design described below to evaluate the program savings:

1. Make a list of all retailers, aggregate the fall 2005 campaign commitment of CFLs for each retailer, develop a suitable stratified sampling plan by committed CFLs, and select a sample of retailers. Ten retailers were selected for sampling.

2. Randomly select one store from each sample retailer. In this study we selected one store from all retailers except for the two retailers with the largest number of expected sales. From these two retailers we visited two stores each.
3. Select one or more random times during weekdays and weekends to do point of sale surveys within each selected store and interview a specified number of buyers of the CFLs.

The sample design below shows the distribution of the lamps and sample across the five strata for the original tracking data. The 494,128 total number of lamps was taken from the tracking data sent by SMUD on September 19, 2005 for the sample design. These data represented the anticipated quantities for the program, although the actual quantities in the end differed considerably. The strata were developed to maximize the amount of kWh savings captured in the surveys while also maintaining a representative sample of small and large retailers.

Stratum	Retailers	Stores	Total Lamps	Max # Lamps	Average # Lamps	Sample
1	32	42	58,888	5,520	1,840	3
2	7	22	74,922	20,200	10,703	2
3	4	77	94,656	26,496	23,664	2
4	2	14	90,046	59,998	45,023	2
5	1	5	175,617	175,617	175,617	1
Total	**46**	**160**	**494,129**		**9,504**	**10**

Table 4: Original Sample Design

Table 5 shows the 10 retailers selected for sampling and the target number of surveys per retailer.

Stratum	Retailer	Stores per Retailer	Surveys per Retailer
1	Retailer A	1	5
	Retailer B	1	7
	Retailer C	2	10
2	Retailer D	1	10
	Retailer E	2	10
3	Retailer F	17	22
	Retailer G	27	23
4	Retailer H	5	13
	Retailer I	9	26
5	Retailer J	5	75
Sample Totals			**200**

Table 5: Original Retailers Selected

Final Sample

Figure 2 shows the nested sampling approach that we took to complete the EM&V. There were 48 retailers with 188 stores in the final tracking data. We selected 10 retailers to visit for the in-store surveys. At these 10 retailers, we performed 202 in-person surveys. Of the 202 in-person surveys, we successfully completed 162 follow-up phone surveys. These 162 customers purchased a total of 1,532 lamps, for an average of 9 lamps. This number is more than double the number of lamps per purchaser that we expected when designing our sample, contributing to higher variation in savings estimates.

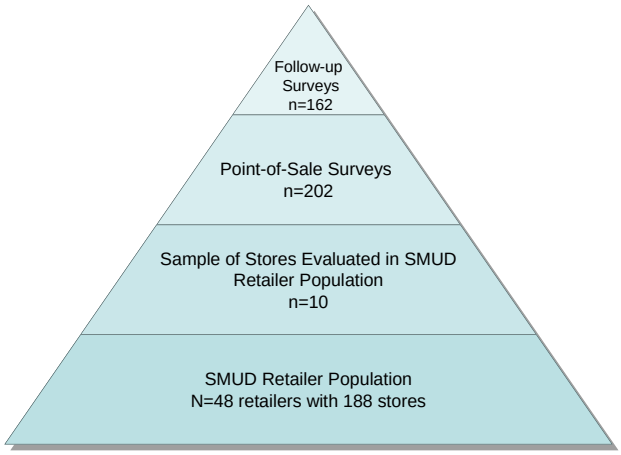


Figure 2: Data Hierarchy

Expanding our sample to the entire SMUD population presented a unique challenge. Given that we sampled based on the customers that we encountered purchasing CFLs, the most appropriate weighting scheme would be a multiple weighting scheme that would weight the customers up to the population of purchasing customers. However, the purchasing customers are unknown since this is a Point-of-Sale program. Therefore, we estimated the number of buyers at each store based upon the average number of lamps each surveyed buyer purchased. Using these data we computed a store-level weight. We then weighted the sample up to the number of stores in the retail chain for a retailer weight. The final weight that we applied was the stratum-level weight where we applied a case weight to ensure that all retailers in the population were being represented by our retailer sample.

Retailer	Stratum	Retailers			In-Store n	Phone Survey n	Stores per Retailer	Weight
		Pop	Sample	Weight				
Retailer B	1	34	3	11.3	7	7	1	315
Retailer A				11.3	4	4	1	378
Retailer C				11.3	13	4	2	6,120
Retailer E	2	6	2	3	5	3	2	1,111
Retailer D				3	19	18	2	813
Retailer F	3	5	2	2.5	19	17	17	429
Retailer K				2.5	13	9	5	1,263
Retailer L	4	2	2	1	17	10	6	959
Retailer I				1	27	23	9	280
Retailer J	5	1	1	1	78	67	5	240

Table 6: Final In-Store and Follow-Up Survey Sample Sizes

2.3 Number of Lamps Sold in Tracking Data

The report contains a number of different quantities of lamps sold through the program during the fall campaign and this section summarizes how the number of lamps used in the analysis was determined. The total number of lamps sold is a moving target throughout the campaign due to the fact that some retailers drop out after receiving funding commitments, and SMUD has to reallocate that funding. Incentive amounts vary with the products promoted, and SMUD was able to extend its incentive budget much farther than anticipated with the final allocation. The three numbers that are highlighted in the table below are the only three lamp quantities that appear in the report:

- **368,900 lamps** – Number of lamps used by SMUD for program planning
- **494,129 lamps** – Number of lamps used in the sample design, based upon initial incentive allocations
- **611,178 lamps** – Final number of lamps used in the impact evaluation, based upon final incentive allocations

2.4 Point-of-Sale Survey

RLW's approach to verifying the savings for the CFLs was to reach the consumer within the stores when they were purchasing the CFLs. For this approach, RLW stationed a surveyor inside the store near where the CFLs were displayed. Once the store customer selected a program CFL or CFL fixture and moved away from the display with product in hand or in basket, the surveyor approached the customer and asked them if they could answer a few questions about their intentions for the soon to be purchased product. A primary reason for performing the survey was to act as a prelude to asking for contact information for a follow-up phone survey that occurred 2-3 months after the in-store survey.

Free-ridership related questions are best answered at the time of purchase and therefore were asked during the in-store survey. The end-user was asked if they would have bought CFLs or CFL fixtures in the absence of the price discount or if the discount increased the number of CFLs or CFL fixtures purchased. Asking free-ridership questions at time of purchase has significant

advantages over post purchase reporting that asks the end-users to recreate their mindset at the time of purchase.

The full in-store survey is contained in the appendix. A sample of the point of sale survey questions that were asked are:

- Have you bought a CFL in the past?
- Do you intend on installing the CFL or CFL fixture in SMUD territory?
- How many of the CFLs would you have purchased if they were full price? (Approx. $3-4)?
- Inventory of wattage and quantity of lamps or fixtures purchased.

At the end of the in-person survey, the surveyor asked if the purchaser was willing to participate in a short follow-up survey by phone. A $20 store incentive was offered to compensate the respondent for their time upon completion of the follow-up survey. The customer was presented a reminder card that contained a sample of the questions that were to be asked in the follow-up survey and they were reassured that their contact information would not be used for any other purpose. This $20 incentive was also used to entice the retailers to participate in the study because they felt the incentive would bring these buyers back to their stores at no cost to them.

We believe that using store credit for an incentive provides a valuable proposition for the retailer that improved retailer cooperation. In-person recruitment by competent and informed surveyors also increased the success rate, which was approximately 95%. We only received a handful of refusals. All of the in-person surveyors attended the kickoff meeting and were fully aware of the project objectives. Point of sale surveys were attempted with all customers who agreed to provide contact information and who expressed a willingness to take the follow-up survey.

As described earlier, a large portion of RLW's efforts went into collecting information about the customers and the motivation behind their purchase right after the purchase had been made. This survey was the basis to our follow up survey; this is where we determined the number of lamps the customer purchased, why they purchased the CFLs, and what they intended to do with them. With this data we were able to accomplish one of our key goals: the quantification of free-ridership.

2.5 Follow Up Telephone Survey

Two to three months after the time of purchase, presumably after the customer has had time to install, use, and evaluate the product, they were contacted by telephone for a follow-up survey. The survey addressed the critical research questions required for the study and the satisfaction level with CFL technology in general. The follow-up survey was administered 2-3 months after the purchase date to allow the purchaser to have as much experience with the product as possible, and to allow for the effects to potentially be seen in the purchaser's electricity bill. The full follow-up telephone survey is contained in the appendix. A sample of the follow-up survey questions is below:

- Is the lamp installed? If no, why not?

- Was it installed in SMUD territory?
- Has the experience with this lamp (these lamps) made you more likely to purchase CFLs in the future with no discount?
- What is your overall satisfaction with CFLs as a technology…
    - For quality of light?
    - For energy savings?

The main reason for the follow-up survey was to verify that the lamps were installed and understand what types of lamps the CFLs replaced. This information was used to inform the savings analysis that is described later in this section.

Another reason for the follow-up survey was the quantification of *spillover*. There is no way that the end-user can answer spillover questions at the time of purchase since spillover savings are attributable to positive experience with program CFLs. In the follow-up survey, the end-user was asked if they had bought CFLs or CFL fixtures or intended to buy CFLs or CFL fixtures *without a discount* in the future due to their experience with program equipment. Since the spillover questions required experience with program equipment, the follow-up survey was administered as late as the evaluation timeline allowed in order to maximize the end-user experience. We determined that January was the latest month that we could administer the survey in order to allow for a timely completion of the project. This allowed the consumers 2-3 months of use before we called for the follow-up survey since the point of sale surveys occurred in October and November.

The evaluation is based on 202 point of sale surveys at 10 retailers and 162 telephone follow-up surveys with these customers. We called 194 customers to complete the 162 surveys, resulting in a conversion rate of 84%. Refer to Table 7 for a listing of all survey dispositions.

Total # of In-Store Surveys	202	-
Customers willing to participate in follow-up survey	194	96%
Completed follow-up surveys	162	84%
Incomplete follow-up surveys	29	15%
Insufficient Data	3	10%
Left message (no response)	12	41%
Wrong Number	6	21%
Language Barrier	3	10%
Disconnected	4	14%
Terminated	2	7%
No Answer	2	7%

Table 7: Follow-up Survey Dispositions

2.6 Analysis

RLW is well known for its innovative, effective Model Based Statistical Sampling (MBSS) methodology that is used to develop stratified samples and to assess the expected statistical precision. Model-based sampling methods were used to analyze the data, i.e., to estimate the population total kWh savings and to evaluate the statistical precision of the results. RLW's

newest SAS-based software tool, Analyze-IT®, was used to compute the overall program savings and error bounds. Analyze-IT® is a comprehensive software system developed by RLW for load research and EM&V sample design and analysis. A full description of MBSS techniques is included in the appendix.

Load Shapes

RLW originally proposed that the energy and peak demand impacts of the program would be quantified by the analysis of a survey sample of *self reported* load shapes. We planned to ask the end-user to report on when the CFL or CFL fixture is operated.

At the project kickoff meeting it was determined that the KEMA CFL Metering Study would instead be used to estimate the residences usage and coincident peak demand of CFLs *by room type*. The CFL Metering Study by KEMA has suggested that end-users, on average, self-report CFL usage one-third more than metering indicates. The study physically metered CFLs in California residences and is believed to provide an accurate account of their usage. The usage of incented products that are installed in commercial facilities as well as outdoor lighting for homes is still based upon self reported load shapes.

KEMA provided us with raw data collected during the 2004 California Lamp Report study for bathrooms, bedrooms, family rooms, garages, hallways, kitchen/dining rooms, living rooms, laundry rooms, and other rooms. The average daily hours of use was determined by dividing the total hours the lamps were in use by 365 days, the number of days in a year by room. The summer-peak coincidence was determined by summing the load for the lamps that were in use between the hours of 1 P.M. and 9 P.M. for the months of June through September, excluding weekends – SMUD's peak demand period. This sum was divided by the total load of the lamps for the entire year.

Since KEMA did not study the time of use for outdoor lighting, we asked the customers to estimate the hours of usage for their outdoor lighting and whether the lamp was controlled by a photocell. The lamps with photocell controls were assumed to be on from sunset to sunrise. Sunrise and sunset times were researched for Sacramento for the whole year. The average hours of operation and coincidental peak (from 1 P.M. to 9 P.M. June-September) were calculated from these data. The customer supplied hours of usage were used for outdoor lighting without photocell controls. Two of the three commercial customers that were surveyed only installed their CFLs outdoors, so we used their self reported hours. Another customer that purchased lamps for both their home and their business had not installed the lamps purchased for their business, so only the lamps that were installed in the home were analyzed.

Replaced Lamp Wattage

We considered two methods to determine the wattage of the lamps that were replaced by the program CFLs. One option was to ask each consumer to report the wattage of the lamp that was replaced by the program CFL. Another option was to use the average incandescent lamp wattages based upon lamp, room, and fixture type that were collected during the CLASS study.

The CLASS study, which was co-sponsored by SMUD, provided a baseline for lighting throughout California. As the RLW team collected an extensive lighting inventory of each home in the study, we were able to calculate the average wattage of incandescent lamps.

At the kickoff meeting, the project team concluded that the CLASS average wattages would provide a more accurate picture of the actual replaced wattage baseline since the data were recently collected by a team of field auditors at over 1,000 homes throughout the state of California. We expect that the CLASS data are more accurate than self-reported responses since the CLASS data were collected by a team of experienced field auditors. The respondents were asked what type of lamp the CFL replaced (i.e. CFL, incandescent, halogen, etc.) as well as the room and the fixture type where the CFL was installed. Room types had to be altered slightly to match the room types in the KEMA CFL Study, but once this was complete, the weighted averages were calculated using RLW's MBSS (VB) application.

Discounted three-way CFLs were analyzed using the highest wattage of the three-way wattage in order to be conservative about the wattage reduced. For example, if the CFL was listed as 13/20/26 watts, 26 watts was used as the CFL wattage. The CLASS incandescent wattages and KEMA CFL hours of use are presented in Table 36 in the appendix.

Installation/Retention Rate

In the follow-up phone survey we attempted to determine the status of each lamp that the customer purchased on the day that the in-store survey was completed (whether it was installed, where it was installed, what it replaced, and whether their positive experience with the technology had inspired them to purchase more CFLs without the SMUD discount).

The CFLs that were not installed, whether it be from equipment failure, customer dissatisfaction, or the participant saving the CFL as a replacement for a future lamp failure, were factored into the potential analysis, but *not* factored into the energy and demand savings for the gross and net savings analysis. Similarly, those lamps that were not yet installed were not credited with any energy or demand reduction in the gross and net savings analyses. Purchasers that we were unable to contact were excluded from the savings analyses completely.

Customers were also asked *where* the lamp was installed, either inside or outside of SMUD service territory. Though we determined that eighteen of the 202 participants surveyed (9% of sampled customers, and 8% of weighted lamps) installed their CFLs outside of SMUD territory, there is a strong possibility that CFL discount programs paid for by other utilities (PG&E and Roseville) spill *into* SMUD territory. As a result, we *included* the savings for the discounted CFLs that were installed outside of SMUD service territory in the total savings calculation, and considered the number of discounted CFLs flowing in and out of SMUD service territory to be equal.

Free-ridership

During the in-store survey, the customers were asked how many of the CFLs in their basket they would have purchased had there been no program discount. The possible responses to this question were: None, Some (with the quantity), or All.

Realizing that some purchasers of CFLs could be both participants and free-riders (if the SMUD discount allowed them to purchase more lamps than they would have been capable of doing without the discount), we created a "free-ridership factor" for each customer. This factor was applied equally to all of the lamps purchased by the customer and was factored into the net savings analysis.

- *Full participant* - If a customer would *not* have purchased any CFLs without the discount, they were considered to be a full participant and were assigned a "free-ridership factor" of one, meaning 100% of the gross savings associated with their CFLs would be applied to the net savings.
- *Free-rider* - If the customer acknowledged that they would have purchased the same number of lamps regardless of the discount, this customer was considered a complete free-rider and was assigned a "free-ridership factor" of zero, meaning 0% of the gross savings associated with their CFLs would be applied to the net savings.
- *Partial Participant* - If the customer conceded that they would have purchased some, but not all of the lamps regardless of the discount, they would be considered a partial participant, and their "free-ridership factor" would be somewhere between zero and one. For example, if the customer purchased ten CFLs but would have purchased two at full price, we would apply a free-rider factor of 0.8 since eight of the ten CFLs were purchased due to the program discount.

Spillover

Spillover was determined by asking the customers if their experience with the incented CFLs influenced them to purchase any additional CFLs without the SMUD discount. If the customer *had* purchased additional non-discounted CFLs, we asked how many they purchased. One participant did not know how many CFLs they had purchased, so we assigned them only one CFL to be conservative. As we did not collect information about spillover CFLs (rooms, wattages, replacement lamp details, etc.), we assigned the average wattage reduction (41.2 watts) in combination with an average daily hours of use (2.74 hours) and average coincidental peak factor (0.15) computed from the study lamps from which we had collected that information.

Spillover was one of the more difficult aspects to measure in the course of this study. The follow-up survey was conducted two to three months after the initial in-store survey. This is a very short time period to expect CFL purchasers to need additional lamps and decide to purchase them at a non-discounted price. Therefore, we did not expect spillover to be very high at this point in the program. Furthermore, the project budget did not allow for identifying any additional purchases by other consumers who may have been influenced by the consumers participating directly in the program.

It should also be noted that the in-store survey was performed while many of the participating stores had a significant amount of inventory yet to be sold to customers. As stores continue to sell the SMUD discounted CFLs until their inventories run out, it is likely that stores still had a significant number of lamps several months after our initial survey. Customers will have had the opportunity to purchase more discounted CFLs after their initial purchase. A follow-up study should be performed nine to twelve months after the initial in-store survey to assess longer-term spillover effects.

Energy and Demand Reduction Calculation

The direct wattage reduction, the hours of use per day, the number of days per year, how many other customers each customer represented (case weight), and the line loss percentage

(provided by SMUD) were used to calculate the program kWh gross savings. The free-rider factor was applied to the gross savings and spillover was added to calculate the program net savings. The wattage reduction, the average coincidental peak, the weights, and the peak line loss percentage (also provided by SMUD) are multiplied together to determine the program demand savings. Applying the free-rider factor and spillover, we calculated the program net demand savings.

3 IMPACT RESULTS

This chapter of the report summarizes the program kWh savings and kW reduction evaluation results. The program tracking data are first summarized, and then the program assumptions are discussed and compared to the EM&V findings. The final sections of this chapter present the actual impact evaluation findings. For the savings verification component of the evaluation, the statistical analysis of the data consisted of extrapolating the verified and installed lamp savings in the sample to the program population to estimate the total number of installed lamp savings achieved by the program. We calculated wattage group-specific realization rates by comparing the tracking system data and program assumptions in each wattage group to the verified lamp savings.

3.1 Program Assumptions

Table 8 shows the total number of CFLs and fixtures incented in the fall 2005 campaign. This information was taken directly from the MOUs enacted for each marketing partnership from the tracking data sent by SMUD on March 4, 2006 for the final expansions. This dataset contained the final MOUs from the Fall 2005 campaign and was used for the ex-ante estimates for the program.

The program is largely dominated by CFLs, constituting 99% of all the products incented through the program. Since fixtures accounted for such a small fraction of the program products and savings, we did not expect to include many fixtures in the sample and therefore planned to analyze the fixtures separately from the lamps using secondary information. The fixture analysis is presented at the end of this chapter. The rest of the chapter consists of a summary of the lamp analysis.

Wattage Group	Lamps	Fixtures
7-11 W	7,886	-
13-16 W	330,550	90
18-20 W	84,940	100
22-30 W	187,802	3,115
32-70 W	-	1,146
Total	**611,178**	**4,451**

Table 8: Lamp and Fixture Counts by Wattage Group

Table 9 provides a summary of the ex-ante planning assumptions. The table also presents the ex-post calculated values for each variable. The average wattage reduction for the verified lamps is significantly lower than that of the ex-ante estimate, at 41 watts compared to the program assumption of 57 watts (based upon final lamp wattage distribution). This difference in watts is a difference of 28%. The ex-post replaced wattages were taken directly from the CLASS study in which incandescent lamp wattages were inventoried by room, fixture, and lamp type. The ex-ante replaced wattages are based upon typical replacement wattages.

The daily hours of use and the coincidental load factor from the ex-post analysis are 18-19% higher than the ex-ante estimates. This indicates that the verified CFLs were installed in rooms of the house with longer operating hours than the average operating hours for CFLs (ex-ante estimate).

The District assumed that 79% of the CFLs and fixtures purchased would be installed and remain in place for the anticipated 9.5 year life of the measures. RLW calculated the proportion of purchased lamps that were installed by the time of the follow-up call, or the installation rate, as 70%. We acknowledge that the installation rate may be higher after a few more months, when people have more time to install the lamps. A follow-up study could be performed to recalculate another installation rate.

Variable	Ex-Ante	Ex-Post	% Change
Wattage Reduction	57	41	-28%
Daily Hours of Use	2.3	2.7	18%
Peak Coincidental Load Factor	0.126	0.150	19%
Installation Rate	79%	70%	-11%

Table 9: Comparison of Ex-Ante Planning Assumptions to Ex-Post Findings

Table 10 displays the program planning assumptions by CFL wattage group. The table shows the average wattage, replacement wattage, and wattage reduction per lamp. The table also shows that SMUD originally estimated the fall 2005 campaign to consist of 368,900 lamps. This estimate was obtained from the original assumed distribution of lighting products for the 2005 fall campaign sent by SMUD from the program planners on March 28, 2006. Based upon the 368,900 lamps, the ex-ante savings for the program would have been 14.99 GWh and 2.28 MW. These totals were calculated using the program assumptions shown in Table 9.

The final number of lamps incented through the program was 611,178 (as shown in Table 8). The estimated and actual distributions of the incented lamps by wattage category are relatively similar. The actual ex-ante savings for the program are 24.60 GWh and 3.75 MW (based upon the 611,178 lamps).

Type	Avgerage Wattage	Replaced Watts	Savings Watts	Ex-Ante Estimated Units Sold	Ex-Ante Actual Units Sold	% Estimated	% Actual	Ex-Ante Actual Total GWh	Ex-Ante Actual Total MW
9-11 W	10	40	30	1,900	7,886	1%	1%	0.17	0.03
13-16 W	13	60	47	200,000	330,550	54%	54%	10.92	1.66
18-20 W	19	75	56	40,000	84,940	11%	14%	3.34	0.51
23-25 W	23	100	77	125,000	187,802	34%	31%	10.17	1.55
Reflectors	16	65	49	500		0.1%		-	-
Other*	25	100	75	1,500		0.4%		-	-
Total				**368,900**	**611,178**			**24.60**	**3.75**

Table 10: SMUD Program Wattage Assumptions Units Sold

Figure 3 compares the sample lamp distribution to the population lamp distribution by wattage. The table shows a more detailed distribution of lamps by actual wattage. The chart shows a summary version of the same information by wattage group. The population and the sample are

good matches in the 9-11 watt and the 13-16 watt groups. However, in the 18-20 watt group the population has a larger share of these wattage types, and in the 23-25 watt group, the sample has a larger proportion of these lamps.

In order to ensure that the lamp distribution in our sample did not bias the findings of this study, all of the sampled lamps were analyzed within wattage groups. Separate realization rates were calculated for each wattage group, and estimates of total savings were calculated for each group based upon the population total of lamps in each group. The separate estimates of total savings by wattage group were then aggregated to the total. By performing the analysis in this way, we ensured that the population distribution of lamps, not the sample distribution of lamps, was the key driver in determining the overall program savings.

Wattage	Population	Sample Weighted
7	0.3%	-
9	1%	-
11	0.2%	-
13	35%	38%
14	8%	7%
15	12%	9%
16	0.01%	-
18	12%	7%
20	2%	-
23	25%	34%
25	5%	3%
26	1%	2%
30	0.002%	-

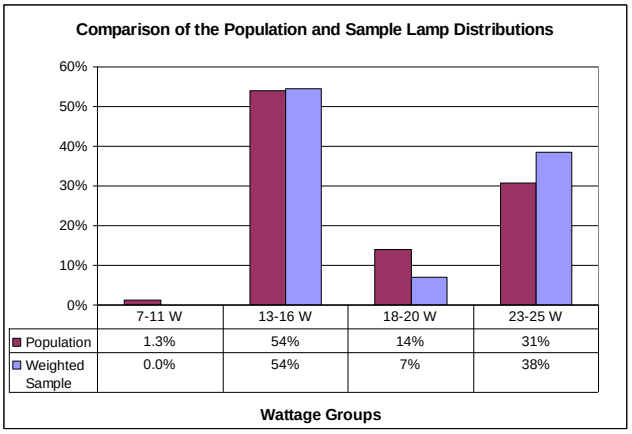


Figure 3: Population and Sample Lamp Distributions by Wattage and Wattage Groups

3.2 Savings Verification Results

Figure 4 displays a scatter plot of the gross ex-ante kWh savings to the gross ex-post kWh savings. The black dotted line in the graph indicates a realization rate of 1.0. The graph indicates that many of the sites have realization rates less than 1.0.

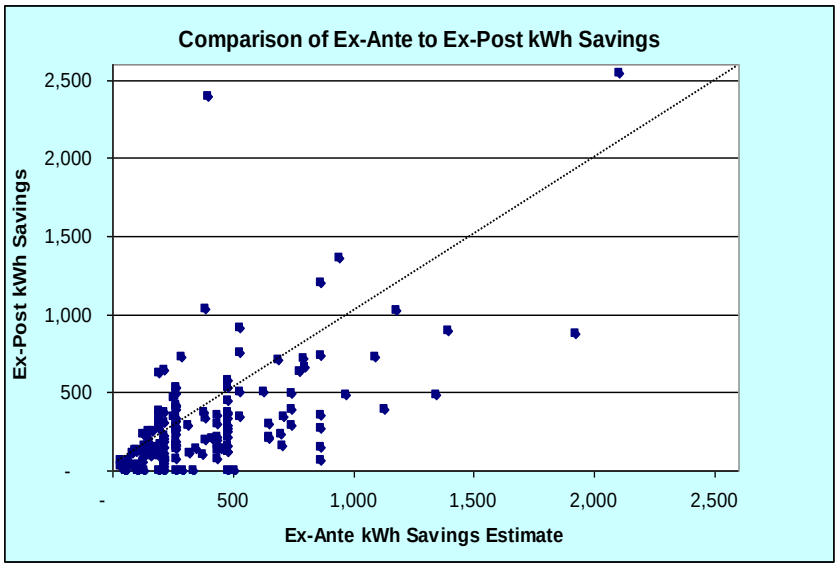


Figure 4: Scatter plot of Gross Ex-Ante to Ex-Post Savings

Table 11 shows the summary kWh savings estimates by wattage group. Note that the sample did not contain any lamps in the lowest wattage group, the 7-11 watt group. Therefore the savings for this group were estimated based upon the lamps in the 13-16 watt group. Those two groups are aggregated in the following tables. Column 2 shows the ex-ante GWH savings for the actual number of lamps incented in the program. Column 3 shows the EM&V measured ex-post *gross* GWh savings for the same number of lamps.

Column 4 shows the gross realization rates, which is computed as the ex-post savings divided by the ex-ante savings. In other words, the gross realization rate is the amount of estimated savings realized by the program *before* accounting for free-ridership and spillover. The gross realization rate estimated for the program is 75.4% with a relative precision of 23.2%. The relative precision is higher than anticipated since we found that the hours of operation were highly variable, especially for outdoor lights, which were self-reported estimates of hours of use. The business with outdoor lights with self-reported hours of operation also added to the variation in the savings estimates since they purchased a large quantity of lamps, installed them outdoors, and ran them for 12 hours per day all year long. There were three customers in the sample that purchased lamps to be used in their business. Additionally, we originally estimated that the average number of lamps purchased per person would be between 2-4 lamps. Instead we found that the average is 9 lamps, with large variation around that average.

Column 6 shows the net-to-gross ratio for the program at 0.97. This includes both free-ridership and spillover. A net-to-gross ratio of near 1.0 indicates that free-ridership and spillover are balancing each other out. The loss in savings from the lamps that would have been purchased anyway without the incentive are balanced out by the added savings from the additional full price lamps that people purchased after participating in and learning from their program experience. The free-ridership rate is 22%, or the net-to-gross ratio is 78% before spillover is added to the net savings. Applying the spillover rate of 19% raises the net-to-gross ratio to 0.97. It should be noted that only participant spillover was assessed. This evaluation

did not attempt to measure non-participant spillover (additional purchase of qualifying lamps outside program tracking, resulting from additional product orders by retailers and purchases by additional consumers resulting from program marketing or "word of mouth" by program participants). This additional spillover would further raise the net-to-gross ratio.

Column 7 displays the net realization rate, or the product of the gross realization rate and the net-to-gross ratio. The net realization rate is the amount of estimated savings realized by the program *after* accounting for free-ridership and spillover. The overall program net realization rate is 73%.

Column 8 shows the EM&V measured ex-post *net* GWh savings for the actual number of lamps incented in the program.

1	2	3	4	5	6	7	8
Wattage Groups	Ex-Ante GWh Savings	Ex-Post GWh Savings	Gross Realization Rate	Relative Precision	Net-to-Gross Ratio	Net Realization Rate	Ex-Post NET GWh Savings
7-16 W	11.09	12.03	108.5%	32.3%	0.81	87.9%	9.75
18-20 W	3.34	1.89	56.6%	28.1%	0.73	41.1%	1.37
23-30 W	10.17	4.61	45.4%	16.2%	1.50	68.1%	6.92
Overall	**24.60**	**18.54**	**75.4%**	**23.2%**	**0.97**	**73.4%**	**18.05**

Table 11: kWh Savings Estimates, Realization Rates, and NTG Ratio

Table 12 displays similar information as the previous table for kW reduction instead of kWh savings. The realization rates and net-to-gross ratio are very similar across tables. However, note that the relative precision is much better in this table at 10% since kW does not factor in the highly variable hours of operation, causing less variation in the reduction estimates.

Wattage Groups	Ex-Ante MW Reduction	Ex-Post MW Reduction	Gross Realization Rate	Relative Precision	Net-to-Gross Ratio	Net Realization Rate	Ex-Post NET MW Reduction
7-16 W	1.69	1.70	100.7%	10.6%	0.81	81.8%	1.38
18-20 W	0.51	0.29	57.3%	39.2%	0.79	45.5%	0.23
23-30 W	1.55	0.73	47.0%	14.1%	1.49	70.2%	1.09
Overall	**3.75**	**2.72**	**72.6%**	**10.2%**	**0.99**	**72.0%**	**2.70**

Table 12: kW Reduction Estimates, Realization Rates, and NTG Ratio

The NTG ratios should differ slightly for kWh and kW since the hours of operation are factored into the estimates of kWh, but not kW. The freeridership rate is calculated for each respondent. This rate is then applied at the customer level to the kWh and kW savings. If Customer A has higher than average operating hours than Customer B, but the same kW reduction, then that A will contribute a larger amount of kWh savings to the program total than B, even though they contribute the same amount to kW savings. Similarly, Customer A will have a larger impact on the kWh net-to-gross ratio even though they have the same impact as Customer B on the kW net-to-gross ratio. Because of these differences in share of contribution among the customers, the overall NTG ratios will be slightly different for kWh and kW.

Table 13 summarizes the ex-ante and ex-post final savings estimates. Note that there are two estimates of ex-ante savings, the first is based upon the expected sales of 369,000 lamps and the second is based upon the actual sales of 611,000 lamps. The verified savings for the actual sales of 611,000 lamps are based upon application of the net realization rates from the evaluation of 73.4% for energy and 72% for demand savings.

It is important to point out that despite the fact that the realization rate is less than 100%, SMUD exceeded their original planning goals by installing 66% more lamps than planned. This resulted in SMUD achieving 20% more net energy and 18% more net demand savings than originally planned with 369,000 lamp sales.

Scenario	MW	GWH
Assumed Savings with Planned 369,000 Sales	2.28	14.99
Assumed Savings with Actual 611,000 Sales	3.75	24.6
Verified Savings with Actual 611,000 Sales	2.7	18.05

Table 13: Final Savings Summary

Gross Savings using Self-Reported Wattage

A secondary impact analysis was performed using self-reported replacement wattage values as provided by the end-users during the follow-up surveys. It was determined at the project kickoff meeting that the CLASS wattage data were the more accurate measurement of replacement wattages since they were collected by an experienced team of on-site surveyors. The self-reported wattages are solely based upon the recollection of the respondent and the evaluators have no way of verifying whether these wattages are accurate. Therefore, the main savings estimates presented earlier in this report based upon the CLASS wattages remain the more accurate of the two measurements of replacement wattage.

Table 14 provides a summary of the ex-ante planning assumptions, the ex-post calculated values using CLASS wattages, and the ex-post calculated values using self-reported wattage values. The wattage reduction is higher for the self-reported estimates relative to the CLASS-based wattage reduction.

Variable	Ex-Ante	Ex-Post	Self-Reported
Wattage Reduction	57	41	48
Daily Hours of Use	2.3	2.7	2.7
Peak Coincidental Load Factor	0.126	0.150	0.150
Installation Rate	79%	70%	70%

Table 14: Comparison of Ex-Ante Planning Assumptions to Ex-Post Findings

Table 15 shows the average wattage by wattage group for self-reported and class wattages. Note that the average self-reported replaced wattages do not vary a large amount as the CFL wattage increases. The ex-ante estimates factored in a larger difference between the replaced wattages for the groups.

Also note that the slight differences in the CLASS replaced wattages are due to the fixture and room combinations for the replaced lamps in each wattage group.

Wattage Groups	Self-Reported			Ex-Post (CLASS)		
	Replaced	Reduction	CFL	Replaced	Reduction	CFL
7-16 W	62	49	13	58	45	13
18-20 W	64	46	18	56	38	18
23-30 W	72	49	23	60	36	23

Table 15: Average Wattage by Group

Table 16 shows the gross realization rates for kWh and kW. The gross kWh realization rate from this analysis is 83%, almost 8% higher than that found using the CLASS wattages.

Wattage Groups	Gross Realization Rate	
	kWh	kW
7-16 W	111%	108%
18-20 W	63%	70%
23-30 W	59%	62%
Overall	**83%**	**84%**

Table 16: Gross Realization Rates using User-Reported Wattages

CFLs Not In Use

Approximately 30% of the lamps were not in use at the time of the follow-up survey. All participants who purchased lamps that were not in use at the time of the follow-up survey were asked to indicate why they were not in use. The table below presents the reasons why the CFLs were not in use. Just over 25% of the CFLs not in use will be used to replace incandescent lamps when they burn out. Slightly under 20% of the not used lamps will be used to replace in use CFLs upon burnout. Approximately 35% of CFLs are not currently in use because the participant has no need for the lamp at the moment or they are storing it for future use to replace the next lamp that burns out. Only four lamps in the study had burned out by the time of the follow-up survey.

We used these data to provide a rough estimate of the potential future savings of the 30% of lamps that are not currently installed. The category variable in the table below shows a classification of the responses into "future savings" potential and "no future savings" potential. We took a conservative approach to estimating future savings and only counted those lamps that were planned to replace incandescent lamps as having savings potential.

Category	Response	Percentage
Future Savings	Replacement for INC lamp	25.5%
No Future Savings	Replacement for CFL	19.9%
	Not needed - no place to put it	18.3%
	Replacement for unknown lamp	16.6%
	Have not taken the time to install	8.6%
	Other	4.2%
	Does not fit in my light fixture	3.1%
	Yes, but not in SMUD territory	1.8%
	Not bright enough	1.4%
	Burned out	0.6%
	Too bright	0.1%

Table 17: Reasons Why CFLs Are Not In Use

The current measured installation rate is 70%, and to estimate savings potential for the 30% of the non-installed lamps, we are estimating that 25% of the 30% of non-installs have future savings potential (8% of the lamps). With the potential factored into the analysis, the future installation rate could potentially be as high as 78%, similar to the ex-ante estimate of 79%.

With an installation rate of 78%, the gross realization rate using the CLASS wattages would be approximately 83-84%.

3.3 Fixture Savings Analysis

There were 4,451 fixtures in the program. These fixtures accounted for less than 1% of the kWh savings and kW reduction of the program. The 4,451 fixtures provide an estimated 184 MWh savings and 35 kW reduction based upon the ex-ante assumptions.

New fixtures were not included in the main EM&V analysis since only a handful of customers purchasing new fixtures were surveyed for the study. RLW was able to survey eight customers who purchased Energy Star fixtures during the in-store surveys, amounting to 23 total fixtures. Of these eight customers, five participated in the follow-up survey, for a total of 15 fixtures. Three participants indicated that one of the fixtures they purchased was not going to replace an existing fixture, but was a new fixture entirely, amounting to added, not reduced load.

These responses are not sufficient to properly characterize the population of fixtures. Therefore, we performed some secondary research of fixture replacement wattage from various sources and present in Table 18 a comparison of the ex-ante estimates to the secondary research. We found that the ex-ante estimates were very similar to other ENERGY STAR lighting fixture program assumptions. Therefore we are concluding that the assumptions are in line with other program expectations and are likely achieving the assumed savings.

Variable	Watt Reduction	Daily Hours of Use
Ex-Ante Assumptions	**74**	**2.3**
Indoor		
DEER + IOU	89.4	2.3
Massachusetts	48.7	2.5
New Jersey	90	3.5
Tacoma Power	90	3.0
WI Div of Energy	84	3.4
Outdoor		
DEER + IOU	82	3.1
Massachusetts	94.7	4.0
New Jersey	90	3.5
Tacoma Power	90	8.0
WI Div of Energy	84	3.4
CLASS Study	82.3	*na*

Table 18: Comparison of Ex-Ante Assumptions to Secondary Research[2] [3] [4] [5] [6]

[2] The Database for Energy Efficient Resources (DEER), Developed by the California Public Utilities Commission and the California investor owned utilities. The number of applied measures and incentive values are from the 2005 Statewide Single Family Rebate Program. http://eega.cpuc.ca.gov/deer/

[3] All electric utilities of Massachusetts use the same lighting assumptions. The hours of use information for all three lighting technologies comes from the extended residential logging results memo of 5/2/05 from RLW Analytics to National Grid. Displaced watts come from Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs Final Report, 10/1/04, NMR and RLW.

[4] New Jersey Clean Energy Program protocols to Measure Resource Savings, September, 2004. Filed with NJ-BPU December, 2004.

[5] Incentive information from Tacoma Power website. Savings information comes from Northwest Energy Star website supported by NW Energy Efficiency Alliance.

[6] State of Wisconsin Department of Administration, Division of Energy, "Evaluation of Deemed Energy Savings Estimates for ENERGY STAR-Labeled Products", July 12, 2002.

4 PROCESS RESULTS

This chapter of the report contains a summary of the follow-up survey analysis, the in-store survey analysis, and in-store surveyor observations and recommendations. Figure 5 presents a distribution of the number of lamps purchased per person; the average number of lamps purchased was 9.

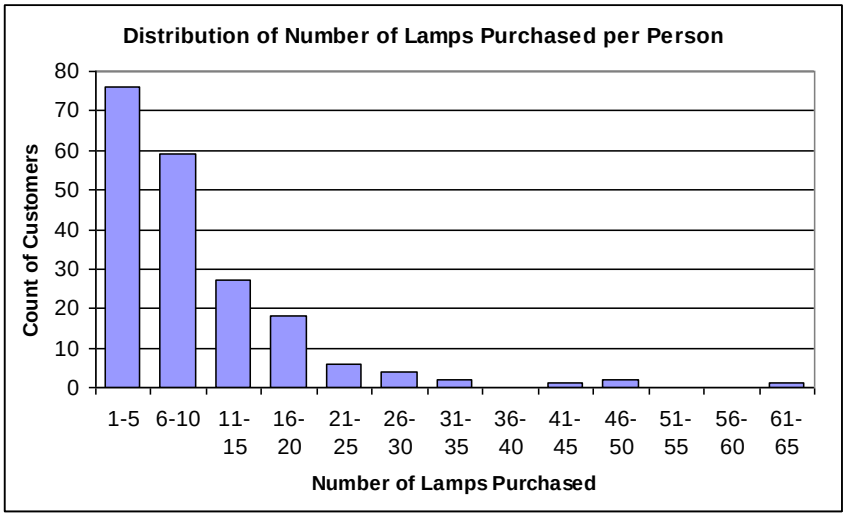


Figure 5: Distribution of Number of Lamps Purchased per Person

Table 19 shows the average number of lamps purchased per buyer at each retailer. Not surprisingly, the largest per person average was at the membership discount store since they sell large packs of lamps.

Retailer	Average Lamps Purchased per Buyer
Costco Wholesale	14.1
A&A Supermkt	9.0
Light Bulbs Plus	8.8
Albertson's	8.4
The Home Depot	8.1
Food Source	6.5
American River Ace Hardware	5.1
Emigh Hardware	4.4
99 Cents Only	4.3
S F Supermarket	1.0

Table 19: Average Number of Lamps Purchased per Person

4.1 Sample Demographics

The follow up survey allowed us to examine the demographic characteristics of the survey respondents. Questions relating to primary language spoken, homeownership, level of education, total household income, and age range were asked of the participants, and their responses are summarized in the tables below. These results are unweighted.

Nearly 85% of surveyed participants speak English as their primary language as can be seen in Table 20. Around 5% surveyed speak Chinese, and another 3% speak Hindi.

Primary Language	Percentage
English	84.6%
Chinese	4.9%
Hindi	3.1%
Spanish	1.9%
Vietnamese	1.9%
Cantonese	1.2%
Afganistan- Pashto	0.6%
African	0.6%
TAMIL-INDIA	0.6%
Thai	0.6%

Table 20: Primary Language

Over 80% of the follow-up survey respondents own their home. The difference from 100% is made up by participants who rent (16.7%) and those who have other circumstances, such as working in exchange for living space (1.2%).

Home Ownership	Percentage
Own	82.1%
Rent	16.7%
Other	1.2%

Table 21: Home Ownership

Approximately 86% of respondents had at least some college level education. The most common overall response was "Some College" at 35.8% of those surveyed.

Level of Education	Percentage
Some College	35.8%
4-Year College Degree	27.8%
Advanced Degree	20.4%
High School Grad or Less	15.4%
Refused	0.6%

Table 22: Highest Level of Education

Although 12.3% of respondents who answered this question were refusals, nearly one-third reported an annual household income between $75,000 and $149,999. Conversely, slightly less than 10% reported less than $10,000 as the annual household income. This suggests a fairly diverse range of incomes, though skewed toward those who could better afford the lamps without the discount.

Household Income	Percentage
$75,000 - $99,999	16.7%
$100,000 - $149,999	16.0%
Refused	12.3%
Less Than $10,000	9.9%
$50,000 - $59,999	9.3%
$60,000 - $74,999	9.3%
$30,000 - $39,999	8.0%
$40,000 - $49,999	8.0%
$20,000 - $29,999	6.2%
$10,000 - $19,999	3.1%
Don't Know	1.2%

Table 23: Total Household Income

Figure 6 shows the distribution of age ranges of participants in this study. Approximately one-quarter of the respondents were between 45 and 54 years old. On the other end of the spectrum, only 1% of respondents were between 20 and 24 years old. The program appears to most effectively target those between 35 and 54 years old.

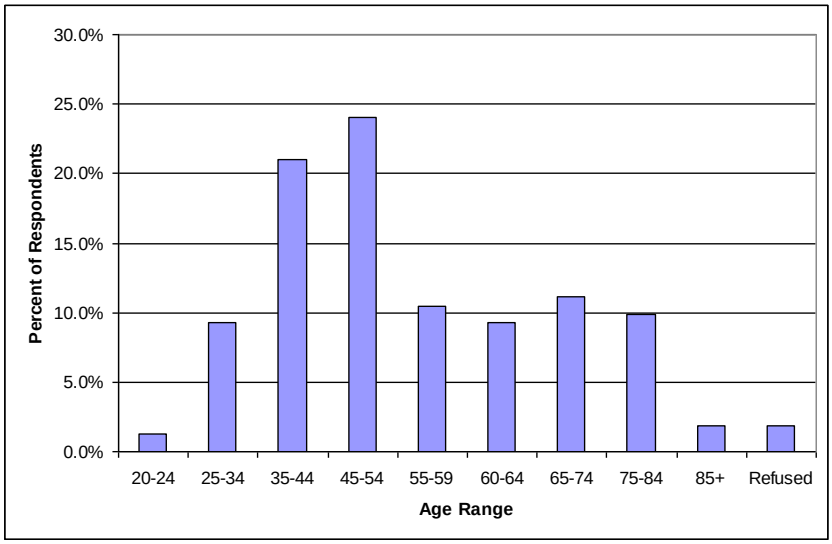


Figure 6: Age Ranges

4.2 Point-of-Sale Survey Results

This section presents the results of the survey that was administered to the 202 respondents in the retail locations as they were purchasing the lamps. SMUD's marketing of the program was measured from the question whose results are displayed in Table 24. We asked the customers whether their intention was to purchase lamps before they entered the store, or whether other factors influenced their decision to buy, such as the incentive, or the fact that they happened to notice the lamps and remembered that they needed some. Less than 25% of the respondents planned to buy light bulbs when they went to the store. This low response suggests that in-store marketing is critical to the success of the program.

Response	Percentage
No	73.3%
Yes	24.9%
Not Sure	1.9%

Table 24: Were You Planning to Purchase Light Bulbs When You Came into the Store Today?

For those participants that went into the store with the intention to purchase lamps, we used the question posed in the caption of Table 25 to determine what lamp technology the participant planned to purchase. The large majority (75.9%) planned to purchase CFLs. The program was successful at converting 20% of these customers from incandescent purchasers to CFL purchasers.

Response	Percentage
CFL	75.9%
Incandescent	20.5%
CFL or Incandescent Mix	2.7%
Don't Know	0.9%

Table 25: What Type of Bulb Were You Planning to Buy?

Table 26 is a summary of motivations for those who responded "Yes" to the question of whether they were planning to purchase lamps when they entered the store. Interestingly, Oprah Winfrey was a factor for a number of participants. A television program had aired the day before one of the in-store surveys took place, in which Oprah urged her viewers to purchase five CFLs to reduce energy consumption. Several participants noted Oprah as their motivation when we posed the question to them.

Response	Percentage
Other	48.0%
Noticed display and reminded of CFL option	19.0%
CFL Style	17.0%
Need to replace incandescent lamp	8.6%
Discount/Sale	7.5%

Table 26: Why Did You Decide to Purchase CFLs Today?

Those participants that planned to purchase CFLs were asked whether they purchased more CFLs than they had planned. Almost three-quarters of the respondents did purchase more than planned.

Response	Percentage
Yes	71.6%
No	28.4%

Table 27: Did You Purchase More CFLs Than Planned?

Those who purchased more CFLs than they planned were asked why they purchased more. Over half of the respondents stated that the discounted price prompted them to purchase more than planned. "Other" responses included recommendations from friends, light quality, and life of the lamp.

Response	Percentage
Discount/Sale	56.4%
Other	43.6%

Table 28: Why Did You Purchase More Than You Planned?

Table 29 examines what convinced customers who didn't originally plan to purchase CFLs when entering the store, to become participants on the day of the survey. The discount was a large driver in their decision to purchase the CFLs. "Other" responses here included remembering the previous day's Oprah Winfrey show in which Oprah touted the energy saving potential of the technology, as well as in-store advertising.

Response	Percentage
Discount/Sale	37.7%
Other	37.0%
Noticed display and reminded of CFL option	7.2%
Wanted to try out CFLs	6.8%
CFL Style	4.2%
Need to replace CFL	4.2%
Need to replace incandescent lamp	2.0%
Noticed display and remembered needed bulbs	0.9%

Table 29: Why Did You Decide to Purchase CFLs Today?

Program recognition was measured by the question analyzed in Table 30. Over 80% of the respondents did not know about the program before entering the store.

Response	Percentage
No	80.2%
Yes	19.8%

Table 30: Before Entering the Store, Did You Know About SMUD Discounted CFLs?

The participants who were familiar with the SMUD discount were then asked how they became aware of the program. Table 31 shows the result of this question.

Response	Percentage
In-store display	24.2%
Other	24.1%
In SMUD bill	22.2%
Newspaper	16.2%
Radio	9.2%
In-store advertisement	4.0%

Table 31: How Did You Find Out About the SMUD Discounted CFLs?

The participants' familiarity with the technology was measured in Table 32. The large majority (76%) of the participants had purchased CFLs in the past.

Response	Percentage
Yes	75.6%
No	24.4%

Table 32: Have You Bought a CFL in the Past?

Those that had purchased CFLs prior to this study were asked whether their purchase was discounted by SMUD. Table 33 displays the result. Over 64% had purchased the CFLs without a SMUD discount, potentially indicating free-ridership. However, since over 80% of the

respondents did not know about the program before entering the store, this could also indicate that many previous purchases were actually discounted through SMUD program even though the purchaser did not realize it.

Response	Percentage
No	64.4%
Yes	28.6%
Don't Know	7.0%

Table 33: Was it Offered at a Discount through SMUD?

4.3 Follow Up Survey Results

As the follow up surveys were performed two to three months after the Program CFL purchase, participants were given enough time to form initial opinions of the CFL technology. Participants were asked questions concerning their satisfaction with the CFL technology and whether there had been any noticeable change in their electric bill. Summaries of their weighted responses can be seen in Figure 7.

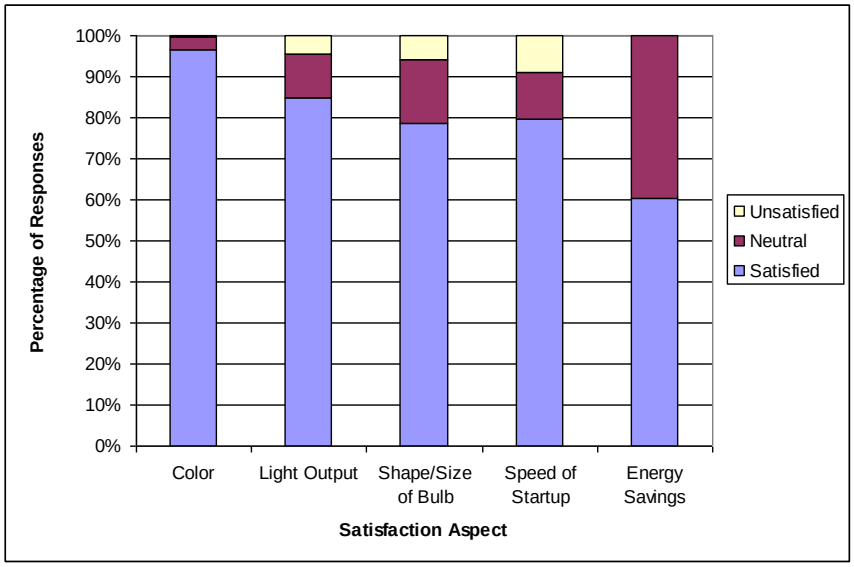


Figure 7: Satisfaction with Specified Aspects of the CFL Technology

Overall, it appears that Program participants are satisfied with the CFL technology, as the percent responding satisfied stays well above 50% for all aspects.

The vast majority of respondents were satisfied with the color of the lamps, as evidenced in Figure 7. While we did not ask whether they had a preference for CFLs over incandescent lamps or vice versa, only 0.2% responded that they were dissatisfied with the light color.

The approval rating decreases to just over three-quarters of the population when the question of light output is posed. Approximately 4% are dissatisfied. Fewer than three-quarters of

participants are dissatisfied with the size and shape of the CFLs offered in the Program. Those indifferent with regard to size and shape are roughly 14% of the population. Though still vastly satisfied with the speed of the CFL speed of startup, those dissatisfied with their speed rises to 8%.

Just over half of participants were satisfied with the energy savings, and over one-third didn't have an opinion one way or the other.

The highest percentage of Program participants did not notice the energy savings in their electric bill from the CFLs. Under one-third indicated a noticeable reduction as shown in Table 34.

Response	Percentage
No	41.9%
Yes	30.8%
Don't Know	27.3%

Table 34: Since Replacing Your Old Lights, Have You Noticed a Reduction in Your Electric Bill?

In a final twist that shows the complexity of the public opinions, the results calculated in Table 35 indicate that over half of the participants consider the CFLs at full price to be worth the extra investment (full price was indicated to the respondents as $3-$4 per lamp). This indicates that participants are using a metric other than simple electric bill reduction when determining the worth of CFLs.

Response	Percentage
YES (at full price)	50.6%
NO (only at a reduced price)	37.1%
Don't Know	12.3%

Table 35: Do You Think that CFLs at Full Price are Worth the Extra Investment or Only at a Reduced Price?

4.4 In-Store Observations

RLW staff administered in-store surveys at ten different retailers during the course of the evaluation of SMUD's Fall 2005 Residential Energy Star Lighting Program. This section summarizes some in-store observations made by the personnel who conducted the field surveys. We begin this section with general observations and recommendations for improving product marketing, and conclude with individual retailer observations.

General Observations

The location of the product was in high visibility areas in many stores, but in some stores the lamps were in low traffic areas. If the goal of the program is to sell out the product within a few months, it is important that stores place the lamps on an end-cap, or if in a supermarket, the SMUD lamps be placed in the household goods aisle where one might expect to find lamps.

In stores where a shopper might not expect to purchase lamps, it is especially important that SMUD representatives visit the store and work with the store personnel to be assured the product is reasonably placed. In addition, if the store has SMUD lamps from the previous campaign, as we saw at Light Bulbs Plus, SMUD should ensure that the quantity of lamps provided to the store is within reason, to ensure that they can sell all the lamps within the campaign cycle. The in-store surveyors found that in most cases the store clerks had a high level of awareness of the SMUD-incented product.

The best method of advertising the SMUD lamps is using a consistent format from store to store so the buyers can easily recognize that the product is a part of the program. In a few instances we found that it was difficult to determine which products were incented by SMUD without consulting with the store managers. There were several retailers where the lamps were packaged in plastic and there were no stickers, such as Home Depot. Although stickers were placed on the outside of the lamp boxes in most cases, the stickers were not consistent from store to store. The majority of the buyers that we spoke with were aware that the product was offered at a discount, but they did not know that it was funded by SMUD.

We recommend continuing to use the stickers, but also posting a consistent sign above the lamps. The sign would ideally be at least 11 x 14 inches in size and printed in color to draw attention to the discount. The sign could include:

- SMUD Logo and ENERGY-STAR Logo
- Original price: ($3.99)
- Special in-store discount courtesy of SMUD: ($-3.00)
- Final price ($0.99)

We do realize that the retailers might resist marketing material from third parties.

The picture below was taken at Emigh's Hardware. The product placement and signage at this store was one of the best examples of prominent placement and signage that we saw at all the retailers. Note that the white SMUD stickers are placed on the top of each lamp box, but the sign makes no reference to the program.

Figure 8: Emigh's Hardware Display

The picture below was taken at Albertson's. The lamps were placed in the middle of the aisles, nearby other discounted items. Notice that a different red SMUD sticker is placed on the outside of the box. The sign as shown in the photo does not have any information on the SMUD program.

Figure 9: Albertson's Display

SMUD utilized several methods to market the energy-efficient lighting products, including bill inserts, radio ads, newspaper ads, and in-store ads. Although there were various methods employed, enough cannot be said about the effectiveness of the Oprah Winfrey show that encouraged consumers to buy energy efficient lighting. We found her input was a selling point for some consumers that we surveyed, and SMUD could benefit by using celebrities to market their program.

The program could also consider limiting the number of lamps sold per customer to achieve a higher installation rate. The advertising of the product could indicate that the reduced price is a limited time offer.

In-Store Observations:

Costco #1 Expo Parkway

The point-of-sale surveys were first administered at the Expo Parkway Costco. Without any resistance from the Costco clerks, the surveyors entered the store and administered the surveys. The SMUD ID badge was instrumental to our success for store clearance purposes and to secure customer assistance in the point-of-sale surveys. We learned that the store was in a high volume location and distributed a high volume of CFLs throughout the program. Surveyors yielded the highest number of completed surveys at this store, with an average of 15 per hour.

Upon entering the store, the surveyors asked to be pointed in the direction of the SMUD rebated lamps; a store clerk was able to assist us without hesitation. The display was excellent; it consisted of a large end cap display in the main aisle, an ideal location within Costco.

The SMUD one page signs consisted of an 8.5 X 11 piece of paper. On the sign were colored SMUD logos, the original price of the lamp, the SMUD instant rebate, and the final price. The one page sign could have been larger to draw attention to the SMUD discount. This small sign on an end cap was a rather modest advertisement for the large quantity of incented product. Surveyors observed the consumers studying the sign and the packages before deciding to purchase them. Many customers hesitated about which product to buy, and how much they cost. Most consumers were able to determine from the sign that the lamps were being offered at a reduced price. Although the instant price reduction was obvious to most, some customers expressed confusion. Such questions included:

- ✓ "Do I have to be a SMUD customer to get the discount?"
- ✓ "Do I mail my receipt to SMUD to get the discount?"
- ✓ "Is the discount applied at the register or on my bill?"

Although the sign clearly stated "Instant Rebate", there was still some confusion about how the discount was applied. Alternative messages that could be used to convey that the lamps are instantly discounted might include "register discount" or "in-store discount" instead of using "rebate". Once we approached the customers who opted to purchase the lamps, we were able to clarify any confusion. Once the customers realized what the actual price was, many of them were eager to purchase more and to encourage those they were shopping with to purchase some. In fact, the 4-pack of lamps was so inexpensive at less than $3 per pack that many customers purchased multiple packs (average of 14 lamps purchased per customer). For this reason, we might suggest a limit to the number of packages a consumer may buy.

Costco #2 Rancho Cordova

The Rancho Cordova Costco had a different atmosphere than that of the Expo Parkway Costco. On the two visits we made to the Rancho Cordova Costco, the surveyors found there were fewer store clerks on hand, the store was quieter, smaller, and there were significantly fewer customers shopping. The display was consistent with that of the Expo Parkway store. Both stores provided two types of SMUD lamps and had one page signs posted above the large pallet of lamps.

To the surveyor's advantage, some of the participants had viewed Oprah's television show, which aired previously that week. On the show, she emphasized the positive impacts that energy-efficient lighting has on the environment by reducing green house gases and encouraged everyone to go buy at least two or more energy-efficient lamps. As a result, several customers noted they wanted to try out the energy-efficient compact fluorescent lamps (CFLs). RLW had more than one surveyor administering in-store surveys on this specific day, and we were surprised to learn that several surveyed shoppers at each of the locations were buying CFLs as a result of Oprah's recommendation.

Although many shoppers knew that they wanted to buy energy-efficient lamps, the surveyors discovered throughout the course of the evaluation when they were presented with more than one option they were confused by what was the best application. Most of the time they were seeking a soft white light, that was bright, preferably a 100-watt equivalent, but small enough to fit into their light fixtures. Unfortunately, this "perfect" light bulb was not available in many stores as oftentimes the options included a 100-watt bulb that had the right amount of lumens but the base of the lamp was larger than that of a standard incandescent and thus reduced sales. The alternate option, a 60-watt equivalent, was small enough but customers sometimes claimed it was not bright enough.

As can be seen in the left of the picture below, the lamps are placed nearby other common household goods, like paper towels, a logical location within the store.

Figure 10: Costco Display

Home Depot

Surveyors visited the Home Depot on three separate occasions. On the first visit, the surveyors were unsuccessful in determining the whereabouts of the SMUD lamps. No SMUD stickers were placed on any of the CFLs, as at other stores. RLW had been informed by store management that the SMUD lamps had arrived. RLW surveyors identified some lamps that were heavily discounted, and attempted to verify that these were the program incented lamps.

Within minutes of locating these lamps, a customer asked for assistance in locating the "$1 SMUD lamps". The surveyor replied, "I think that this six-pack of Ultra-Light Spiral Lamps is the product you are looking for". The customer explained that the package could not be the SMUD lamps because the bill insert stated that the lamps could be purchased for one dollar each. The surveyor noted that the lamps were less than a dollar each but that the customer would have to buy at least six to get them at that price. The buyer however was certain that they could not be the SMUD lamps, as they were not sold in a single pack. The customer explained that they had visited five retail locations in search of the SMUD lamps but was unsuccessful at finding them.

After consulting with the director of the lighting department, among many other store directors and clerks, the surveyors were informed that all of the SMUD lamps were either sold out or had not arrived. The surveyors exited the store and assumed the lighting director and salespeople were correct. Additionally, when reviewing the in-store ad, the SMUD-incented lamps were advertised at full price. This was due to the fact that the advertisement was designed at the corporate level, for distribution to stores inside and outside of SMUD service territory.

After SMUD personnel verified that the lamps were in the store, the RLW surveyors returned to Home Depot for a second visit and learned that the lamps identified during their initial visit were indeed those incented by the SMUD program. The surveyors were pleased to find that the lamps had been moved to a more prominent location on an end cap.

In summary, the confusion that the surveyors and customer experienced over the product could be reduced by placing a sticker on the product and providing signs to Home Depot. Since there are many salespeople involved in inventory placement, this is one retailer that could use more assistance from SMUD program implementers in uniformly identifying and placing the product. However, we do realize that the retailers might resist marketing material from third parties and this may not be possible.

The picture below shows one placement of the product that was found on one of the aisles in the lighting department. At this particular Home Depot, there were approximately four different locations where boxes of lamps were placed throughout the store.

Figure 11: Home Depot Display

Food Source Grocery Store

At the Food Source Grocery Store, the pallets of SMUD lamps had an unlikely placement within the store, counterintuitive to what one might expect. After pacing the store, the lamps were located between two frozen food aisles. Although the aisle was larger than most, and in the corner near the front of the store, they were not close to the register, and it was unlikely to be noticed unless a shopper had a need for frozen food. When the surveyor inquired with the store clerk about the unusual product placement, he explained it was a good idea because of the upcoming Thanksgiving holiday.

Figure 12: Food Source Display

99 Cents Store

The 99 Cents Store was the only retailer in the evaluation where purchasers of energy-efficient table lamps or fixture with a compact fluorescent circuline bulb were surveyed. Because of the unique fixture, the surveyors had anticipated a slightly different response from the consumers. The surveyors placed a request with the store manager to carry out the point of-sale-surveys and confirmed that the product had arrived. The store manager confirmed their presence and stated that they would hold the fixtures back from the floor until the surveyors arrived.

However, upon arrival at the store, the surveyor noticed a number of customers leaving the store with large boxes containing the energy-efficient fixture. The surveyors found that only two fixtures remained on the shelf. A second pallet of fixtures that were being held for the next day was then brought out.

Within a few seconds of the fixtures arriving on the floor, all 15 fixtures were in the hands of shoppers and out the door. Not anticipating the rapid response, the surveyors found themselves tracking down the customers outside of the store to ask them for assistance with the survey. Unfortunately, there were far fewer fixture surveys completed that day than expected. Part of this was because the store did not enforce the rule of "one lamp per customer," and because there was no indication that the customers could only purchase one fixture.

The main lesson from this in-store visit is that the retailer should have enforced the rule of one fixture per person. The average number of fixtures purchased was three, with one customer purchasing nine fixtures.

SF Market:

The in-store visit to SF Market was difficult from the outset due to language difficulties with the store manager when calling them to set up a time for the in-store surveys. They readily agreed to participate in the evaluation, but after performing the in-store surveys it became evident that their understanding of the program and the evaluation needed some clarification.

Once the surveyors arrived at the store, they were challenged with locating the incented lamps. The only lamps that they found on the store shelves were incandescent lamps. The survey team was assured by the SMUD distributor that lamps had been delivered to the store. Therefore, the team sought a store manager to assist with locating the lamps. Since SF Market was in a predominately Asian-language speaking community, finding a store manager to assist the team was difficult.

The team ultimately learned that the incented lamps were not displayed on the shelf because the store was giving them away to their customers at no charge. This presented an interesting predicament to the evaluators, as the surveys were intended to be completed with buyers. There were only 12 lamps remaining in the store, and the team decided that the best approach would be to have SF Market administer the program as usual and give the lamps away to the customers while RLW conducted the survey. The survey questions were rephrased to ask the customers if they would have considered buying the lamps, had they been offered for sale. The evaluation team decided that these SF Market participants were not free-riders since they could not have purchased the lamps at full price without the program since SF Market did not sell CFLs.

The survey team observed that the SF Market customers had minimal experience with CFL lighting. Due to their lack of familiarity with the lamps, we found that by giving away the lamp was an effective method to introduce them to this new type of lighting. After observing this approach, we would recommend SMUD consider providing a light bulb exchange program in areas of non-English speaking demographics where SMUD customers can exchange their incandescent lamps for energy efficient CFL lamps.

AA Market:

Before arriving at AA Market, the surveyors called to inquire as to whether the SMUD lamps were delivered and on display and if the surveys could be administered. When we arrived at the store, we were able to find the lamps with some ease. Once at the store, the store managers were very cooperative with the surveyors and offered much assistance with their task.

The lamps were placed in the far right corner, on large pallets next to other bulk items. Unfortunately they were not located on an aisle shelf, where a consumer might expect to find them. Due to poor placement and cashier and customer lack of knowledge of the items, we expect that this store will take a long time to sell all the lamps and may need SMUD marketing assistance.

For the duration of the visit, the surveyors worked with the store owner and put the lamps on a table where the customers would see them before entering. Surprisingly, few customers even looked at the lamps.

Lack of advertising and familiarity with the lamps were large barriers to the quick sale of the lamps. Although the surveyors were able to find some marketing material that the manufacturers had placed in the lamp boxes for the store to use in advertising the product (small signs that hang on the back of the box), they were not in use. There was also no indication the lamps were offered at a reduced price. A consumer might have thought that this was the regular price. Over the course of several hours, a few customers "discovered" the lamps when entering or exiting the store. Once we approached them to discuss their purchase intentions, we found they were confused about:

- ✓ What the various sizes were for (60W replacement and 100W replacements)
- ✓ If the two sizes sold were the same price
- ✓ Why we wanted to speak with them about the lamps they purchased

Due to the subtle language barrier, we assumed there were quite a few more unanswered questions.

5 LESSONS LEARNED & RECOMMENDATIONS

This chapter presents observations made about the 2005 Fall Campaign through the course of conducting this evaluation. Recommendations to improve the program are also presented.

Use more targeted marketing to improve installation rate. As mentioned in the report, the verified installation rate was 70%, compared to the SMUD assumption of 79%. The program will be more effective if it is able to precisely target the customers that can not afford to purchase CFLs, are more likely to install the lamp rather than keep it on a shelf as a backup, and those that are replacing incandescent lamps with the incented CFLs, as opposed to replacing failed CFLs with new CFLs. SMUD should consider a follow-up study with the sampled customers to understand if the installation rate improves over time.

Consider limiting the number of lamps sold per customer to achieve a higher installation rate. The average number of lamps purchased was about 9 lamps per customer. By reducing the number of lamps allowed per customer, the program will likely improve the installation rate since more people will install the lamps rather than store them as replacements, which will increase program energy and demand savings impacts.

Target markets with low CFL penetration rates. The less penetrated markets would likely include customers that would install the CFLs at a higher rate, and also have lower rates of free-ridership. This could be done by performing some basic CFL penetration research by neighborhoods and targeting the businesses that sell CFLs in the neighborhoods with low penetration. Inserts could only be included in bills going to customers in the lower-income/government assistance rate class. The program could also be advertised in places that lower-income people frequent such as public assistance offices. Create relationships with churches with high proportions of minority worshippers and have them spread the word. Advertise on Spanish language television and radio channels (and other non-English channels). SMUD has already made an effort to target these underserved markets by offering the incented products at markets that serve minority and low income customers such as SF Market and the 99 Cents Store.

Indicate that the sale is available for a limited time offer. Another interesting observation from one of the store operators was that they were modestly discontented with the CFL "buydown" program. It was this manager's feeling that offering incentives for the lamps at certain times of the year all but assures that sales during non-program times will be relatively flat. Although responses indicate only a 22% free-ridership rate, this particular store manager felt that people hold off on their CFL purchases until the program returns. This assertion was made by only one manager and is not a widespread opinion, but it is feasible that some customers have changed their buying habits to benefit from the program, as this program has been in place for several years.

In contrast to this assertion, the evaluation team found that over 80% of the respondents did not know about the SMUD program before entering the stores. This indicates that purchasers do not have a high level of awareness of the program and are likely not targeting their

purchases in times when the program is running. Another possible scenario is that purchasers do not attribute the lower CFL prices to the SMUD program, but to the retailer, and target CFL purchases to dates when the retailers have discounted CFLs in stock.

Provide standardized marketing material to stores to ensure that the products are uniformly signed. Visit the stores shortly after the lamps have been delivered to ensure that the lamps are properly signed and placed where the product is being displayed. Include the SMUD logo on the signage so customers understand that SMUD is providing the lowered pricing. Include both the reduced and original price on the signs to show the dollar savings. Recommend that the lamps/fixtures are placed on high visibility end-caps near the household goods.

Ensure that all products have a uniform SMUD sticker on the package. Some of the products we encountered during the in-store visits did not have SMUD stickers on the package, making the identification of the incented product difficult for both the evaluators and the consumers.

In-store surveys are an effective way to evaluate POS programs. Retailers were very cooperative in allowing RLW to perform the in-store surveys on their sales floor. This approach yielded an overall response rate of 84%.

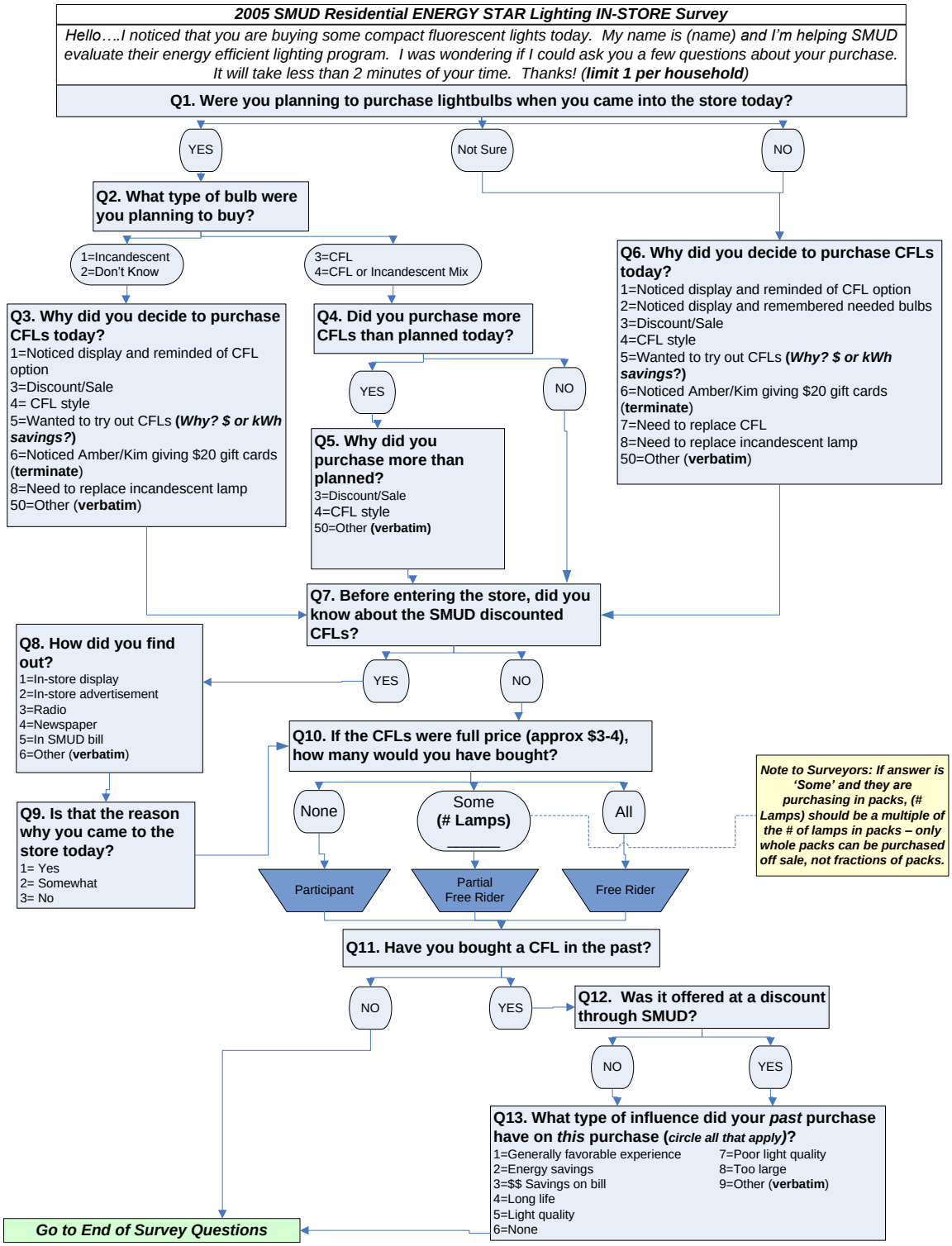
6 APPENDIX A

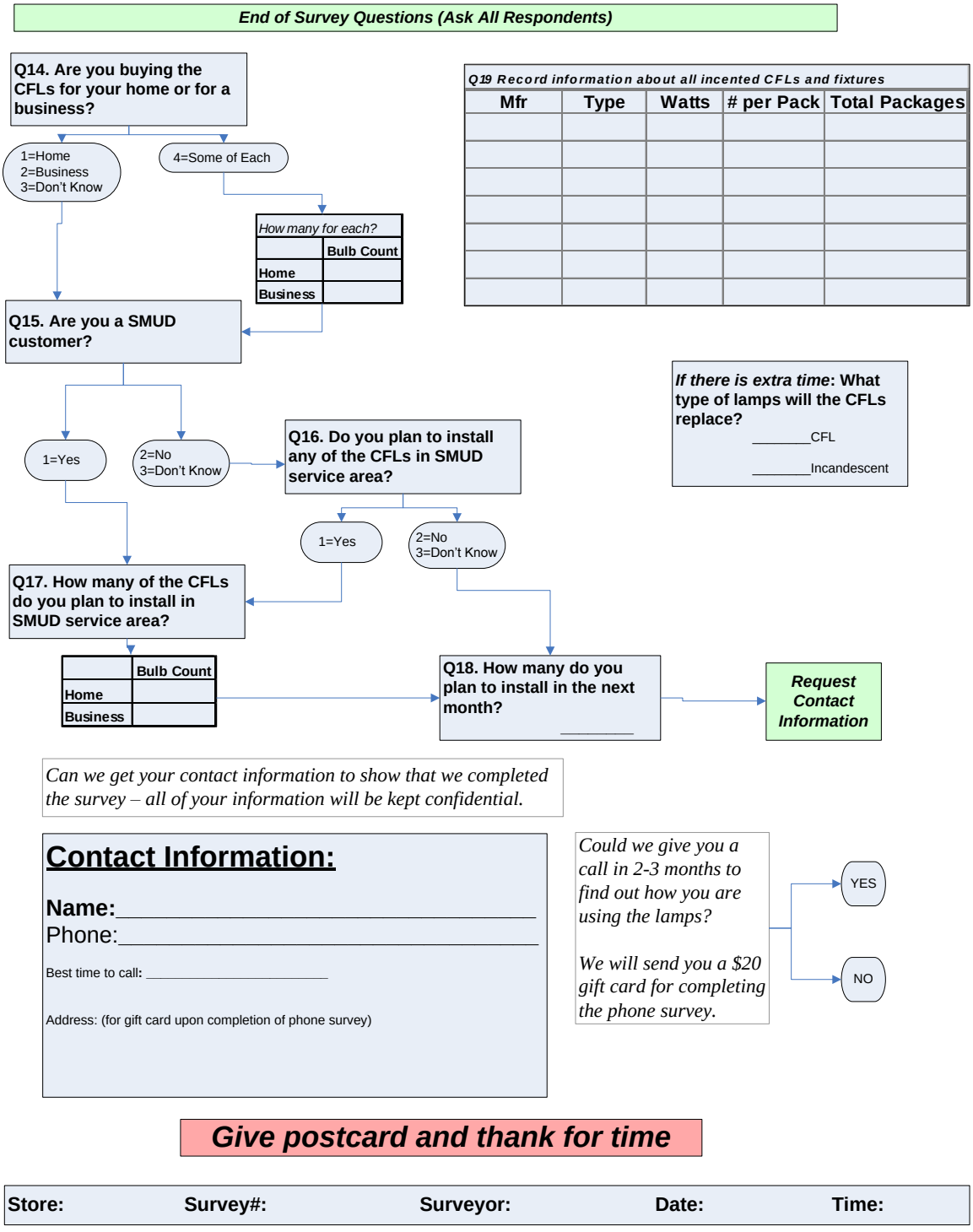
Room	Fixture	Wattage	Daily Hours
Bathroom	Architecturally Integrated	60.0	1.6
	Ceiling Fan	58.7	1.6
	Ceiling Mount	68.7	1.6
	Chandelier/Hanging	47.0	1.6
	Floor Lamp	89.4	1.6
	Recessed Can	84.7	1.6
	Recessed Lighting - Other	82.2	1.6
	Table Lamp	60.0	1.6
	Torchiere	379.3	1.6
	Track Lighting	71.4	1.6
	Under Counter	36.8	1.6
	Wall Mount	45.7	1.6
Bedroom	Architecturally Integrated	24.3	1.5
	Ceiling Fan	52.7	1.5
	Ceiling Mount	63.8	1.5
	Chandelier/Hanging	43.9	1.5
	Floor Lamp	63.4	1.5
	Other	58.2	1.5
	Recessed Can	67.1	1.5
	Recessed Lighting - Other	35.1	1.5
	Table Lamp	64.4	1.5
	Torchiere	78.6	1.5
	Track Lighting	58.6	1.5
	Wall Mount	57.6	1.5
Family Room	Architecturally Integrated	30.1	2.5
	Ceiling Fan	45.8	2.5
	Ceiling Mount	59.1	2.5
	Chandelier/Hanging	33.5	2.5
	Floor Lamp	65.6	2.5
	Recessed Can	75.0	2.5
	Recessed Lighting - Other	121.4	2.5
	Table Lamp	67.3	2.5
	Torchiere	86.7	2.5
	Track Lighting	73.3	2.5
	Wall Mount	61.6	2.5
Garage	Ceiling Fan	48.9	2.5
	Ceiling Mount	76.5	2.5
	Chandelier/Hanging	69.0	2.5
	Floor Lamp	66.0	2.5
	Garage Door Opener	53.8	2.5
	Other	15.7	2.5
	Recessed Can	74.8	2.5
	Table Lamp	145.6	2.5
	Track Lighting	70.1	2.5
	Under Counter	15.7	2.5
	Wall Mount	77.1	2.5
Hallway	Architecturally Integrated	40.0	1.6
	Ceiling Fan	55.8	1.6
	Ceiling Mount	54.0	1.6
	Chandelier/Hanging	34.5	1.6
	Floor Lamp	60.0	1.6
	Other	60.0	1.6
	Recessed Can	68.7	1.6
	Recessed Lighting - Other	59.7	1.6
	Table Lamp	29.0	1.6
	Track Lighting	88.1	1.6
	Wall Mount	46.4	1.6

Room	Fixture	Wattage	Daily Hours
Kitchen/Dining Room	Architecturally Integrated	27.7	3.4
	Ceiling Fan	49.1	3.4
	Ceiling Mount	61.0	3.4
	Chandelier/Hanging	37.9	3.4
	Floor Lamp	56.8	3.4
	Other	60.0	3.4
	Recessed Can	73.5	3.4
	Recessed Lighting - Other	69.3	3.4
	Table Lamp	67.4	3.4
	Torchiere	98.8	3.4
	Track Lighting	76.1	3.4
	Under Counter	45.7	3.4
	Wall Mount	56.2	3.4
Laundry Room	Ceiling Fan	75.0	1.2
	Ceiling Mount	62.0	1.2
	Chandelier/Hanging	229.1	1.2
	Floor Lamp	66.0	1.2
	Other	76.0	1.2
	Recessed Can	71.6	1.2
	Recessed Lighting - Other	61.5	1.2
	Table Lamp	75.0	1.2
	Wall Mount	81.0	1.2
Living Room	Architecturally Integrated	59.2	3.3
	Ceiling Fan	45.8	3.3
	Ceiling Mount	63.1	3.3
	Chandelier/Hanging	35.1	3.3
	Floor Lamp	58.1	3.3
	Other	31.0	3.3
	Recessed Can	70.3	3.3
	Recessed Lighting - Other	65.0	3.3
	Table Lamp	70.8	3.3
	Torchiere	92.0	3.3
	Track Lighting	68.5	3.3
	Wall Mount	52.1	3.3
Other	Architecturally Integrated	50.0	1.9
	Ceiling Fan	49.7	1.9
	Ceiling Mount	60.1	1.9
	Chandelier/Hanging	42.7	1.9
	Floor Lamp	72.0	1.9
	Garage Door Opener	40.0	1.9
	Other	64.5	1.9
	Recessed Can	75.0	1.9
	Recessed Lighting - Other	40.9	1.9
	Table Lamp	69.9	1.9
	Torchiere	88.8	1.9
	Track Lighting	68.9	1.9
	Wall Mount	55.6	1.9
Outside	Architecturally Integrated	5.2	Self Reported
	Ceiling Fan	64.9	Self Reported
	Ceiling Mount	70.0	Self Reported
	Chandelier/Hanging	43.0	Self Reported
	Floor Lamp	42.9	Self Reported
	Other	67.5	Self Reported
	Recessed Can	68.4	Self Reported
	Recessed Lighting - Other	41.4	Self Reported
	Wall Mount	64.6	Self Reported

Table 36: CLASS Incandescent Wattages and KEMA CFL Hours of Use

6.1 Point of Sale Survey




End of Survey Questions (Ask All Respondents)
Q14. Are you buying the CFLs for your home or for a business?
1=Home
2=Business
3=Don't Know
4=Some of Each
How many for each?
Bulb Count
Home
Business
Q15. Are you a SMUD customer?
1=Yes
2=No
3=Don't Know
Q16. Do you plan to install any of the CFLs in SMUD service area?
1=Yes
2=No
3=Don't Know
Q17. How many of the CFLs do you plan to install in SMUD service area?
Bulb Count
Home
Business
Q18. How many do you plan to install in the next month?
Q19 Record information about all incented CFLs and fixtures
Mfr
Type
Watts
per Pack
Total Packages
If there is extra time: What type of lamps will the CFLs replace?
_____CFL
_____Incandescent
Request Contact Information
Can we get your contact information to show that we completed the survey – all of your information will be kept confidential.
Contact Information:
Name:_____
Phone:_____
Best time to call: _____
Address: (for gift card upon completion of phone survey)
Could we give you a call in 2-3 months to find out how you are using the lamps?
We will send you a $20 gift card for completing the phone survey.
YES
NO
Give postcard and thank for time
Store:
Survey#:
Surveyor:
Date:
Time:

6.2 Follow-Up Survey Instrument

Store Survey Information:

Respondent: _____ **Store Surveyed:**_____

Address:_____ **Date of Survey:**_____

Phone: _____ **Store Surveyor:**_____

Best time to call:_____

Lamps Purchased:

Watts:_____

Mfr:_____

#/Pack:_____

Total Packs:_____

Total Bulbs:_____

Outcome Codes	
1=Completed	6=Refusal
2=Callback	7=Termination
3=Left Message	8=Wrong Number
4=Busy	9=Disconnected Number
5=No Answer	10=Language Barrier

	Date	Time		Initials	Outcome	Notes
Call 1		____:____	AM/PM			
Call 2		____:____	AM/PM			
Call 3		____:____	AM/PM			
Call 4		____:____	AM/PM			
Call 5		____:____	AM/PM			
Call 6		____:____	AM/PM			
Call 7		____:____	AM/PM			

Introduction

Hello, this is **(surveyor)** and I am calling on behalf of SMUD. Can I speak with **<<RESPONDENT>>**? I'm calling regarding the compact fluorescent light bulbs that you purchased a couple of months ago. You may recall meeting my associate, **<<STORE SURVEYOR>>,** at **<<STORE NAME>>** in **<<CITY>>**. You said that it would be OK to call you to ask you a few questions about how you're using the CFLs. We will mail you a $20 gift card for **<<STORE NAME>>** if you can answer a few questions for us. This should take about 5-10 minutes.

Q1. Is this a good time for you?

1) Yes
2) No **Call back date and time:**_____

Our records indicate that you purchased **<<Number of Packs>>** packs of SMUD discounted CFLs. All of our questions will relate to these **<<Total Lamps>>** bulbs.

Q2. Did you install the CFLs in your home or business, or both?

1) Home → Answer Home Section only
2) Business → Answer Business Section only
3) Both → Answer *both* Home *and* Business Sections
4) Haven't installed any of the CFLs

4a) Why Not? (See lookup table A) → Go to Demographics

HOME: Let's talk about the CFLs you installed in your home.

Q3 Is your home in the -SMUD service area?

1) Yes
2) No

*Enter **<<Total Lamps Purchased>>** line(s) for each CFL purchased.

				CFL questions				***Business only***
				Q4	**Q5**	**Q6**	**Q7**	**Q8**
Pack ID	**Bulb ID**	**Watts**	**# per pack**	**Is the bulb installed? *If no* : Why not?**	**In what room is it installed?**	**What type of fixture is the CFL installed in?**	**What type of bulb did the CFL replace?**	**Do you recall the wattage of the replaced bulb?**
				(see lookup table A)	*(see lookup table B)*	*(see lookup table C)*	*(see lookup table D)*	record exact wattage
					SKIP Q5-Q8 IF CFL NOT INSTALLED			
	1			YES / NO Code:				
	2			YES / NO Code:				
	3			YES / NO Code:				
	4			YES / NO Code:				
	5			YES / NO Code:				
	6			YES / NO Code:				
	7			YES / NO Code:				
	8			YES / NO Code:				
	9			YES / NO Code:				
	10			YES / NO Code:				
	11			YES / NO Code:				
	12			YES / NO Code:				
	13			YES / NO Code:				
	14			YES / NO Code:				
	15			YES / NO Code:				
	16			YES / NO Code:				
	17			YES / NO Code:				
	18			YES / NO Code:				
	19			YES / NO Code:				
	20			YES / NO Code:				

BUSINESS: Let's talk about the CFLs you installed in your business.

Q9. Is your business in SMUD service area?

1) Yes
2) No

Q10. Does daylight play a role in how many hours you use the lamps each day?

1) YES - ask for operating hours for BOTH Winter and Summer
2) NO - ask for operating hours for entire year, record in WINTER columns

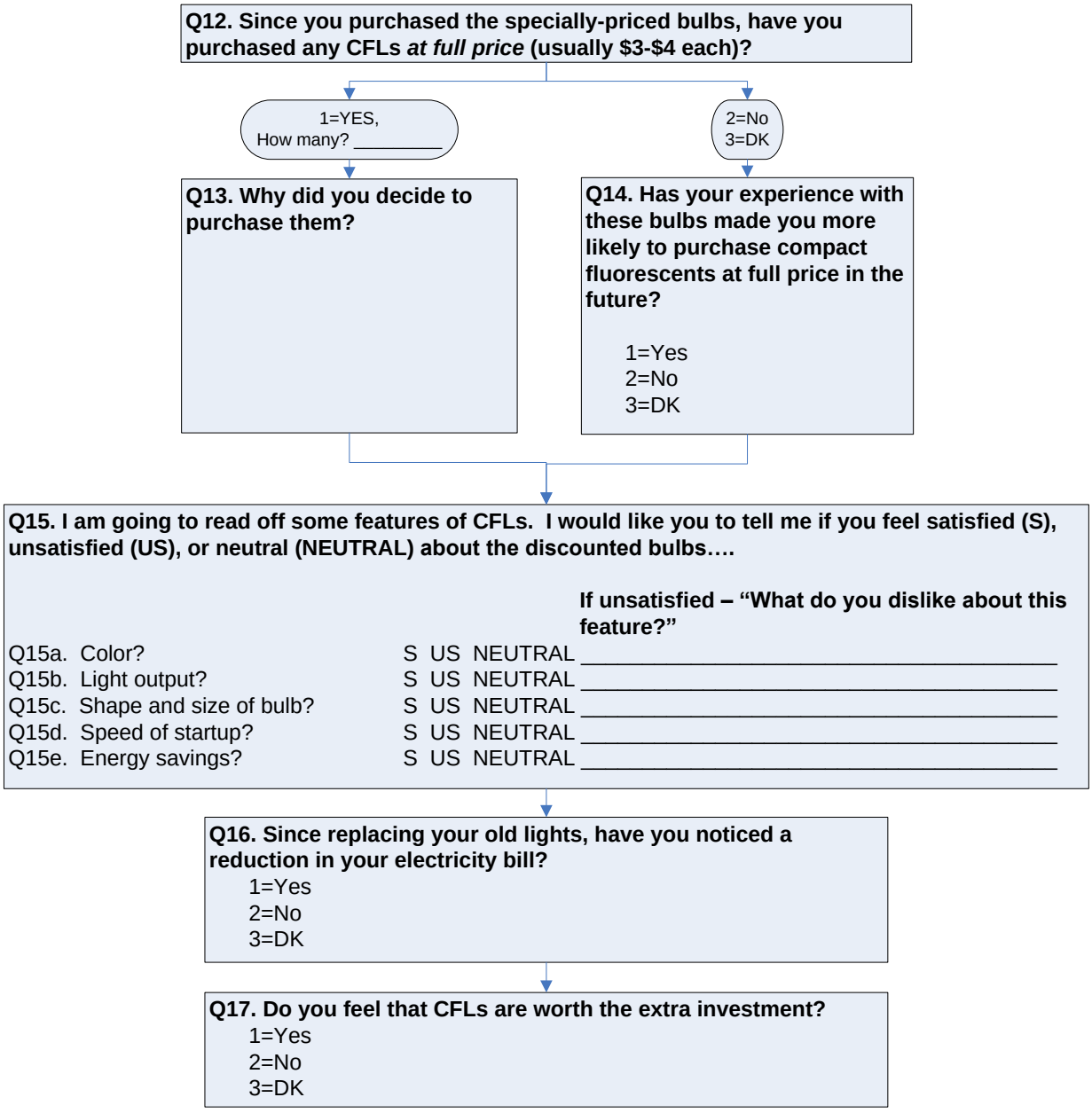
Q11A.

Pack ID	Bulb ID	*Monday - Friday*			
		Winter		*Summer*	
		On	Off	On	Off
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				

Q11B.

Pack ID	Bulb ID	*Weekend*			
		Winter		*Summer*	
		On	Off	On	Off
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				

SPILLOVER AND SATISFACTION QUESTIONS



DEMOGRAPHIC QUESTIONS

I just have a few final questions for background and classification purposes only.

Q18. What is your household's primary language?

1) English
2) Spanish
3) Chinese
4) Russian
5) Italian
6) Vietnamese
7) Hindi
8) Korean
9) French
10) Japanese
11) Other:_____
98) Don't Know

Q19. Do you own or rent your home?

1) Own
2) Rent
3) Other: Specify_____
98) Don't Know
99) Refused

Q20. What is the highest level of education you have completed?

1) High School Graduate or Less
2) Some College
3) 4-Year College Degree
4) Advanced Degree
99) Refused

Q21. Can you tell me the year you were born?

1) _____
98) Don't Know
99) Refused

Q22. Lastly, into which of the following categories did your household income fall in 2005?

1) Less Than $10,000
2) $10,000 - $19,999
3) $20,000 - $29,000
4) $30,000 - $39,999
5) $40,000 - $49,999
6) $50,000 - $59,999
7) $60,000 - $74,999
8) $75,000 - $99,999
9) $100,000 - $149,999
10) $150,000 or more
98) Don't Know
99) Refused

These are all of my questions. Thank you for your time. Can I verify the mailing address where you'd like us to send your $20 gift card?

Verify or Obtain Address:

Name: _____

Mailing Street or PO Box: _____

Mailing City: _____

Mailing State: _____

Mailing Zip: _____