Final Report

**Measurement and Evaluation Study
of the 2003 SDG&E Residential
Hard-to-Reach Lighting Program**

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This document is the final report for the Measurement and Evaluation Study of the 2003 SDG&E Local Residential Hard-to-Reach Lighting Program. This report contains verification of the number of lamps distributed and the number of lamps currently in use. Additionally, this report contains measures of program effectiveness resulting from a process evaluation.

The program allows Hard-to-Reach (HTR) residential customers to exchange inefficient halogen torchiere fixtures and incandescent bulbs for ENERGY STAR qualified torchiere fixtures and compact fluorescent lamps at no cost.

The primary objectives of the study are to:

1. Verify achieved levels of energy and peak demand savings through a program savings study, and

2. Measure indicators of program effectiveness through a process evaluation.

The evaluation is based on telephone surveys with 126 program participants. We called a total of 245 participants to complete 126 surveys, resulting in a conversion rate of 51.4%[1]. Only 8 participants refused to complete the survey, which is a refusal rate of only 3.3%. Refer to Table 43 for a complete listing of all survey dispositions. The survey responses have been statistically extrapolated to the program population.

Savings Verification Results

Table 1 presents the estimated number of lamps distributed and in use now relative to the number of lamps distributed according to the program tracking system.   For all program participants, the total number of lamps distributed was estimated to be 55,000 lamps representing a distribution realization rate of 98.5%. The distribution rate for torchieres was 106.5%, while the distribution rate for compact fluorescent lamps (CFLs) was 98.1%[2]. A total of 46,211 lamps are currently in use, representing an excellent overall usage rate relative to lamp distribution of 84.0%.

	Program Tracking # Lamps Distributed	Estimated # Lamps Distributed	Distribution Realization Rate	Estimated # Lamps In Use Now	Usage Rate (Tracking)	Usage Rate (Distribution)
Torchieres	2,679	2,854	106.5%	2,679	100.0%	93.9%
CFLs	53,170	52,146	98.1%	43,532	81.9%	83.5%
Total	**55,849**	**55,000**	**98.5%**	**46,211**	**82.7%**	**84.0%**

Table 1: Lamp Distribution and Usage Rates by Lamp Type

Once the number of lamps distributed was estimated, we determined the program's peak demand reduction and energy savings, using IPMVP option A, stipulated energy savings. The

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[1] The conversion rate is defined as the ratio of successfully completed surveys to all attempted contacts.

[2] There were a handful of respondents who stated they received more torchieres than recorded in the program tracking data, whereas there was only one respondent who stated they received fewer torchieres than recorded in the program tracking data. This results in the estimated number of torchieres distributed exceeding the total recorded in the program tracking data, and consequently a torchiere distribution rate that exceeds 100%.

stipulated values for the relevant parameters were combined with the verified lamp distributions[3]. As detailed in the section entitled "Stipulated Parameters and Cost Effectiveness Inputs", we have reviewed and revised where appropriate the assumed values for the stipulated parameters. Consequently, we have calculated the verified program savings first using the stipulated parameters assumed by the program and then using the revised stipulated parameters recommended by RLW.

Table 2 displays the verified demand reduction and energy savings resulting from combining the verified lamp distributions with the stipulated parameters assumed by the program as shown in Table 11. Overall, the program is achieving a gross demand reduction of 563 kW and a net demand reduction of 450 kW. For energy savings, the program is achieving an annual gross energy savings of 3,580,476 kWh, an annual net energy savings of 2,864,381 kWh, a life cycle gross energy savings of 25,779,427 kWh, and a life cycle net energy savings of 20,623,542 kWh.

	# Distributed	Total Annual Gross kW Demand Reduction	Total Annual Net kW Demand Reduction	Total Annual Gross kWh Savings	Total Annual Net kWh Savings	Life Cycle Gross kWh	Life Cycle Net kWh
14 W CFL	3,248	17	14	107,184	85,747	771,725	617,380
27 W CFL	48,898	469	376	2,982,778	2,386,222	21,476,002	17,180,801
55 W / 63 W Torchiere (Q1 Only)	224	10	8	61,824	49,459	445,133	356,106
70 W Torchiere (Q2 - Q4)	2,630	67	54	428,690	342,952	3,086,568	2,469,254
Total	**55,000**	**563**	**450**	**3,580,476**	**2,864,381**	**25,779,427**	**20,623,542**

Table 2: Program Demand Reduction and Energy Savings Using Program Assumed Parameters

Table 3 compares the evaluated net kW demand reduction and net kWh energy savings to those recorded in the program's AEAP filing and the CPUC target. The verified net demand reduction and energy savings just barely fall short of those recorded in the program's AEAP filing. However, the verified net demand reduction and energy savings exceed the CPUC targets. There is less than a 1.0% difference between both the verified net demand reduction and energy savings and the values filed by the program. This difference is likely explained by the respondent's inability to distinguish between the 14 Watt and 27 Watt CFLs, as footnoted on this page.

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[3] Respondents were typically unable to distinguish between 14-Watt CFLs and 27-Watt CFLs. Therefore, our evaluation estimates the total number of CFLs distributed. Since the stipulated parameters are different for the 2 types of CFL, it was necessary to also estimate the number of lamps distributed of each wattage. To do this, we multiplied the total number of CFLs distributed by the proportion of CFLs of that wattage, as determined from the program tracking data. For example, the program tracking data shows that 14-Watt CFLs accounted for 6.2% of all CFLs. We have verified that a total of 43,532 CFLs were distributed and are in use now. So, we have estimated the number of 14-Watt CFLs distributed and in use as (43,532 * 6.2%) = 2,712.

	CPUC Target	Program AEAP Filed	Verified With Ex-Ante Parameters
Net kW Demand Reduction	448	454	450
Net kWh Energy Savings	2,487,523	2,888,833	2,864,381

Table 3: Demand Reduction and Energy Savings Compared to AEAP Filing Using Program Assumed Parameters

Table 4 shows the results of combining the verified lamp distributions using the RLW recommended stipulated parameters. Overall, the program is achieving a gross demand reduction of 489 kW and a net demand reduction of 391 kW. For energy savings, the program is achieving an annual gross energy savings of 2,089,112 kWh, an annual net energy savings of 1,671,290 kWh, a life cycle gross energy savings of 18,802,012 kWh, and a life cycle net energy savings of 15,041,610 kWh [4].

	# Distributed & In Use Now + # Burned Out	Total Annual Gross kW Demand Reduction	Total Annual Net kW Demand Reduction	Total Annual Gross kWh Savings	Total Annual Net kWh Savings	Life Cycle Gross kWh	Life Cycle Net kWh
14 W CFL	2,787	14	12	61,883	49,506	556,943	445,554
27 W CFL	41,951	403	322	1,719,655	1,375,724	15,476,899	12,381,519
55 W / 63 W Torchiere (Q1 Only)	210	9	7	38,737	30,990	348,637	278,910
70 W Torchiere (Q2 - Q4)	2,469	63	50	268,837	215,070	2,419,534	1,935,627
Total	**47,417**	**489**	**391**	**2,089,112**	**1,671,290**	**18,802,012**	**15,041,610**

Table 4: Program Demand Reduction and Energy Savings Using Revised Stipulated Parameters

Table 5 compares the evaluated net kW demand reduction and net kWh energy savings based on the RLW recommended stipulated parameters to those recorded in the program's AEAP filing and the CPUC target. The verified net demand reduction and energy savings both fall short of the program's AEAP filing and the CPUC targets. The verified net demand reduction is approximately 86% of the value filed by the program, and the verified energy savings are approximately 58% of the value filed by the program. The difference in net demand reduction is due to two primary reasons. First, the stipulated parameters assumed a 100% installation rate for all lamps distributed by the program, when in fact the utilization rate was approximately 86%. Secondly, the stipulated parameters assumed 3.5 hours of operation for all lamps distributed, which is too high considering the quantity of lamps distributed to each customer. Detailed specifics for each of these observations are articulated in the chapter entitled "Observations and Recommendations".

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[4] We have calculated the life cycle energy savings as (first-year annual energy savings) * (effective useful life).

	CPUC Target	Program AEAP Filed	Verified With Revised Parameters
Net kW Demand Reduction	448	454	391
Net kWh Energy Savings	2,487,523	2,888,833	1,671,290

Table 5: Demand Reduction and Energy Savings Compared to AEAP Filing Using Revised Stipulated Parameters

All participants who stated they received lamps which were not currently in use were asked to indicate why. Table 6 presents the reasons why CFLs are not currently in use. Just over 30% of CFLs not in use are not currently in use because the participant did not have enough fixtures to place all of the lamps they received. Approximately 20% of CFLs are not currently in use because the participant has not taken the time to install them, and over 15% of CFLs are not currently in use because the CFL burned out.

	Estimated # CFLs	Error Bound	Relative Precision
Not Enough Fixtures	2,272	1,015	44.7%
Have Not Taken Time to Install	1,544	1,055	68.3%
Burned Out	1,206	1,031	85.5%
Did Not Fit in My Light Fixture	971	643	66.2%
Other	555	644	116.0%
Not Bright Enough	417	730	175.2%
Too Bright	243	302	124.5%
Total	**7,208**	**2,158**	**29.9%**

Table 6: Reasons Why CFLs Are Not In Use

Table 7 shows the number of lamps not currently in use, but future use of the lamps is planned. For torchieres, of the 175 torchieres not currently in use, participants plan to use 65 in the future. For CFLs, of the 8,614 lamps not currently is use, participants plan to use 5,794 sometime in the future.

	# Lamps Distributed	# Lamps In Use Now	# Don't Know If In Use	# Lamps Future Use Planned	# Lamps Not In Use & No Planned Use
Torchieres	2,854	2,679	0	65	110
CFLs	52,146	43,532	1,406	5,794	1,414
Total	**55,000**	**46,211**	**1,406**	**5,859**	**1,524**

Table 7: Number of Lamps Not In Use Now and Planned Future Use

Process Evaluation Results

Nearly 70% of program participants state they have told others about the lamps they received through the program and about 90% of these participants report only mentioning good things. This finding indicates that participants are pleased with the lamps received through the program, as evidenced by the fact that 70% of participants have told others about the lamps, and 90% of these participants report only mentioning good things about the lamps and the program.

Among participants who told others about the lamps received through the program, about 40% report others have procured and are using similar bulbs. This finding reinforces the fact that participants are pleased with the lamps received through the program. Not only are participants telling others about the lamps received through the program, but approximately 40% of participants who have told others (or 28% of all participants)[5] report that at least one other person has purchased similar lamps for their own use.

Observations and Recommendations

Several observations were made about the 2003 Hard-to-Reach Lighting 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 chapter entitled "Observations and Recommendations". Our major observations are:

1. Stipulated parameters need review and possible revision as program evolves,

2. The program should consider reducing the number of lamps distributed per customer,

3. The evaluation results show excellent distribution and usage rates,

4. The radio appears to connect with truly hard-to-reach customers,

5. Newspaper attracts marginally hard-to-reach customers, and

6. Participant networking with peers has resulted in non-participant procurement and usage of similar lamps

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[5] $0.7*0.4 = 0.28$

This is the final report for the Measurement and Evaluation Study of the 2003 SDG&E Local Residential Hard-to-Reach Lighting Program. In this chapter, we will describe the 2003 program as well as our general evaluation approach.

Program Overview

The SDG&E Local Residential Hard-to-Reach Lighting Turn-In Program targets hard-to-reach (HTR) residential customers, including seniors and lower and fixed income customers that may not have financial means or other resources to participate in energy efficiency programs. The program allows HTR residential customers to exchange inefficient halogen torchiere fixtures and incandescent bulbs for ENERGY STAR qualified torchiere fixtures and compact fluorescent lamps at no cost. For the 2003 program, HTR residential customers could exchange up to 2 halogen torchiere fixtures and up to 10 incandescent bulbs[6]. In 2003, according to the program tracking system, the program exchanged 53,170 compact fluorescent lamps and 2,679 torchiere lamps to 6,934 HTR customers.

Evaluation Overview

The primary objectives of the study are to:

1. Verify achieved levels of energy and peak demand savings through a program savings study, and

2. Measure indicators of program effectiveness through a process evaluation.

To verify the achieved levels of energy and peak demand savings, the study determined the number of measure distributions achieved during the 2003 program year using telephone surveys. The same telephone survey was also utilized to measure indicators of program effectiveness.

Using the SDG&E program tracking data as a sampling frame, we selected a statistically representative sample of 125 participants for the telephone survey. All results were extrapolated to the program participant population.

We used a telephone survey to serve two purposes: verifying the lamp distributions and assessing the effectiveness of the program approach in delivering customer satisfaction. For each participant in the sample, the survey verified the distributed lamps listed in the SDG&E tracking database. The survey also determined how participants heard of the program, reasons for participation, program satisfaction, and customer perceptions on how the program has helped them manage their energy bills.

For the savings verification component of the evaluation, the statistical analysis of the data consisted of extrapolating the verified lamp distributions and installations in the sample to the program population to estimate the total number of lamp distributions and installations achieved by the program. We calculated measure-specific distribution and utilization rates by comparing the tracking system data to the verified lamp distributions and usage. The total number of lamp distributions achieved in the program year that were also in use at the time of data collection was then used to verify the energy and peak demand savings achieved by the program using IPMVP option A, Stipulated Energy Savings. We also reviewed the stipulated parameters used

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[6] In 2002 program participants could only exchange and receive up to five new CFLs.

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by the program to estimate savings for accuracy and reasonableness. We then revised the stipulated parameter values as appropriate. For the process evaluation component of the study, the statistical analysis of the data consisted of weighted frequency distributions, means, and cross-tabulations, where appropriate, to measure indicators of program effectiveness.

Program Population Characteristics

Table 8 summarizes the number of participants who received a given number of torchieres and CFLs according to the program tracking system. As shown in the table, 4,339 participants out of a total of 6,934 (i.e. about 63%) received a total of 10 CFLs according to the program tracking data, with 854 of participants receiving at least one torchiere in addition to the 10 CFLs. Only 1,412 participants (i.e. about 20% of all participants) received between 1 – 5 CFLs. In total, according to the program tracking system, the 2003 program exchanged 53,170 compact fluorescent lamps and 2,679 torchiere lamps to 6,934 HTR customers. Equivalently, the program distributed approximately 8.05 lamps to each participant.

# of Participants				
# of CFLS	# of Torchieres			Total
	0	1	2	
0	-	388	304	692
1	47	10	6	63
2	93	17	7	117
3	65	17	6	88
4	108	26	3	137
5	848	108	51	1,007
6	106	18	13	137
7	78	17	7	102
8	139	14	15	168
9	65	12	7	84
10	3,485	494	360	4,339
Total	**5,034**	**1,121**	**779**	**6,934**

Table 8: Program Tracking Number of Lamps Distributed to Participants

Table 9 summarizes the home ownership status of 2003 participants according to the program tracking system. According to the program tracking system, 54% of participants own their home, 32% rent their home, and the home ownership status is unknown for the remaining 14% of participants.

	% of Participants
Own	54%
Rent	32%
Unknown	14%

Table 9: Program Tracking Distribution of Home Ownership Status

Table 10 summarizes the primary language spoken at home of 2003 participants according to the program tracking system. According to the program tracking system, 56% of participants primarily speak English in their home, 16% of participants primarily speak Spanish in their

home, 11% of participants primarily speak a language other than English or Spanish in their home, and the primary language spoken at home is unknown for the remaining 17% of participants.

	% of Participants
English	56%
Spanish	16%
Other	11%
Unknown	17%

Table 10: Program Tracking Distribution of Primary Language Spoken at Home

Savings Verification Results

For the savings verification component of the evaluation, the statistical analysis of the data consisted of extrapolating the verified lamp distributions and installations in the sample to the program population to estimate the total number of lamp distributions and installations achieved by the program. We calculated measure-specific distribution and utilization rates by comparing the tracking system data to the verified lamp distributions and usage. The total number of lamp distributions achieved in the program year that were also in use at the time of data collection was then used to verify the energy and peak demand savings achieved by the program using IPMVP option A, Stipulated Energy Savings. We also reviewed the program's stipulated parameters in the detailed cost-effectiveness workpapers for accuracy and reasonableness. We revised these parameters as appropriate, as discussed in the following section.

Stipulated Parameters and Cost Effectiveness Inputs

Table 11 displays the stipulated parameters assumed by SDG&E's 2003 hard-to-reach lighting program by lamp type. The program assumed each lamp would be operating for 1,278 hours annually, or 3.5 hours per day, on average. Note that the program did not revise its assumptions used to calculate the parameters between 2002 and 2003, even though the structure of the program changed between 2002 and 2003[7].

	Demand Reduction per Unit (kW)	Energy Savings per Unit (kWh)	EUL	NTG Ratio
14 W CFL	0.0052	33	9.0	0.8
27 W CFL	0.0096	61	9.0	0.8
55 W / 63 W Torchiere (Q1 Only)	0.0432	276	9.0	0.8
70 W Torchiere (Q2 - Q4)	0.0255	163	9.0	0.8

Table 11: Program Assumed Stipulated Parameters

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[7] Prior to August 2002, each HTR customer could exchange up to 2 halogen torchiere fixtures and up to 5 incandescent bulbs. Starting in August 2002, HTR residential customers could exchange up to 2 halogen torchiere fixtures and up to 10 incandescent bulbs. In 2002, according to the program tracking system, the program exchanged 40,318 compact fluorescent lamps and 2,450 torchiere lamps to 7,330 HTR customers. Therefore, according to the program tracking data, the 2002 program distributed approximately 5.8 lamps to each participant.

We reviewed the program assumed stipulated parameters for reasonableness. For each lamp type, we found the stipulated parameters to be reasonable, with two notable exceptions:

1. We believed the assumed operating hours of 1,278 hours per year was too large, particularly because the program distributed an average of 8.05 lamps to each program participant, and

2. We noticed the program did not include utilization factors in its calculations. In other words, the program assumes that each lamp would in fact be put into use and would achieve demand reduction and energy savings accordingly. The telephone surveys conducted with program participants revealed that 15% or the lamps distributed were not in use, as a result we have discounted the energy savings for these measures.

In an attempt to validate and verify the program assumed annual operating hours, we reviewed numerous research studies conducted in past 10 years regarding the hours of operations in residential lighting applications. Specifically, we consulted the following research studies:

1. Northeast Utilities Impact Evaluation for the 2000 Energy Star Home New Construction Program, RLW Analytics, Inc., 2002.

2. Phase IV Market Effect Study of California Residential Lighting and Appliance Program, Xenergy, 2002.

3. Research Summary of Northwest Energy Efficiency Alliance Residential New Construction Lighting Program, Ecos Consulting, Benya Lighting Design & Rising Sun Enterprises, 2002.

4. California Energy Commission Lighting Efficiency Technology Report Volume 1: California Baseline, Heschong Mahone Group, 1999.

5. Baseline Residential Lighting Energy Use Study, Tribwell & Lerman Tacoma Public Utilities, 1996.

Each of the aforementioned studies contains evidence indicating residential lamps on average are in operation for fewer than 3.5 hours per day (1,278 hours annually). There is considerable evidence showing that after the first 3 – 5 lamps in a residence, the hours of operation of the remaining lamps drops off considerably. Therefore, while it may be reasonable to assume that the first 3 – 5 lamps are in operation for 3.5 hours per day (1,278 hours annually), it is not reasonable to assume such a value for the remaining lamps.

We have decided to utilize the HMG study mentioned previously (California Energy Commission Lighting Efficiency Technology Report Volume 1: California Baseline 1999) as the most valid representation of residential lighting operating hours in California. We selected the HMG study for the following reasons:

1. It is restricted to California, whereas some of the other studies are restricted to geographic locations other than California, and

2. Hours of operation were calculated using monitored data of actual operation of more than 2,600 fixtures.

3. The results reported are likely to more accurately represent actual residential lighting hours of operation in California because the HMG study relied on monitored data, not self-report estimates.

The HMG study shows that, in California, lamps used the most (located in kitchens / dining rooms) are used for an average of approximately 3.4 hours a day while lamps used the least

(located in bedrooms) are used for approximately 1.4 hours per day. Furthermore, the HMG study shows that for all residential lighting in California, the average hours of operation are 2.34 hours per day[8]. In this current study, we have estimated that over 30% of all CFLs distributed through the program and currently in use are located in the bedroom, with nearly 50% of all torchieres distributed through the program and currently in use located in the bedroom. Additionally, only about 12.4% of all CFLs distributed through the program and currently in use are located in the kitchen, with less than 2% of all torchieres distributed through the program and currently in use located in the kitchen. We believe that assuming the average hours of operation for all residential lighting as found in the HMG study is both appropriate and reasonable in this situation. Therefore, we shall assume a value of 2.34 hours per day, or 854 hours annually, to revise the stipulated parameters for energy savings.

Additionally, we believe the program should include utilization rates (i.e. the percentage of lamps that are installed by participants) in its calculations of the stipulated parameters, particularly since the program distributed just over 8 lamps to each participant on average. We will include the utilization rate estimated in this study (i.e. the # of lamps in use now plus the number of lamps burned out relative to the # of lamps distributed), in our verification of achieved demand reduction and energy savings. Specifically, we will assume that 94% of all distributed torchieres and 86% of all distributed CFLs are now in use or were previously in use but have since burned out. In other words, demand reduction and energy savings will be attributed to the program only for those lamps in use now and those lamps previously in use but currently burned out[9].

Lastly, we also note that the nine year EUL used by SDG&E is greater than recommended by the Energy Efficiency Policy manual, which recommends 8 year EULs for screw-in CFL measures. Considering a 9 year EUL, and 3.5 hours a day, CFLs distributed through the program would last 11,498 hours, far greater than the 8,000-10,000 hours of operation often cited by CFL manufacturers. However, by reducing the daily hours of operation to 2.34 hours, the total hours of operation per CFL becomes 7,982 hours, much more in-line with industry standards. Therefore, by adjusting the daily operating hour assumption from 3.5 to 2.34, the EUL becomes a more credible value.

Table 12 shows the revised stipulated parameters we calculated using the revised annual hours of operation. Similar to the program, we have utilized the non-coincident kW reduction to calculate the energy savings, whereas the demand reduction shown in Table 12 is the coincident kW reduction[10].

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[8] 4.   California Energy Commission Lighting Efficiency Technology Report Volume 1: California Baseline, Heschong Mahone Group, 1999, P.31.

[9] The EUL is generally an estimate of the median number of years that the measures installed under a given program are still in place and operable, therefore we would be penalizing the program twice if we did not include burned out lamps in the utilization rate calculation.

[10] The program assumes a coincidence factor of 20%, so coincident kW = 0.2*(non-coincident kW).

	Demand Reduction per Unit (kW)	Energy Savings per Unit (kWh)	EUL	NTG Ratio	Utilization Rate
14 W CFL	0.0052	22	9.0	0.8	85.8%
27 W CFL	0.0096	41	9.0	0.8	85.8%
55 W / 63 W Torchiere (Q1 Only)	0.0432	184	9.0	0.8	93.9%
70 W Torchiere (Q2 - Q4)	0.0255	109	9.0	0.8	93.9%

Table 12: RLW Recommended Stipulated Parameters

Verification of Number of Lamps Distributed

Table 13 presents the estimated number of lamps distributed and in use now relative to the number of lamps distributed according to the program tracking system. For all program participants, the total number of lamps distributed was estimated to be 55,000 lamps, representing a distribution realization rate of 98.5%. The distribution rate for torchieres was 106.5%[11], and for CFLs, the distribution rate was 98.1%. A total of 46,211 lamps are currently in use, representing a usage realization rate relative to lamp distribution of 84.0%.

	Program Tracking # Lamps Distributed	Estimated # Lamps Distributed	Distribution Realization Rate	Estimated # Lamps In Use Now	Usage Rate (Tracking)	Usage Rate (Distribution)
Torchieres	2,679	2,854	106.5%	2,679	100.0%	93.9%
CFLs	53,170	52,146	98.1%	43,532	81.9%	83.5%
Total	**55,849**	**55,000**	**98.5%**	**46,211**	**82.7%**	**84.0%**

Table 13: Lamp Distribution and Usage Rates by Lamp Type

Table 14 shows the estimated number of lamps distributed and error bound by lamp type as well as overall. The total number of lamps distributed was found to be 55,000, with an error bound of 1,073 lamps, yielding a 90% confidence interval of (53,927, 56,073) lamps.

	# Lamps Distributed	Error Bound	Relative Precision
Torchieres	2,854	261	9.2%
CFLs	52,146	1,041	2.0%
Total	**55,000**	**1,073**	**2.0%**

Table 14: Number of Lamps Distributed by Lamp Type

Table 15 shows the estimated number of lamps in use now for both torchieres and CFLs. The table also shows the error bound by lamp type as well as for the overall program. The total

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[11] There were a small number of respondents who stated they received more torchieres than recorded in the program tracking data, whereas there was only one respondent who stated they received fewer torchieres than recorded in the program tracking data. This results in the estimated number of torchieres distributed exceeding the total recorded in the program tracking data, and consequently a torchiere distribution rate that exceeds 100%.

number of lamps in use now is 46,211 lamps, with an error bound of 2,325 lamps, yielding a 90% confidence interval of (43,886, 48,536) lamps.

	# Lamps In Use Now	Error Bound	Relative Precision
Torchieres	2,679	263	9.8%
CFLs	43,532	2,311	5.3%
Total	**46,211**	**2,325**	**5.0%**

Table 15: Number of Lamps In Use Now by Lamp Type

Table 16 presents the number of CFLs in use now and error bound by room type as well as overall. Over 30% (13,805 / 43,532) of all CFLs in use now are located in a bedroom, with approximately another 20% located in the living room. Just over 10% of the CFLs in use now are located in kitchens and bathrooms. Porch lights, cited in many reports as the longest operating fixture in the household represents 7% of all lamps distributed.

	Estimated # CFLs In Use Now	Error Bound	Relative Precision	% of Total CFLS In Use Now
Bedroom	13,805	1,711	12.4%	31.7%
Living Room	8,851	1,300	14.7%	20.3%
Kitchen	5,414	1,207	22.3%	12.4%
Bathroom	4,894	1,480	30.2%	11.2%
Porch	3,141	1,063	33.8%	7.2%
Hallway	2,637	723	27.4%	6.1%
Dining Room	1,510	672	44.5%	3.5%
Garage	1,163	472	40.6%	2.7%
Closet	920	388	42.1%	2.1%
Home Office	833	340	40.8%	1.9%
Attic	52	91	175.2%	0.1%
Other	312	254	81.4%	0.7%
Total	**43,532**	**2,325**	**5.0%**	

Table 16: Number of CFLs In Use Now by Room Type

All participants who stated received lamps that were not currently in use were asked to indicate why. For torchieres not currently in use, the reasons are that the recipient prefers using the CFLs they received, the torchiere is broken, or the torchiere is in storage at the current time. There were only 2 survey respondents who reported receiving torchieres that are not currently in use. One respondent, who received one torchiere, stated the torchiere was not in use because they preferred using the CFLs they received. The other respondent, who received two torchieres that are not currently in use, stated that one of the torchieres is broken and the other is temporarily in storage while they find a new apartment.

Table 17 presents the reasons why CFLs are not currently in use. Just over 30% of CFLs not in use are not currently in use because the participant did not have enough fixtures to place all of the lamps they received. Approximately 20% of CFLs not in use are not currently in use

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because the participant has not taken the time to install them, and over 15% of CFLs not in use are not currently in use because the CFL burned out.

These findings suggest that the program may be distributing too many CFLs at these events to each customer. For example, customers are not able to find enough fixtures to fit all lamps in, and they are not taking the time to install lamps in all of their fixtures. More customers could be served by the program if the number of CFLs allowed per customer was reduced. Doing so would most likely improve the program's cost effectiveness, through improved utilization rates and possible gains in average operating hours per lamp.

	Estimated # CFLs	Error Bound	Relative Precision
Not Enough Fixtures	2,272	1,015	44.7%
Have Not Taken Time to Install	1,544	1,055	68.3%
Burned Out	1,206	1,031	85.5%
Did Not Fit in My Light Fixture	971	643	66.2%
Other	555	644	116.0%
Not Bright Enough	417	730	175.2%
Too Bright	243	302	124.5%
Total	**7,208**	**2,158**	**29.9%**

Table 17: Reasons Why CFLs Are Not In Use

Table 18 presents the number of torchieres in use now. The table also presents percent of totals and error bounds by room and for all torchieres. Over 45% of torchieres in use now are located in the living room, with over 45% of torchieres in use now located in the bedroom. A handful of torchieres are located in home offices or kitchens.

	Estimated # Torchieres In Use Now	Error Bound	Relative Precision	% of Total Torchieres In Use Now
Living Room	1,296	292	22.5%	48.4%
Bedroom	1,274	268	21.0%	47.6%
Home Office	65	93	142.8%	2.4%
Kitchen	44	60	137.7%	1.6%
Total	**2,679**	**263**	**9.8%**	

Table 18: Number of Torchieres In Use Now by Room Type

Table 19 shows the number of lamps not currently in use but future use of the lamps is planned. For torchieres, of the 175 torchieres not currently in use, participants plan to use 65 in the future. For CFLs, of the 8,614 lamps not currently is use, participants plan to use 5,794 in the future. In total, 1,524 of the 55,000 lamps may not ever be used, equating to nearly 3% of all lamps distributed.

	# Lamps Distributed	# Lamps In Use Now	# Don't Know If In Use	# Lamps Future Use Planned	# Lamps Not In Use & No Planned Use
Torchieres	2,854	2,679	0	65	110
CFLs	52,146	43,532	1,406	5,794	1,414
Total	**55,000**	**46,211**	**1,406**	**5,859**	**1,524**

Table 19: Number of Lamps Not In Use Now But Future Use Planned

Verify Program Savings

Once the number of lamps distributed was estimated, we determined the program's peak demand reduction and energy savings, using IPMVP option A, stipulated energy savings. The stipulated values for the relevant parameters were combined with the verified lamp distributions to determine the program's demand reduction and energy savings impacts[12]. As detailed in the section entitled "Stipulated Parameters and Cost Effectiveness Inputs", we have reviewed and revised where appropriate the assumed values for the stipulated parameters. Consequently, we have calculated the verified program savings first using the stipulated parameters assumed by the program and then using the revised stipulated parameters recommended by RLW.

Verified Savings Using Program Assumed Stipulated Parameters

Table 20 displays the verified demand reduction and energy savings results resulting from combining the verified lamp distributions with the stipulated parameters assumed by the program as shown in Table 11. Overall, the program is achieving a gross demand reduction of 563 kW and a net demand reduction of 450 kW. For energy savings, the program is achieving an annual gross energy savings of 3,580,476 kWh, an annual net energy savings of 2,864,381 kWh, a life cycle gross energy savings of 25,779,427 kWh, and a life cycle net energy savings of 20,623,542 kWh.

	# Distributed	Total Annual Gross kW Demand Reduction	Total Annual Net kW Demand Reduction	Total Annual Gross kWh Savings	Total Annual Net kWh Savings	Life Cycle Gross kWh	Life Cycle Net kWh
14 W CFL	3,248	17	14	107,184	85,747	771,725	617,380
27 W CFL	48,898	469	376	2,982,778	2,386,222	21,476,002	17,180,801
55 W / 63 W Torchiere (Q1 Only)	224	10	8	61,824	49,459	445,133	356,106
70 W Torchiere (Q2 - Q4)	2,630	67	54	428,690	342,952	3,086,568	2,469,254
Total	**55,000**	**563**	**450**	**3,580,476**	**2,864,381**	**25,779,427**	**20,623,542**

Table 20: Program Demand Reduction and Energy Savings Using Program Assumed Parameters

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[12] Respondents were unable to distinguish between 14-Watt CFLs and 27-Watt CFLs. Therefore, our evaluation estimates the total number of CFLs distributed. Since the stipulated parameters are different for the 2 types of CFL, it was necessary to also estimate the number of lamps distributed of each wattage. To do this, we multiplied the total number of CFLs distributed by the proportion of CFLs of that wattage, as determined from the program tracking data. For example, the program tracking data shows that 14-Watt CFLs accounted for 6.2% of all CFLs. We have verified that a total of 43,532 CFLs were distributed and are in use now. So, we have estimated the number of 14-Watt CFLs distributed and in use as (43,532 * 6.2%) = 2,712.

Table 21 compares the evaluated net kW demand reduction and net kWh energy savings to those recorded in the program's AEAP filing and the CPUC target. The verified net demand reduction and energy savings just barely fall short of those recorded in the program's AEAP filing. However, the verified net demand reduction and energy savings exceed the CPUC targets. There is less than a 1.0% difference between both the verified net demand reduction and energy savings and the values filed by the program. This difference is likely explained by the respondent's inability to distinguish between the 14 Watt and 27 Watt CFLs, as footnoted on the previous page.

	CPUC Target	Program AEAP Filed	Verified With Ex-Ante Parameters
Net kW Demand Reduction	448	454	450
Net kWh Energy Savings	2,487,523	2,888,833	2,864,381

Table 21: Demand Reduction and Energy Savings Compared to AEAP Filing Using Program Assumed Parameters

Verified Savings Using Revised Stipulated Parameters

Table 22 shows the results of combining the verified lamp distributions with the revised stipulated parameters. Under these parameters, the program is achieving a gross demand reduction of 489 kW and a net demand reduction of 391 kW. For energy savings, the program is achieving an annual gross energy savings of 2,089,112 kWh, an annual net energy savings of 1,671,290 kWh, a life cycle gross energy savings of 18,802,012 kWh, and a life cycle net energy savings of 15,041,610 kWh [13].

	# Distributed & In Use Now + # Burned Out	Total Annual Gross kW Demand Reduction	Total Annual Net kW Demand Reduction	Total Annual Gross kWh Savings	Total Annual Net kWh Savings	Life Cycle Gross kWh	Life Cycle Net kWh
14 W CFL	2,787	14	12	61,883	49,506	556,943	445,554
27 W CFL	41,951	403	322	1,719,655	1,375,724	15,476,899	12,381,519
55 W / 63 W Torchiere (Q1 Only)	210	9	7	38,737	30,990	348,637	278,910
70 W Torchiere (Q2 - Q4)	2,469	63	50	268,837	215,070	2,419,534	1,935,627
Total	**47,417**	**489**	**391**	**2,089,112**	**1,671,290**	**18,802,012**	**15,041,610**

Table 22: Program Demand Reduction and Energy Savings Using Revised Stipulated Parameters

Table 23 compares the evaluated net kW demand reduction and net kWh energy savings to those recorded in the program's AEAP filing and the CPUC target. The verified net demand reduction and energy savings both fall short of those recorded in the program's AEAP filing and the CPUC targets. The verified net demand reduction is approximately 86% of the value filed by the program, and the verified energy savings are approximately 58% of the value filed by the program. The difference in net demand reduction is due to a lack of a utilization factor in the program's assumed stipulated parameter. The difference in energy savings is due to both the lack of a utilization factor in the program's assumed stipulated parameter and assumed hours of

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[13] We have calculated the life cycle energy savings as (first-year annual net energy savings) * (effective useful life).

operation that was determined to be too large, particularly because the program distributed an average of 8.05 lamps per program participant.

	CPUC Target	Program AEAP Filed	Verified With Revised Parameters
Net kW Demand Reduction	448	454	391
Net kWh Energy Savings	2,487,523	2,888,833	1,671,290

Table 23: Demand Reduction and Energy Savings Compared to AEAP Filing Using Revised Stipulated Parameters

Process Evaluation Results

Table 24 shows how participants first became aware of SDG&E's 2003 Residential Hard-to-Reach Lighting Program. Nearly one-fifth of participants became aware of the program through word-of-mouth. Approximately 10% of participants learned of the program through flyers and radio advertisements, while over 5% of participants cannot recall how they learned of the program.

	% of Participants
Word of Mouth - Friend / Relative / Co-Worker	17.8%
Radio	10.4%
Flyer	10.1%
Letter or Mailing (Other Than Bill Insert)	7.0%
Community Center	6.8%
Bill Insert	5.9%
Church	4.9%
Newspaper	4.6%
Other Community Group or Organization - Flyer or verbally informed	4.5%
WIC Center	2.4%
Store	2.4%
Senior Center	1.6%
Clinic or Hospital	1.6%
Community Service Agency	1.6%
YMCA	0.8%
Other	10.0%
Don't Know / Can't Remember	7.4%

Table 24: Source of Awareness of Hard-to-Reach Lighting Program

Next, respondents were asked to provide the primary reason they participated in the program. Table 25 displays the responses. Over 75% of participants state their primary reason for participating in the program was to save energy or reduce their electricity bill.

	% of Participants
Energy Savings	77.7%
Safety	7.8%
Free Benefit	12.3%
Other	2.2%

Table 25: Primary Reason for Participating in Hard-to-Reach Lighting Program

Table 26 presents the incidence of participants noticing a change in their electricity bill since participating in the Hard-to-Reach Lighting Program. Over 40% of participants have noticed a change in their bill. Approximately another 20% of participants do not know if they have seen a change in their bill.

	% of Participants
Yes	41.9%
No	36.5%
Don't Know	21.6%

Table 26: Incidence of Noticing a Change in Electricity Bill

All participants who have noticed a change in their electricity bill were asked to compare the change to their expectations. As shown in Table 27, over 30% of participants who have noticed a change are experiencing less energy savings than they expected, with nearly 40% of participants who have noticed a change saving about as much as they expected. Over 20% of participants who have noticed a change are saving even more than they expected, while more than 30% experienced energy savings that were less than expected.

	% of Participants With Change in Bill
Less Than Expected	32.3%
About As Much As Expected	39.3%
Even More Than Expected	23.2%
Don't Know	5.2%

Table 27: Change in Electricity Bill Compared to Participant Expectations Among Participants Who Noticed A Change in Bill

Table 28 displays the incidence of program participants telling others about the lamps they received through the program. Almost 70% of participants report that they have told others about the lamps received through the program.

	% of Participants
Yes	68.6%
No	30.5%
Don't Know	0.8%

Table 28: Incidence of Telling Others about Lamps Received Through Program

Participants who told others about the lamps were asked how many people they told. Table 29 summarizes the responses. More than half of participants who told others about the lamps report telling 1 to 3 people, and over 30% of these participants told 4 to 9 people.

	% of Participants Who Told Others
I Told A Few People (1 to 3)	54.7%
I Told Some People (4 to 9)	31.9%
I Told A Lot of People (10 or More)	11.6%
Don't Know	1.8%

Table 29: Number of People Told about Lamps from Program
Among Participants Who Told Others about Lamps

Participants who reported telling others about the lamps they received through the program were asked how good or bad the information was they mentioned to others. As shown in Table 30, almost 90% of participants state that everything they mentioned to others was all good, indicating that participants are quite pleased with the program and the lamps they received through the program.

	% of Participants Who Told Others
All Bad	-
Some Bad and Some Good	2.4%
Neither Bad Nor Good (Neutral)	3.2%
All Good	89.7%
Don't Know	4.7%

Table 30: Content of Information Mentioned about Lamps
from Program Among Participants Who Told Others about
Lamps

Table 31 presents the incidence of others purchasing the same type of lamps among participants who have told others. Over half of participants who have told others do not know if others have purchased the same type of lamps. Almost 40% of participants who told others report that other people have purchased similar lamps.

	% of Participants Who Told Others
No, Nobody	9.1%
A Few People (1 to 3)	31.7%
Some People (4 to 9)	6.2%
A Lot of People (10 or More)	1.9%
Don't Know	51.1%

Table 31: Incidence of Others Purchasing Same Type of Lamps Among Participants Who Told Others about Lamps

Demographics

Table 32 presents the home ownership status of the Hard-to-Reach Lighting Program participants. Nearly 65% of participants own their homes.

	% of Participants
Own	64.5%
Rent	33.9%
Military Housing	0.8%
Refused	0.8%

Table 32: Home Ownership Status

Table 33 shows the distribution of the number of people per household among program participants. Over 35% of participating households are occupied by one or two people. Approximately another 35% of participating households contain either three or four people, and over 25% of participating households are occupied by five or more people.

	% of Participants
One	10.7%
Two	24.1%
Three	16.6%
Four	19.3%
Five	11.2%
Six	10.3%
Seven or More	6.4%
Refused	1.4%

Table 33: Number of People in Household

Table 34 summarizes the distribution of the primary language spoken in participating households. Over 55% of participating households primarily speak English, and over 35% of participating households speak Spanish.

	% of Participants
English	55.7%
Spanish	35.4%
Russian	0.8%
Vietnamese	0.8%
Tagalog	2.4%
Other	4.9%

Table 34: Primary Language of Household

All respondents were asked the highest level of education they have completed. As shown in Table 35, almost 50% of participants are high school graduates or less, over 20% have completed some college, over 10% have a 4-year college degree, and almost 15% have an advanced degree.

	% of Participants
High School Graduate or Less	48.9%
Some College	22.3%
4-Year College Degree	11.6%
Advanced Degree	13.1%
Refused	4.1%

Table 35: Level of Education Completed

Table 36 presents the distribution of 2002 household income. Over 25% of participants had a 2003 household income of $23,000 or less. Just over 10% of participants had a 2003 household income between $23,001 and $32,500. Over 25% of participants had a 2003 household income of $43,501 or more.

	% of Participants
Less Than $23,000	25.8%
$23,001 - $27,000	8.1%
$27,001 - $32,500	2.2%
$32,501 - $38,000	10.3%
$38,001 - $43,500	4.2%
$43,501 or More	28.2%
Don't Know	8.4%
Refused	12.8%

Table 36: 2002 Household Income

Source of Awareness of Program Among Various Demographic Groups

Table 37 displays how participants first became aware of the program by home ownership status. Renters were significantly more likely to learn about the program either through word-of-mouth, and owners were significantly more likely to learn about the program through a bill insert or a flyer.

	% of Participants	
	Owners	**Renters**
Bill Insert	8.0%	2.4%
Radio	10.9%	10.0%
YMCA	1.3%	-
WIC Center	2.5%	2.4%
Letter or Mailing (Other Than Bill Insert)	6.7%	8.0%
Flyer	13.6%	4.0%
Word of Mouth - Friend / Relative / Co-Worker	9.6%	29.5%
Senior Center	2.5%	-
Community Center	6.5%	7.6%
Church	5.0%	4.8%
Clinic or Hospital	2.5%	-
Community Service Agency	1.3%	2.4%
Other Community Group or Organization - Flyer or verbally informed	5.0%	3.6%
Newspaper	4.2%	5.6%
Store	2.5%	2.4%
Other	8.8%	12.8%
Don't Know / Can't Remember	9.0%	4.8%

Table 37: Source of Awareness of Hard-to-Reach Lighting Program by Home Ownership Status

As shown in Table 38, participants whose household's primary language is Spanish were significantly more likely to learn about the program through the radio, the WIC Center, or a store. Participants whose primary language is English were significantly more likely to learn about the program through a bill insert, a flyer, a community center, other community group, or the newspaper.

	% of Participants	
	English	**Spanish**
Bill Insert	7.8%	4.6%
Radio	-	29.4%
YMCA	1.5%	-
WIC Center	-	4.6%
Letter or Mailing (Other Than Bill Insert)	7.3%	8.4%
Flyer	12.4%	4.6%
Word of Mouth - Friend / Relative / Co-Worker	16.7%	17.2%
Senior Center	2.9%	-
Community Center	9.2%	-
Church	4.4%	4.6%
Clinic or Hospital	2.9%	-
Community Service Agency	1.5%	-
Other Community Group or Organization - Flyer or verbally informed	6.6%	2.3%
Newspaper	8.2%	-
Store	-	4.6%
Other	12.2%	9.2%
Don't Know / Can't Remember	6.6%	10.7%

Table 38: Source of Awareness of Hard-to-Reach Lighting Program by Primary Language Spoken At Home

Table 39 presents how participants first became aware of the program by level of education completed. Participants who have completed high school or less were significantly more likely to learn about the program through the radio or the WIC Center. Participants who completed at least a 4-year college degree were significantly more likely to learn about the program through a letter or mailing other than a bill insert, a flyer, or a clinic / hospital. Participants who have completed an advanced degree were significantly more likely to learn about the program through a bill insert, a community center, or the newspaper.

	% of Participants			
	High School or Less	**Some College**	**College Graduate**	**Advanced Degree**
Bill Insert	5.0%	6.1%	-	16.5%
Radio	16.8%	6.1%	-	-
YMCA	-	3.6%	-	-
WIC Center	5.0%	-	-	-
Letter or Mailing (Other Than Bill Insert)	6.1%	4.9%	18.6%	6.2%
Flyer	13.5%	-	18.6%	4.1%
Word of Mouth - Friend / Relative / Co-Worker	19.1%	21.2%	11.7%	12.3%
Senior Center	-	3.6%	7.0%	-
Community Center	5.8%	2.4%	4.6%	21.7%
Church	5.0%	3.6%	7.0%	6.2%
Clinic or Hospital	-	-	13.9%	-
Community Service Agency	-	7.3%	-	-
Other Community Group or Organization - Flyer or verbally informed	3.3%	9.1%	-	6.2%
Newspaper	1.1%	6.1%	7.0%	14.4%
Store	1.7%	3.6%	-	-
Other	9.9%	13.3%	11.7%	-
Don't Know / Can't Remember	7.7%	9.1%	-	12.3%

Table 39: Source of Awareness of Hard-to-Reach Lighting Program by Level of Education

Table 40 shows how participants learned of the program by 2003 household income. As shown in the table, participants in the lowest income categories were significantly more likely to learn about the program through the radio or the WIC Center. Participants with a 2003 household income of $43,501 or greater were more likely to learn about the program through the newspaper or another community group or organization.

	% of Participants			
	<= $23,000	**$23,001 - $43,500**	**$43,501 +**	**Refused**
Bill Insert	6.3%	12.0%	4.8%	-
Radio	19.4%	16.4%	-	6.1%
YMCA	-	-	-	9.2%
WIC Center	6.3%	3.3%	-	-
Letter or Mailing (Other Than Bill Insert)	7.3%	14.2%	-	9.2%
Flyer	12.6%	2.2%	14.8%	9.2%
Word of Mouth - Friend / Relative / Co-Worker	18.9%	10.4%	20.6%	24.7%
Senior Center	3.1%	-	2.9%	-
Community Center	9.4%	8.8%	7.7%	-
Church	3.1%	6.5%	5.7%	-
Clinic or Hospital	3.1%	-	2.9%	-
Community Service Agency	3.1%	-	-	9.2%
Other Community Group or Organization - Flyer or verbally informed	-	3.3%	10.1%	-
Newspaper	4.2%	3.3%	9.6%	-
Store	-	-	-	9.2%
Other	3.1%	16.4%	9.6%	-
Don't Know / Can't Remember	-	3.3%	11.5%	23.1%

Table 40: Source of Awareness of Hard-to-Reach Lighting Program by 2003 Household Income

This chapter presents observations made about the 2003 Hard-to-Reach Lighting Program through the course of conducting this evaluation. Recommendations to improve the program are also presented.

Excellent Distribution and Usage Rates

The program is experiencing high lamp distribution and lamp usage rates. Overall, the program achieved a distribution rate of 98.5%, demonstrating that the program kept excellent records of lamp distribution. Nearly 85% of all lamps distributed through the program are currently in use, and the majority of lamps not currently in use are intended for future use.

Stipulated Parameters May Need Revision When Program Structure Changes

We found it necessary to revise the stipulated parameters used for in calculating demand reduction and energy savings attributable to the program, as detailed in the section entitled "Stipulated Parameters and Cost Effectiveness Inputs". The program did not revise its assumptions used to calculate the parameters between 2002 and 2003, even though the structure of the program changed between 2002 and 2003. In 2003, the program distributed a greater number of lamps to fewer program participants, resulting in 8.05 total lamps distributed to each participant on average. The program assumed that all distributed bulbs would be utilized and they assumed an average hours of operation of 3.5 hours per day. Several studies regarding hours of operation for residential lighting in California and elsewhere in the country contain evidence indicating residential lamps on average are in operation for fewer than 3.5 hours per day. There is considerable evidence showing that after the first 3 – 5 lamps in a residence, the hours of operation of the remaining lamps drops off considerably. Failing to review and revise the stipulated parameters even though the program structure changed has resulted in the program failing to meet either the CPUC targets or AEAP filings for net demand reduction and energy savings.

The Program Should Consider Reducing the Number of Lamps Distributed on a Per Customer Basis

In 2003 the HTR Lighting Program distributed about 8 lamps per customer, although each customer was welcome to up to 10 lamps. In order to improve program cost effectiveness we recommend reducing the number of lamps available to each customer, similar to the 2002 program which allowed only 5 lamps per customer and still yielded high program satisfaction ratings. By reducing the number of lamps allowed per customer the program will very likely improve the utilization rates, which will increase program energy and demand savings impacts. Moreover, a reduction in the number of lamps distributed per customer would allow the program to use a higher number of annual hours of operation, assuming an argument could be made that the lamps were being installed in fixtures known to have more frequent usage. This could be accomplished through participant education at the time of the giveaway events. Assuming these factors were implemented, longer operating hours would produce increased energy savings, in addition to an increase in the number of customers that would be served by the program.

Radio as a Source of Program Awareness

The radio has proven to be a great source of connecting with the truly hard-to-reach residential market segment. Approximately 10% of renter participants, about 30% of Spanish-speaking participants, over 15% of participants who have completed high school or less, and nearly 20% of participants whose 2003 household income was less than $23,000 first became aware of the program through the radio.

Conversely, only about 10% of homeowners, no English-speakers, no participants with a college degree or more, and no participants with a 2003 household income of $43,501 or greater heard about the program through the radio.

If possible, we recommend increasing, or at a minimum maintaining, the level of program promotional activities taking place through the radio. This will help to ensure that the program continues to connect with the truly hard-to-reach.

Newspaper as a Source of Program Awareness

Program promotions in newspapers seem to be attracting program participants that may not be the truly hard-to-reach residential segment. Only 6% of renter participants, 0% of Spanish-speaking participants, 1% of participants who have completed high school or less, and 4% of participants whose 2003 household income was less than $23,000 first became aware of the program through the newspaper.

Conversely, 4% of homeowners, nearly 10% of English-speakers, approximately 15% of participants with an advanced degree, and approximately 10% of participants with a 2003 household income of $43,500 or more heard about the program through the newspaper.

Therefore, we recommend decreasing the level of program promotions in newspapers. This will help to ensure that the program's resources are directed towards residential customers that are truly hard-to-reach.

Participant Networking With Non-Participant Peers

Program participants have networked with their peers about the program and the lamps received through the program. Nearly 70% of program participants state they have told others about the program and the lamps they received. Among participants who have told others, approximately 40% report that the peer networking has resulted in non-participants procuring and using similar lamps.

To evaluate the number of lamps distributed through the 2003 Hard-to-Reach Lighting Program, RLW utilized telephone surveys with a statistically representative sample of program participants. We used the program tracking data to design a sample statistically representative of the program. For each program participant in the sample, we verified the number of lamps distributed listed in the program tracking data using a phone survey.

We also assessed the effectiveness of the program approach in delivering customer satisfaction using phone surveys. The process evaluation component was also designed to explore how participants first became aware of the program, reasons for participation, whether the participant networked with their peers about the program and the program measures, and whether the networking resulted in any non-program procurements and use of identical measures by those peers.

Sample Design

The selection of the sample homes was guided by a model-based statistical sampling plan. Model-based sampling methods were also used to analyze the data, i.e., to extrapolate the findings from the sample homes to the target population of all program participants and to evaluate the statistical precision of the results. We stratified the participant population by the number of lamps exchanged, as a way to maximize the number of lamps verified in the sample.

Theoretical Foundation

MBSS™ methodology was used to develop an efficient sample design and to assess the likely statistical precision associated the planned sample. The target variable of analysis, denoted y, is the number of lamps distributed through the program. The primary stratification variable, the program tracking number of lamps distributed, will be denoted x. A ratio model was formulated to describe the relationship between y and x for all units in the population, e.g., program participants.

The MBSS™ ratio model consists of two equations called the primary and secondary equations:

$$y_k = \beta x_k + \varepsilon_k$$
$$\sigma_k = sd(y_k) = \sigma_0 x_k^\gamma$$

Here $x_k > 0$ is known throughout the population. k denotes the sampling unit, i.e., the participant. $\{\varepsilon_1, \ldots, \varepsilon_N\}$ are independent random variables with zero expected value, and β, σ_0, and γ (gamma) are parameters of the model. The primary equation can also be written as

$$\mu_k = \beta x_k$$

Under the MBSS ratio model, it is assumed that the expected value of y is a simple ratio or multiple of x.

Here, y_k is a random variable with expected value μ_k and standard deviation σ_k. Both the expected value and standard deviation generally vary from one unit to another depending on x_k, following the primary and secondary equations of the model. In statistical jargon, the ratio model is a (usually) heteroscedastic regression model with zero intercept.

One of the key parameters of the ratio model is the <u>error ratio</u>, denoted *er*. The error ratio is a measure of the strength of the association between *y* and *x*. The error ratio is suitable for measuring   the   strength

of a heteroscedastic relationship and for choosing sample sizes. It is *not* equal to the correlation coefficient. It *is* somewhat analogous to a coefficient of variation except that it describes the association between two or more variables rather than the variation in a single variable.

Using the model discussed above, the error ratio, *er*, is defined to be:

$$er \;=\; \frac{\sum\limits_{k=1}^{N}\sigma_k}{\sum\limits_{k=1}^{N}\mu_k} \;=\; \frac{\dfrac{1}{N}\sum\limits_{k=1}^{N}\sigma_k}{\dfrac{1}{N}\sum\limits_{k=1}^{N}\mu_k}$$

Figure 1 gives some typical examples of ratio models with different error ratios. An error ratio of 0.2 represents a very strong association between *y* and *x*, whereas an error ratio of 0.8 represents a weak association.

As Figure 1 indicates, the error ratio is the principle determinant of the sample size required to satisfy the 90/10 criteria for estimating *y*. If the error ratio is small, then the required sample is correspondingly small.
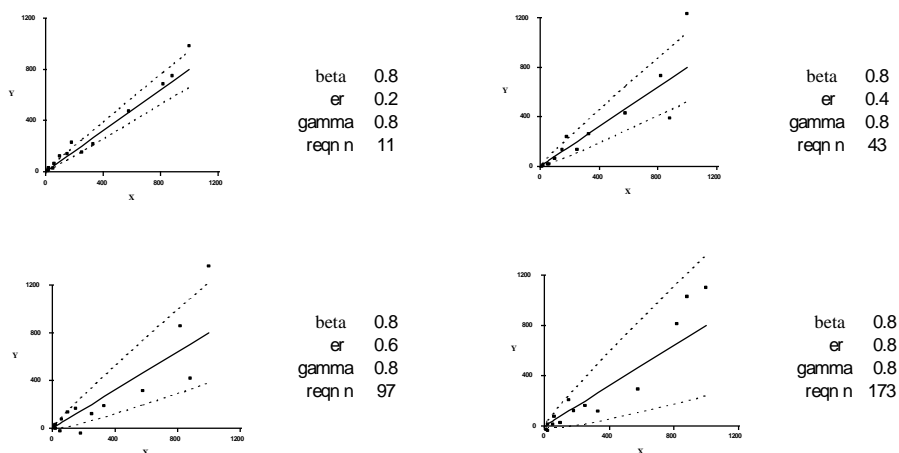

Figure 1: Examples of MBSS Ratio Models

Sampling Plan

At the planning stage of the M&V evaluation for the Residential Hard-to-Reach Lighting Program, we proposed a sample of 125 participants for the telephone survey effort. We calculated the error ratio from the 2002 evaluation to utilize in planning the 2003 sample design. The error ratio for the 2002 evaluation was 0.1202, and we assumed this value for the 2003 sample design. The expected relative precision associated with our sampling plan was $\pm\,2.0\%$.

We stratified the program population by program tracking number of lamps distributed. Table 41 shows our original sampling plan. Our sampling plan called for a sample of 125 participants for telephone survey data collection. This sample design was expected to yield a relative

precision of ±2.0% at the 90% level of confidence for the overall number of lamps distributed through the program.

Stratum	Max. # Lamps	Population Size	Population # Lamps	Sample Size
1	8	2,434	9,796	25
2	10	1,159	11,422	25
3	10	1,146	11,460	25
4	10	1,145	11,450	25
5	20	1,050	11,721	25
Total		6,934	55,849	125

Table 41: Original Hard-to-Reach Lighting Program Sample Design

Final Sample Design

Our original sampling plan called for five strata where the program population was stratified by program tracking number of lamps distributed. Once all of the telephone survey data was collected and we examined the distribution of the program tracking total number of lamps exchanged, we realized it was more appropriate to utilize our own specification of the stratum cutpoints. Our specification of stratum cutpoints was based on our understanding of the program as well as examining the distributions of the program tracking total number of lamps exchanged in the program population and our sample.

The case weights were calculated using post-stratification with our own specification of the stratum cutpoints. In this approach, we used our understanding of the program as well as the distributions of the program tracking total number of lamps exchanged in the program population and our sample to devise an appropriate set of stratum cutpoints. Once the cutpoints are devised, the population and sample sizes are tabulated within each stratum.

Table 42 shows the final sample design that was used to calculate the case weights. In this case, a sample of 126 participants has been divided among three strata based on program tracking number of lamps distributed. The stratum cutpoints were devised using our own specification as described above. Next, the population sizes shown in column three and sample sizes shown in column five were calculated from the stratum cutpoints. The final step was to calculate the case weights shown in the last column. For example, the case weight for the 10 participants in the first stratum is 842 / 10 = 84.200.

Stratum	Max. # Lamps	Population Size	Population # Lamps	Sample Size	Case Weight
1	2	842	1,249	10	84.200
2	10	5,231	44,769	93	56.247
3	12	861	9,831	23	37.435
Total		6,934	55,849	126	

Table 42: Final Hard-to-Reach Lighting Program Sample Design

Telephone Survey Instrument Design

We developed a questionnaire for the evaluation with separate sections dedicated to the verification of distributed lamps and the process evaluation. The first section of the survey instrument is dedicated to verifying the distribution and usage of lamps recorded in the SDG&E program tracking database including:

- Verification of the number of lamps distributed,
- Verification of lamps in use now,
- If not in use now, reason why not,
- If not in use now, do they still have the lamp, are they planning on using it, and under what conditions would they do so,

The next section of the participant survey instrument was designed to obtain a variety of information for the process evaluation including:

- How participants heard of the lighting turn-in program,
- The reasons for program participation,
- Customer perceptions on how the program has helped them manage their energy bills,
- Participant satisfaction and recommended program improvements,
- Whether the participant networked with their peers about the program and the program measures, and
- Whether the networking resulted in any non-program procurements and use of identical measures by those peers.

The survey also contained a series of demographic questions. The following demographics were captured with the survey:

- Home ownership status,
- Number of people in household,
- Primary language of household,
- Level of education completed, and
- 2003 household income.

RLW submitted the survey instrument to the SDG&E project manager and other interested parties for a final review and ultimately approval.

Telephone Survey Data Collection

Using the survey instrument described above, telephone surveys were conducted from RLW's CA office. All telephone surveyors were provided instruction on program operation, proper etiquette for contacting participants, and how to interpret participant responses.

All survey calls were tracked and any refusals or incomplete responses were recorded. Upon completing each interview, the telephone survey manager reviewed the survey for accuracy and completeness and then entered the data into an electronic database designed specifically for this survey by the project analyst.

Data were validated automatically using imbedded database functionality. The entered data were also continuously reviewed by the telephone survey manager. Prior to analysis, the project analyst thoroughly performed a quality control check on the data, identifying and correcting any illogical or unreasonable responses.

Table 43 presents the dispositions of the telephone survey data collection effort. We attempted to contact a total of 245 participants. Of these 245 participants, 126 completed a telephone survey, corresponding to conversion rate of 51.4%[14]. Only 8 participants refused to complete the survey, which is a refusal rate of only 3.3%.

Disposition	# of Participants
Total	**245**
Callback	6
Cannot remember program.	8
Claims no participation in program.	2
Disconnected	15
Language Barrier	6
Left Message	14
No Answer	4
No phone number/cannot locate #	4
Participant recently passed away.	1
Refusal	8
Stratum Filled	27
Wrong Number	24
Completed	**126**
Conversion Rate	**51.4%**

Table 43: Telephone Survey Dispositions

Lamp Verification Analysis

Stratified ratio estimation techniques were used to extrapolate the sample results to the target population. The general idea behind stratified ratio estimation is that there is a relationship between the variable of interest – in this case, number of lamps distributed – and a variable that is known for the entire population – in this case, the program tracking number of lamps distributed. Using this prior information allows for greater precision with a given sample size because the prior information eliminates some of the statistical uncertainty.

The estimate of the number of lamps distributed in the population is expressed as the ratio of the sample average number of lamps distributed to the sample average program tracking number of lamps distributed times the population total program tracking number of lamps distributed.

$$Y = y/x \ X$$

---

[14] The conversion rate is defined as the ratio of successfully completed surveys to all attempted contacts.

Where:

Y is the population total number of lamps distributed

y is the average number of lamps distributed in the sample

X is the population total program tracking number of lamps distributed

x is the average program tracking number of lamps distributed in the sample.

Lamp distribution and usage results for the overall program are calculated in the results chapter. Results are also disaggregated for torchieres versus CFLs.

Theoretical Background

The sample design discussion in the methodology section of this report described the sample designs used in this study. Therefore this section will describe in more detail the methods used to extrapolate the results to the target population. Two topics will be described:

- Case weights
- Stratified ratio estimation using case weights.

Case Weights

Background

Given observations of a variable *y* in a stratified sample, estimate the population total *Y*.

Note that the population total of *y* is the sum across the *H* strata of the subtotals of y in each stratum. Moreover each subtotal can be written as the number of cases in the stratum times the mean of *y* in the stratum. This gives the equation:

$$Y \;=\; \sum_{h=1}^{H} N_h \, \mu_h$$

Motivated by the preceding equation, we estimate the population mean in each stratum using the corresponding sample mean. This gives the conventional form of the stratified-sampling estimator, denoted $\hat{Y}$, of the population total *Y:*

$$\hat{Y} \;=\; \sum_{h=1}^{H} N_h \, \bar{y}_h$$

With a little algebra, the right-hand side of this equation can be rewritten in a different form:

$$\hat{Y} \;=\; \sum_{h=1}^{H} N_h \, \bar{y}_h$$
$$=\; \sum_{h=1}^{H} N_h \left(\frac{1}{n_h} \sum_{k \in s_h} y_k \right)$$
$$=\; \sum_{k=1}^{n} \left(\frac{N_h}{n_h} \right) y_k$$

Motivated by the last expression, we define the **case weight** of each unit in the sample to be $w_k = \dfrac{N_h}{n_h}$. Then the conventional estimate of the population total can be written as a simple weighted sum of the sample observations:

$$\hat{Y} \;=\; \sum_{k=1}^{n} w_k \, y_k$$

The case weight w_k can be thought of as the number of units in the population represented by unit *k* in the sample. The conventional sample estimate of the population total can be obtained by calculating the weighted sum of the values observed in the sample.

Stratified Ratio Estimation

Ratio estimation is used to estimate the population total *Y* of the target variable *y* taking advantage of the known population total *X* of a suitable explanatory variable *x*. The ratio estimate of the population total is denoted $\hat{Y}_{ra}$ to distinguish it from the ordinary stratified sampling estimate of the population total, which is denoted as $\hat{Y}$.

Motivated by the identity $Y = BX$, we estimate the population total *Y* by first estimating the population ratio *B* using the sample ratio $b = \bar{y}/\bar{x}$, and then estimating the population total as the product of the sample ratio and the known population total *X*. Here the sample means are calculated using the appropriate case weights. This procedure can be summarized as follows:

$$
\begin{aligned}
\hat{Y}_{ra} &= b\,X \quad \text{where} \\
b &= \frac{\bar{y}}{\bar{x}} \\
\bar{y} &= \frac{1}{\hat{N}} \sum_{k=1}^{n} w_k \, y_k \\
\bar{x} &= \frac{1}{\hat{N}} \sum_{k=1}^{n} w_k \, x_k \\
\hat{N} &= \sum_{k=1}^{n} w_k
\end{aligned}
$$

The conventional 90 percent confidence interval for the ratio estimate of the population total is usually written as

$$
\begin{aligned}
\hat{Y}_{ra} &\pm 1.645\sqrt{V\!\left(\hat{Y}_{ra}\right)} \quad \text{where} \\
V\!\left(\hat{Y}_{ra}\right) &= \sum_{h=1}^{H} N_h^2 \left(1 - \frac{n_h}{N_h}\right) \frac{s_h^2(e)}{n_h} \\
s_h^2(e) &= \frac{1}{n_h - 1} \sum_{k \in s_h} \left(e_k - \bar{e}_h\right)^2 \\
e_k &= y_k - b\,x_k
\end{aligned}
$$

We can calculate the relative precision of the estimate $\hat{Y}_{ra}$ using the equation

$$rp = \frac{1.645\sqrt{V(\hat{Y}_{ra})}}{\hat{Y}_{ra}}$$

MBSS theory has led to an alternative procedure to calculate confidence intervals for ratio estimation, called model-based domains estimation. This method yields the same estimate as the conventional approach described above, but gives slightly different error bounds. This approach has many advantages, especially for small samples, and has been used throughout this study.

Under model-based domains estimation, the ratio estimator of the population total is calculated as usual. However, the variance of the ratio estimator is estimated from the case weights using the equation

$$V(\hat{Y}_{ra}) \quad = \quad \sum_{k=1}^{n} w_k\left(w_k - 1\right)e_k^2$$

Here w_k is the case weight discussed above and e_k is the sample residual $e_k = y_k - b\,x_k$. Then, as usual, the confidence interval is calculated as

$$\hat{Y}_{ra} \quad \pm \quad 1.645\sqrt{V(\hat{Y}_{ra})}$$

and the achieved relative precision is calculated as

$$rp = \frac{1.645\sqrt{V(\hat{Y}_{ra})}}{\hat{Y}_{ra}}$$

The model-based domains estimation approach is often much easier to calculate than the conventional approach since it is not necessary to group the sample into strata. In large samples, there is generally not much difference between the case-weight approach and the conventional approach. In small samples the case-weight approach seems to perform better. For consistency, we have come to use model-based domains estimation in most work.

This methodology generally gives error bounds similar to the conventional approach. Equally, the model-based domains estimation approach can be derived from the conventional approach by making the substitutions:

$$\begin{aligned} \bar{e}_h &\approx 0 \\ s_h^2(e) &\approx \frac{1}{n_h}\sum_{k \in s_h} e_k^2 \end{aligned}$$

In the first of these substitutions, we are assuming that the within-stratum mean of the residuals is close to zero in each stratum. In the second substitution, we have replaced the within-stratum variance of the sample residual *e,* calculated with $n_h - 1$ degrees of freedom, with the mean of the squared residuals, calculated with n_h degrees of freedom.

Model-based domains estimation is appropriate as long as the expected value of the residuals can be assumed to be close to zero. This assumption is checked by examining the scatter plot of *y* versus *x*. It is important to note that the assumption affects only the error bound, not the estimate itself. $\hat{Y}_{ra}$ will be essentially unbiased as long as the case weights are accurate.

Process Analysis

The project analyst analyzed the results of the telephone survey. The quantitative process survey analysis was carried out using SPSS, a commonly used statistical software package. RLW calculated weighted frequencies, means, and cross tabulations of data, where appropriate, to provide unbiased estimates of population characteristics. All statistical significance tests were conducted at the 90% level of confidence, and statistically significant differences are shaded in gray. These tests have been used to make comparisons among various demographic groups.

Telephone Survey Instrument

SDG&E 2003 Hard-To-Reach Lighting Turn-In Program

M&V Survey Instrument

Surveyor _____Date _____Time _____

<<Customer>>:_____ *<<Customer Acct>>* # _____

<<Address>> _____ *<<City>>*: _____

<<Phone>>: _____

Call Log

Codes:

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

	Date:	*Time:*		*Code*	*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				

Room Codes				
Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13: _____*	*Not in Use = 14*	*Don't Know = 98*

Introduction

Hello, this is **<<interviewer>>** and I am calling on behalf of SDG&E. I'm looking to speak with ***<<respondent>>***.

I'm calling regarding the SDG&E 2003 residential lighting turn-in program. We are conducting an evaluation study of the program on their behalf.   SDG&E has provided us the program records in order to conduct the study.

Q1. I have a few brief questions that will take only a couple of minutes to complete. May I ask you these questions now?

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

Q2. Our information shows that you turned in light fixtures or bulbs for energy efficient types through the SDG&E lighting turn-in program on <<event date>> - is this correct?

1) Yes
2) No   → **Thank and Terminate**
98) DK   → **Is there someone else in your home who would know?**
            Record Name_____

99) Refused → **Thank and Terminate**

   If respondent initially does not recall program, read the following program description:

Q3. This program was provided by SDG&E to allow people like you to exchange halogen upright floor lamps (called torchieres) and/or standard light bulbs (called incandescent bulbs) for energy saving lamps or bulbs for no charge. Do you remember this program?

1) If contact does recall   → **Continue survey**
2) If contact cannot recall → **Thank for their time, end call**

Room Codes				
Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13:* _____	*Not in Use = 14*	*Don't Know = 98*

Q4. How did you first become aware of SDG&E's Lighting Turn In Program? **Do Not Read List - Only One Response.**

1) Bill insert
2) Radio
3) YMCA
4) WIC (Women, Infant and Child) Center
5) Letter or Mailing (Other Than Bill Insert)
6) Flyer
7) Word of mouth - friend/relative/co-worker
8) Meals on Wheels
9) Senior Center
10) Community Center
11) Church
12) Salvation Army Center
13) Clinic or Hospital
14) Community Service Agency
15) Other Community Group or Organization – flyer or verbally informed
16) Other:_____
98) Don't Know/Can't remember

Inspect program records below:

 # torchieres exchanged: *<<# torchieres>>* ,If >0, → Administer Torchiere Questions.

 # incandescent bulbs exchanged: *<<# incandescent>>*,If >0, → Administer Incandescent Questions

TORCHIERE QUESTIONS

ASK Q5 TO Q12 IF RESPONDENT TURNED IN TORCHIERES

Q5. Our records indicate that you exchanged <<# torchieres>> halogen upright floor lamps for energy-saving compact fluorescent upright floor lamps. Is that correct?

1) Yes → **Go To Q7**
2) No

Q6. How many upright floor lamps did you exchange?

1) One
2) Two
3) None, I did not exchange any torchieres → Go To Incandescent Questions

Room Codes				
Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13:* _____	*Not in Use = 14*	*Don't Know = 98*

Q7.Is this/are those upright floor lamps in use now?

    1) Yes

    2) No→ **GO Q9**

    3) (IF TWO WERE EXCHANGED) Only one of the two

Q8.In what room did you install your new torchiere(s)? <<# torchieres>>

    1) Code_____DK Refused→ GO TO Incandescent Questions

    2) Code_____DK Refused→ **GO TO Incandescent Questions**

Q9.Do you still have it/them?

    1) Yes

    2) No

    3) (IF TWO WERE EXCHANGED AND NOT IN USE) Only one of the two

Q10.   Why did you not use it/them?

_____

_____

_____

Q11.   Are you still planning to use it/them?

    1) Yes

    2) No → **Go To Incandescent Questions**

    98) Don't Know → **Go To Incandescent Questions**

    99) Refused → **Go To Incandescent Questions**

Q12.   When or how do you plan to use it/them?

_____

_____

_____

GO TO Incandescent Questions

Room Codes				
Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13: _____*	*Not in Use = 14*	*Don't Know = 98*

INCANDESCENT QUESTIONS

Inspect program records below:

 # incandescent bulbs exchanged: <<# *incandescent*>>,If >0, → Administer Incandescent Questions. Otherwise, go to Q16.

Q13.   Our records indicate that you exchanged <<# incandescents>> standard, incandescent bulbs for energy-saving compact fluorescent bulbs. Is that correct?

   1) Yes → **Go To Q15**
   2) No

Q14.   How many standard bulbs did you exchange for energy saving bulbs?

   1) One
   2) Two
   3) Three
   4) Four
   5) Five
   6) Six
   7) Seven
   8) Eight
   9) Nine
   10) Ten

Room Codes				
Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13:* _____	*Not in Use = 14*	*Don't Know = 98*

11) None, I did not exchange any incandescent bulbs → Go To Q16

Q15.   Can you recall which rooms you installed your new CFL(s)? <<# CFL>>

1) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

2) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

3) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

4) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

5) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

6) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

7) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

8) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

9) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

10) Code_____ If Not in Use (14), Code _____ Still Plan to Use?   Yes / No / DK

Total Quantity in Q14 Must Equal Response to Q15.

Not In Use Codes

Do not fit in my light fixture = 1	Fixture is difficult to access = 2	Don't like color = 3	Not bright enough = 4	Too Bright = 5
Takes too long to turn on = 6	Have not taken the time to install them = 7	Burned out = 8	Extras/No place to put them=9	Other:_____ _____= 10

Room Codes

Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13:* _____	*Not in Use = 14*	*Don't Know = 98*

PROGRAM AWARENESS/PERCEPTION QUESTIONS

I just have a few questions now about the program itself.

Q16.   Why did you participate in this program? Do not read list; if more than one response, rank answers in order of respondent priority.

1)   _____Energy savings → Ex. "Save on power bills", "reduce electricity use", etc.
2)   _____Safety   → Ex. "reduce chance of fire", "get rid of hot halogen bulbs", etc.
3)   _____ Free benefit   → Ex. "get new lamps", "get new bulbs", "no cost for it", etc.
4)   _____Environmental Concerns → Ex. "reduce air pollution", "do the right thing", etc.
5)   _____Other _____

Q17.   Since replacing your old lights, have you noticed a change in your electricity bill?

1)   Yes

2)   No   → **Go To Q19**

98)   DK → **Go To Q19**

99)   Refused → **Go To Q19**

Q18.   Is it as much as you expected to save, less than, or even more than you expected?   Read responses if needed

1)   Less than I expected

2)   About as much as I expected

3)   Even more than I expected

98) DK

99) Refused

Next, we just want to know how much you might have shared about the program with others.

Q19.   Have you told other people about what you got from the program?

1)   Yes

2)   No → **Go To Q23**

98) DK → **Go To Q23**

99) Refused → **Go To Q23**

Room Codes				
Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13: _____*	*Not in Use = 14*	*Don't Know = 98*

Q20.   Which statement would best fit how many people you told: Read 1, 2, and 3 on list

1) I told a few people – perhaps about 1 to 3

2) I told some people – perhaps about 4 to 9

3) I told a lot of people – perhaps 10 or more

98) DK

99) Refused

Q21.   How good or bad was everything you mentioned about the program?

1) All bad → **Go To Q23**

2) Some bad and good things

3) All good

98) DK

99) Refused

Q22.   As far as you know, have the people you told about the energy efficient lamps gone out and purchased similar lighting products as the ones you received at the event?

1) No, nobody

2) A few people – perhaps about 1 to 3

3) Some people – perhaps about 4 to 9

4) A lot of people – perhaps 10 or more

98) Don't know

99) Refused

Q23.   What did you like or not like about the 2003 program?

Positive Comments

1. Excellent Program no complaints

2. Good learning opportunity to try new product

3. Lowers my bills saves money & energy

4. Distribution location convenient

5. Courteous & educated staff

6. Like that it's no cost.

7. Couldn't afford CFL w/out program

Negative/Neutral Comments

9. Lamps were defective

10. No limits on qty to be exchanged

11. Increase variety of CFL 's

12. Lumen output not enough increase wattage

13. Prefer white light over warm light

14. More staffing lines too long

15. Distribution location poor choice

Room Codes				
Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13:*	*Not in Use = 14*	*Don't Know = 98*

8. Other:_____ 16. Program ran out of CFL

Q24.　　Is there anything about the program that the utility should eliminate, adjust, or improve?

_____

_____

_____

DEMOGRAPHIC QUESTIONS

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

Q25.　　Do you own or rent your home?

1) Own

2) Rent

3) Other: Specify_____

98) Don't Know

99) Refused

Q26.　　How many people live in the household?

1) #_____

98) Don't Know

99) Refused

Q27.　　What is your household's primary language?

1) English

2) Spanish

3) Chinese

4) Russian

5) Italian

6) Vietnamese

7) Indian

Room Codes				
Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13:* _____	*Not in Use = 14*	*Don't Know = 98*

8) Korean

9) French

10) Other:_____

11) Don't Know

Q28.   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

Q29.   Lastly, into which of the following categories did you household income fall for 2002?

1) Less Than $23,000

2) $23,001 - $27,000

3) $27,001 - $32,500

4) $32,501 - $38,000

5) $38,001 - $43,500

6) $43,501 or more

98) Don't Know

99) Refused

Q30.   Can you tell me your age?

1) _____

98) Don't Know

99) Refused

These are all of my questions. Thank you for your time.

Room Codes				
Bedroom = 1	*Kitchen = 2*	*Living/Family = 3*	*Hallway = 4*	*Closet = 5*
Outside/Porch = 6	*Garage = 7*	*Home Office = 8*	*Dining = 9*	*Commercial = 10*
Attic = 11	*Exercise =12*	*Other = 13:* _____	*Not in Use = 14*	*Don't Know = 98*