Yolo Energy Efficiency Project (YEEP) EM&V

Project 1 – CPUC No. 1079-04

Evaluation Report

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Yolo Energy Efficiency Project

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1. EXECUTIVE SUMMARY

This report presents the final results of an evaluation of the Yolo Energy Efficiency Project's Hardware and Incentive Program (YEEP 1). The Yolo Energy Efficiency Project (YEEP) was a hybrid of both information and energy savings measures. YEEP provided rebates, giveaways, and direct installations to the residences and businesses of Yolo County. YEEP 1 includes five (5) Energy Efficiency Measures (EEMs) that are expected to achieve net annual energy savings of 6.52 MWh and 1.55 MW of demand reduction. Below is a list of the EEMs implemented through YEEP.

- EEM1: Commercial Lights Lite
- EEM2: Residential CFL Giveaway
- EEM3: Residential Torchiere Swap
- EEM4: Residential Sunscreens (SF and MF)
- EEM5: Residential Evaporative Coolers

The general purpose of this evaluation was to provide an ongoing analysis of the program and to document savings as required by the CPUC. The evaluation strategy was to develop an overall approach for the portfolio of residential and commercial measures. The M&V resources were allocated such that the measures with the largest energy savings received the most attention. However, the overall plan was also balanced so that all measures received adequate attention such that accurate demand and energy savings were estimated.

The methodologies for gross and net results were designed specifically for each measure. Review of program deemed savings and on-site or telephone measure verification was conducted for each measure.

The net savings for each measure was determined through a decision-maker survey that assessed free-ridership. Free-ridership was calculated by determining participants' decisions prior to participating in the program and the importance of YEEP incentives (when applicable). The net-to-gross analysis estimated the portion of the savings directly credited to each measure. The decision-maker survey was also used to assess customer satisfaction with the program. The evaluation was not designed to address program spillover.

The overall YEEP program level evaluation results are provided in Table 1. The program estimated values exceeded program goals in each EEM and in total. Overall, the program achieved gross savings, electric (kWh) and demand reduction realization rates of 85% and 83% respectively. This result indicates that the program savings were slightly less than the verified results. The relatively high Net-to-Gross Ratio (NTGR) of 86%[1] for kWh, and 89% for demand, indicate that the program is experiencing little free-ridership

[1] The default value assumed by the CPUC is 0.80.

and influencing participants to install and properly use the measures. The overall net realization rate was 74% for energy (kWh) and 74% for demand.

Energy & Demand Results	Program Estimate	Gross Results			Net-to-Gross Ratio	Net Results		
		Verified Estimate	Relative Precision	Real. Rate		Verified Estimate	Relative Precision	Real. Rate
Energy Savings (kWh)	8,376,453	7,145,069	4.7%	85%	86%	6,173,935	8.1%	74%
Demand Reduction (kW)	1,779.0	1,477.3	5.8%	83%	89%	1,318.7	8.1%	74%

Table 1: YEEP Program Savings

2. INTRODUCTION

This report presents the final results of an evaluation of the Yolo Energy Efficiency Project's Hardware Incentive Programs (YEEP 1). The report includes the evaluation methodology, analysis of the gross and net annual energy savings and peak load reduction, and the conclusions of customer satisfaction from the decision-maker survey.

Section 3 presents the evaluation methodology for the program. Section 4 presents results in detail for each measure.

2.1 Program Description

The Yolo Energy Efficiency Project provides direct installations, technical assistance, marketing and training, and market transformation projects to the residences and businesses of Yolo County through a portfolio approach containing two integrated and complimentary programs:

YEEP-1, a hardware incentive program, and

YEEP-2, an information and market transformation program.

The broad program objectives include:

- Realize quantifiable economic and societal benefits of energy efficiency
- Serve hard to reach and low income markets
- Develop a climate-specific program
- Reduce Central Valley residential cooling contribution to peak demand
- Develop strategies for long-term market transformation in the residential cooling market
- Coordinate closely with other programs for information and market transformation, and to induce additional savings by increasing subscription to Statewide programs and through low-cost and no-cost measures

YEEP 1 provided rebates, giveaways, and direct installations to the residences and businesses of Yolo County. The program was a comprehensive, multiple market project, with goals to save energy, develop local infrastructure, educate and inform participants, and innovate delivery methods through the use of energy efficiency training and outreach and provision of rebates for the successful installation of energy saving measures. YEEP 1 was anticipated to achieve the following net annual energy goals:

- 6.52 MWh energy savings
- 1.55 MW of demand reduction.

YEEP 1 implemented five Energy Efficiency Measures (EEMs) to serve multiple customer classes, including:

- EEM1 Commercial Lights Lite - The purpose of this measure was to promote the installation of prescribed energy efficient lighting measures in the small commercial sector. Incentives were typically paid directly to contractors, and were designed to cover a high percentage of the installed cost.
- EEM2 Residential CFL Giveaway - This measure promoted the use of screw-in compact fluorescent bulbs in the residential sector. Program delivery occurred through direct give-away of the measure.
- EEM3 Residential Torchiere Swap - This measure allowed participants to trade in halogen torchiere lamps for EnergyStar® compact fluorescent torchieres.
- EEM4 Residential Sunscreens (SF and MF) - The purpose of this measure was to incent single family homeowners and multifamily property owners to install shadescreens through rebates that were designed to cover a percentage of the measure cost.
- EEM5 Residential Evaporative Coolers - This measure provided direct installation of advanced whole house evaporative coolers for the low-income single family sector.

The general purpose of this evaluation was to provide an ongoing analysis of the Yolo Energy Efficiency Project and to document savings as required by the CPUC. The evaluation strategy was to develop an overall approach for the portfolio of residential and commercial programs. The M&V resources were allocated such that the programs with the largest energy savings received the most attention. However, the overall plan was also balanced so that all programs received adequate attention such that accurate demand and energy savings were estimated.

2.2 Overall YEEP 1 M&V Results Summary

Table 2 presents the overall electric energy (kWh) savings of the program. The evaluation analysis shows total program gross level energy savings of 7,145,069 kWh corresponding to a gross realization rate of 85%. The total program net level energy savings are 6,173,935 kWh corresponding to a net realization rate of 74%. The program-level net-to-gross ratio (NtGR) is 86%.

Electric Energy Savings Results (kWh)	Program Estimate	Gross Results			Net-to-Gross Ratio	Net Results		
		Verified Estimate	Relative Precision	Real. Rate		Verified Estimate	Relative Precision	Real. Rate
EEM1: Commercial Lights Lite	5,157,869	5,054,711	6.8%	98%	98%	4,951,554	16.2%	96%
EEM2: Residential CFL Giveaway	2,639,957	1,697,115	5.7%	64%	53%	895,700	13.9%	34%
EEM3: Residential Torchiere Swap	117,121	117,121	0%	100%	79%	92,673	29.0%	79%
EEM4: Residential Sunscreens (SF and MF)	49,756	49,756	0%	100%	72%	35,937	9.5%	72%
EEM5: Residential Evaporative Coolers	411,750	226,366	22.2%	55%	88%	198,071	22.6%	48%
Total	**8,376,453**	**7,145,069**	**4.7%**	**85%**	**86%**	**6,173,935**	**8.1%**	**74%**

Table 2: YEEP 1 KWh Energy Savings Results[2]

Table 3 presents the overall demand reduction of the program. The total program gross level energy savings are1,477.3 kW corresponding to a gross realization rate of 83%. The total program net level energy savings are 1,318.7 kW corresponding to a net realization rate of 74%. The total program-level net-to-gross ratio is 89%. Measure-specific results are similar to the KWh energy savings results.

[2] For EEM1: Commercial Lights Lite, the program estimated savings is the actual deemed savings estimate and not the CPUC workbook savings estimate.

Electric Demand Reduction Results (kW)	Program Estimate	Gross Results			Net-to-Gross Ratio	Net Results		
		Verified Estimate	Relative Precision	Real. Rate		Verified Estimate	Relative Precision	Real. Rate
EEM1: Commercial Lights Lite	1,039.28	1,018.49	6.8%	98%	98%	997.71	16.2%	96%
EEM2: Residential CFL Giveaway	332.07	213.47	5.7%	64%	53%	112.67	13.9%	34%
EEM3: Residential Torchiere Swap	13.24	13.01	15.3%	96%	79%	10.30	29.0%	76%
EEM4: Residential Sunscreens (SF and MF)	34.41	34.41	0%	100%	72%	24.85	9.5%	72%
EEM5: Residential Evaporative Coolers	360.00	197.92	22.2%	55%	88%	173.18	22.6%	48%
Total	**1,779.0**	**1,477.3**	**5.8%**	**83%**	**89%**	**1,318.7**	**8.1%**	**74%**

Table 3: YEEP Demand Reduction Results[3]

[3] For EEM1: Commercial Lights Lite, the program estimated demand reduction is the actual deemed demand reduction estimate and not the CPUC workbook demand reduction estimate.

3. EM&V METHODOLOGY

The evaluation methodology consisted of utilizing various approaches to analyze the program. It included sample design, on-site data collection, decision-maker surveys, and analysis of energy savings. Savings were estimated for statistically representative samples, and expanded to their respective populations using sampling weights. Since statistically representative samples were used to estimate the savings for single family and commercial measures, there is some error associated with the savings estimates, which is measured by the relative precisions of the savings estimates[1]. The methodologies for gross and net results were designed specifically for each measure. Review of program deemed savings and on-site or phone measure verification was conducted for each measure.

The decision-maker survey was utilized to establish the baseline for customer free-ridership. The net-to-gross analysis estimated the portion of the savings directly credited to each measure. To do this, we attempted to understand the free-ridership rate associated with each participant, based on responses from a decision-maker survey. The survey was also used to assess customer satisfaction with the program. The evaluation was not designed to address program spillover,

3.1 Sample Design

Our sample design approach consisted of a combination of stratified sampling and simple random sampling techniques. We stratified the program population in samples drawn for EEM1 Commercial Lights Lite, EEM2 Residential CFL Giveaway, and EEM4 Residential Sunscreens. We used simple random sampling for EEM3 Residential Torchiere Swap and EEM5 Residential Evaporative Coolers. Our ability to stratify the program population in a given EEM was directly related to whether each participant had a project-specific estimate of energy savings or not. Specifically, if each participant had a project-specific estimate of energy savings, we were able to utilize stratified sampling techniques. Otherwise, we utilized traditional simple random sampling techniques to guide our sample selection.

3.1.1 Sampling Plan

Theoretical Background

Sampling arises whenever we need to collect information about a sample of units in a population (EEM) in order to estimate the collective characteristics of all units in the population (EEM). The central challenge of sample design is to guide the selection of

[1] The relative precision of an estimate of a characteristic of a population of interest measures the percentage error associated with the estimate at a given level of confidence. For example, suppose that for a given EEM, the evaluated energy savings is estimated at 10,000 kWh, with a relative precision of ± 5.0% at the 90% confidence level. The associated 90% confidence interval is (10,000 – (0.05*10,000), 10,000 + (0.05*10,000)) kWh, or (9,500, 10,500) kWh. This implies there is a 90% chance that the actual energy savings of the EEM is contained in the interval (9,500, 10,500) kWh.

projects so that findings from a sample can be extrapolated to a target population without bias and with measurable statistical precision. In addition, sample design helps to identify the size of the sample needed for a given level of precision, or to identify the statistical precision to be expected from a given sample size.

There are two key components to determining the sample size required by a study: the desired level of relative precision and the analysis model(s) used to achieve the study objectives. When you cannot take advantage of stratified sampling techniques, assuming the population size is large relative to the sample size and assuming the 90% level of confidence, the formula for estimating the expected relative precision for a given sample size is $rp = \frac{1.645 * cv}{\sqrt{n}}$, where cv = coefficient of variation of the target variable in target population[1], rp = expected level of relative precision, and n = planned sample size. Since most EEMs did not have a population size large relative to the sample size, we must also take the Finite Population Correction factor (FPC) into account, or $rp = \frac{1.645 * cv}{\sqrt{n}} * \sqrt{1 - \frac{n}{N}}$, where = coefficient of variation of the target variable in target population, rp = expected level of relative precision, n = planned sample size, and N = population size. When you can utilize stratified sampling techniques and the ratio model for estimation, assuming the 90% level of confidence and taking into account the FPC, the formula for estimating the expected relative precision for a given sample size is $rp = \frac{1.645 * er}{\sqrt{n}} * \sqrt{1 - \frac{n}{N}}$, where er = error ratio[2], rp = expected level of relative precision, n = planned sample size, and N = population size.

For planning purposes for each EEM, we must assume a value for either the cv or the er, depending on the planned analysis model. For planning, the values of these parameters are selected based on past experience evaluating programs of a similar nature. At the conclusion of each study, we calculate the values of these parameters as applicable based on our actual sample and population so that we can utilize the values for planning future studies of a similar nature.

Sampling Plan

Table 4 shows our final sample design. As shown in the table, we achieved a relative precision of 7.1% for the overall YEEP 1 portfolio annual energy savings.

[1] The coefficient of variation (cv) is defined to be $cv = \frac{\delta}{\mu}$, or the population standard deviation divided by the population mean for a given variable of interest.

[2] The error ratio (er) measures the strength of the association between the dependent variable (i.e. achieved energy savings) and the independent variable (i.e DEEP-estimated energy savings) in the ratio model. A more detailed explanation of the error ratio as well as the formula is included in the Appendix to this report.

Measure Description	Program kWh Savings	Pop. Size (# of part.)	Survey Type	Sample Size	Rel. Prec.
EEM1 Commercial Lights Lite	5,157,869		On-site	75	11.4%
EEM2 Res. CFL Giveaway	2,639,957	11,069	Phone	244	10.4%
EEM3 Res. Torchiere Swap	117,121	677	Phone	104	16.1%
EEM4 Res. Sunscreens (SF and MF)	49,756	319	Phone	56	18.6%
EEM5 Res. Evaporative Coolers	411,750	450	On-site	50	11.4%
Total	**8,376,453**				**7.1%**

Table 4: Final Sample Design

3.2 Decision-maker Surveys

Decision-maker surveys were used to verify deemed savings assumptions, establish the baseline for customer free-ridership, and determine customer satisfaction with the program. Decision-maker surveys were completed for each EEM with each survey specifically tailored for the measure. The majority of surveys were completed by telephone, with the exception of EEM1 Commercial Lights Lite and EEM5 Res. Evaporative Coolers where on-site data collection occurred.

3.2.1 Gross Savings Component

For EEM2 Residential CFL Giveaway, EEM3 Residential Torchiere Swap, and EEM4 Residential Sunscreens, decision-maker surveys were used to confirm measure installation and collect data on measure operating conditions. Savings per participant were calculated based on the reported and confirmed quantity and usage of the measures. In the absence of actual operating conditions, standard operating hour assumptions consistent with other programs were used.

3.2.2 Net Savings Component

The net savings for each EEM were determined by the decision-maker surveys through assessment of free-ridership rates. Free-ridership was calculated by determining participants' decisions prior to participating in the program and the importance of program incentives. Specifically, we questioned participants about the importance of the actions they would have taken prior to learning about the program. If they had already decided to install a measure before receiving the program incentive, these respondents were then asked at what time they would have completed the installation. Also, when applicable participants were asked to rate the importance of the program incentive in their decision. Answers were rated on a one to five scale, where a one represents very unimportant and a five represents very important. The combinations of responses were used to calculate the free-ridership rate per participant.

3.2.3 Satisfaction Component

The decision-maker survey was also used to determine customer satisfaction with the program. The survey asked a number of questions designed to gauge participant satisfaction levels with various aspects of the program, including the contractor, the program process, program direct contact, and the measure. Participant satisfaction levels were rated on a one to five scale, where a one represents very dissatisfied and a five represents very satisfied. If respondents indicated that they were dissatisfied we asked them to explain why they were dissatisfied.

3.3 On-site Data Collection

On-site surveys were conducted for EEM1 Commercial Lights Lite and EEM5 Residential Evaporative Coolers.

On-site engineering analysis was the primary method used to assess the savings associated with the measures. The focus of the on-site engineering assessments was the development of an independent estimate of the energy savings associated with the installed measures. The on-site survey consisted of an inventory of incented measures, which included measure identification and quantification.

3.3.1 EEM1 Commercial Lights Lite

The EEM1 Commercial Lights Lite program was a comprehensive EEM for the commercial market. This measure served both commercial facilities and multi-family common areas. The measure was primarily targeted to very small and small commercial businesses (PG&E A-1, A-6 and A-10 accounts), but was also available to large businesses with E-19 accounts. It provided comprehensive lighting retrofits directly installed by YEEP Listed contractors, and includes a menu of lighting improvements with proven significant kWh savings.

Program savings estimate spreadsheets were used as a reference to generate a data collection form. The data collection form included detailed records of the installed light fixtures including quantity and type of lamps and ballasts, delamping and new reflectors for all incented fixtures in the retrofitted space. Most of the sites had retrofits done for all the fixtures, but a few had partial retrofits, and in such cases the on-site form included details on only the retrofitted fixtures. The surveyors confirmed the lamp and ballast types and counts on-site. Any differences observed between the installed fixtures and the program spreadsheets were noted on the form. While on site, the surveyors also conducted a decision-maker survey with the customer. The decision-maker survey was used to establish the baseline for customer free-ridership and determine customer satisfaction with the program.

3.3.2 EEM5 Residential Evaporative Coolers

The EEM5 Residential Evaporative Coolers program provided direct installation of whole house evaporative coolers for the low income single family sector. The program offered a unique challenge in that a large number of participants were non-English (Spanish) speakers. In order to overcome this language barrier, surveyors from HMG teamed up with YEEP staff members who were fluent in Spanish to conduct the surveys.

The survey team collected details on the evaporative cooler make and model number and schedule of operation of the unit. The on-site survey form also collected similar details on the existing HVAC and/or evaporative cooling units. The surveyors identified whether the units were still operational after the YEEP evaporative cooler was installed and whether the operation had changed as a result of the evaporative cooler.

While on site, the surveyors also conducted a decision-maker survey with the customer. The decision-maker survey was used to establish the baseline for customer free-ridership and determine customer satisfaction with the program.

3.4 Deemed Savings Review

YEEP used a deemed savings approach to estimate the savings from the EEMs incented by the program. These savings were based upon recorded or calculated savings from similar energy efficiency programs run by California utilities and other third party programs. The majority of the EEMs were based upon estimates from the 2001 DEER (Database for Energy Efficiency Resources) Update Study[1] (2001 DEER Study) or the PG&E 2002 Express Efficiency Workpapers[2] (PG&E Workpapers). The key purpose of these studies was to create a common set of cost and savings data across the state's major utilities to improve the consistency of information and assumptions used in energy-efficiency analyses.

Following is a brief summary of the deemed savings verification for each EEM. For all EEMs, HMG used YEEP's deemed savings per unit estimates as the basis for the gross savings and demand reduction after our review concluded appropriate values were used for the deemed savings. Gross energy savings and demand reduction results for each EEM are presented in Section 4.

3.4.1 EEM1 Commercial Lights Lite

The EEM1 Commercial Lights Lite program's deemed savings were determined for the project-level and at the measure-level. The project-level savings are used in the CPUC workbook which allows for only one default savings value per EEM. In this case the EEM is the entire program and the savings are the average project-level savings. However, projects differ on actual savings depending on the specific measures installed. Thus, YEEP assigned deemed savings for each possible lighting measure that could be installed in a project. The project-level deemed savings were determined using values derived from the 2002-2003 Davis Energy Efficiency Project's commercial lighting programs (DEEP Lighting Programs) measure-level savings. Measure-level deemed savings were based on values supplied from the PG&E Workpapers.

YEEP used the appropriate demand and peak savings from the PG&E Workpapers to calculate deemed savings for the lighting retrofit measures.

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[1] Xenergy, Inc. 2001. "Database for Energy Efficiency Resources Update Study". For the California Energy Commission.

[2] Pacific Gas & Electric Company. 2001."2002 Energy Efficiency Program Selection R.01-08-028, Energy Efficiency Proposal, Statewide Nonresidential Retrofit Express Efficiency".

3.4.2 EEM2 Residential CFL Giveaway

The EEM2 Res. CFL Giveaway program used deemed savings assumptions based on the results of the PY2002-2003 Davis Energy Efficiency Program (DEEP). The EM&V of DEEP found actual savings to be 79.5 kWh per bulb installed, based on the number of hours of use reported by program participants. The program adopted a net-to-gross ratio of 0.40. This is slightly higher than the net realization rate found by the DEEP's EM&V. YEEP staff use the higher rate because they believed that the Yolo County is likely to have fewer free riders than in Davis, where energy efficiency has had a high profile for many years. The savings assumptions in the change proposal should improve the accuracy of YEEP's reported energy savings.

3.4.3 EEM3 Residential Torchiere Swap

Deemed savings for Torchiere Swap is based on the Statewide Residential Energy Efficiency Management Program, 2002, Rev. 5-14-2002 (submitted to CPUC by the IOUs as part of 2003 program documentation).

YEEP used the appropriate demand and peak savings from the Statewide Residential Energy Efficiency Management Program to calculate deemed savings for the lighting retrofit measures. YEEP adopted a net-to-gross ratio of 0.75 to reflect findings from the DEEP EM&V final report.

3.4.4 EEM4 Residential Sunscreens

The measure savings for installing sunscreens on single family and multifamily residential windows were based upon estimates from the 2001 DEER Study. Energy savings estimates for the sunscreens measure were developed with DOE-2 simulations of a prototype house with equal window areas on all orientations. Simulations were conducted for various vintages of buildings and for various CEC forecasting climate zones. The DEER study calculates savings from sunscreens on all four orientations and averages the savings to get unit savings numbers (kWh/sq.ft of window shade screened).

YEEP provided incentives for installing sunscreens on non-north windows only. YEEP assumed that savings from shading the north windows would be negligible and hence the unit savings should really be based on the non-north orientations only. In order to account for this difference in approach, YEEP took the DEER unit savings number and multiplied it by 1.25 to get their unit savings number for non-north window shading. YEEP also adopted a net-to-gross ratio of 0.76 to reflect findings from the DEEP EM&V final report.

This seems like a reasonable approach considering that there is rarely direct solar penetration from the north windows, and sunscreens would not save much. While it could be debated whether 1.25 is the appropriate multiplier, the approach overall seemed reasonable.

3.4.5 EEM5 Residential Evaporative Coolers

For YEEP 1, a particular manufacturer model number (Phoenix HE2911) was used for the direct installation. YEEP adopted anet-to gross ratio (NET-TO-GROSS) of 0.55

based on the DEEP program evaluation by HMG, where it was observed that most users did not replace their old units with the DEEP unit, as described above.

The deemed savings was based on testing completed by the Davis Energy Group (DEG) on the unit. However, DEG has not yet produced written documentation on the test procedures and results. HMG recommended that YEEP follow-up with DEG to document the additional savings, or in absence of such written documentation, conduct testing at the Stockton Energy Training Center to validate the savings differences between the DEEP unit and the YEEP unit. However, for this analysis, we have used the program accepted values.

3.5 Net Savings Analysis

The decision-maker surveys were used to determine the amount of free-ridership occurring in the program, or equivalently, the net savings of the program. Individual responses were examined to determine the level of free-ridership occurring on a participant specific basis. For EEMs where a sample of the population was used for the evaluation, Model-Based Statistical Sampling or MBSS™ was used to extrapolate the results to the target population. A description of MBSS extrapolation methodology is provided in Appendix B: Theoretical Foundation of Savings Estimation. Net energy savings and demand reduction results for each EEM are calculated in the next section.

4. EVALUATION RESULTS

This section summarizes the gross savings, net savings, and the associated net-to-gross ratios for the Yolo Energy Efficiency Project's Hardware Incentive Programs (YEEP 1) by measure.

4.1 EEM1 Commercial Lights Lite

This section summarizes the savings results for EEM1 Commercial Lights Lite program. A sample of 75 participants was used to estimate the savings performance for the 400 program participants.

4.1.1 Gross Results

Table 5 presents the program level gross energy savings and demand reduction. Overall, the program achieved annual energy savings of 5,054,711 kWh, corresponding to a gross realization rate of 98%. The associated relative precision at the 90% level of confidence is 6.8%.

Overall, the program achieved gross demand reduction 1,018.49 kW, corresponding to a gross realization rate of 98%. The associated relative precision at the 90% level of confidence is 6.8%.

Gross Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	5,157,869	1,039.28
Evaluation Estimated	5,054,711	1,018.49
Realization Rate	98%	98%

Table 5: EEM1 Commercial Lights Lite Gross Energy Savings and Demand Reduction

4.1.2 Net Results

Table 6 presents the program level gross energy savings and demand reduction. Overall, the program achieved annual energy savings of 4,951,553.96 kWh, corresponding to a gross realization rate of 96%. The associated relative precision at the 90% level of confidence is 16.2%.

Overall, the program achieved gross demand reduction 997.71 kW, corresponding to a gross realization rate of 96%. The associated relative precision at the 90% level of confidence is 16.2%.

Net Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	5,157,869	1,039.28
Evaluation Estimated	4,951,553.96	997.71
Realization Rate	96%	96%

Table 6: EEM1 Commercial Lights Lite Net Energy Savings and Demand Reduction

4.1.3 Program Process and Customer Satisfaction Results

This section summarizes participants' responses to questions regarding the program process and customer satisfaction.

All survey respondents were asked how they first became aware of the program. Table 7 summarizes the results. Nearly 33% of participants learned of the program through YEEP staff.

Program Awareness	% of Respondents
YEEP Staff	33%
Contractor	19%
Friend/Colleague	14%
YEEP Marketing	7%

Table 7: EEM1 Commercial Lights Lite Participant Awareness of Program

Table 8 lists the satisfaction results for several program areas, including the program process, communication with YEEP staff, the installation contractor, and the resultant lighting system.

	YEEP Program	YEEP Staff	Contractor	Lighting System
Very Satisfied	50%	50%	42%	42%
Somewhat Satisfied	33%	50%	16%	45%
Neither Satisfied nor Dissatisfied	17%	0%	32%	9%
Somewhat Dissatisfied	0%	0%	10%	3%
Very Dissatisfied	0%	0%	0%	0%
Don't Know/No Opinion	0%	0%	0%	0%

Table 8: EEM1 Commercial Lights Lite Satisfaction Results

4.2 EEM2 Residential CFL Giveaway

This section summarizes the savings results for EEM2 Residential CFL Giveaway program. A sample of 254 participants was used to estimate the savings performance of the 11,069 participants of the program, representing 33,207 CFLs.

4.2.1 Gross Results

Table 9 presents the program level gross energy savings and demand reduction. Overall, the program achieved annual energy savings of 1,697,115 kWh, corresponding to a gross realization rate of 64%. The associated relative precision at the 90% level of confidence is 5.7%.

Overall, the program achieved gross demand reduction 213.47 kW, corresponding to a gross realization rate of 64 %. The associated relative precision at the 90% level of confidence is 5.7%.

Gross Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	2,639,957	332.07
Evaluation Estimated	1,697,115	213.47
Realization Rate	64%	64%

Table 9: EEM2 Residential CFL Giveaway Gross Energy Savings and Demand Reduction

4.2.2 Net Results

Table 10 presents the program level gross energy savings and demand reduction. Overall, the program achieved annual energy savings of 895,700 kWh, corresponding to a gross realization rate of 34%. The associated relative precision at the 90% level of confidence is 13.9%.

Overall, the program achieved gross demand reduction 112.67 kW, corresponding to a gross realization rate of 30%. The associated relative precision at the 90% level of confidence is 13.9%.

Net Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	2,639,957	332.07
Evaluation Estimated	895,700	112.67
Realization Rate	34%	34%

Table 10: EEM2 Residential CFL Giveaway Net Energy Savings and Demand Reduction

4.2.3 Program Process and Customer Satisfaction Results

This section summarizes participants' responses to questions regarding the program process and customer satisfaction.

All survey respondents were asked how they first became aware of the program. Table 11 summarizes the results. Nearly 80% of participants report learning of the program through the community events in which YEEP held the CFL Giveaway promotions. Another 16% (approximately) report learning of the program through YEEP marketing and 4% of participants heard of the program though a friend or colleague.

Program Awareness	% of Respondents
Community Events	80%
YEEP Marketing	16%
Friend/Colleague	4%

Table 11: EEM2 Residential CFL Giveaway Participant Awareness of Program

Table 12 lists the satisfaction results for several program areas, including the program process and the performance of the CFL bulbs themselves. Approximately 81% of participants are very satisfied with both the program process and 68% are very satisfied with the performance of the CFL bulbs, with the majority of the remaining participants reporting being somewhat satisfied.

	YEEP Program	CFL Bulbs
Very Satisfied	81%	68%
Somewhat Satisfied	10%	14%
Neither Satisfied nor Dissatisfied	5%	3%
Somewhat Dissatisfied	1%	2%
Very Dissatisfied	0%	2%
Don't Know/No Opinion	3%	12%

Table 12: EEM2 Residential CFL Giveaway Satisfaction Results

4.3 EEM3 Residential Torchiere Swap

This section summarizes the savings results for the EEM3 Residential Torchiere Swap program. A sample of 104 participants was used to estimate the savings performance of the 677 program participants

4.3.1 Gross Results

Table 13 presents the program level gross energy savings and demand reduction. Overall, the program achieved annual energy savings of 117,121 kWh, corresponding to a gross realization rate of 100%. All respondents stated that their torchiere was in use, there was no variation in the gross savings sample data. Consequently, the associated relative precision at the 90% level of confidence is 0%.

Overall, the program achieved gross demand reduction 13.01 kW, corresponding to a gross realization rate of 96%. The associated relative precision at the 90% level of confidence is 15.3%.

Gross Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	117,121	13.24
Evaluation Estimated	117,121	13.01
Realization Rate	100%	96%

Table 13: EEM3 Residential Torchiere Swap Gross Energy Savings and Demand Reduction

4.3.2 Net Results

Table 14 presents the program level net energy savings and demand reduction. Overall, the program achieved annual energy savings of 92,673 kWh, corresponding to a net realization rate of 79%. The associated relative precision at the 90% level of confidence is 29.0%.

Overall, the program achieved net demand reduction 10.30 kW, corresponding to a net realization rate of 76%. The associated relative precision at the 90% level of confidence is 29.0%.

Net Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	117,121	13.24
Evaluation Estimated	92,673	10.30
Realization Rate	79%	76%

Table 14: EEM3 Residential Torchiere Swap Net Energy Savings and Demand Reduction

4.3.3 Program Process and Customer Satisfaction Results

This section summarizes participants' responses to questions regarding the program process and customer satisfaction.

All survey respondents were asked how they first became aware of the program. Table 15 summarizes the results. Just over 77% of participants learned of a newspaper ad, with approximately another 12% of participants learning of the program through a friend or colleague.

Program Awareness	% of Respondents
YEEP Marketing	77%
Friend/Colleague	12%
Community Events	11%

Table 15: EEM3 Residential Torchiere Swap Participant Awareness of Program

Table 16 lists the satisfaction results for the program, including the program process and the torchiere itself. Nearly 78% of participants are very satisfied with the program process, with 14% reporting they are somewhat satisfied. Participants appear to be less satisfied with the torchieres themselves than they were with the program process, as only 69% of participants report being very satisfied with the torchiere itself.

	YEEP Program	Torchiere
Very Satisfied	78%	69%
Somewhat Satisfied	14%	18%
Neither Satisfied nor Dissatisfied	2%	3%
Somewhat Dissatisfied	2%	2%

Very Dissatisfied	0%	1%
Don't Know/No Opinion	4%	7%

Table 16: EEM3 Residential Torchiere Swap Satisfaction Results

4.4 EEM4 Residential Sunscreens

This section summarizes the savings results for the EEM4 Residential Sunscreens program. A sample of 56 participants was used to estimate the savings performance of the 319 program applications. There were a total of 26,466 of shadescreens square footage was installed at the homes of the 288 participants since participants were allowed to submit multiple applications per site or individual.

4.4.1 Gross Results

Table 17 presents the program level gross energy savings and demand reduction. Overall, the program achieved annual energy savings of 49,756 kWh, corresponding to a gross realization rate of 100%. The associated relative precision at the 90% level of confidence is 0%.

Overall, the program achieved gross demand reduction 34.41 kW, corresponding to a gross realization rate of 100%. The associated relative precision at the 90% level of confidence is 0%.

Gross Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	49,756	34.41
Evaluation Estimated	49,756	34.41
Realization Rate	100%	100%

Table 17: EEM4 Residential Sunscreens Gross Energy Savings and Demand Reduction

4.4.2 Net Results

Table 18 presents the program level gross energy savings and demand reduction. Overall, the program achieved annual energy savings of 35,937 kWh, corresponding to a gross realization rate of 72%. The associated relative precision at the 90% level of confidence is 9.5%.

Overall, the program achieved gross demand reduction 24.85 kW, corresponding to a gross realization rate of 72 %. The associated relative precision at the 90% level of confidence is 9.5%.

Net Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	49,756	34.41
Evaluation Estimated	35,937	24.85
Realization Rate	72%	72%

Table 18: EEM4 Residential Sunscreens Net Energy Savings and Demand Reduction

4.4.3 Program Process & Customer Satisfaction Results

This section summarizes participants' responses to questions regarding the program process and customer satisfaction.

All survey respondents were asked how they first became aware of the program. Table 19 summarizes the results. 33% of participants learned of the program through retail sunscreen channels, with approximately another 41% of participants learning of the program through YEEP advertising efforts, such as newspaper advertising and flyers.

Program Awareness	% of Respondents
Retail/Store	33%
YEEP Marketing	31%
Installer Contracter	18%
Family/Friend/Colleague	12%
Community Events	4%
YEEP Staff/Office	2%

Table 19: EEM4 Residential Sunscreens Participant Awareness of Program

Table 20 lists the satisfaction results for several program areas, including the program process, communication with YEEP staff[1], and the installation contractor. Because a majority of participants only dealt with the contractor and had no communication with YEEP staff, contractor satisfaction reflected on overall satisfaction with the YEEP program. Nearly all participants are either somewhat or very satisfied, with at least 88% of respondents very satisfied with each program area. Overall, most participants were very satisfied with the program.

	YEEP Program	YEEP Staff	Contractor	Sunscreen
Very Satisfied	93%	88%	91%	91%
Somewhat Satisfied	4%	12%	2%	4%
Neither Satisfied nor Dissatisfied	0%	0%	0%	2%
Somewhat Dissatisfied	0%	0%	0%	0%

[1] Only those participants who stated they had direct contact with a YEEP staff member were asked to rate their satisfaction with their communication with YEEP staff.

Very Dissatisfied	0%	0%	0%	0%
Don't Know/No Opinion	3%	0%	7%	3%

Table 20: EEM4 Residential Sunscreens Satisfaction Results

4.5 EEM5 Residential Evaporative Coolers

This section summarizes the savings results for the EEM5 Residential Evaporative Coolers program. A sample of 50 participants was used to estimate the savings performance of the 450 program participants.

4.5.1 Gross Results

Table 21 presents the program level gross energy savings and demand reduction. Overall, the program achieved annual energy savings of 226,366 kWh, corresponding to a gross realization rate of 55%. The associated relative precision at the 90% level of confidence is 22.2%.

Overall, the program achieved gross demand reduction 197.92 kW, corresponding to a gross realization rate of 55%. The associated relative precision at the 90% level of confidence is 22.2 %.

Gross Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	411,750	360.00
Evaluation Estimated	226,366	197.92
Realization Rate	55%	55%

Table 21: EEM5 Residential Evaporative Coolers Gross Energy Savings and Demand Reduction

4.5.2 Net Results

Table 22 presents the program level net energy savings and demand reduction. Overall, the program achieved annual energy savings of 198,071 kWh, corresponding to a net realization rate of 48%. The associated relative precision at the 90% level of confidence is 22.6%.

Overall, the program achieved net demand reduction 173.18 kW, corresponding to a net realization rate of 48%. The associated relative precision at the 90% level of confidence is 22.6 %.

Net Results	Energy Savings (kWh)	Demand Reduction (kW)
Program Estimated	411,750	360.00
Evaluation Estimated	198,071	173.18
Realization Rate	48%	48%

Table 22: EEM5 Residential Evaporative Coolers Net Energy Savings and Demand Reduction

4.5.3 Program Process & Customer Satisfaction Results

This section summarizes participants' responses to questions regarding the program process and customer satisfaction.

All survey respondents were asked how they first became aware of the program. Table 23 summarizes the results. Nearly 86% of participants learned of the program through YEEP staff, with approximately another 6% of participants learning of the program through a friend or colleague.

Program Awareness	% of Respondents
YEEP Staff	86%
Friend/Colleague	6%
Other	8%

Table 23: EEM5 Residential Evaporative Coolers Participant Awareness of Program

Table 24 lists the satisfaction results for several program areas, including the program process, communication with YEEP staff, and the installation contractor. Overall, most participants were satisfied with the program.

	YEEP Program	YEEP Staff	Contractor
Very Satisfied	44%	52%	52%
Somewhat Satisfied	52%	46%	40%
Neither Satisfied nor Dissatisfied	2%	0%	2%
Somewhat Dissatisfied	0%	0%	0%
Very Dissatisfied	0%	0%	2%
Don't Know/No Opinion	2%	2%	2%

Table 24: EEM5 Residential Evaporative Coolers Satisfaction Results

In order to assess if energy savings were being realized and noticed, we first asked respondents if they were responsible for the electricity bills. Ninety-five percent of respondents were responsible for the electric bills.

5. APPENDIX A: THEORETICAL FOUNDATION OF SAMPLE DESIGN

MBSS™ (Model-Based Statistical Sampling) methodology was used where feasible to develop an efficient sample design and to assess the likely statistical precision associated the planned sample. In the situations where we could not utilize MBSS methodology, we made use of traditional simple random sampling (SRS) techniques. The following paragraphs describe MBSS methodology.

The target variable of analysis, denoted *y*, is the actual energy savings of the lighting project. The primary stratification variable, the tracking system estimated energy savings of the project, 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., all program participants.

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

$$\begin{aligned} y_k &= \beta x_k + \varepsilon_k \\ \sigma_k &= sd(y_k) = \sigma_0 x_k^{\gamma} \end{aligned}$$

Here $x_k > 0$ is known throughout the population. k denotes the sampling unit, i.e., the site. $\{\varepsilon_1, \ldots, \varepsilon_N\}$ 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.

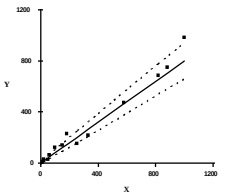
One of the key parameters of the ratio model is the error ratio, denoted *er*. The error ratio is a measure of the strength of the association between *y* and *x*. The error ratio is suitable for measuring the strength of a heteroscedastic relationship and for choosing sample sizes. It is *not* equal 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:

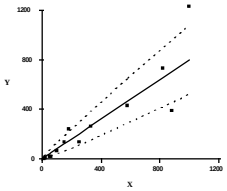
$$er = \frac{\sum_{k=1}^{N} \sigma_k}{\sum_{k=1}^{N} \mu_k} = \frac{\frac{1}{N}\sum_{k=1}^{N} \sigma_k}{\frac{1}{N}\sum_{k=1}^{N} \mu_k}$$

Table 25 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.

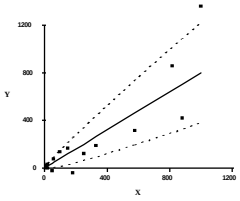
As Table 25 indicates, the error ratio is the principle determinant of the sample size required to satisfy the 90/10 criteria for estimating *y*. If the error ratio is small, then the required sample is correspondingly small.



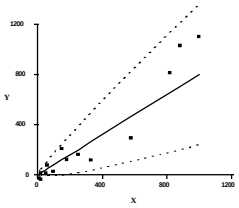
beta	0.8
er	0.2
gamma	0.8
reqn n	11



beta	0.8
er	0.4
gamma	0.8
reqn n	43



beta	0.8
er	0.6
gamma	0.8
reqn n	97



beta	0.8
er	0.8
gamma	0.8
reqn n	173

Table 25: Examples of MBSS Ratio Models

6. APPENDIX B: THEORETICAL FOUNDATION OF SAVINGS ESTIMATION

MBSS™ methodology was used where feasible to extrapolate the results to the target population. In the situations where we could not utilize MBSS methodology, we made use of traditional simple random sampling (SRS) techniques. MBSS has been used for all of California's IOUs, NEES, Northeast Utilities, Consolidated Edison, The New York Power Authority, Wisconsin Electric, Sierra Pacific Power Company, and Washington Power and Light among others. MBSS was used in the end-use metering component of the 1992 evaluation of PG&E's CIA program, the 1994, 1996, and 1998 NRNC evaluations for PG&E and Southern California Edison, and the 1998 NRNC Baseline Study for the CBEE. A complete description of MBSS methodology is available if further discussion of the methodology is required.[1]

The following sections will describe in more detail three topics:

- Case weights
- Balanced stratification to calculate case weights
- Stratified ratio estimation using case weights.

6.1 Case Weights

6.1.1 Theoretical Foundation

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:*

[1] *Methods and Tools of Load Research, The MBSS System, Version V.* Roger L. Wright, RLW Analytics, Inc. Sonoma CA, 1996.

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

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

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

Motivated by the last expression, we define the ***case weight*** of each unit in the sample to be $w_k = \frac{N_h}{n_h}$. 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.

6.1.2 Calculating the Case Weights

Balanced post-stratification was used to calculate the case weights associated with the final participant sample. In this approach, the sample projects are sorted by the stratification variable, annual energy savings, and then divided equally among the strata. Then the first stratum cutpoint is determined midway between the values of the stratification variable for the last sample case in the first stratum and the first sample case in the second stratum. The remaining strata cutpoints are determined in a similar fashion. Then the population sizes are tabulated within each stratum. Finally the case weights are calculated in the usual way.

6.2 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

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

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

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

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

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

and the achieved relative precision is calculated as

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

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.

7. APPENDIX C: SURVEY INSTRUMENTS

This section provides the survey instruments used for the program evaluation.

7.1 EEM1 Commercial Lights Lite Decision-maker Survey

Introduction/Background

[*The site surveyor will meet with the customer (business owner who signed the Contractor agreement and is listed in the database)*]

I would like to ask you some questions regarding your recent lighting retrofit.

Q1. Are you the best person to be speaking with regarding the YEEP Lights Lite program?

1	Yes
2	No / [Meet with new person]
3	No / Not available [*get phone number for other person*]
4	No / No other person / DK / Refused [*skip to thanks*]

Q2. What was the primary motivation for changing your lighting system?

_____

Q3. How old was your lighting system prior to the replacement? _____years

Q4. How did you first learn of YEEP Lights Lite? (ONE RESPONSE ONLY)

1	Contractor
2	YEEP staff
3	Friend / Business colleague / Professional association
4	YEEP marketing / advertising
5	Other (specify)_____
6	Have not heard of it
99	Don't know / Refused

Q5. How did you first hear about the energy efficient lighting technologies that were installed? (ONE RESPONSE ONLY)

1	Contractor
2	YEEP representative
3	Friend / Business colleague / Professional association
4	YEEP marketing / advertising
5	Other (specify)_____
99	Don't know / Refused

Free-Rider Questions

Q6. How important was the overall cost in your decision to go ahead with the lighting retrofit?

1	Very Unimportant (Why?)
2	Unimportant (Why?)
3	Neither important or unimportant
4	Important
5	Very Important
98	Don't Know
99	Refused

If unimportant why?_____

Q7. How important was the YEEP incentive in allowing you to install the energy efficient lighting? Would you say…

1	Very Unimportant (Why?)
2	Unimportant (Why?)
3	Neither important or unimportant
4	Important
5	Very Important
99	DK
100	Refused

If unimportant why?_____

Q8. Do you think you would have installed the energy efficient lighting system were it not for the YEEP Program?

1	Yes
2	No (Skip to Q10)
99	Don't know
100	Refused

Q9. When, (relative to actual installation) would the replacement have occurred?

1	Same time or sooner
2	Within 6 months
3	1 year later
4	2 years later
5	More than 2 years
99	Don't know
100	Refused

Spillover Questions

Q10. Since participating in YEEP's Program, have you installed any additional energy efficient lighting equipment without a rebate?

1	No **(Skip to Q12)**
2	Yes
99	Don't know
100	.Refused

If Yes, what equipment has been installed?_____

Q11. Did participation in the Program influence your decision to install the energy efficient equipment? If not, what prompted you to install them?

1	No
2	Yes
98.	Don't know
99.	Refused

If No, what prompted you to install them?_____

Satisfaction Questions

Q12. Using the following codes, record customer satisfaction to the following questions.

1	Extremely dissatisfied
2	Somewhat dissatisfied
3	Neither satisfied nor dissatisfied(**Skip to Q14)**
4	Somewhat satisfied(**Skip to Q14)**
5	Very satisfied (**Skip to Q14)**

Q13 How satisfied are you with:	1*	2*	3	4	5	DK/NR
a) Contractor						
b) YEEP program process						
c) Resulting lighting system						

Q14. If dissatisfied, Why?

a) Contractor _____

b) YEEP program process _____

c) Resulting lighting system _____

Q15. Did you have direct contact with a YEEP staff member?

1	Yes
2	No (**Skip to Q16)**
98.	Don't know
99.	Refused

Q16. How satisfied were you with the service provided by the YEEP staff member? Would you say you were . . .

1	Extremely dissatisfied, why?
2	Somewhat dissatisfied, why?
3	Neither satisfied nor dissatisfied
4	Somewhat satisfied
5	Very satisfied
99	Don't Know
100	Refused

If dissatisfied,Why?_____

Q22. In comparison to your expectation of energy cost savings, would you say that you are experiencing more, the same or less cost savings?

1	Significantly less
2	Slightly less
3	The same
4	Slightly more
5	Significantly more
99	Don't know / Refused

Q23. Do you have any other comments?

_____

7.2 EEM1 Commercial Lights Lite Verification Survey

	Site ID #: «EEMNum»
Business Name: «CompanyName»	***Survey Date: «Survey_Date»***
Business Address: «Addr1»	***Survey Time: «Survey_Time»***
Business City: «City»	***Surveyor Name***
Site Contact: «Contact_Name»	***Schedule** (Weekday):*
Phone Number: «Phone»	***Schedule** (Weekend):*

	Per YEEP	***On-site***				***Notes***
		Total	*Reflectors*	*Delamp*	*Refrig kit*	
2' lamps						
1 lamp T8	«M_2_ft_1_lamp»					
2 lamp T8	«M_2_ft_2_lamp»					
3 lamp T8						
4 lamp T8						
3' lamps						
1 lamp T8	«M_3_ft_1_lamp»					
2 lamp T8	«M_3_ft_2_lamp»					
3 lamp T8						
4 lamp T8						
4' lamps						
1 lamp T8	«M_4_ft_1_lamp»					
2 lamp T8	«M_4_ft_2_lamp»					
3 lamp T8	«M_4_ft_3_lamp»					
4 lamp T8	«M_4_ft_4_lamp»					
6' lamps						
1 lamp T8	«M_6_ft_1_lamp»					
8' lamps						
1 lamp T8						
2 lamp T8	«M_8_ft_2_lamp»					
3 lamp T8						
4 lamp T8						
Exit Signs						
LED or T1 retrofit kit	«Exit_Ret»					
New LED or T1	«Exit_New»					
CFL						
Candles	«CFL_Candles»					
A-Lamps	«CFL_ALamps»					
Globes	«CFL_Globes»					
Reflectors	«CFL_Reflectors»					
Spirals	«CFl_Spirals»					
Other						

7.3 EEM2 Residential CFL Giveaway Survey

Surveyor _____Date _____Time _____

Introduction

Hello, may I speak with <<***respondent***>>. My name is <<**interviewer**>>**,** I am calling on behalf of the Yolo Energy Efficiency Program, or YEEP, regarding their Compact Fluorescent Twister Lamp Bulb Give-Away program. We are conducting an evaluation study of the program on their behalf. We received your name and contact information from YEEP's program records in order to conduct the study. Your responses will be kept confidential and will only be reported in aggregate in our evaluation report.

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 received free light bulbs from YEEP, 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

Q3. Our records show that your home is located at <<**address**>>**,** is this the correct address?

1. Yes
2. No → Enter Corrected Address here (_____)

100. DK
101. Refused

Q4. Which YEEP light bulbs did you install?

Small Twister	_____
Large Twister	_____
Covered Globe	_____

If one of the bulbs were not installed, ask why?_____

Q5. Are all the bulbs still installed?

1. Yes
2. No, why not? (*if no, prompt for number and type of bulbs no longer installed, as part of the Why*)

98. DK
99. Refused

If not, why?_____

Q6. In which rooms have you installed them in? (Do not prompt)

	Small Twister	Large Twister	Covered Globe
Bedroom			
Bathroom			
Kitchen			
Family Room/Living Room			
Dining Room			
Laundry			
Closet			
Garage			
Outside			
Other_____			

Q7. Could you estimate how many hours the fixtures with the YEEP light bulbs are used on a typical *weekday*?

Small Twister _____
Large Twister _____
Covered Globe _____

Q8. Could you estimate how many hours the fixtures with the YEEP light bulbs are used on a typical *weekend* day?

Small Twister _____
Large Twister _____
Covered Globe _____

Q9. Which YEEP light bulb did you like the best? Why?

Small Twister _____
Large Twister _____
Covered Globe _____

Why?_____

Q10. If you had not received the free YEEP light bulbs, would you have purchased them at your own cost?

1. Yes
2. Maybe
3. No
99. Don't know
100. Refused

Q11. Before participating in YEEP's Compact Fluorescent Give-Away Program, had you used compact fluorescent bulbs?

1. Yes
2. No
99. Don't know
100. Refused

If Yes, please describe the nature of that prior experience?_____

Q12. Since participating in YEEP's Compact Fluorescent Give-Away Program, have you purchased any additional compact fluorescent bulbs at your own cost?

1. Yes
2. No, why not?
99. Don't know /
100. Refused

If not, why not?_____

Satisfaction/Process Questions

Q13. How did you first become aware of YEEP's Compact Fluorescent Give-Away program?

1. Community Events
2. YEEP Advertising (newspaper/radio)
3. YEEP Website
4. YEEP office/staff
5. Friend/colleague
6. Other:_____

98. DK
99. Refused

Q14. How would you rate your satisfaction with YEEP's Compact Fluorescent Give-Away program from a scale of one to give, where 5 is Very Satisfied?

1. Very unsatisfied, why?
2. Not Satisfied, why?
3. Neither satisfied nor unsatisfied
4. Satisfied
5. Very Satisfied

Why?_____

Q15. Could you rate your satisfaction with the performance of the compact fluorescent bulbs you have installed in your house from a scale of one to give, where 5 is Very Satisfied?

1. Very Dissatisfied, why?
2. Not Satisfied, why?
3. Neither satisfied nor dissatisfied
4. Satisfied
5. Very Satisfied

Why?_____

Q16. Have you heard of the Energy Star label?

1. Yes
2. Maybe
3. No (Skip to Q19)

98. Don't know
99. Refused

Q17. What does the Energy Star label mean to you?

_____

Q18. Did the Energy Star label influence your decision to accept and install the YEEP light bulbs?

1. Yes
2. Maybe
3. No
98. Don't know
99. Refused

Q19. Do you have any recommendations to improve this program?

_____

7.4 EEM3 Residential Torchiere Swap Survey Instrument

Surveyor _____Date _____Time _____

Introduction

Hello, may I speak with <<***respondent***>>. Hello, my name is <<**interviewer**>>**,** I am calling on behalf of the Yolo Energy Efficiency Program, or YEEP, regarding their Torchiere Swap program. We are conducting an evaluation study of the program on their behalf. We received your name and contact information from YEEP's program records in order to conduct the study.

Q1. I have a few brief questions that will take only a few 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 exchanged your halogen torchiere floor lamp with a more efficient fluorescent one from YEEP, 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

Q3. Our records show that your home is located at <<**address**>>**,** is this the correct address?

1. Yes
2. No – Ask for correction_____
98. DK
99. Refused

Q4. Have you used the new fluorescent torchiere floor lamp in your home?

3. Yes
4. No, why not? (Skip to Q9) _____
98. DK
99. Refused

Q5. Is it still in use in your home?

1. Yes
2. No, why not? (Skip to Q9) _____
98. DK
99. Refused

Q6. In which room do you use it in?

1. Bedroom
2. Home office/den
3. Family Room/Dining Room
4. Other _____
98. DK
99. Refused

Q7. Could you estimate how many hours the torchiere is turned on a typical *weekday*? _____

Q8. Could you estimate how many hours the torchiere is turned on a typical *weekend* day? _____

Q9. Had you decided to replace your halogen torchiere floor lamp with an efficient fluorescent model before you heard of the YEEP program?

1. Yes - What plans already existed?_____
2. Maybe
3. No (Skip to Q11)
99. Don't know
100. Refused

Q10. When, (relative to actual installation) would that have occurred?

1. Same time or sooner
2. Within 6 months
3. 1 year later
4. More than 1 years

Q11. Before participating in YEEP's Torchiere Swap, did you have any prior experience with high efficiency torchiere floor lamps?

1. Yes, please describe the nature of that prior experience?_____
2. No
98. Don't know
99. Refused

Q12. Since participating in YEEP's Torchiere Swap Program, have you installed any additional energy efficient lighting, such as other fluorescent torcheriers or compact fluorescent bulbs, at your own cost?

1. Yes
2. No
98. Don't know
99. Refused

Satisfaction/Process Questions

Q13. How did you first become aware of YEEP's Torchiere Swap program?

1. Community Events
2. YEEP Advertising (newspaper/radio/website)
3. YEEP office/staff
4. Friend/colleague
5. Other:_____
98. DK/
99. Refused

Q14. How would you rate your satisfaction with YEEP's Torchiere Swap Program?

1. Very dissatisfied, why?
2. Not satisfied , why?
3. Neither satisfied nor dissatisfied
4. Satisfied
5. Very Satisfied

Why?_____

Q15. How would you rate your satisfaction with your fluorescent torchiere lamp?

1. Very dissatisfied, why?
2. Not satisfied , why?
3. Neither satisfied nor dissatisfied
4. Satisfied
5. Very Satisfied

Why?_____

Q16. What recommendations would you have to improve this program for future program participants like yourself?

_____

7.5 EEM4 Residential Sunscreens Survey Instrument

Interviewer _____Date _____Time _____

Introduction

Hello, may I speak with ***Contact Name***. My name is **<<interviewer>>,** I am calling on behalf of the Yolo Energy Efficiency Program, or YEEP, regarding their Sunscreen Rebate program. We are conducting an evaluation study of the program on their behalf. We received your name and contact information from YEEP's program records in order to conduct the study. Your responses will be kept confidential and will only be reported in aggregate in our evaluation report.

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 received a rebate for installing sunscreens. Is this correct?

1. Yes
2. No → Thank and Terminate
98. DK → Is there someone else in your home who would know? **e**_____
99. Refused → Thank and Terminate

Q3. Our records show that your home is located at Address, is this the correct address?

1. Yes
2. No, *ask them for correction (enter here* _____*)*
98. DK
99. Refused

Q4. We need to understand where the sunscreens were installed. Please indicate which window orientations received sunscreens, the number of windows per side, and if possible, the square footage of sunscreens installed by orientation.

1. North - _____ windows _____ sf
2. South - _____ windows _____ sf
3. East - _____ windows _____ sf
4. West - _____ windows _____ sf

Q5. How important was the YEEP rebate in your decision to install the sunscreens?

1. Very unimportant
2. Somewhat unimportant
3. Neither important nor unimportant
4. Somewhat important
5. Very important

Q6. Had you decided to install sunscreens before you heard about the YEEP rebate?

1. Yes - what plans already existed?_____
2. Maybe
3. No (Skip to Q8)
98. Don't know
99. Refused

Q7. When, (relative to actual installation) would that have occurred?

1. Same time or sooner
2. Within 6 months
3. 1 year later
4. 2 years later
5. More than 2 years
98. Don't know
99. Refused

Q8. Where did you purchase the sunscreen materials?_____

Satisfaction/Process Questions

Q9. How did you first become aware of YEEP's Sunscreen program? (do not prompt)

1. Community Events
2. YEEP Advertising (newspaper/radio/website)
3. YEEP office/staff
4. Friend/colleague
5. Installer/contractor
6. Retail/Store
7. Other:_____
98. Don't know
99. Refused

Q10. How would you rate your satisfaction with YEEP's Sunscreen program?

1. Very unsatisfied, why?
2. Not Satisfied, why?
3. Neither satisfied nor unsatisfied
4. Satisfied
5. Very Satisfied

Why:_____

Q11. How would you rate your satisfaction with the installer, if not self-installed, that completed the installation of your sunscreens?

1. Very unsatisfied, why?
2. Not Satisfied, why?
3. Neither satisfied nor unsatisfied
4. Satisfied
5. Very Satisfied

Why:_____

Q12. How would you rate your satisfaction with the sunscreens?

1. Very unsatisfied, why?
2. Not Satisfied, why?
3. Neither satisfied nor unsatisfied
4. Satisfied
5. Very Satisfied

Why:_____

Q13. Did you have direct contact with a YEEP staff member?

1. Yes
2. No (Skip to Q15)
99. Don't know / Refused

Q14. How satisfied were you with the information and service provided by a YEEP staff member? Would you say you were . . .

1. Very unsatisfied, why?
2. Not Satisfied, why?
3. Neither satisfied nor unsatisfied
4. Satisfied
5. Very Satisfied

Why: _____

Q15. Has the sunscreens provided more comfort to your household? Please explain.

_____

Q16. Have you noticed a difference in your energy bills since installing the sunscreens?

1. Yes, I am paying less
2. Yes, I am paying more
3. No, I am paying the same
99. DK/Refused

Q17. What recommendations would you have to improve this program for future program participants like yourself?

_____

7.6 EEM5 Residential Evaporative Coolers Decision-maker Survey Instrument

Interviewer: _____Date _____Time _____

Customer:_____ EEM Trans#_____

Address: _____

Hello, may I speak with <<***respondent***>>.

Hello, my name is <<**interviewer**>> and I am with the Yolo Energy Efficiency Program, or YEEP, and its Evaporative Cooler program. We are currently studying the program. We received your name and contact information from YEEP's program records in order to conduct the study. Your responses will be kept confidential and will be combined with everyone else's in our report so no one can be identified.

Q1. Our information shows that YEEP installed an evaporative cooler in your home, is this correct?

1. Yes → Record Model # and Make: _____
2. No → Thank and Terminate

98. DK → Is there someone else in your home who would know? _____
99. Refused → Thank and Terminate

Q2. Do you rent or own your residence?

1. Rent property and mobile home
2. Rent property and own mobile home
3. Own property and mobile home

98. DK
99. Refused

Q3. Did you previously use an air conditioner or evaporative cooler or both at this address?

1. Yes, I used an air conditioner
2. Yes, I used an evaporative cooler
3. Yes, I used both an air conditioner and an evaporative cooler
4. No

98. DK
99. Refused

Q4. Where is the new YEEP evaporative cooler installed and/or where were (are) the existing air conditioners or evaporative coolers installed, and?

Type/Location	Existing Unit 1 Type:	Existing Unit 2 Type:	YEEP Evap. Cooler Type: Evap. Cooler
Bedroom			
Bathroom			
Kitchen			
Family Room/Living Room			
Dining Room			
Laundry			
Closet			
Garage			
Outside			
Other_____			

Q5. How often did you previously use the unit(s) in the summer time? Would you say it is used….. *(prompt with - rarely, occasionally, frequently, every day etc – if needed)*

PRE-PROGRAM PARTICIPATION

	Existing Unit 1	Existing Unit 2
Not At All		
Rarely		
Occasionally		
Frequently		
Every Day		
DK		
Refused		
Other_____		

Q6. Were they/Was it removed when the new YEEP unit was installed?

1. Yes, both Existing Units were removed
2. Yes, only Existing Unit 1 was removed
3. Yes, only Existing Unit 2 was removed
4. No

98. DK
99. Refused

Q7. What is the usage of the old units after installing the YEEP unit? What is the usage of the new YEEP unit? Would you say it is used…*(prompt with - rarely, occasionally, frequently, every day etc – if needed)*

POST-PROGRAM PARTICIPATION

	Existing Unit 1	Existing Unit 2	YEEP Evap. Cooler
Not At All			
Rarely			
Occasionally			
Frequently			
Every Day			
DK			
Refused			
Other_____			

Q8. What were the main reasons you recently decided to install a new evaporative cooler?_____

Q9. Had the YEEP program *not been* available to you, which of the following actions would you have most likely taken?

1. Purchased a window air conditioning unit
2. Fixed the existing evaporative cooler
3. Would have purchased the same type of evaporative cooler
4. Would have purchased an evaporative cooler, but a less expensive less efficient unit
5. Would not have purchased anything **(skip to Q11)**
6. Other:_____

98. DK
99. Refused

Q10. At what time would you have purchased it?

1. Same time or sooner
2. Several months later
3. One year later
4. More than a year later
98. DK
99. Refused

Satisfaction/Process Questions

Q11. How did you first become aware of YEEP's Evaporative Cooler program?

1. YEEP staff
2. Friend/colleague
3. Other:_____
98. DK
99. Refused

Q12. How would you rate your satisfaction with the YEEP staff? If dissatisfied, why?

1. Very unsatisfied, why?
2. Not Satisfied , why?
3. Neither satisfied nor unsatisfied
4. Satisfied
5. Very Satisfied
98. DK
99. Refused

Q13. How would you rate your satisfaction with YEEP's Evaporative Cooler program?

1. Very unsatisfied, why?
2. Not Satisfied , why?
3. Neither satisfied nor unsatisfied
4. Satisfied
5. Very Satisfied

Why: _____

Q14. Has participating in YEEP's Evaporative Cooler program provided more comfort to your household. Please explain._____

Q15. How would you rate your satisfaction with the contractor that completed the installation of your evaporative cooler?

6. Very unsatisfied, why?
7. Not Satisfied, why?
8. Neither satisfied nor unsatisfied
9. Satisfied
10. Very Satisfied

Why:_____

Q16. Are you responsible for the electric bills?

1. Yes
2. No **(Skip to Q18)**

98. DK
99. Refused

Q17. Have you noticed any change in the amount of money you spend on your monthly summertime electric bill since the installation of the evaporative cooler?

1. Yes, I am paying less
2. Yes, I am paying more
3. No, I am paying the same

98. DK
99. Refused

Q18. What recommendations would you have to improve this program for future program participants like yourself?_____

7.7 EEM5 Residential Evaporative Coolers Verification Survey Instrument

Surveyor _____Date _____Time _____

Customer: :_____EEM Trans#_____

Address :_____

Equipment Verification:

Equipment	YEEP Evap. Cooler	Existing Unit 1	Existing Unit 2
Type:	Evap. Cooler		
Make:			
Model#			
Location			
Hooked up			

Type of Residence:

1. Mobile Home, Single Wide
2. Mobile Home, Double Wide
3. Modular/prefabricated
4. Other_____

Notes: _____