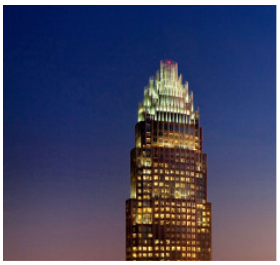
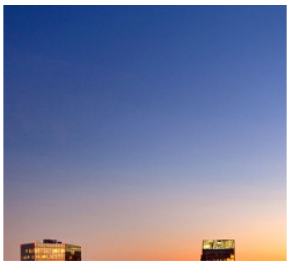
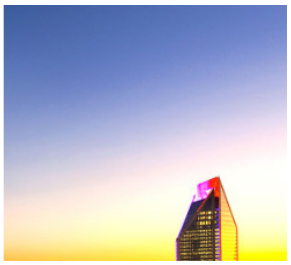
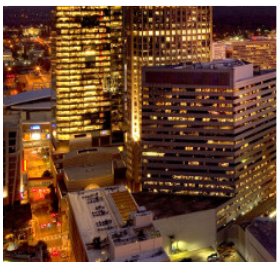

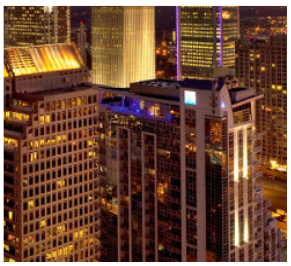

2015 NONRESIDENTIAL DOWNSTREAM ESPI DEEMED POOL COVER IMPACT EVALUATION

Final Report

Submitted to:
California Public Utilities Commission

Prepared by:

Itron

1111 Broadway
Suite 1800
Oakland, CA 94607
www.itron.com/consulting

March 31, 2017


TABLE OF CONTENTS

LIST OF TABLES

1 EXECUTIVE SUMMARY

1.1 NEED FOR STUDY

In 2013, the California Public Utilities Commission (CPUC) developed the Efficiency Savings and Performance Incentive (ESPI) mechanism,[1] which lays out various ways the investor owned utilities (IOUs) can receive monetary incentives for the performance of their energy efficiency programs. One component of this mechanism is based on how much energy savings are derived over the life of the energy efficient equipment (lifecycle savings), or measures, that were installed through these programs.

The ESPI process identifies a list of energy efficiency measures that comprise the greatest levels of uncertainty among the portfolio of energy efficient measures offered by a given IOU. The CPUC and their consultants conduct research on these uncertain measures to estimate their lifecycle savings. A component of the ESPI mechanism then pays incentives to the IOUs based on these evaluated energy savings values.

1.2 ENERGY EFFICIENCY MEASURES STUDIED

This study evaluates one of the energy efficiency measures with high levels of uncertainty that were offered by the 2015 IOU energy efficiency programs: Commercial Pool Covers. Commercial Pool Covers were only offered under Southern California Gas' (SCG) energy efficiency programs. Prior to these evaluations, the IOU's submitted a claim for the amount of energy they believe the uncertain measures will save. The Commercial Pool Cover measure represents roughly 0.72% of the total therm energy savings claimed by all of SCG's program measures, over the life of the measures.

1.3 APPROACH

This study's objective is to evaluate SCG's energy savings claim for the Commercial Pool Cover measure and to conduct research that develops revised estimates of savings. This study looks at the energy (therm) savings provided over the lifetime of the measure. In order to develop a revised savings estimate, telephone surveys and on-site visits were conducted with a sample of customers that installed the Commercial Pool Cover measure. The data collected as part of these activities include information on how the pool covers are used, and how the pool covers affect the energy consumption of related

[1] D.13.09.023, Decision Adopting Efficiency Savings and Performance Incentive Mechanism.

equipment, such as the pool's heater. These data are used to support the estimate of lifecycle therm savings associated with the installed pool covers.

This evaluation then compares the initial savings claim made by SCG to this evaluation's results developed using the data collected on site. The initial savings claim is often times referred to as ex ante savings, because this is the savings value before (ex ante) the evaluation is conducted. The evaluation savings value is then referred to as the ex post savings, because this is the savings values developed after (ex post) the evaluation.

The ratio of the ex post (evaluation estimated) to ex ante (deemed program claim) savings is referred to as the "realization rate," or the rate at which ex ante savings are realized through the evaluation.

The evaluation also examines how successful the IOU programs were in influencing customers to install energy efficient measures that would not have been installed if the programs had not existed. Customers that would have installed the same energy efficient equipment in the absence of the program are considered free riders. They are referred to as free riders because they are receiving incentives from the programs for actions they would have undertaken without the program's existence. Therefore, the evaluation examines both the "gross" amount of savings derived among all participants, and the savings that is generated "net" of free riders.

This evaluation also developed estimates of the ratio between the net and gross levels of savings (the net-to-gross ratio or NTGR). To estimate the NTGR, the telephone survey includes several questions regarding the program's influence on the customer's decision to install the energy efficient equipment. The survey examines various factors related to the program and other non-program factors, as well as asking the customer what they would likely have done in the absence of the program.

These survey question responses determine how likely the program has influenced the customer's decision to install the measure, and conversely, how likely the participant was a free rider. For the sample of telephone surveyed participants, the NTGR is estimated as the ratio of the sample's total savings that is net of free ridership to the total gross savings.

The ultimate goal of this evaluation is to estimate ex post net lifecycle energy savings. This value is the savings estimated by the evaluation (ex post), which is generated by the program over the life of the measures (lifecycle) that are installed, minus (net) the free riders.

1.4 RESULTS

The results of this evaluation are provided in the table below. Shown are the ex post (evaluation) and ex ante (claimed) net lifecycle savings values (therms), the realization rates (ratio of ex post to ex ante), and the corresponding NTGR (the ratio of lifecycle savings that is net of free riders, to the gross lifecycle savings).

TABLE 1-1: EX ANTE AND EX POST NET LIFECYCLE THERM SAVINGS, REALIZATION RATES AND NTGRS

Energy Efficiency Measure	Net Lifecycle Therm Savings		Net Realization Rate (Ex Post/Ex Ante)	Net-to-Gross Ratio
	Ex Ante (Claimed)	Ex Post (Evaluated)		
Pool Covers	1,028,605	1,122	0.11%	0.68

The evaluation performed on-site visits and/or telephone surveys for 18 different SCG participants installing pool covers. Of the 18 participants, 17 were determined to have no associated savings for one of three reasons:

- The installed pool cover was the same level of efficiency as the pre-existing pool cover.
- The installed pool cover did not exceed the minimum level of efficiency associated with what is considered standard practice in the industry.
- The pool was empty 9 months out of the year and not heated the other three months.

Finally, the one pool cover that was associated with actual energy savings was just slightly more efficient than the minimum level of efficiency associated with what is standard practice in the industry. Therefore, the evaluated savings for this site was significantly less than the amount claimed by SCG.

As a result, the realization rate (ratio of ex post to ex ante savings) was extremely small, only 0.11%.

1.5 RECOMMENDATIONS

Strong consideration should be given to no longer offering the commercial pool cover measure. If this measure is to continue to be offered, customers must be required to install covers with efficiency levels that exceed both their pre-existing pool cover, as well as the industry standard practice value.

This recommendation is based primarily on the fact that 16 of the 18 sites evaluated did not meet these efficiency requirements and had zero resulting savings.

These results are documented in more detail in Section 4 of the report.

1.6 CONTACT INFORMATION

The ED Project Manager for this study was Ms. Mona Dzvova. Itron served as the Prime Contractor managing this study, led by Mr. Brian McAuley.

The following is Ms. Dzvova and Mr. McAuley's contact information.

Firm	Lead	Contact Info
CPUC 505 Van Ness Ave San Francisco, CA 94102	Mona Dzvova Energy Division DSM Evaluation Section	Phone: (415) 703-1231 Email: mona.dzvova@cpuc.ca.gov
Itron, Inc 12348 High Bluff Dr, Suite 210 San Diego, CA 94607	Brian McAuley Senior Energy Consultant Consulting & Analysis	Phone: (858) 724-2657 Email: brian.mcauley@itron.com

2 INTRODUCTION AND OVERVIEW OF STUDY

This report documents the activities undertaken by the Nonresidential Downstream Deemed ESPI Pool Cover Impact Evaluation of the 2015 IOUs' energy efficiency programs.[2] The overall goal of this study is to perform an impact evaluation on deemed pool cover measures that were identified in the ESPI decision.[3]

This report is informed by Attachment 2 and 3 of the ESPI decision for program year (PY) 2015 and details the goals and objectives of the impact evaluation to meet those requirements. Likewise, the report will discuss the researchable issues, information on the measure groups evaluated as well as the data sources used, the approach for sampling, the verification analysis and the methods used to determine ex post impacts. Finally, the report will present the results and findings from the analysis that can then be used to update the NTGRs and gross/net first year and lifecycle savings for the measures detailed in the ESPI decision.

2.1 EVALUATION RESEARCH OBJECTIVES

The objective of this study is to perform a measure and/or measure-parameter impact evaluation, utilizing new primary evaluation data in order to update existing gross and/or net savings estimates and inform future savings values for pool cover measures that were identified in the ESPI decision. Attachment 2 of the ESPI decision provides an overview of the portfolio parameters that have been identified as potentially requiring ex post verification. The parameters associated with deemed measure verification include measure installation/verification, UES, NTGRs, gross and net energy savings values, EUL, and impact load shapes.

While the verification of assumptions and uncertainty surrounding these parameters are not measure-specific, the final 2015 ESPI Uncertain List identifies a number of deemed nonresidential measures that are subject to some level of ex post evaluation for the 2015 program year. Pool covers are one of the measures that were identified in that decision. It is important to note that the parameters associated with this measure represent potential areas of focus and that the ex post evaluation is not limited in scope to any specific parameters. The evaluation team has determined, with guidance from the CPUC, what

[2] This report focuses on the ESPI measures that were identified for the 2015 program cycle.

[3] D.13.09.023, Decision Adopting Efficiency Savings and Performance Incentive Mechanism. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M076/K775/76775903.PDF http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Shareholder+Incentive+Mechanism.htm

measures and measure-parameters are subject to ex post evaluation. This determination is based on a number of factors, which will be presented in more detail throughout this report:

- **Pool Covers** (PGE, SCE, SDGE)
  - Uncertainty surrounding gross and net savings. Early replacement, normal replacement and add-on retrofit status unclear. Issues result in baseline, free-ridership, installation and measure eligibility uncertainty.

A number of research objectives have been targeted in order to develop net and gross ex post impacts for the measures detailed above. For this evaluation, a gross realization rate (GRR) approach has been utilized, where site-specific gross ex post impacts have been estimated from a sample of participants. These site-specific gross ex post impacts were then compared to the ex ante claim from the tracking data to develop a ratio of ex post to ex ante savings.

The following tasks have been performed by collecting new primary data from participant phone surveys and on-site verification analyses, in order to develop the realization rates. A more detailed description of the impact methodologies is below, but to summarize:

- Confirm installations (verification). This includes on-site verification of measure installations that represent a significant percentage of ex ante claimed savings.
- Estimate baseline (both pre-retrofit and code based) and replacement (post-retrofit) equipment efficiencies.
- Estimate participant free-ridership to support the development of net-to-gross ratios and net savings values.
- Estimate first year and lifetime gross and net ex post impacts (therms).
- Develop gross and net realization rates (GRRs and NRRs) that can be used to estimate population level estimates of ex post gross and net savings (both first year and lifecycle).

2.2 STUDIED MEASURE GROUPS

The pool cover measures listed in the ESPI Uncertain List for 2015 are aggregate measures that are comprised of three unique deemed measure names. As presented in Table 2-1, all of the pool covers that were rebated by SCG in 2015 were designated for outdoor applications. In total, 36 sites claimed therms savings from the installation of a rebated pool cover. First year and lifecycle therms savings for each

measure type are also provided. Table 2-2 presents the percentage of first year and lifecycle therm savings[4] that the pool cover measure contributes to both SCG and SW portfolio level therm savings.

TABLE 2-1: FIRST YEAR AND LIFECYCLE THERM SAVINGS FOR DEEMED POOL COVER MEASURES

Measure Name	n	First Year Therm Savings	% First Year Therm Savings	Lifecycle Therm Savings	% Lifecycle Therm Savings
Large Outdoor Pool Cover	1	21,136	9%	126,815	9%
Pool Cover-Outdoor	18	96,111	40%	480,556	36%
Small Outdoor Pool Cover	17	122,012	51%	732,074	55%
All	**36**	**239,259**	**100%**	**1,339,445**	**100%**

TABLE 2-2: PERCENTAGE OF FIRST YEAR AND LIFECYCLE THERM SAVINGS FOR DEEMED POOL COVER MEASURES

2015 ESPI Measure	Percent of Portfolio First Year Therm Savings		Percent of Lifecycle Therm Savings	
	SW	SCG	SW	SCG
Pool Covers	0.58%	1.62%	0.29%	0.72%

As evidenced above, the pool cover measures that were identified in the ESPI decision represent roughly 0.29% of statewide and 0.72% of SCG portfolio lifecycle ex ante therm savings, respectively. Given the contribution to ex ante savings and the uncertainty surrounding several of the impact parameters associated with this measure, the evaluation team has conducted phone interviews and on-site verification for a sample of projects that were rebated in 2015. The evaluation team has used these data collection methods to estimate NTGRs and levels of free-ridership and has employed a gross realization rate (GRR) approach to estimate gross savings. The GRR refers to the approach of estimating site-specific savings values for a sample of participants, and developing a realization rate of savings (the ratio of aggregate ex post savings to aggregate ex ante savings for the sample) and applying the GRR to the ex ante savings value for the population to estimate ex post population level savings.

2.3 OVERVIEW OF IMPACT EVALUATION APPROACH

The ex post savings for the pool cover measures are estimated using the site-specific values collected using the phone surveys and on-site verification work along with typical weather data. The difference between the baseline energy consumption and installed case will provide the savings estimate for

[4] These savings do not include those associated with Codes and Standards.

installing a pool cover. This is done using TMY3 hourly weather data and an excel spreadsheet with hourly data. Per 2013 Title 24, all outdoor pools with gas or electric heating must have covers.[5]

For outdoor pools, code does not provide any specifics as to what type of pool cover must be installed, therefore the baseline for pools with no previous cover will be industry standard practice (ISP) which is a pool cover with a thermal resistance of 2.0.[6] If the outdoor pool has an existing pool cover, there are two possibilities. One, if the existing pool cover has remaining useful life, a dual baseline will be used. The first baseline will be a cover equivalent to the existing equipment for the remaining useful life (RUL) of the existing cover. The second baseline will depend on the R-value of the existing equipment. If it is less than ISP then the baseline is ISP. If not, the second baseline will continue to be the existing equipment. The second scenario is ROB where the baseline will be either ISP or the existing pool cover – whichever is more efficient.

To estimate the remaining useful life (RUL) of an existing pool cover for early replacement installations, evaluators collected information on the age and condition of the pre-existing pool cover, replacement practices and the history of past replacements. This information was garnered from phone interviews and on-site surveys with facility staff.

The Energy Smart Pools calculator has been used to calculate savings for sites where the installed pool cover is more efficient than code and industry standard practice. The following algorithms are consistent with the Energy Smart Pools calculator, and have been utilized to validate the results of the Energy Smart Pools calculator. The general method used to calculate savings is based off the following algorithm:

$$MMBtu_{savings} = \frac{(\sum q_{heater,base} - \sum q_{heater,install})}{100{,}000 * \eta_{heater}}$$

Where:

$MMBtu_{savings}$ = annual energy savings for the pool cover.

$\sum q_{heater,base}$ = the total energy that the gas heater requires to maintain temperature at the baseline condition, calculated as the sum of the hourly input, Btu.

[5] 2013 Title 24 Section 110.4, page 94. http://www.energy.ca.gov/2012publications/CEC-400-2012-004/CEC-400-2012-004-CMF-REV2.pdf

[6] The baseline research was completed for work paper WPSCGNRWH150309A. Market research says "The cover must have 1/8" thick (L), high-density polyethylene foam of thermal conductivity (K) Factor 0.25 BTU/sq. ft.-Hr-°F/inch (ASTM D2326). The new pool cover must cover at least 95% of the pool with a minimum R-value of 0.5 ft^2-hr-F/Btu (R=L/K)."

$\sum q_{heater,install}$ = the total energy that the gas heater requires to maintain temperature at the installed condition, calculated as the sum of the hourly input, Btu.

η_{heater} = efficiency of the heater.

The amount of energy that the heater has to put into the system is equivalent to the sum of all other heat transfer mechanisms. The different heat transfer mechanisms included for the pool are radiation from the sun to the pool, radiation from the pool to the environment, evaporation, convection from the surface of the pool, conduction to the ground and heating make up water. All of these mechanisms will either increase or decrease the temperature to varying degrees. Assuming that the heater is running, and keeping the pool at a constant temperature, the algorithm is:

$$q_{heater} = q_{solar} + q_{sky} + q_{conv} + q_{evap} + q_{cond} + q_{makeup}$$

Where:

q_{heater} = hourly energy required by the heater, Btu/hr.

q_{solar} = hourly solar radiation, Btu/hr.

q_{sky} = hourly radiation from the sky to the pool, Btu/hr.

q_{conv} = hourly heat from convection (free and forced), Btu/hr.

q_{evap} = hourly energy lost from evaporation, Btu/hr.

q_{cond} = hourly energy from the ground to the pool, Btu/hr.

q_{makeup} = the amount of energy required to heat the makeup water, Btu/hr.

Each heat transfer method has its own algorithm (or algorithms) that are used to calculate savings. The calculation methodology for each mechanism is not provided in this document, but the mechanisms that will affect the energy savings most significantly are detailed below.

Evaporation causes the pool to decrease in temperature in two ways; 1) by removing latent heat and 2) by increasing the amount of makeup water that is required. This issue is significantly diminished by installing the most basic cover. Since the baseline assumption for outdoor pools with existing covers is a pool cover that covers the entire pool, the amount of evaporation does not change significantly from the baseline case to the installed case. The largest driver of increased savings for pools with existing covers is

the decrease in radiative loses while the cover is on. The calculation for the radiation uses the following algorithm:

$$q_{sky} = h_{runv}A_{unc}(T_{sky} - T_{pool}) + h_{rcov}A_{cov}(T_{sky} - T_{cov})$$

Where:

q_{sky} = the amount of radiation heat transfer from the sky into the pool. When the temperature of the sky is higher than the temperature of the pool the sky will be radiating heat into the pool. When the pool is warmer than the sky the pool will radiate heat into the sky. This value will be reduced by adding a pool cover that has a higher insulation value than the baseline.

h_{runv} = the radiative heat transfer coefficient and is based on the temperature of the pool. Since this value is for the area of the pool that is not covered the temperature of the pool is the same as the surface temperature.

A_{unc} = the amount of area that the pool is not covered. When the entire pool is covered this value will be 0.

T_{sky} = the temperature of the sky in degrees Fahrenheit. This value is calculated using the temperature of the air and the dew point temperature. These values will be used based on the weather data for the nearest weather station, or the indoor air temperature.

T_{pool} = the temperature of the pool. The temperature set point of the pool will be collected during the phone survey or on-site.

h_{rcov} = the radiative heat transfer coefficient and is based on the temperature of the pool.

A_{cov} = the area of the pool that is covered.

T_{cov} = the temperature of the surface of the pool cover. The pool cover temperature is based on the temperature of the pool and the insulating value of the pool cover. If the pool cover does not have any insulation the pool cover temperature is the same as the pool temperature. The pool cover temperature will be calculated using the sky temperature, air temperature and the solar radiation from the weather files.

To estimate population savings for pool covers, a GRR approach has been used. A single GRR has been developed across the sample and applied to the pool cover population.

The remainder of this report will discuss how relevant impact parameters were evaluated for the ESPI pool cover measures, along with the following:

- Section 3 discusses the data sources that were utilized to estimate each of the individual measure parameters, the sample design, and resulting data used in the evaluation.
- Section 4 presents the methods used for estimating each individual impact parameter.
- Section 5 presents the net-to-gross analysis and resulting NTGR.
- Section 6 presents the final study results, including the gross and net realization rates and total population level ex post energy savings values.
- Section 7 presents the conclusions and recommendations.
- Appendix A presents supporting materials for the net-to-gross analysis.
- Appendix B presents a summary of key information collected as part of the on-site visits.
- Appendix AA presents the standardized high level savings for both gross and net first year and lifecycle.
- Appendix AB presents the standardized per unit savings for both gross and net first year and lifecycle.
- Appendix AC presents the summary of recommendations for the Response to Recommendations (RTR).

3 DATA SOURCES, SAMPLE DESIGN AND DATA COLLECTION

3.1 DATA SOURCES

The evaluation team utilized a variety of data sources to support the development of the site-specific estimates of gross and net ex post savings.

3.1.1 On-site Audits

The evaluation team conducted on-site audits for a sample of participants based on information that was gathered during the phone interview. The purpose of these audits was to collect site-specific information that could be used to support the parameter estimates that are used in the impact algorithm. On-site surveyors verified that measures that were rebated were installed and operable. In the event that rebated quantities were not consistent with the quantities found on site, the surveyors also quantified and detailed the reason for that inconsistency.

Surveyors also collected information regarding pool characteristics (length, width, depth and temperature), pool cover characteristics (equipment model information, thickness and coverage area) and pool heater characteristics (heating capacity and efficiency). Surveyors also verified the pool temperature, heater nameplates and assessed the wind protection and shading factor. They also verified the pool cover schedules and the pool activity level.

Surveyors also attempted to collect information on the baseline equipment that had been replaced. In the event that data was not available, self-report data was gathered on the pre-existing cover to help define the baseline condition.

3.1.2 Participant Phone Survey

The evaluation team conducted in depth interviews to recruit customers for the on-site verification as well as to collect data useful for the net-to-gross (NTG) analysis. Another key component of the phone interview was to gather self-report data on pool schedules and activity levels as well as any information regarding the installed cover (as well as any previous covers that had been installed in the past). These data were used to ascertain the eligibility of the measure and the existing pool cover (if applicable). This process informed the on-site data collection process.

3.2 ONSITE AND PHONE SURVEY ACHIEVED SAMPLE DESIGN

As presented in Table 2-1, there were 36 unique sites that participated in 2015. Given the low number of unique contacts participating in the frame, the evaluation team issued a data request to SCG to garner more specific customer contact information than is available in the Customer Information System (CIS) and tracking data, along with account representative information (where available). Ultimately, as result of the data request, there were 25 unique contacts representing the 36 sites. The evaluation team attempted a census on these projects to try and recruit as many customers as possible to take part in the phone interview and on-site verification. Table 3-1 below presents the on-site and phone survey sample quotas along with the achieved sample design.

TABLE 3-1: 2015 POOL COVER PHONE SURVEY AND ON-SITE ACHIEVED DATA COLLECTION

PA	Measure Name	Phone Survey			On-site Verification		
		Quota	Achieved	% LC Savings	Quota	Achieved	% LC Savings
SCG	Pool Covers	20 to 25	18	45%	10 to 15	10	36%

Given that there were only 25 unique contacts, the evaluation team targeted all participants, but anticipated that recruitment would not be 100%. The phone survey target was set between 20 and 25. The evaluation team conducted phone interviews for 18 sites. The in-depth interviews represented roughly 45% of the ex ante lifecycle therm savings for the measure.

After performing a desk review on all the in-depth interviews, the evaluation team conducted 10 on-site visits. The verification analysis represented 36% of lifecycle therm savings.

3.3 DATA COLLECTION

The evaluation team collected pool cover make and model numbers and cover R-values during the initial phone interviews to make an initial assessment of potential savings. If the pool cover that was installed was equivalent to the baseline R-value or the phone survey determined that the pool cover was a like-for-like replacement, then the evaluation team determined that there would be no savings. When in-depth interviews were completed, but the contact was unable to provide documentation of the pool cover R-value, then the evaluation team attempted to schedule and complete an on-site verification. Of the 18 phone surveys that were completed, 7 of them were determined to have installed covers that were industry standard practice (ISP) from the phone interview alone. The other 11 phone surveys did not provide enough information on the type of pool cover or if the cover was higher than ISP. Of these, 10 sites were visited. The one remaining site was not visited, but as discussed in more detail below, a follow-up phone interview was conducted and sufficient information was gathered over the phone in order to develop an estimate of savings.

During the on-site verification, the evaluation team verified that all pool covers were installed and in operation at the time of the on-site visit. In addition to verifying that the pool covers were installed, the auditor also recorded the make and model number of the cover. The majority of sites had the same type of cover installed. Over 60% of the pools verified on site installed the Spectrum Aquatics Thermal-King Pool Cover, while approximately 30% of the pools installed T-Star Enterprises EnergySaver XER pool blanket.

After completing the on-site visits and collecting the pool cover and heater specifications, the evaluation team determined that only one of the covers was eligible for savings. The other pools either had ISP pool covers or were like-for-like replacement (the customer installed the exact same cover as they had replaced).

In addition to the on-site audits and the in-depth interviews, the evaluation team also contacted the manufacturers for the three different pool cover types, T-Star, Spectrum Aquatics and Thermgard. The purpose of these phone calls was to ascertain the R-value of each cover and see what distinguishes one pool cover from the other. The evaluation team discovered that the way in which each manufacturer calculates the R-value differs, which makes it difficult to compare them directly. For instance, one company takes the R-value as:

$$R = \frac{1}{k}$$

Where:
k = thermal conductivity of material

Using this approach, and using a thermal conductivity of 0.25 btu/ft²·°F·h, the R-value is 4 ft²·°F·h/Btu. This is the value used by one of the pool covers. The second approach is that the layers need to be summed, and that the actual thickness needs to be used:

$$R = \frac{l_1}{k_1} + \frac{l_2}{k_2} + \frac{l_3}{k_3}$$

Where:
l_1 = thickness of material #1
k_1 = thermal conductivity of material #1
l_2 = thickness of material #2
k_2 = thermal conductivity of material #2
l_3 = thickness of material #3
k_3 = thermal conductivity of material #3

Using this approach – because the thickness of each material is so small (approx. 1/8 in) and a thermal conductivity of the foam is 0.25 btu/ft²·°F·h – the R-value is approximately 0.5 ft²·°F·h/Btu. These two

methods yield very different values and therefore cannot be compared directly. The evaluation team verified the thermal conductivity of the foam in both the Thermgard and the Spectrum Aquatics pool covers to be 0.25 btu/ft²·°F·h. The T-Star cover R-value could not be verified, but based on the workpapers, appears to be approximately 0.5 btu/ft²·°F·h. In order to compare the pool covers, the evaluation has used the approach that assumes the thickness is one, since all of the layers are not available for each different pool cover.

4 GROSS IMPACT METHODOLOGY

4.1 FIRST YEAR IMPACT

As discussed above, of the 18 sites that were evaluated as part of this study, 16 either installed a like-for-like pool cover or installed an industry standard pool cover, resulting in zero savings. Of the two remaining sites, one was visited on site and was eligible for savings based on the installed equipment.

An on-site visit was attempted for the final site, but instead a follow-up interview was conducted instead to gather the necessary information. This site installed a pool cover that is higher than ISP, but the pool operation did not result in any savings. The pool is seasonal, and therefore only open in the summer. The rest of the year, it is closed and drained. While the pool is open – late May to early August – the cover is used. The site contact reported that they rely on solar heating as the primary heating type during this time period and that the gas heater is never used. The pool temperature is set to 80°F, but with the cover rarely goes below 81°F. Since this is the case, the pool heater never runs, resulting in zero savings. Because this pool is seasonal, and closed during the on-site period no on-site was necessary. During the follow up call, the evaluation team was able to verify crucial information, such as operation, desired temperature and heating fuel type with the site contact.

The final pool visited on site has a cover R-value higher than ISP and has a heater that runs while the cover is in use. Using data collected from the on-site, the evaluation team compared the installed pool with an R-value of 4.0 to a baseline pool cover that has an R-value of 2.0. In both the baseline and installed cases, the pool has an insulated cover. The evaluation team used the SCG Pool Cover and Pool Heater Energy Savings calculator to calculate savings for the site. Site-specific values such as pool area, average depth, desired temperature, opening and closing days, hours of operation, heater efficiency, heater capacity and proposed cover R-value were used. The final savings for the site was determined to be 170 therms because the pool was small and the amount of time that the pool is heated is only the summer.

4.2 LIFECYCLE IMPACT

The lifecycle impact is the amount of savings over the life of the measure. For pool covers, the estimated useful life (EUL) is five years. In order for the pool cover to be eligible for the program, it must have an extended warranty for up to five years. Using an EUL of five years results in a lifetime savings of 850 therms for the one pool cover that was more efficient than ISP.

Durability is the main differentiating factors for these insulated pool covers, since the number one reason the customer replaces the pool cover is that they wear out or tear. The auditor also verified the condition

of the installed pool cover to make sure that they would last the remaining useful life. Only one of the thirteen pool covers that were verified onsite showed signs of wearing out, such as, holes or tears in the cover.

5 NET-TO-GROSS ANALYSIS

The in-depth interviews conducted for this evaluation served not only to verify the use of rebated pool covers and to examine the pool and surrounding areas, but also to acquire information about the influence of the program on the purchase of the new pool covers. The questions asked of interviewees were designed to gather information that allowed the evaluation team to estimate participant free-ridership to support the development of net-to-gross ratios (NTGRs) and net savings values. A standard battery of NTG questions were asked of the interviewees who purchased pool covers through SCG's program. Two main types of customers participated in SCG's program through the purchase of commercial pool covers – schools/universities and cities that operate recreational pool centers.

These pools were represented in community recreation centers and schools. The discussion in this subsection focuses on the responses given by customers who were interviewed and visited onsite. The approach for estimating NTGRs for these customers was based on the large non-residential free-ridership approach developed by the NTGR Working Group and documented in the *Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Non-residential Customers*.

The in-depth interviews revealed that virtually all of the customers who purchased pool covers did so to replace old pool covers that were described as "worn out" or "in bad condition." In a few cases, a cover was purchased where one had not been used before. The most common reasons given for the purchase of covers were to reduce energy costs and because it is standard practice to keep pools covered. When asked about whether pool covers would have been purchased without the availability of the rebate, more than half the respondents indicated that they would have purchased the exact same type of cover at the same time with a high likelihood (70% - 100% probability), indicating free-ridership. A set of other respondents noted that there might have been a delay in the purchase, but covers would have been purchased.

The resulting NTGRs were calculated as the average of three program attribution indices (PAI) known as PAI-1, PAI-2, and PAI-3. Each of these scores represents the highest response or the average of several responses given to one or more questions about the decision to install a program measure.

- **Program Attribution Index 1 (PAI–1)** is a score that reflects the influence of the most important of various program-related elements in the customer's decision to select a given program measure. The PAI-1 score is calculated as the highest program influence factor divided by the sum of the highest program influence factor and the highest non-program influence factor. Some example non-program factors are: previous experience with the measure, recommendation from an engineer, standard practice, corporate policy, compliance with rules or regulations,

organizational maintenance or equipment replacement policies and "other – specify." Payback is treated as a program influence factor if the rebate/incentives played a major role in meeting payback criteria, but is treated as a non-program influence factor if it did not play a major role in meeting payback criteria.

- **Program Attribution Index 2 (PAI–2)** is a score that captures the perceived importance of program factors (including rebate/incentives, recommendation, and training) relative to non-program factors in the decision to implement the specific measure that was eventually adopted or installed. This score is determined by asking respondents to assign importance values to the program and most important non-program influences so that the two total 10. The program influence score is adjusted (i.e., divided by 2) if respondents had made the decision to install the measure before learning about the program. The final score is divided by 10 to be put into decimal form, thus making it consistent with PAI-1.
- **Program attribution index 3 (PAI–3)** is a score that captures the likelihood of various actions the customer might have taken at the given time and in the future if the program had not been available (the counterfactual). This score is calculated as 10 minus the likelihood that the respondent would have installed the same measure in the absence of the program. The final score is divided by 10 to put into decimal form, thus making it consistent with PAI-1 and PAI-2.

The NTGR was estimated as an average of these three scores. If one of the scores was not available (generally due to respondents giving a "don't know" or "refusal" response), then the NTGR was estimated as the average of the two available score. If two or more scores were missing, results were discarded from the calculation.

Table 5-1 presents the ex post NTGR scores that were developed – using the above methodology – weighted by ex post lifecycle therm savings. Also presented are the ex ante NTG ratios. Given the fact that there were zero savings for all but one pool cover participant, the resulting ex post NTG ratio represents only that customer (all other participants have zero weight).

TABLE 5-1: EX ANTE AND EXPOST NET-TO-GROSS RATIOS FOR DEEMED POOL COVERS

Measure	Weight	n	Ex Ante NTG	Ex Post NTG
Pool Covers	Therm	1	0.75	0.68

6 EVALUATION RESULTS

This section of the report presents the gross and net realization rates that the evaluation team developed for the 2015 deemed pool cover measure. These results are presented for both first year and lifecycle therm savings.

6.1 GROSS FIRST YEAR REALIZATION RATES

The evaluation team estimated gross realization rates (GRR) by examining the ratio of the aggregate evaluated gross savings to the aggregated ex ante gross savings. The evaluation team utilized the following algorithm to develop customer specific GRRs:

$$Gross\_Realization\_Rate = \frac{\sum_{i=1}^{n} Gross\_Ex\_Post\_Impact_i}{\sum_{i=1}^{n} Gross\_Ex\_Ante\_Impact_i}$$

Where:

$Gross\_Ex\_Post\_Impact_i$ = the site-specific gross ex post impact estimate for customer i in the population.

$Gross\_Ex\_Ante\_Impact_i$ = the site-specific gross ex ante impact estimate for customer i in the population.

Table 6-1 below presents the population level first year therm gross realization rates for the pool cover measure along with the aggregate ex ante and ex post first year therm savings. Given the fact that the GRR is less than 1% - ex post savings were zero for all but one of verified measures – the corresponding relative precision is high (152%), since it is proportional to one over the GRR. However, the margin error around the mean at the 90% confidence interval is 0.002. This extremely low GRR is driven by the fact that 16 of the 18 sites either installed a like-for-like pool cover or installed an industry standard pool cover, resulting in zero savings. Furthermore, one additional site had zero savings due to the way the pool was operated.

TABLE 6-1: 2015 FIRST YEAR GROSS THERM REALIZATION RATES FOR POOL COVERS

Measure	First Year Gross Therm Savings				
	Ex Ante Savings	Ex Post Savings	GRR	Relative Precision	Margin of Error
Pool Covers	239,259	323	0.13%	151.7%	0.002

6.2 GROSS LIFECYCLE REALIZATION RATES

Table 6-2 presents the population level lifecycle GRRs for the pool cover measure along with the aggregate ex ante and ex post lifecycle therm savings. The corresponding relative precision and margin of error are also presented. The evaluation team did not conduct an effective useful life (EUL) analysis for the pool cover measure (ex ante EUL was used). For the one measure with positive therm savings, the EUL was 5 years, however, for other measures that were evaluated that had zero savings, the EUL was either 5 or 6 years. This explains the slight drop in the lifecycle GRR relative to the first year GRR.

TABLE 6-2: 2015 LIFECYCLE GROSS THERM REALIZATION RATES FOR POOL COVERS

Measure	Lifecycle Gross Therm Savings				
	Ex Ante Savings	Ex Post Savings	GRR	Relative Precision	Margin of Error
Pool Covers	1,339,445	1,661	0.12%	151.7%	0.002

6.3 NET FIRST YEAR REALIZATION RATES

The evaluation team estimated the net ex post impacts in a similar manner as the gross impacts, however, the NTG ratios were multiplied by the gross impacts. The resulting net realization rates (NRR) represent the ratio of aggregated evaluated net savings to the aggregated ex ante net savings. The evaluation team utilized the following algorithm to develop customer specific NRRs:

$$Net\_Realization\_Rate = \frac{\sum_{i=1}^{n} Net\_Ex\_Post\_Impact_i}{\sum_{i=1}^{n} Net\_Ex\_Ante\_Impact_i}$$

Where:

$Net\_Ex\_Post\_Impact_i$ = the site-specific net ex post impact estimate for customer i in the population

$Net\_Ex\_Ante\_Impact_i$ = the site-specific net ex ante impact estimate for customer i in the population.

Table 6-3 below presents the population level first year therm net realization rates for the pool cover measure along with the aggregate ex ante and ex post first year therm savings. The net realization rate is impacted by the difference in ex ante and ex post gross savings along with the differences between the ex ante and ex post NTG ratios. As presented in Table 5-1, the ex post NTG ratio for pool cover measures was roughly 10% less than the ex ante claim. The NRR differs from the GRR by the same order of

magnitude. The overall first year NRR is 0.12%. Because the NTGR is based on a sample size of only one participant with non-zero savings, the relative precision and margin of error could not be estimated for the NRR.

TABLE 6-3: 2015 FIRST YEAR NET THERM REALIZATION RATES FOR POOL COVERS

Measure	First Year Net Therm Savings		
	Ex Ante Savings	Ex Post Savings	NRR
Pool Covers	181,386	218	0.12%

6.4 NET LIFECYCLE REALIZATION RATES

Table 6-4 presents the population level lifecycle NRRs for the pool cover measure along with the aggregate ex ante and ex post lifecycle therm savings. Again, the evaluation team did not conduct an effective useful life (EUL) analysis for the pool cover measure (ex ante EUL was used), however, differences in ex ante EULs corresponds to a slight difference in the lifecycle NRR relative to the first year. As stated above, because the NTGR is based on a sample size of only one participant with non-zero savings, the relative precision and margin of error could not be estimated for the NRR.

TABLE 6-4: 2015 LIFECYCLE NET THERM REALIZATION RATES FOR POOL COVERS

Measure	Lifecycle Net Therm Savings		
	Ex Ante Savings	Ex Post Savings	NRR
Pool Covers	1,028,605	1,122	0.11%

7 CONCLUSIONS AND RECOMMENDATIONS

Strong consideration should be given to no longer offering the commercial pool cover measure. If this measure is to continue to be offered, customers must be required to install covers with R values that exceed both their pre-existing pool cover, as well as the industry standard practice value of R-2.

Of the 18 sites that were evaluated as part of this study, 16 either installed a like-for-like pool cover or installed an industry standard pool cover, resulting in zero savings. One additional site had zero savings due to the way the pool was operated. Overall, the net lifecycle realization rate was only 0.1 %.

These results are documented in more detail in Section 4 of the report.

APPENDIX A NTG MATERIALS

NET-TO-GROSS APPENDIX MATERIALS

This appendix includes the following documents:

The Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers, developed by the Nonresidential Net-to-Gross Working Group in October 2012, which describes the algorithm used to estimate the NTGRs. This method has been used for the 2013-15 ESPI nonresidential impact evaluations.

The guide used for the in-depth interviews.

The net-to-gross ratios and corresponding program attribution index scores for all 18 interview respondents.

An example calculation for a NTGR score. Note that an excel version of this calculator was posted to the Commercial PCG Basecamp project on January 30th, 2017.

Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers

Prepared for the Energy Division, California Public Utilities Commission

By

The Nonresidential Net-To-Gross Ratio Working Group

October 16, 2012

TABLE OF CONTENTS

Acknowledgments

As part of the evaluation of the 2010-12 energy efficiency programs designed and implemented by the four investor-owned utilities (Pacific Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, and San Diego Gas and Electric Company) and third parties, the Energy Division of the California Public Utilities Commission (CPUC) re-formed the nonresidential net-to-gross ratio working group that was originally formed during the PY2006-2008 evaluation. The main purpose of this group was to furtherrefine and improve the standard net-to-gross methodological framework that was developed during the PY2006-2008 evaluation cycle. This framework includes decision rules, for integrating in a systematic and consistent manner the findings from both quantitative and qualitative information in estimating net-to-gross ratios. The working group, listed alphabetically, is composed of the following evaluation professionals:

- Jennifer Fagan, Itron, Inc.
- Nikhil Gandhi, Strategic Energy Technologies, Inc.
- Kay Hardy, Energy Division, CPUC
- Jeff Hirsch, James J. Hirsch & Associates
- Richard Ridge, Ridge & Associates
- Mike Rufo, Itron, Inc.
- Claire Palmgren, KEMA
- Valerie Richardson, KEMA
- Philippus Willems, PWP, Inc.

A public webinar was conducted to obtain feedback from the four investor-owned utilities and other interested stakeholders. The questionnaire was then pre-tested and, based on the pre-test results, finalized in December 2011.

1. OVERVIEW OF THE LARGE NONRESIDENTIAL FREE RIDERSHIP APPROACH

The methodology described in this section was developed to address the unique needs of Large Nonresidential customer projects developed through energy efficiency programs offered by the four California investor-owned utilities and third-parties. This method relies exclusively on the Self-Report Approach (SRA) to estimate project and program-level Net-to-Gross Ratios (NTGRs), since other available methods and research designs are generally not feasible for large nonresidential customer programs. This methodology provides a standard framework, including decision rules, for integrating findings from both quantitative and qualitative information in the calculation of the net-to-gross ratio in a systematic and consistent manner. This approach is designed to fully comply with the *California Energy Efficiency Evaluation: Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals* (Protocols) and the *Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report Approaches* (Guidelines)**.**

This approach preserves the most important elements of the approaches previously used to estimate the NTGRs in large nonresidential customer programs. However, it also incorporates several enhancements that are designed to improve upon that approach, for example:

- The method incorporates a 0 to 10 scoring system for key questions used to estimate the NTGR, rather than using fixed categories that are assigned weights.

- The method asks respondents to jointly consider and rate the importance of the many likely events or factors that may have influenced their energy efficiency decision making, rather than focusing narrowly on only their rating of the program's importance. This question structure more accurately reflects the complex nature of the real-world decision making and should help to ensure that all non-program influences are reflected in the NTGR assessment in addition to program influences.

It is important to note that the NTGR approach described in this document is a general framework, designed to address all large nonresidential programs. In order to implement this approach on a program-specific basis, it also needs to be customized to reflect the unique nature of the individual programs.

2. BASIS FOR SRA IN SOCIAL SCIENCE LITERATURE

The social sciences literature provides strong support for use of the methods used in the SRA to assess program influence. As the *Guidelines* notes,

> More specifically, the SRA is a mixed method approach that involves asking one or more key participant decision-makers a series of structured and open-ended questions about whether they would have installed the same EE equipment in the

absence of the program as well as questions that attempt to rule out rival explanations for the installation (Weiss, 1972; Scriven, 1976; Shadish, 1991; Wholey et al., 1994; Yin, 1994; Mohr, 1995). In the simplest case (e.g., residential customers), the SRA is based primarily on quantitative data while in more complex cases the SRA is strengthened by the inclusion of additional quantitative and qualitative data which can include, among others, in-depth, open-ended interviews, direct observation, and review of program records. Many evaluators believe that additional qualitative data regarding the economics of the customer's decision and the decision process itself can be very useful in supporting or modifying quantitatively-based results (Britan, 1978; Weiss and Rein, 1972; Patton, 1987; Tashakkori and Teddlie, 1998).[1]

More details regarding the philosophical and methodological underpinnings of this approach are in Ridge, Willems and Fagan (2009), Ridge, Willems, Fagan and Randazzo (2009) and Megdal, Patil, Gregoire, Meissner, and Parlin (2009). In addition to these two articles, Appendix A provides an extensive listing of references in the social sciences literature regarding the methods employed in the SRA.

3. FREE RIDERSHIP ANALYSIS BY PROJECT TYPE

There are three levels of free-ridership analysis. The most detailed level of analysis, the **Standard – Very Large Project** NTGR, is applied to the largest and most complex projects (representing 10 to 20% of the total) with the greatest expected levels of gross savings[2] The **Standard** NTGR, involving a somewhat less detailed level of analysis, is applied to projects with moderately high levels of gross savings. The least detailed analysis, the **Basic** NTGR, is applied to all remaining projects. Evaluators must exercise their own discretion as to what the appropriate thresholds should be for each of these three levels.

4. SOURCES OF INFORMATION ON FREE RIDERSHIP

There are five sources of free-ridership information in this study. Each level of analysis relies on information from one or more of these sources. These sources are described below.

1. **Program Files**. As described in previous sections of this report, programs often maintain a paper file for each paid application. These can contain various pieces of information which are relevant to the analysis of free-ridership, such as letters written by the utility's customer representatives that document what the customer had planned to do in the absence of the rebate and explain the customer's motivation for implementing the efficiency measure. Information on the measure payback with and without the rebate may also be available.

[1] *Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report Approaches*, October 15, 2007, pg. 3.

[2] Note that we do not refer to an Enhanced level of analysis, since this is defined by the Protocols to involve the application of two separate analysis approaches, such as billing analysis or discrete choice modeling.

2. **Decision-Maker Surveys**. When a site is recruited, one must also determine who was involved in the decision-making process which led to the implementation of measures under the program. They are asked to complete a Decision Maker survey. This survey obtains highly structured responses concerning the probability that the customer would have implemented the same measure in the absence of the program. First, participants are asked about the timing of their program awareness relative to their decision to purchase or implement the energy efficiency measure. Next, they are asked to rate the importance of the program versus non-program influences in their decision making. Third, they are asked to rate the significance of various factors and events that may have led to their decision to implement the energy efficiency measure at the time that they did. These include:

    - the age or condition of the equipment,
    - information from a feasibility study or facility audit
    - the availability of an incentive or endorsement through the program
    - a recommendation from an equipment supplier, auditor or consulting engineer
    - their previous experience with the program or measure,
    - information from a program-sponsored training course or marketing materials provided by the program
    - the measure being included as part of a major remodeling project
    - a suggestion from program staff, a program vendor, or a utility representative
    - a standard business practice
    - an internal business procedure or policy
    - stated concerns about global warming or the environment
    - a stated desire to achieve energy independence.

    In addition, the survey obtains a description of what the customer would have done in the absence of the program, beginning with whether the implementation was an early replacement action. If it was not, the decision maker is asked to provide a description of what equipment would have been implemented in the absence of the program, including both the efficiency level and quantities of these alternative measures. This is used to adjust the gross engineering savings estimate for partial free ridership, as discussed in Section 5.2.

    This survey contains a core set of questions for **Basic** NTGR sites, and several supplemental questions for both **Standard and Standard – Very Large** NTGR sites For example, if a Standard or Standard-Very Large respondent indicates that a financial calculation entered highly into their decision, they are asked additional questions about their *financial criteria* for investments and their rationale for the current project in light of them. Similarly, if they respond that a *corporate policy* was a primary consideration in their decision, they are asked a series of questions about the specific policy that led to their adoption of the installed measure. If they indicate the installation was a *standard practice*, there are supplemental questions to understand the origin and evolution of that standard practice within their

organization. These questions are intended to provide a deeper understanding of the decision making process and the likely level of program influence versus these internal policies and procedures. Responses to these questions also serve as a basis for consistency checks to investigate conflicting answers regarding the relative importance of the program and other elements in influencing the decision. In addition, **Standard – Very Large** sites may receive additional detailed probing on various aspects of their installation decision based on industry- or technology-specific issues, as determined by review of other information sources. For Standard-Very Large sites all these data are used to construct an internally consistent "story" that supports the NTGR calculated based on the overall information given.

3. **Vendor Surveys**. A Vendor Survey is completed for all **Standard** and **Standard-Very Large** NTGR sites that utilized vendors, and for **Basic** NTGR sites that indicate a high level of vendor influence in the decision to implement the energy efficient measure. For those sites that indicate the vendor was very influential in decision making, the vendor survey results enter directly into the NTGR scoring. The vendor survey findings are also be used to corroborate Decision Maker findings, particularly with respect to the vendor's specific role and degree of influence on the decision to implement the energy efficient measure. Vendors are queried on the program's significance in their decision to recommend the energy efficient measures, and on their likelihood to have recommended the same measure in the absence of the program. Generally, the vendors contacted as part of this study are contractors, design engineers, distributors, and installers.

4. **Utility and Program Staff Interviews**. For the Standard and Standard-Very Large NTGR analyses, interviews with utility staff and program staff are also conducted. These interviews are designed to gather information on the historical background of the customer's decision to install the efficient equipment, the role of the utility and program staff in this decision, and the name and contact information of vendors who were involved in the specification and installation of the equipment.

5. **Other information**. For **Standard – Very Large Project** NTGR sites, secondary research of other pertinent data sources is performed. For example, this could include a review of standard and best practices through industry associations, industry experts, and information from secondary sources (such as the U.S. Department of Energy's Industrial Technologies Program, Best Practices website URL, http://www1.eere.energy.gov/industry/bestpractices/). In addition, the Standard- Very Large NTGR analysis calls for interviews with other employees at the participant's firm, sometimes in other states, and equipment vendor experts from other states where the rebated equipment is being installed (some without rebates), to provide further input on standard practice within each company.

Table 1 below shows the data sources used in each of the three levels of free-ridership analysis. Although more than one level of analysis may share the same source, the amount of information that is utilized in the analysis may vary. For example, all three levels of analysis obtain core question data from the Decision Maker survey.

Table 1: Information Sources for Three Levels of NTGR Analysis

	Program File	Decision Maker Survey Core Question	Vendor Surveys	Decision Maker Survey Supplemental Questions	Utility & Program Staff Interviews	Other Research Findings
Basic NTGR	√	√	√[1]		√[2]	
Standard NTGR	√	√	√[1]	√	√	
Standard NTGR - Very Large Projects	√	√	√[3]	√	√	√

[1]Only performed for sites that indicate a vendor influence score (N3d) greater than maximum of the other program element scores (N3b, N3c, N3g, N3h, N3l).

[2]Only performed for sites that have a utility account representative

[3]Only performed if significant vendor influence reported or if secondary research indicates the installed measure may be becoming standard practice.

A copy of the complete survey forms (with lead-in text and skip patterns) are available upon request.

5. NTGR FRAMEWORK

The Self-Report-based Net-to-Gross analysis relies on responses to a series of survey questions that are designed to measure the influence of the program on the participant's decision to implement program-eligible energy efficiency measure(s). Based on these responses, a NTGR is derived based on responses to a set of "core" NTGR questions.

5.1. NTGR Questions and Scoring Algorithm

A self-report NTGR is computed for all NTGR levels using the following approach. Adjustments may be made for **Standard – Very Large** NTGR sites, if the additional information that is collected is inconsistent with information provided through the Decision Maker survey.

The NTGR is calculated as an average of three scores. Each of these scores represents the highest response or the average of several responses given to one or more questions about the decision to install a program measure.

- **Program attribution index 1 (PAI–1) score** that reflects the influence of the **most important** of various program and program-related elements in the

customer's decision to select the specific program measure at this time. Program influence through vendor recommendations is also incorporated in this score.

- **Program attribution index 2 (PAI–2) score** that captures the perceived importance of the program (whether rebate, recommendation, training, or other program intervention) relative to non-program factors in the decision to implement the specific measure that was eventually adopted or installed. This score is determined by asking respondents to assign importance values to both the program and most important non-program influences so that the two total 10. The program influence score is adjusted (i.e., divided by 2) if respondents say they had already made their decision to install the specific program qualifying measure before they learned about the program.

- **Program attribution index 2 (PAI–3) score** that captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available (the counterfactual).

When there are multiple questions that feed into the scoring algorithm, as is the case for both the **PAI-1** and **PAI-3** scores, the maximum score is always used. The rationale for using the maximum value is to capture the most important element in the participant's decision making. Thus, each score is always based on the strongest influence indicated by the respondent. However, high scores that are inconsistent with other previous responses trigger consistency checks and can lead to follow-up questions to clarify and resolve the discrepancy.

The calculation of each of the above scores is discussed below. For each score, the associated questions are presented and the computation of each score is described.

5.1.1. PAI–1 score

For the Decision Maker, the questions asked are:
I'm going to ask you to rate the importance of the program as well as other factors that might influence your decision to implement [MEASURE.] Think of the degree of importance as being shown on a scale with equally spaced units from 0 to 10, where 0 means not at all important and 10 means very important, so that an importance rating of 8 shows twice as much influence as a rating of 4.

Now, using this 0 to 10 rating scale, where 0 means "Not at all important" and 10 means "Very important," please rate the importance of each of the following in your decision to implement this specific [MEASURE] at this time.

- Availability of the PROGRAM rebate

- Information provided through a recent feasibility study, energy audit or other types of technical assistance provided through PROGRAM

- Information from PROGRAM training course

- Information from other PROGRAM marketing materials
- Suggestion from program staff
- Suggestion from your account rep
- Recommendation from a vendor/supplier (If a score of greater than 5 is given, a vendor interview is triggered)

For the Vendor, the questions asked (if the interview is triggered) are:
I'm going to ask you to rate the importance of the [PROGRAM] in influencing your decision to recommend [MEASURE] to [CUSTOMER] and other customers. Think of the degree of importance as being shown on a scale with equally spaced units from 0 to 10, where 0 means not at all important and 10 means very important, so that an importance rating of 8 shows twice as much influence as a rating of 4.

1. Using this 0 to 10 scale where 0 is 'Not at all important" and 10 is "Very Important," how important was the PROGRAM, including incentives as well as program services and information, in influencing your decision to recommend that CUSTOMER install the energy efficiency MEASURE at this time?

2. And using a 0 to 10 likelihood scale, where 0 denotes "not at all likely" and 10 denotes "very likely," if the PROGRAM, including incentives as well as program services and information, had not been available, what is the likelihood that you would have recommended this specific energy efficiency MEASURE to CUSTOMER?
3. Now, using a 0 to 100 percent scale, in what percent of sales situations did you recommend MEASURE before you learned about the [PROGRAM]?
4. And using the same 0 to 100 percent scale, in what percent of sales situations do you recommend MEASURE now that you have worked with the [PROGRAM]?
5. And, using the same 0 to 10 scale where 0 is "Not at all important" and 10 is "Very important", how important in your recommendation were:
    a. Training seminars provided by UTILITY?
    b. Information provided by the UTILITY website?
    c. Your firm's past participation in a rebate or audit program sponsored by UTILITY?

If the Vendor interview is triggered, a score is calculated that captures the highest degree of program influence on the vendor's recommendation. This score (VMAX) is calculated as the MAXIMUM value of the following:

1. The response to question 1
2. 10 minus the response to question 2
3. The response to question 4 minus the response to question 3, divided by 10
4. The response to question 5a.
5. The response to question 5b.
6. The response to question 5c.

Note that vendors are asked an additional question regarding other ways that their recommendations regarding the measure might have been influenced. Their responses are not used in the direct calculation of the NTGR but are potentially useful in making adjustments to the core NTGR.

The PAI–1 score is calculated as:
The highest program influence score divided by the sum of the highest program influences (i.e., the responses to the first six decision maker questions) plus the highest non-program influence score, multiplied by 10. and, if the vendor interview has been triggered, the VMAX score multiplied by the score the decision makers assigned to the vendor recommendation.

5.1.2. PAI–2 score

The questions asked are:

1. Did you learn about PROGRAM BEFORE or AFTER you decided to implement the specific MEASURE that was eventually adopted or installed?

2. Now I'd like to ask you a last question about the importance of the program to your decision as opposed to other factors that may have influenced your decision. Again using the 0 to 10 rating scale we used earlier, where 0 means "Not at all important" and 10 means "Very important," please rate the overall importance of PROGRAM versus the most important of the other factors we just discussed in your decision to implement the specific MEASURE that was adopted or installed. This time I would like to ask you to have the two importance ratings -- the program importance and the non-program importance -- total 10.

The PAI–2 score is calculated as:
The importance of the program, on the 0 to 10 scale, to question 2. This score is reduced by half if the respondent learned about the program after the decision had been made.

5.1.3. PAI–3 Score

The questions asked are:

1. Now I would like you to think about the action you would have taken with regard to the installation of this equipment if the &PROGRAM had not been available.

Using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if PROGRAM had not been available, what is the likelihood that you would have installed exactly the same program-qualifying efficiency equipment that you did in this project?

The PAI-3 score is calculated as:

10 minus the likelihood of installing the same equipment

5.1.4. The Core NTGR

The self-reported core NTGR in most cases is simply the average of the PAI-1, PAI-2, and PAI-3 scores, divided by 10. The one exception to this is when the respondent indicates a 10 in 10 probability of installing the same equipment at the same time in the absence of the program, in which case the NTGR is based on the average of the PAI-2 and PAI-3 scores only.

5.2. Data Analysis and Integration

The calculation of the Core NTGR is fairly mechanical and is based on the answers to the closed-ended questions. However, the reliance of the Standard NTGR – Very Large on more information from so many different sources requires more of a case study level of effort. The SRA Guidelines point out that a case study is one method of assessing both quantitative and qualitative data in estimating a NTGR. A case study is an organized presentation of all these data available about a particular customer site with respect to all relevant aspects of the decision to install the efficient equipment. In such cases where multiple interviews are conducted eliciting both quantitative and qualitative data and a variety of program documentation has been collected, one will need to integrate all of this information into an internally consistent and coherent story that supports a specific NTGR.

The following data sources should be investigated and reviewed as appropriate to supplement the information collected through the decision maker interviews.

- Account Representative Interview
- Utility Program Manager/Staff Interview
- Utility Technical Contractor Interview
- Third party Program Manager Interview
- Evaluation Engineer Interview
- Gross Impact Site Plan/Analysis Review
- Corporate Green/Environmental Policy Review (if mentioned as important)
- Corporate Standard Practice Review (if mentioned as important)
- Industry Standard Practice Review (if mentioned as important)
- Corporate payback review (if mentioned as important)
- Review relevant codes and standards, including regulatory requirements
- Review industry publications, websites, reports such as the Commercial Energy Use Survey, historical purchase data of specific measures etc.

As detailed in the Self-Report NTGR Guidelines, when complementing the quantitative analysis of free-ridership with additional quantitative and qualitative data from multiple respondents and other sources, there are some basic concerns that one must keep in mind. Some of the other data – including interviews with third parties who were involved in the decision to install the energy efficient equipment – may reveal important influences on the customer's decision to install the qualifying program measure. When one chooses to

incorporate other data, one should keep the following principles in mind: 1) the method chosen should be balanced. That is, the method should allow for the possibility that the other influence can either increase or decrease the NTGR calculated from the decision maker survey responses, 2) the rules for deciding which customers will be examined for potential other influences should be balanced. In the case of Standard –Very Large interviews, all customers are subject to such a review, so that the pool of customers selected for such examination will not be biased towards ones for whom the evaluator believes the external influence will have the effect of influencing the NTGR in only one direction, 3) the plan for capturing other influences should be based on a well-conceived causal framework. The onus is on the evaluator to build a compelling case using a variety of quantitative and/or qualitative data for estimating a customer's NTGR.

Establishing Rules for Data Integration

Before the analysis begins, the evaluation team should establish, to the extent feasible, rules for the integration of the quantitative and qualitative data. These rules should be as specific as possible and be strictly adhered to throughout the analysis. Such rules might include instructions regarding when the NTGR based on the quantitative data should be overridden based on qualitative data, how much qualitative data are needed to override the NTGR based on quantitative data, how to handle contradictory information provided by more than one person at a given site, how to handle situations when there is no decision-maker interview, when there is no appropriate decision-maker interview, or when there is critical missing data on the questionnaire, and how to incorporate qualitative information on deferred free-ridership.

One must recognize that it is difficult to anticipate all the situations that one may encounter during the analysis. As a result, one may refine existing rules or even develop new ones during the initial phase of the analysis. One must also recognize that it is difficult to develop algorithms that effectively integrate the quantitative and qualitative data. It is therefore necessary to use judgment in deciding how much weight to give to the quantitative versus qualitative data and how to integrate the two. The methodology and estimates, however, must contain methods to support the validity of the integration methods through preponderance of evidence or other rules/procedures as discussed above.

For the **Standard-Very Large** cases in the large Nonresidential programs, the quantitative data used in the NTGR Calculator (which calculates the "core" NTGR), together with other information collected from the decision maker regarding the installation decision, form the initial basis for the NTG "story" for each site. Note that in most cases, supplemental data such as tracking data, program application files and results of interviews with program/IOU staff and vendors, will have been completed before the decision maker is contacted and will help guide the non-quantitative questioning in the interview. In practice, this means that most potential inconsistencies between decision maker responses and other sources of information should have been resolved before the interview is complete and data are entered into the NTGR Calculator. For example, if a company has an aggressive "green" policy widely promoted on its website that is not mentioned by the decision makers, the interviewer will ask the respondent to clarify the role of that policy in the decision. Conversely, if the decision maker attributes the

decision to install the equipment to a new company wide initiative rather than the program, yet there is no evidence of such an initiative reported by program staff, vendors, or the company's website, the decision maker will be asked to explain the discrepancy so that his or her responses can be changed if needed.

In some cases, however, it may be necessary to modify or override one of the scores contributing to the overall NTGR or the NTGR itself. Before this is done all quantitative and qualitative data will be systematically (and independently) analyzed by two experienced researchers who are familiar with the program, the individual site and the social science theory that underlies the decision maker survey instrument. Each will determine whether the additional information justifies modifying the previously calculated NTGR score, and will present any recommended modifications and their rationale in a well-organized manner, along with specific references to the supporting data. Again, it is important to note that the other influences can have the effect of either increasing or decreasing the NTGR calculated from the decision maker survey responses, and one should be skeptical about a consistent pattern of "corrections" in one direction or another.

Sometimes, *all* the quantitative and qualitative data will clearly point in the same direction while, in others, the *preponderance* of the data will point in the same direction. Other cases will be more ambiguous. In all cases, in order to maximize reliability, it is essential that more than one person be involved in analyzing the data. Each person must analyze the data separately and then compare and discuss the results. Important insights can emerge from the different ways in which two analysts look at the same set of data. Ultimately, differences must be resolved and a case made for a particular NTGR. Careful training of analysts in the systematic use of rules is essential to insure inter-rater reliability[3].

Once the individual analysts have completed their review, they meet to discuss their respective findings and present to the other the rationale for their recommended changes to the Calculator-derived NTGR. Key points of these arguments will be written down in summary form (e.g., Analyst 1 reviewed recent AQMD ruling and concluded that customer would have had to install the same measure within 2 years, not 3, thereby reducing NP score from 7.8 to 5.5) and also presented in greater detail in a workpaper so that an independent reviewer can understand and judge the data and the logic underlying each NTGR estimate. Equally important, the CPUC will have all the essential data to enable them to replicate the results, and if necessary, to derive their own estimates.

The outcome of the reconciliation by two analysts determines the final NTGR for a specific project. Again, the reasoning behind the "negotiated" final value must be thoroughly documented in a workpaper, while a more concise summary description of the rationale can be included in the NTGR Calculator workbook (e.g., Analyst 1 and Analyst 2 agreed that the NTGR score should have been higher than the calculated value of 0.45

[3] Inter-rater reliability is the extent to which two or more individuals (coders or raters) agree. Inter-rater reliability addresses the consistency of the implementation of a rating system.

because of extensive interaction between program technical staff and the customer, but they disagreed on whether this meant the NTGR should be .6 or .7. After discussion, they agreed on a NTGR of .65 as reflecting the extent of program influence on the decision).

In summary, it has been decided that supplemental data from non-core NTG questions collected through these surveys should be used in the following ways in the California Large Nonresidential evaluations:

- Vendor interview data will be used at times in the direct calculation of the NTGR. It will also be used to provide context and confirming/contradictory information for Standard-Very Large decision maker interviews.

- Qualitative and quantitative information from other sources (e.g., industry data, vendor estimates of sales in no-program areas, and other data as described above) may be used to alter core inputs only if contradictions are found with the core survey responses. Since judgments will have to be made in deciding which information is more compelling when there are contradictions, supplemental data are reviewed independently by two senior analysts, who then summarize their findings and recommendations and together reach a final NTGR value.

- Responses will also be used to construct a NTGR "story" around the project; that is they will help to provide the context and rationale for the project. This is particularly valuable in helping to provide guidance to program design for future years. It may be, for example, that responses to the core questions yield a high NTGR for a project, but additional information sources strongly suggest that the program qualifying technology has since become standard practice for the firm or industry, so that free ridership rates in future years are likely to be higher if program rules are not changed.

- Findings from other non-core NTGR questions (e.g., Payback Battery, Corporate Policy Battery) are also be used to **cross-check the consistency** of responses to core NTGR questions. When an inconsistency is found, it is presented to the Decision Maker respondent who is then be asked to explain and resolve it if they can. If they are not able to do so, their responses to the core NTGR question with the inconsistency may be overridden by the findings from these supplemental probes. These situations are handled on a case-by-case basis; however consistency checks are programmed into the CATI survey instrument used for the Basic and Standard cases.

Finally, some analysis of additional information beyond the close-ended questions that are used to calculate the Core NTGR could be done for the **Standard NTGR**. For example information regarding the financial criteria used to make capital investments, corporate policy regarding the purchase of energy efficiency equipment or the influence of standard practice in the same industry as the participant could be taken into account and used to make adjustments to the Core NTGR in a manner similar what is done for the Standard – Very Large NTGR.

5.3. Accounting for Partial Free Ridership

Partial free-ridership can occur when, in the absence of the program, the participant would have installed something more efficient than the program-assumed baseline efficiency but not as efficient as the item actually installed as a result of the program.

In situations where there is partial free ridership, the assumed baseline condition is affected. Absent partial free ridership, the assumed baseline would normally be based on existing equipment (in early replacement cases), on code requirements (in normal replace on burnout cases), or on a level above current code (e.g., this could be a market average or value purposefully set above code minimum but below market average; in this case, the definition and requirement would typically be defined by a specific program's baseline rules). In some cases, there may be a "dual" baseline (more specifically, a baseline that changes over the measure's EUL) if the project involves early replacement plus partial free ridership. In such cases, the baseline basis for estimating savings is the existing equipment over the remaining useful life (RUL) of the equipment, and then a baseline of likely intermediate efficiency equipment (e.g., code or above) for the remainder of the analysis period (i.e., the period equal to the EUL-RUL). When there is partial free ridership, the baseline equipment that would have been installed absent the program is of an intermediate efficiency level (resulting in lower energy savings than that assumed by the program if the program took in situ equipment efficiency as the basis for savings over the entire EUL). A related issue with respect to determination of the appropriate baseline is whether the adjustment made, if any, from the in situ or otherwise claimed baseline in the ex ante calculation, is whether the adjustment applies to the gross or net savings calculation.

Assignment of Partial Free Ridership Effects to Gross versus Net. In past evaluations, partial free ridership impacts have principally been incorporated into the net-to-gross ratio. This is because most partial free ridership is induced by market conditions, rather than by non-market factors. Market conditions refer primarily to standard adoption of a technology by a particular market segment or end user as a result of competitive market forces or other end user-specific factors. The key determining principle with respect to application of the adjustment to the net-to-gross ratio is whether there is a level of efficiency, below the efficiency of the measure for which savings are paid and claimed, but above what is required by code or minimum program baseline requirements that the end user would have implemented anyway without the program. Conditions that cause this adjustment to be made to gross savings rather than the net-to-gross ratio may include factors such as

- changing baseline equipment to meet changed business circumstances (such as increased production/throughput, changes in occupancy, etc.);
- compliance with environmental regulations, indoor air quality requirements, safety requirements; or
- the need to address an operational problem.

Each project should be examined separately for partial free ridership and a determination should be made based on the unique circumstances of each installation of whether an adjustment to gross savings or the net-to-gross ratio is warranted.

Data Collection Procedures. Information is gathered on partial free ridership using the following questions asked as part of the decision maker NTGR survey.

1. Now I would like you to think one last time about what action you would have taken if the program had not been available. Supposing that you had not installed the program qualifying equipment, which of the following alternatives would you have been MOST likely to do?
    a. Install fewer units
    b. Install standard efficiency equipment or whatever required by code
    c. Install equipment more efficient than code but less efficient than what you installed through the program
    d. repair/rewind or overhaul the existing equipment
    e. do nothing (keep the existing equipment as is)
    f. something else (specify what _____)

2. (IF FEWER UNITS) How many fewer units would you have installed? (It is okay to take an answer such as ...HALF...or 10 percent fewer ... etc.)

3. (IF MORE EFFICIENT THAN CODE) Can you tell me what model or efficiency level you were considering as an alternative? (It is okay to take an answer such as … 10 percent more efficient than code or 10 percent less efficient than the program equipment)

4. (IF REPAIR/REWIND/OVERHAUL) How long do you think the repaired/rewound/refurbished equipment would have lasted before requiring replacement?

In addition, these same partial free ridership questions should be asked during the on-site audit for a given project. This latter interview will be conducted by the project engineers. The collected information helps the gross impact and NTG analysis teams gain a more complete understanding of the true project baseline and equipment selection decision. These decision maker questions are included in the Excel version of the CATI-based Standard and Basic decision maker survey instrument as well as in the Standard-Very Large instrument.

Data Analysis and Integration Procedures. In cases where partial free ridership is found and it is determined that the adjustment should be made to the net-to-gross ratio, the following procedure should be used:

On the net side, the adjustment is based on the intermediate baseline indicated by the decision maker for the time period in which the intermediate equipment would have been installed. The calculation of energy saved under this intermediate baseline is done, and then divided by the savings calculated under the in situ baseline. The resulting ratio is then multiplied by the initial NTGR which was previously calculated using only the

'core' scoring inputs. The effect of this adjustment is to reduce the NTGR further to reflect the effects of the revealed partial free ridership.

In all cases, the Gross Impacts and NTG analysis teams will need to carefully coordinate their calculations to ensure that they are not inadvertently adjusting the savings twice for the same partial free ridership, i.e., through adjustments both to the gross savings calculation and to the NTG ratio.

6. NTGR INTERVIEW PROCESS

The NTGR surveys are conducted via telephone interviews. Highly-trained professionals with experience levels that are commensurate with the interview requirements should perform these interviews. Basic and Standard level interviews should be conducted by senior interviewers, who are highly experienced conducting telephone interviews of this type. Standard - Very Large interviews should be completed by professional consulting staff due to the complex nature of these projects and related decision making processes. More than likely, these will involve interviews of several entities involved in the project including the primary decision maker, vendor representatives, utility account executives, program staff and other decision influencers, as well as a review of market data to help establish an appropriate baseline.

All but the Standard -Very Large interviews should be conducted using computer-aided telephone interview (CATI) software. Use of a CATI approach has several advantages: (1) the surveys can be customized to reflect the unique characteristics of each program, and associated program descriptions, response categories, and skip patterns; (2) it drastically reduces inaccuracies associated with the more traditional paper and pencil method; and (3) the process of checking for inconsistent answers can be automated, with follow up prompts triggered when inconsistencies are found.

7. COMPLIANCE WITH SELF-REPORT GUIDELINES

The proposed NTGR framework fully complies with all of the CPUC/ED and the MECT's Guidelines for Estimating Net-to-Gross Ratios Using the Self-Report Approach.

Appendix A

References

Blalock, H. (1970). Estimating measurement error using multiple indicators and several points in time," *American Sociological Review*, 35, pp. 101-111.

Bogdan, Robert and Steven J. Taylor. (1975). *Introduction to qualitative research methods*. New York: John Wiley & Sons.

Britan, G. M. (1978). Experimental and contextual models of program evaluation. *Evaluation and Program Planning*, 1: 229-234.

Cochran, William G. (1977). *Sampling techniques*. New York: John Wiley & Sons.

Crocker, L. and J. Algina. (1986). *Introduction to classical and modern test theory*. New York: Holt, Rinehart & Winston.

Cronbach L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297-334.

DeVellis, R.F. (1991). *Scale development: Theory and applications*. Newbury Park, CA: Sage Publications, Inc.

Duncan, O.D. (1984). *Notes on social measurement: Historical and critical*. New York: Russell Sage.

Guba, E. G. (1978). Toward a methodology of naturalistic inquiry in educational evaluation. *CSE Monographic Series in Evaluation No. 8*. Los Angeles: Center for the Study of Evaluation.

Hall, Nick, Johna Roth, Carmen Best, Sharyn Barata, Pete Jacobs, Ken Keating, Ph.D., Steve Kromer, Lori Megdal, Ph.D., Jane Peters, Ph.D., Richard Ridge, Ph.D., Francis Trottier, and Ed Vine, Ph.D. (2007). *California Energy Efficiency Evaluation: Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. Prepared for the California Public Utilities Commission.

Lyberg, Lars, Paul Biemer, Martin Collins, Edith De Leeuw, Cathryn Dippo, Norbert Schwarz, and Dennis Trewin. (1997). *Survey measurement and process quality*. New York, NY: John Wiley & Sons.

Madow, William G., Harold Nisselson, Ingram Olkin. (1983). *Incomplete data in sample surveys*. New York: Academic Press.

Maxwell, Joseph A. (2004). Using Qualitative Methods for Causal Explanations. *Field Methods, Vol. 16, No. 3*, 243-264.

Megdal, Lori, Yogesh Patil, Cherie Gregoire, Jennifer Meissner, and Kathryn Parlin (2009). Feasting at the Ultimate Enhanced Free-Ridership Salad Bar. *Proceedings of the International Energy Program Evaluation Conference*.

Mohr, Lawrence B. (1995). *Impact analysis for program evaluation*. Thousand Oaks, CA: Sage Publications, Inc.

Netemeyer, Richard G., William O. Bearden, and Subhash Sharma. (2003). *Scaling procedures: Issues and applications*. Thousand Oaks, CA: SAGE Publications.

Patton, Michael Quinn. (1987). *How to use qualitative methods in evaluation*. Newbury Park, California: SAGE Publications.

Ridge, Richard, Philippus Willems, and Jennifer Fagan. (2009). Self-Report Methods for Estimating Net-to-Gross Ratios in California: Honest! *Proceedings from the 19th National Energy Services Conference*.

Ridge, Richard, Philippus Willems, Jennifer Fagan and Katherine Randazzo. (2009). The Origins of the Misunderstood and Occasionally Maligned Self-Report Approach to Estimating the Net-To-Gross Ratio. *Proceedings of the International Energy Program Evaluation Conference*.

Rogers, Patricia J., Timothy A. Hacsi, Anthony Petrosino, and Tracy A. Huebner (Eds.) (2000). *Program theory in evaluation: Challenges and opportunities*. San Francisco, CA: Jossey-Bass Publishers.

Rossi, Peter and Howard E. Freeman. (1989). *Evaluation: A systematic approach.* Newbury Park, California: SAGE Publications.

Sayer, Andrew. (1992). *Method in social science: A Realist Approach*. New York: Routledge.

Sax, Gilbert. (1974). *Principles of educational measurement and evaluation*. Belomont, CA: Wadsworth Publishing Company, Inc.

Schumacker, Randall E. and Richard G. Lomax. (1996). *A beginner's guide to structural equation modeling*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Scriven, Michael. (1976). Maximizing the power of causal explanations: The modus operandi method. In G.V. Glass (Ed.), *Evaluation Studies Review Annual, Vol. 1*, pp.101-118). Bevery Hills, CA: Sage Publications.

Shadish, Jr., William R. and Thomas D. Cook, and Laura C. Leviton. (1991). *Foundations of program evaluation*. Newbury Park, CA: Sage Publications, Inc.

Stone, Arthur A., Jaylan S. Turkkan, Christine A. Bachrach, Jared B. Jobe, Howard S. Kurtzman, and Virginia S. Cain. (2000). *The science of the self-report: Implications for research and practice*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Tashakkori, Abbas and Charles Teddlie. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. Thousand Oaks, CA: SAGE Publications.

TecMarket Works, Megdal & Associates, Architectural Energy Corporation, RLW Analytics, Resource Insight, B & B Resources, Ken Keating and Associates, Ed Vine and Associates, American Council for an Energy Efficient Economy, Ralph Prahl and Associates, and Innovologie. (2004). *The California evaluation framework.* Prepared for the California Public Utilities Commission and the Project Advisory Group.

Velleman, P. F., and Wilkinson, L. (1993), Nominal, ordinal, interval and ratio typologies are misleading. *American Statistician, 47(1),* 65-72.

Weiss, Carol H. (1998). *Evaluation*. Upper Saddle River, New Jersey: Prentice Hall.

Weiss, R. S. and M.Rein. (1972). The Evaluation of broad-aim programs: Difficulties in experimental design and an alternative. In C. H. Weiss (ed.) *Evaluating action programs: Readings in social action and education*. Boston: Allyn and Bacon.

Wholey, Joseph S., Harry P. Hatry and Kathryn E. Newcomer. (1994). *Handbook of practical program evaluation*. San Francisco, CA: Jossey-Bass, Inc.

Yin, Robert K. (1994). *Case study research: Design and methods*. Newbury Park, California: SAGE Publications.

Participant Survey for CPUC
2013-2015 Commercial Evaluation

NET TO GROSS

DISPLAY For the sake of expediency, during this next battery we will be referring to the ..... program as THE PROGRAM and we will be referring to the installation of ...<%NTGMEASURE>... as THE MEASURE.

A3 There are usually a number of reasons why an organization like yours decides to participate in energy efficiency programs like this one. In your own words, can you tell me why you decided to participate in this program?

1	To replace old or outdated equipment	N2
2	As part of a planned remodeling, build-out, or expansion	N2
3	To gain more control over how the equipment was used	N2
4	Maintenance downtime/associated expenses for old equip were too high	N2
5	Had process problems and were seeking a solution	N2
6	To improve equipment performance	N2
7	To improve production as a result of the change in equipment	N2
8	To comply with codes set by regulatory agencies	N2
9	To improve visibility/plant safety	N2
10	To comply with company policies regarding regular equipment retrofits or remodeling	N2
11	To get a rebate from the program	N2
12	To protect the environment	N2
13	To reduce energy costs	N2
14	To reduce energy use/power outages	N2
15	To update to the latest technology	N2
16	To improve the comfort level of the facility	N2
77	RECORD VERBATIM	N2
88	Don't know	N2
99	Refused	N2

N2 Did your organization make the decision to install this new equipment before or after you became aware of rebates/cost reduction available through the PROGRAM?

1	Before	N3a
2	After	N3a
88	Refused	N3a
99	Don't know	N3a

DISPLAY Next, I'm going to ask you to rate the importance of the program as well as other factors that might have influenced your decision to install this equipment through the program. Using a scale of 0 to 10 where 0 means not at all important and 10 means extremely important, how would you rate the importance of...

N3a The age or condition of the old equipment

#	Record 0 to 10 score (_____)	N3aa
88	Refused	N3b
99	Don't know	N3b

IF N3a > 5 and NTG_TYPE >= 2 THEN ASK

N3aa How, specifically, did this enter into your decision to install/delamp this equipment?

77	RECORD VERBATIM	N3b
88	Don't know	N3b
99	Refused	N3b

N3b Availability of the PROGRAM rebate/cost reduction

#	Record 0 to 10 score (_____)	N3bb
88	Refused	N3c
99	Don't know	N3c

IF N3b > 7 AND NTG_TYPE >= 2, THEN ASK

N3bb Why do you give it this rating?

77	Record VERBATIM	N3c
88	Refused	N3c
99	Don't know	N3c

IF A1B(1)|ID0(1) THEN ASK; ELSE SKIP TO N3d

N3c Please rate the degree of importance of information provided through...A1B(1)|<ID0(1)/The Facility or System AUDIT/>

#	Record 0 to 10 score (_____)	N3cc
88	Refused	N3d
99	Don't know	N3d

IF N3c > 7 and NTG_TYPE >= 2, THEN ASK

N3cc Why do you give it this rating?

77	Record VERBATIM	N3d
88	Refused	N3d
99	Don't know	N3d

If V1 = 1 THEN ASK; ELSE SKIP TO N3e

N3d Recommendation from an equipment vendor that sold you the equipment and/or installed it for you **[VENDOR_1]**

#	Record 0 to 10 score (_____)	N3e
88	Refused	N3e
99	Don't know	N3e

N3e Your previous experience with energy efficient projects?

#	Record 0 to 10 score (_____)	N3f
88	Refused	N3f
99	Don't know	N3f

N3f Your previous experience with <%UTILITY>'s program or a similar utility program?

#	Record 0 to 10 score (_____)	N3g
88	Don't know	N3g
99	Refused	N3g

NTG_TYPE >= 3 THEN ASK, ELSE N3h

N3g Information from the Program, Utility, or Program Administrator training course?

#	Record 0 to 10 score (_____)	N3gg
88	Refused	N3h
99	Don't know	N3h

IF N3g > 5, THEN ASK

N3gg What type of information was provided during the training?

77	Record VERBATIM	N3ggg
88	Refused	N3h
99	Don't know	N3h

N3ggg How, specifically, did this enter into your decision to install/delamp this equipment?

77	RECORD VERBATIM	N3h
88	Don't know	N3h
99	Refused	N3h

N3h Information from the Program, Utility, or Program Administrator Marketing materials?

#	Record 0 to 10 score (_____)	N3hh
88	Refused	N3j
99	Don't know	N3j

IF N3h > 5 and NTG_TYPE >= 2, THEN ASK

N3hh What type of information was provided that pertained to the PROJECT?

77	Record VERBATIM	N3hhh
88	Refused	N3j
99	Don't know	N3j

IF N3hh = 77, THEN ASK

N3hhh How, specifically, did this enter into your decision to install/delamp this energy efficient equipment?

77	RECORD VERBATIM	N3j
88	Don't know	N3j
99	Refused	N3j

IF NTG_TYPE >= 2

N3j Standard practice in your business/industry

#	Record 0 to 10 score (_____)	N3k
88	Refused	N3k
99	Don't know	N3k

If AP9 = 3 or AP9a = 3 THEN ASK; ELSE SKIP TO N3m

N3l Endorsement or recommendation by your account rep?

#	Record 0 to 10 score (_____)	N3ll
88	Refused	N3m
99	Don't know	N3m

IF N3l > 5 & NTG_TYPE >= 2 THEN ASK

N3ll What did they recommend?

77	Record VERBATIM	N3lll
88	Refused	N3m
99	Don't know	N3m

IF N3LL(77)

N3lll How specifically did this enter into your decision to install this project using energy efficient equipment?

77	RECORD VERBATIM	N3m
88	Don't know	N3m
99	Refused	N3m

IF NTG_TYPE >= 2, ASK

N3m Corporate policy or guidelines

#	Record 0 to 10 score (_____)	N3mm
88	Refused	N3n
99	Don't know	N3n

IF N3m > 5, THEN ASK

N3mm How, specifically, did this enter into your decision to install/delamp this equipment?

77	RECORD VERBATIM	N3n
88	Don't know	N3n
99	Refused	N3n

N3n Payback or return on investment of installing this equipment

#	Record 0 to 10 score (_____)	N3o
88	Refused	N3o
99	Don't know	N3o

N3o Improved product quality

#	Record 0 to 10 score (_____)	N3oo
88	Refused	N3p
99	Don't know	N3p

IF N3o > 5, THEN ASK

N3oo How, specifically, did this enter into your decision to install/delamp this equipment?

77	RECORD VERBATIM	N3p
88	Don't know	N3p
99	Refused	N3p

IF FM050 = 12 AND NTG_TYPE = 4, THEN ASK, ELSE SKIP TO N3r

N3p Compliance with state or federal regulations such as Title 24, air quality, OSHA, or FDA regulations

#	Record 0 to 10 score (_____)	N3pp
88	Refused	N3r
99	Don't know	N3r

IF N3p > 5, THEN ASK

N3pp How, specifically, did this enter into your decision to upgrade to energy efficient equipment?

77	RECORD VERBATIM	N3r
88	Don't know	N3r
99	Refused	N3r

ASK IF NTG_TYPE >= 3

N3r Compliance with your organization's normal remodeling or equipment replacement practices?

#	Record 0 to 10 score (_____)	N3rrr
88	Refused	N3s
99	Don't know	N3s

IF A3(2|10)&N3R(6||10);

N3RRR What is your normal cycle in number of years for which you typically retrofit your equipment to comply with your organization@'s normal remodeling or equipment replacement practices?

# yrs	Record Number of Years	N3rr
88	Refused	N3rr
99	Don't know	N3rr

IF N3r > 5, THEN ASK

N3rr How, specifically, did this enter into your decision to install/delamp this equipment?

77	RECORD VERBATIM	N3s.
88	Don't know	N3s.
99	Refused	N3s.

N3s Were there any other factors we haven't discussed that were influential in your decision to install/delamp this MEASURE?

1	Nothing else influential	CC1
77	Record verbatim	N3ss
88	Refused	CC1
99	Don't know	CC1

ASK IF N3s = 77

N3ss Using the same zero to 10 scale, how would you rate the influence of this factor?

#	Record 0 to 10 score (_____)	CC1
88	Refused	CC1
99	Don't know	CC1

CONSISTENCY CHECKS ON N3p, N3q and N3r
If NTG_TYPE = 4
IF A3 = 8, AND N3p < 4, THEN ASK

CC1 You indicated earlier that compliance with codes or regulatory policies was one of the reasons you did the project. However, just now you scored the importance of compliance with state or federal regulations or standards such as Title 24, air quality, OSHA, or FDA regulations in your decision making fairly low, why is that?

77	RECORD VERBATIM	CC1a
88	Don't know	CC1a
99	Refused	CC1a

IF A3 ^= 8, and N3p > 7, THEN ASK

CC1a You indicated earlier that compliance with codes or regulatory policies was not one of the primary reasons you did the project. However, just now you scored the importance of compliance with state or federal regulations or standards such as Title 24,air quality, OSHA, or FDA regulations in your decision making fairly high, why is that?

77	RECORD VERBATIM	CC3
88	Don't know	CC3
99	Refused	CC3

IF A3 = 2 or 10, AND N3r < 4, THEN ASK

NCC3 You indicated earlier that a regularly scheduled retrofit was one of the reasons you did the project. However, just now you scored the importance of compliance with your company's regularly scheduled retrofit or equipment replacement in your decision making fairly low, why is that?

77	RECORD VERBATIM	CC3a
88	Don't know	CC3a
99	Refused	CC3a

IF A3 ^= 2 and A3 ^= 9 and A3^=10 AND N3r > 7 THEN ASK

NCC3a You indicated earlier that a regularly scheduled retrofit was NOT one of the reasons you did the project. However, just now you scored the importance of compliance with your company's regularly scheduled retrofit or equipment replacement in your decision making fairly high, why is that?

77	RECORD VERBATIM	N33
88	Don't know	N33
99	Refused	N33

PAYBACK BATTERY
If INCENT <> 100 AND NTG_TYPE >= 2, THEN ASK; ELSE SKIP TO N33

P1 What financial calculations does your company typically make before proceeding with the installation of energy efficient equipment like you installed through the program?

1	Payback	P2A
2	Return on investment	P2B
77	Record VERBATIM	P3
88	Don't know	P3
99	Refused	P3

If P1 = 1 THEN ASK; ELSE SKIP TO P2B

P2A What is your threshold in terms of the payback or return on investment your company uses before deciding to proceed with installing energy efficient equipment like you installed through the program? Is it…

1	0 to 6 months	P3
2	6 months to 1 year	P3
3	1 to 2 years	P3
4	2 to 3 years	P3
5	3 to 5 years	P3
6	Over 5 years	P3
88	Don't know	P3
99	Refused	P3

IF P1 = 2 THEN ASK

P2B What is your ROI?

1	Record ROI____;	P3

P3 Did the rebate move your energy efficient equipment project within this acceptable range?

1	Yes	P4
2	No	P3a
88	Don't know	P3a
99	Refused	P3a

If P3 = 1 THEN ASK; ELSE SKIP TO P3A

P4 On a scale of 0 to 10, with a zero meaning NOT AT ALL IMPORTANT and 10 meaning Very Important, how important in your decision was it that the project was in the acceptable range?

#	Record 0 to 10 score (_____)	P3a
88	Refused	P3a
99	Don't know	P3a

CONSISTENCY CHECKS ON N3b and P3

IF P3 = 1, AND N3b < 5, THEN ASK

P3a The rebate seemed to make the difference between meeting your financial criteria and not meeting them, but you are saying that the rebate didn't have much effect on your decision, why is that?

77	Record VERBATIM	P3e
88	Don't know	P3e
99	Refused	P3e

IF P3 = 2, AND N3b > 5, THEN ASK

P3e The rebate didn't cause the installation of energy efficient equipment to meet your company's financial criteria, but you said that the rebate had an impact on the decision to install this energy efficient equipment. Why did it have an impact?

77	Record VERBATIM	N33
88	Don't know	N33
99	Refused	N33

IF N3D(8||10) | N3E(8||10) | N3F(8||10) | N3J(8||10) | N3M(8||10) | N3N(8||10) | N3O(8||10) | N3P(8||10) | N3R(8||10);

Next, I would like you to rate the importance of the PROGRAM in your decision to implement this MEASURE as opposed to other factors that may have influenced your decision such as...(SCAN BELOW AND READ TO THEM THOSE

DISPLAY FACTORS THAT INFLUENCED THEIR DECISION)
(READ ITEMS WHERE THEY GAVE A RATING OF 8 or higher)

<%N3D> Equipment Vendor recommendation	...@[%N3D>@
<%N3E> Previous experience with this measure	...@[%N3E>@
<%N3F> Previous experience with this program	...@[%N3F>@
<%N3J> Standard practice in your business/industry	...@[%N3J>@
<%N3M> Corporate policy or guidelines	...@[%N3M>@
<%N3N> Payback on investment.	...@[%N3N>@
<%N3O> To improve production as a result of lighting,	...@[%N3O>@
<%N3P> Compliance with state or federal regulations or standards such as Title 24, air quality, OSHA, or FDA regulations	...@[%N3P>@
<%N3R> Compliance with normal maintenance or retrocommissioning policies or your companies regularly scheduled retrofit or lighting replacement	...@[%N3R>@

DISPLAY If you were given 10 points to award in total, how many points would you give to the importance of the program and how many points would you give to these other factors?

N41 How many of the ten points would you give to the importance of the PROGRAM in your decision?

#	Record 0 to 10 score (_____)	N42
88	Refused	N42
99	Don't know	N42

N42 and how many points would you give to all of these other factors?)

#	Record 0 to 10 score (_____)	N41P
88	Refused	N41P
99	Don't know	N41P

If N41 <> 88 and N41 <> 99 and N42 <> 88 and N42 <> 99, compute N41 + N42. While N41+N42 <> 10, display:
__We want these two sets of numbers to equal 10.
<%N41> for Program influence and
<%N42> for Non Program factors

DISPLAY
Next, I would like for you to consider the importance of the PROGRAM in your decision to install your equipment *at the time you did* rather than waiting to install new equipment sometime in the future, regardless of the actual efficiency of the equipment you selected. Please rate the importance of the program on this timing decision as opposed to other factors that may have influenced your decision.
If Needed - else skip…
If you were given 10 points to award in total, how many points would you give to the importance of the program and how many points would you give to these other factors in your decision to install your equipment at the time you did rather than waiting to install new equipment sometime in the future.

N41P
How many of the ten points would you give to the importance of the PROGRAM in your decision TO INSTALL YOUR EQUIPMENT AT THE TIME YOU DID?

#	Record 0 to 10 score (_____)	N42P
88	Refused	N42P
99	Don't know	N42P

N42P
and how many points would you give to all of these other factors?\

#	Record 0 to 10 score (_____)	REPLACE
88	Refused	REPLACE
99	Don't know	REPLACE

If N41P <> 88 and N41P <> 99 and N42P <> 88 and N42P <> 99, compute N41P + N42P. While N41P+N42P <> 10, display:
__We want these two sets of numbers to equal 10.
<%N41P> for Program influence and
<%N42P> for Non Program factors

IF DELAMP <> 1;

REPLACE
Was the installion of this measure....<%NTGMEASURE> ...a replacement of existing equipment or was it additional equipment you installed in your facility?

1	Replace/Modification/Retrofit	DISPLAY
2	Add-on	DISPLAY
88	Refused	DISPLAY
99	Don't know	DISPLAY

DISPLAY
Now I would like you to think about the action you would have taken with regard to the installation of this equipment if the program had not been available.

IF REPLACE(1) | DELAMP == 1

N5
Using a likelihood scale from 0 to 10, where 0 is not at all likely and 10 is extremely likely, if THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same program qualifying energy efficient equipment that you did for this project?

#	Record 0 to 10 score (_____)	N5a
88	Refused	N5B
99	Don't know	N5B

IF REPLACE(2) THEN ASK; ELSE SKIP TO N6

N5aa
Using a likelihood scale from 0 to 10, where 0 is Not at all likely and 10 is Extremely likely, if THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same energy efficient equipment at the same time as you did?

#	Record 0 to 10 score (_____)	N6
88	Don't know	N6
99	Refused	N6

CONSISTENCY CHECKS
IF N3b > 7 and N5 > 7, THEN ASK

N5a
When you answered ...<%N3B> ... for the question about the influence of the rebate, I would interpret that to mean that the rebate was quite important to your decision to install. Then, when you answered ..<%N5>... for how likely you would be to install the same equipment **without** the rebate, it sounds like the rebate was not very important in your installation decision. I want to check to see if I am misunderstanding your answers or if the questions may have been unclear. Will you explain in your own words, the role the rebate played in your decision to install this efficient equipment?

77	Record VERBATIM	NN5aa
88	Don't know	NN5aa
99	Refused	NN5aa

Would you like for me to change your score on the importance of the rebate that you gave a rating of <%N3B> and/or change your rating on the likelihood you would install the same equipment without the rebate which you gave a rating of <%N5> and/or we can change both if you wish?

NN5aa

1	No change	N5b
77	Record how they would rate rebate influence and how they would rate likelihood to install without the rebate	N5b
88	Don't know	N5b
99	Refused	N5b

ASK IF REPLACE(1)

Using the same scale as before, if the program had not been available, what is the likelihood that you would have done this project at the same time as you did?

N5b

#	Record 0 to 10 score (_____)	DISPLAY
88	Refused	DISPLAY
99	Don't know	DISPLAY

DEFERRED FREE RIDERSHIP FOLLOW-UP

DISPLAY If N5b < 9; ELSE SKIP TO N6

Next, I'd like to ask a couple of questions to help us estimate at what point in the future you would definitely have replaced your existing equipment. We understand that you can't know exactly when you would have done this, especially so far into the future. We're just trying to get a sense of how long you think the current equipment or process would have kept serving your company's needs before you had to or chose to replace it.

DISPLAY TD1

If the program had not been available, how likely is it that you would have replaced your existing equipment within one year of when you did? Would you say…

TD1

1	Definitely would have (1.0 probability)	N9bb
2	Probably would have (0.75 probability)	TD2
3	50-50 chance (0.50 probability)	TD2
4	Probably not (0.25 probability)	TD2
5	Definitely not (0.0 probability)	TD2

IF TD1 = 2, 3, 4, 5 ASK TD2, ELSE GO TO N9bb

If the program had not been available, how likely is it that you would have replaced your existing equipment within three years of when you did? Would you say…

TD2

1	Definitely would have (1.0 probability)	N9bb
2	Probably would have (0.75 probability)	TD3
3	50-50 chance (0.50 probability)	TD3
4	Probably not (0.25 probability)	TD3
5	Definitely not (0.0 probability)	TD3

IF TD2 = 2, 3, 4, 5 ASK TD3; ELSE GO TO N6

If the program had not been available, how likely is it that you would have replaced your existing equipment within five years of when you did? Would you say…

TD3

1	Definitely would have (1.0 probability)	N9bb
2	Probably would have (0.75 probability)	N9bb
3	50-50 chance (0.50 probability)	N9bb
4	Probably not (0.25 probability)	N9bb
5	Definitely not (0.0 probability)	N9bb

CONSISTENCY CHECK ON AGE

IF (N3a > 6 AND TD3 = 3, 4 or 5) THEN ASK; ELSE SKIP TO N6

Earlier when I asked about the influence of the age/condition of the old equipment on your decision to install this new equipment, you gave me a rating of <%N3A> out of ten. I would interpret this to mean that the age/condition was quite influential in your decision to install this new equipment when you did. Perhaps I have either recorded something incorrectly or maybe you could explain in your own words the role the age/condition of the existing equipment played in your decision to install this new energy efficient equipment.

N9bb

77	Record VERBATIM	N6
88	Don't know	N6
99	Refused	N6

ADDITIONAL BASELINE INPUT

Now I would like you to think one last time about what action you would have taken if the program had not been available. Which of the following alternatives would you have been MOST likely to do?

N6

1	Install/Delamped fewer units	N7
2	Install standard efficiency equipment or whatever required by code	N7
3	Installed equipment more efficient than code but less efficient than what you installed through the program	N7
4	Done nothing (keep existing equipment as is)	N7
5	Done the same thing I would have done as I did through the program	N7
6	Repair/rewind or overhaul the existing equipment	N7
77	Something else (specify what _____)	N7
88	Don't know	N7
99	Refused	N7

Ask if N6 = (1, 2, 3, 4) and (N5 > 8 and N5b > 8 OR N5aa > 8)

In an earlier response, you said that if the program had not been available, there was a very high likelihood that you would have installed exactly the same equipment as you did through the program. However, just now you have indicated that you would not have installed the same equipment as you did without the benefit of the program. Can you explain to me why there is this difference?

N7

77	Record VERBATIM	N6a
88	Don't know	N6a
99	Refused	N6a

Ask if N6(1);

How many fewer units would you have installed/Delamped? (It is okay to take an answer such as ...HALF...or 10 percent fewer ... etc.)

N6a

77	RECORD VERBATIM	ER2
88	Refused	ER2
99	Refused	ER2

Ask if N6(3);

Can you tell me what model or efficiency level you were considering as an alternative? (It is okay to take an answer such as … 10 percent more efficient than code or 10 percent less efficient than the program equipment)

N6b

77	RECORD VERBATIM	ER2
88	Don't know	ER2
99	Refused	ER2

Ask if N6(6);

How long do you think the repaired equipment would have lasted before requiring replacement?

N6c

77	RECORD VERBATIM	ER2
88	Don't know	ER2
99	Refused	ER2

EARLY REPLACEMENT BATTERY

[IF N5b < 8 and A3 = 1, 4, 8, or 10 THEN ASK. ELSE SKIP TO SP1]

Earlier, when I asked you a question about why you decided to implement the project using high efficiency equipment, you gave reasons related to <A3> Now I would like to ask you some follow up questions regarding these responses you gave me.

DISPLAY ER2

IF REPLACE(1) AND N6c IS UNRECORDED;

How many more years do you think your equipment would have gone before failing and required replacement?

ER2

77	___ Estimated Remaining Useful Life (in years)	ER6
88	Don't know	ER6
99	Refused	ER6

IF A3 = 4, THEN ASK

How much downtime did you experience in the past year?

ER6

77	_____Downtime Estimate (in weeks)	ER9
88	Don't know	ER9
99	Refused	ER9

In your opinion, based on the economics of operating this equipment, for how many more years could you have kept this equipment functioning?

ER9

Yrs	___ Estimated Remaining Useful Life	ER11
88	Don't know	ER11
99	Refused	ER11

IF A3 = 8, THEN ASK

Can you briefly describe the specific code/regulatory requirements that this project addressed?

ER15

77	RECORD VERBATIM	ER19
88	Don't know	ER19
99	Refused	ER19

IF A3 = 10, THEN ASK

Can you briefly describe the specific company policies regarding regular/normal maintenance/replacement policy(ies) that were relevant to this project? Or briefly describe the specific company policies regarding regular equipment retrofits and remodeling?

ER19

77	RECORD VERBATIM	PP1
88	Don't know	PP1
99	Refused	PP1

PROCESS QUESTIONS - ASK ALL

PP1 What do you believe the PROGRAM'S primary strengths are?

77	Record VERBATIM	PP2
88	Don't know	PP2
99	Refused	PP2

PP2 What concerns do you have about the PROGRAM, if any? (IF NEEDED: What do you view as the primary features that need to be improved?)

77	Record VERBATIM	PP4
88	Don't know	PP4
99	Refused	PP4

PP4 On a scale of 0 - 10, where 0 is completely dissatisfied and 10 is completely satisfied, how would you rate your OVERALL satisfaction with the <%PROGRAM>?

#	Record 0 to 10 score (_____)	PP5
88	Refused	PP5
99	Don't know	PP5

IF PP4 < 4 THEN ASK; ELSE SKIP TO PP5A

PP5 Why do you say that?

77	Record VERBATIM	PP5A
88	Don't know	PP5A
99	Refused	PP5A

PP5A Using the same 0 - 10 scale, how would you rate your OVERALL satisfaction with the performance of the energy efficient measures you had installed?

#	Record 0 to 10 score (_____)	PP5B
88	Refused	PP6
99	Don't know	PP6

IF PP5A < 6 THEN ASK; ELSE SKIP TO PP6

PP5B Why do you say that?

77	Record VERBATIM	PP6
88	Don't know	PP6
99	Refused	PP6

PP5C Using the same 0 - 10 scale, how would you rate your OVERALL satisfaction with the quality of the installers' work?

#	Record 0 to 10 score (_____)	PP5D
88	Refused	PP5E
99	Don't know	PP5E

PP5D Why do you say that?

77	Record VERBATIM	PP5E
88	Don't know	PP5E
99	Refused	PP5E

PP5E From your perspective, what if anything could be done to improve the quality of the installers' work?

77	Record VERBATIM	PP6
88	Don't know	PP6
99	Refused	PP6

In qsl: IF ^UNRECORDED(IMPLEMENTER);

ASK IF %IMPLEMENTER = "a local government", "state government", or "an independent firm"; ELSE PP10

PP6 The program you participated in was run by %IMPLEMENTER. Has your organization participated in energy efficiency programs run by <%UTILITY> in the past three years?

1	Yes	PP8
2	No	PP10
88	Refused	PP10
99	Don't know	PP10

ASK IF PP6=1

PP8 Please consider your recent experience with the PROGRAM run by %IMPLEMENTER versus your past experience with the program run by <%UTILITY>. Are there any differences between the two that stand out? Any there attributes or services that seemed better in one or the other?

1	No differences	PP10
77	Yes, Record DIFFERENCES	PP10
88	Don't know	PP10
99	Refused	PP10

ASK IF IOU_PROG = 1 (utility administered program); ELSE PP12

PP10 The program you participated in was run by <%UTILITY>. Have you participated in programs run by governments, institutions, or other independent firms in the past three years? (select all that apply)

1	Local Government	PP14
2	State Government or Institution	PP14
3	Independent Firm	PP12
88	Refused	PP16
99	Don't know	PP16

ASK IF PP10 = 3;

PP12 Please consider your experiences with the program run by an independent firm versus your recent experience with the program run by an independent firm versus your recent experience with <%UTILITY>'s program. Are there any differences between the two that stand out? Are there attributes or services that seemed better in one or the other? (NOTE: SPECIFY WHICH ENTITY IS REFERRED TO IN EACH COMMENT)

1	No differences	PP16
77	Yes, RECORD DIFFERENCES	PP16
88	Refused	PP16
99	Don't know	PP16

ASK if PP10 in (1, 2)

PP14 Please consider your experiences with the program run by a government or institution versus your recent experience with <%UTILITY>'s PROGRAM. Are there any differences between the two that stand out? Are there attributes that seemed better in one or the other? (NOTE: SPECIFY WHICH ENTITY IS REFERRED TO IN EACH COMMENT)

77	Yes, Record VERBATIM	PP16
78	No differences	PP16
88	Refused	PP16
99	Don't know	PP16

ASK if PP6 = 1 or PP10 = 1, 2 or 3. ELSE PP3

PP16 Which entity, the <%UTILITY> program or the <%IMPLEMENTER> <%PP10> program was more effective in supporting your organization's decision making process?

1	%IMPLEMENTER	PP18
2	%UTILITY	PP18
3	Very little difference	PP18
88	Refused	PP18
99	Don't know	PP18

If PP16 in (1, 2) then ask; else skip to PP20

PP18 How significant was this difference, would you say…

1	Very Significant	PP20
2	Somewhat Significant	PP20
3	Not very significant	PP20
88	Refused	PP20
99	Don't know	PP20

PP20 Which entity had a better technical understanding of the energy use at your facility and provided the best technical assistance in specifying the project?

1	%IMPLEMENTER	PP22
2	%UTILITY	PP22
3	Very little difference	PP22
88	Refused	PP22
99	Don't know	PP22

If PP20 in (1, 2) then ask; else skip to PP24

PP22 How significant was this difference, would you say…

1	Very Significant	PP24
2	Somewhat Significant	PP24
3	Not Very Significant	PP24
88	Refused	PP24
99	Don't know	PP24

PP24 Which entity was more effective in supporting you through the application process

1	%IMPLEMENTER	PP26
2	%UTILITY	PP26
3	Very little difference	PP26
88	Refused	PP26
99	Don't know	PP26

If PP24 in (1, 2) then ask; else skip to PP3;

PP26 How significant was this difference, would you say…

1	Very Significant	PP3
2	Somewhat Significant	PP3
3	Not very significant	PP3
88	Refused	PP3
99	Don't know	PP3

PP3 Do you have any comments on the current incentive structure of the PROGRAM?

1	No	ID1
77	Yes - RECORD COMMENTS_____	ID1
88	Don't know	ID1
99	Refused	ID1

LONG TERM INFLUENCE
If NTG_TYPE >= 2
IF N3f > 4, THEN ASK, ELSE CCC12A

Now I'd like you to think about your organization's experiences with %UTILITY's energy efficiency programs and efforts over the longer term, for example, over the past 5, 10, or even 20 years.

In an earlier question, you indicated that your previous experience with utility energy efficiency programs was a factor that

DISPLAY influenced your decision to implement this PROJECT. I would like to ask you a few questions about this experience. LT2

LT2 For how many years have you been participating in %UTILITY's energy efficiency programs?

# yrs	Record Number of Years	LT3
88	Refused	LT3
99	Don't know	LT3

LT3 During this time, how many times has your organization participated in these PROGRAM(s)?

1	7 to 10 times, or more	CA6
2	4 to 7 times	CA6
3	2 to 4 times	CA6
4	less than 2 times	CA6
88	Refused	LT6
99	Don't know	LT6

IF LT3(1||4);

CA6 What type of equipment did you install through this (these) program(s)? [READ RESPONSE CATEGORIES]

1	Indoor lighting	LT6
2	Cooling equipment	LT6
3	Natural gas equipment, such as water heater, furnace or appliances	LT6
4	Insulation or windows	LT6
5	Refrigeration	LT6
6	Industrial process equipment	LT6
7	Greenhouse heat curtains	LT6
8	Food service equipment	LT6
77	OPEN \SOMETHING OTHER (specify)	LT6
88	Refused	LT6
99	Don't Know	LT6

LT6 What factors led you to participate in these program(s)?

77	Record VERBATIM	LT7
88	Refused	LT7
99	Don't know	LT7

LT7 And exactly how did that experience help to convince you to install this energy efficient equipment?

77	Record VERBATIM	LT8
88	Refused	LT8
99	Don't know	LT8

IF LT3 = 1 or 2, THEN ASK. ELSE CCC12A.

Have these programs had any long-term influence on your organization's energy efficiency related practices and policies that go beyond the immediate effect of incentives on individual projects? [DO NOT READ: Examples are causing them to add energy efficiency procurement policies, internal incentive or reward structures for improving energy efficiency, or adoption

LT8 of energy management best practices.]

1	Yes	LT9
2	No	CC12A
88	Refused	CC12A
99	Don't know	CC12A

If LT8 = 1 then ask; else skip to CA2;

LT9 Has your organization developed a specification policy for the selection of energy efficient equipment? [EXAMPLES... REQUIREMENTS THAT ALL NEW FLUORESCENT LIGHTING SYSTEMS USE ELECTRONIC BALLAST, OR THAT ALL NEW MOTORS BE PREMIUM EFFICIENCY]

1	Yes	LT10
2	No	LT10
88	Refused	LT10
99	Don't know	LT10

LT10 Has your organization assigned responsibility for controlling energy usage and costs to any of the following‘

1	An in-house staff person	LT11
2	A group of staff	LT11
3	An outside contractor	LT11
4	NONE OF THESE	LT11
88	Refused	LT11
99	Don't know	LT11

LT11 Does your organization have any internal incentive or reward policies for business units or staff responsible for managing energy costs?

1	Yes	LC7
2	No	CA2
88	Refused	CA2
99	Don't know	CA2

Ask if LT11(1)

LC7 How do these incentive/reward structures work?

77	OPEN/Record	CA2
88	Refused	CA2
99	Don't know	CA2

CA2 In marketing materials or in communications with customers, does your company highlight the ways in which your business is environmentally conscious?

1	Yes	RETURN TO REMAINDER OF SURVEY
2	No	RETURN TO REMAINDER OF SURVEY
77	OPEN\RECORD OTHER	RETURN TO REMAINDER OF SURVEY
88	Refused	RETURN TO REMAINDER OF SURVEY
99	Don't know	RETURN TO REMAINDER OF SURVEY

NTGR and PAI scores for all 18 respondents

ID	NTGR	PAI1	PAI2	PAI3
1	0.48	4.4	5	5
2	0.48	5.3	3	6
3	0.14	3.3	1	0
4	0.20	5.0	1	0
5	0.38	5.3	3	3
6	0.57	5.0	5	7
7	0.20	5.0	1	0
8	0.47	5.0	4	5
9	0.23	5.0	2	0
10	0.13	3.8	0	0
11	0.17	5.0	0	0
12	0.68	5.3	7	8
13	0.20	5.0	1	0
14	0.71	5.3	6	10
15	0.60	5.0	7	
16	0.40	5.0	7	0
17	0.58	5.3	7	5
18	0.44	5.6	4	4

NTGR Algorithm Calculator

Survey Question		Example Score	Notes:
	Score 1:	**PAI-1**	
	Highest Program Influence Score	**10.00**	
	Highest Non-program Influence Score	**8.00**	
	PAI - 1 Score = Highest Program Factor / (Highest Program Factor + Highest Nonprogram Factor)	**5.56**	
	Please rate the importance of each of the following in your decision to implement this specific [MEASURE] at this time.		
N3b	Availability of the program rebate	9	Program Factor
N3c	Information provided through study, audit or other technical assistance provided through the program	7	Program Factor
N3g	Information from your utility or program training course	8	Program Factor
N3h	Information from your utility or program marketing materials	6	Program Factor
N3l	Suggestion by your utility account rep	10	Program Factor
N3n (if P4 > =6)	Payback on the investment P (score if rebate moved into range, 0 else)	8	Program Factor
N3n (if P4 < 6)	Payback on the investment NP (score if rebate did not affect PB, 0 else)		Non-program factor
N3a	Age or condition of the old equipment	6	Non-program factor
N3e	Previous experience with an EE project	8	Non-program factor
N3f	Previous experience with this program	3	Non-program factor
N3j	Standard practice in your industry	5	Non-program factor
N3m	Corporate policy or guidelines	6	Non-program factor
N3o	Improved lighting quality (includes visibilty, safety)	5	Non-program factor
N3p	Compliance with rules or codes set by regulatory agencies	2	Non-program factor
N3r	Reduced maintenance or equipment replacement policies	3	Non-program factor
N3s if open end is program related	Other Program factor from open end	5	Program Factor
N3s if open end is non-program related	Other Non-Program factor from open end	5	
	PAI - 2 Score -- Score reduced by half if learned after decision = N41 or N41/2 if N2 = AFTER	**8**	
N2	Did you make the decision to install MEASURE before or after you began discussions with UTILITY regarding the availability of rebates for this measure?	AFTER	
	How significant was PROGRAM versus other factors in your decision to implement this MEASURE?		
N41	Please rate the overall importance of the PROGRAM in your decision to implement this MEASURE?	8	
	Score 3 -- No-Program Score = 10 minus N5 Score	**7.00**	
N5	If the PROGRAM had not been available, what is the likelihood that you would have installed exactly the same program qualifying efficient equipment	3	
	OVERALL NTGR SCORE	**0.69**	

APPENDIX B SITE REPORTS

ID 2		
Phone Survey Status - Complete **On-Site Complete** - No	**PoolCover 1**	**PoolCover 2**
Age of Existing Pool Cover(Yrs)	6	8
Condition of Existing Cover	Various tears and coming apart at the seams	Various tears and coming apart at the seams
Surface Area(sf)	6,150	5,100
Average Depth	7.75	7.75
Volume(Gal)	356,540	300,000
Temperature(°F)	70-80	70-80
Heater Capacity(Btuh)		
Heater Fuel Type	NG	NG
Heater Efficiency		
Hours of Operation	5:30 am to 6:30 pm	7:00 am to 6:00 pm
Pool Cover Schedule	7 pm to 5:30 am	6:00 pm to 7:00 am
Shading Factor		
Wind Shielding Factor		
Activity Level	High	High
Pool Cover Make	T-Star	T-Star
Pool Cover Model	Energy Saver XER	Energy Saver XER
Comments		

ID 11	
Phone Survey Status - Complete **On-Site Complete** - Yes	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	7
Condition of Existing Cover	Wind-blown and tattered
Surface Area(sf)	3,000
Average Depth	6.5
Volume(Gal)	160,000
Temperature(°F)	78
Heater Capacity(Btuh)	1,530,000
Heater Fuel Type	NG
Heater Efficiency	
Hours of Operation	Summer: 8:00 am to 8:00 pm Winter: 4:00 pm to 8:00 pm
Pool Cover Schedule	Summer: 8:00 pm to 8:00 am Winter: 8:00 pm to 4:00 pm
Shading Factor	0%
Wind Shielding Factor	0%
Activity Level	High
Pool Cover Make	ThermGard
Pool Cover Model	1212 DLX
Comments	

ID 10	
Phone Survey Status - Complete **On-Site Complete** - No	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	
Condition of Existing Cover	No Prior Pool Cover
Surface Area(sf)	12,300
Average Depth	8.25
Volume(Gal)	759,086
Temperature(°F)	
Heater Capacity(Btuh)	
Heater Fuel Type	
Heater Efficiency	
Hours of Operation	Summer: 8:00 am to 7:00 pm Winter: Closed and drained
Pool Cover Schedule	Summer: 7:00 pm to 8:00 am Winter: Closed and drained
Shading Factor	
Wind Shielding Factor	
Activity Level	
Pool Cover Make	
Pool Cover Model	
Comments	Pool Not Heated

ID 12	
Phone Survey Status- Complete **On-Site Complete**- Yes	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	
Condition of Existing Cover	Prior pool covers were not being used because they were so damaged
Surface Area(sf)	5,400
Average Depth	5
Volume(Gal)	181,000
Temperature(°F)	80
Heater Capacity(Btuh)	1,800,000
Heater Fuel Type	NG
Heater Efficiency	
Hours of Operation	1:00 pm to 8:00 pm
Pool Cover Schedule	Saturday 8pm to Monday 1:00 pm
Shading Factor	20%
Wind Shielding Factor	0%
Activity Level	High
Pool Cover Make	T-Star
Pool Cover Model	Energy Saver XER
Comments	Site with ex post gross savings.

ID 18	
Phone Survey Status - Complete **On-Site Complete** - No	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	8
Condition of Existing Cover	Falling apart, multiple tears, fraying, almost unusable, ripped every time it rolled up
Surface Area(sf)	9,385
Average Depth	7.5
Volume(Gal)	500,000
Temperature(°F)	78
Heater Capacity(Btuh)	
Heater Fuel Type	NG
Heater Efficiency	
Hours of Operation	3 hours per day winter, 8 hours per day summer
Pool Cover Schedule	Covered December through February when not in use
Shading Factor	
Wind Shielding Factor	
Activity Level	
Pool Cover Make	Thermgard
Pool Cover Model	1214 XL
Comments	

ID 14	
Phone Survey Status - Complete **On-Site Complete** - Yes	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	UNK
Condition of Existing Cover	Delaminating and have tears
Surface Area(sf)	12,300
Average Depth	8.25
Volume(Gal)	680,000
Temperature(°F)	80
Heater Capacity(Btuh)	2,000,000
Heater Fuel Type	NG
Heater Efficiency	82%
Hours of Operation	Summer M-F: 6 :00 am to 8:00 pm; Winter and SAT-SUN: 10:00 am to 5:00 pm
Pool Cover Schedule	Covered Daily During Unoccupied HRS
Shading Factor	0%
Wind Shielding Factor	75%
Activity Level	Medium
Pool Cover Make	Spectrum Aquatics
Pool Cover Model	Thermal King
Comments	

ID 3	
Phone Survey Status - Complete **On-Site Complete** - No	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	7
Condition of Existing Cover	There were some tears.
Surface Area(sf)	6,150
Average Depth	7
Volume(Gal)	285,000
Temperature(°F)	80
Heater Capacity(Btuh)	
Heater Fuel Type	
Heater Efficiency	
Hours of Operation	Summer(3 mo): 6:00 am to 10:00 pm Rest of the Year: 6:00 am to 6:00 pm
Pool Cover Schedule	Covered Daily During Unoccupied HRS
Shading Factor	0%
Wind Shielding Factor	0%
Activity Level	High
Pool Cover Make	T-Star
Pool Cover Model	Energy Saver XER
Comments	

ID 1	
Phone Survey Status - Complete **On-Site Complete** - No	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	5
Condition of Existing Cover	Was in poor condition
Surface Area(sf)	1,252
Average Depth	2.75
Volume(Gal)	24,000
Temperature(°F)	91
Heater Capacity(Btuh)	
Heater Fuel Type	
Heater Efficiency	
Hours of Operation	8:00 am to 8:00 pm
Pool Cover Schedule	8:00 pm to 8:00 am
Shading Factor	60%
Wind Shielding Factor	25%
Activity Level	High
Pool Cover Make	T-Star
Pool Cover Model	Energy Saver XER
Comments	

ID 6	
Phone Survey Status - Complete **On-Site Complete** - Yes	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	9
Condition of Existing Cover	The pool cover was scratched and frayed at the edges. Small deep scratches were also present on the cover.
Surface Area(sf)	7,200
Average Depth	7.5
Volume(Gal)	391,000
Temperature(°F)	82
Heater Capacity(Btuh)	2,000,000
Heater Fuel Type	NG
Heater Efficiency	82%
Hours of Operation	5:00 am to 9:00 pm
Pool Cover Schedule	9:00 pm to 5:00 am
Shading Factor	0%
Wind Shielding Factor	100%
Activity Level	High
Pool Cover Make	Spectrum Aquatics
Pool Cover Model	Thermal King
Comments	

ID 8		
Phone Survey Status - Complete **On-Site Complete** - Yes	**PoolCover 1**	**PoolCover 2**
Age of Existing Pool Cover(Yrs)	UNK	UNK
Condition of Existing Cover	There were tears in the covers and they were very unusable.	There were tears in the covers and they were very unusable.
Surface Area(sf)	1,800	3,375
Average Depth	4	9
Volume(Gal)	54,000	260,000
Temperature(°F)	81	81
Heater Capacity(Btuh)	199,999	199,999
Heater Fuel Type	NG	NG
Heater Efficiency		
Hours of Operation	7:00 am to 9:00 pm	7:00 am to 9:00 pm
Pool Cover Schedule	Winter: Covered During Unoccupied HRS Summer: NOT Covered	Winter: Covered During Unoccupied HRS Summer: NOT Covered
Shading Factor	0%	0%
Wind Shielding Factor	100%	100%
Activity Level	Low	Low
Pool Cover Make	Spectrum Aquatics	Spectrum Aquatics
Pool Cover Model	Thermal King	Thermal King
Comments	NOT Heated in Summer	NOT Heated in Summer

ID 9	
Phone Survey Status - Complete **On-Site Complete** - Yes	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	N/A
Condition of Existing Cover	No Prior Pool Cover / This is a NEW Pool
Surface Area(sf)	4,805
Average Depth	7
Volume(Gal)	290,000
Temperature(°F)	81
Heater Capacity(Btuh)	1,800,000
Heater Fuel Type	NG
Heater Efficiency	82%
Hours of Operation	7:00 am to 7:00 pm
Pool Cover Schedule	Covered Daily During Unoccupied HRS
Shading Factor	0%
Wind Shielding Factor	50%
Activity Level	High
Pool Cover Make	Spectrum Aquatics
Pool Cover Model	Thermal King
Comments	

ID 4	
Phone Survey Status - Complete **On-Site Complete** - Yes	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	7
Condition of Existing Cover	was okay
Surface Area(sf)	12,000
Average Depth	7.5
Volume(Gal)	675,000
Temperature(°F)	80
Heater Capacity(Btuh)	1,800,000
Heater Fuel Type	E
Heater Efficiency	
Hours of Operation	5:30 am to 8:30 pm
Pool Cover Schedule	Winter: Covered approx. 75% of Unoccupied HRS Summer: NOT Covered
Shading Factor	25%
Wind Shielding Factor	100%
Activity Level	High
Pool Cover Make	T-Star
Pool Cover Model	Energy Saver XER
Comments	

ID 13	
Phone Survey Status - Complete **On-Site Complete** - Yes	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	7
Condition of Existing Cover	shredding
Surface Area(sf)	6,375
Average Depth	8
Volume(Gal)	382,500
Temperature(°F)	81
Heater Capacity(Btuh)	2,000,000
Heater Fuel Type	NG
Heater Efficiency	
Hours of Operation	5:30 am to 8:30 pm
Pool Cover Schedule	Winter: Covered approx. 75% of Unoccupied HRS Summer: NOT Covered
Shading Factor	50%
Wind Shielding Factor	50%
Activity Level	High
Pool Cover Make	T-Star
Pool Cover Model	Energy Saver XER
Comments	

ID 7	
Phone Survey Status - Complete **On-Site Complete** - Yes	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	7
Condition of Existing Cover	was okay
Surface Area(sf)	6,375
Average Depth	6
Volume(Gal)	286,875
Temperature(°F)	80
Heater Capacity(Btuh)	1,440,000
Heater Fuel Type	NG
Heater Efficiency	
Hours of Operation	5:30 am to 8:30 pm
Pool Cover Schedule	Winter: Covered approx. 75% of Unoccupied HRS Summer: NOT Covered
Shading Factor	25%
Wind Shielding Factor	100%
Activity Level	Low
Pool Cover Make	T-Star
Pool Cover Model	Energy Saver XER
Comments	

ID 15	
Phone Survey Status - Complete **On-Site Complete** - No	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	
Condition of Existing Cover	No Prior Pool Cover
Surface Area(sf)	6,225
Average Depth	9
Volume(Gal)	330,000
Temperature(°F)	80
Heater Capacity(Btuh)	
Heater Fuel Type	
Heater Efficiency	
Hours of Operation	M-SA: Ave. of 5 HR Per Day SU: 4 HRS
Pool Cover Schedule	Covered Every Night
Shading Factor	0%
Wind Shielding Factor	25%
Activity Level	Medium
Pool Cover Make	T-Star
Pool Cover Model	Energy Saver XER
Comments	

ID 17	
Phone Survey Status - Complete **On-Site Complete** - No	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	
Condition of Existing Cover	No Prior Pool Cover
Surface Area(sf)	12,326
Average Depth	3.25
Volume(Gal)	300,446
Temperature(°F)	81
Heater Capacity(Btuh)	
Heater Fuel Type	
Heater Efficiency	
Hours of Operation	6:30 am to 9:00 pm
Pool Cover Schedule	Covered During Closed Hours
Shading Factor	0%
Wind Shielding Factor	25%
Activity Level	Medium
Pool Cover Make	T-Star
Pool Cover Model	Energy Saver XER
Comments	

ID 16	
Phone Survey Status - Complete **On-Site Complete** - No	**PoolCover 1**
Age of Existing Pool Cover(Yrs)	5
Condition of Existing Cover	Getting tears and sides were frayed
Surface Area(sf)	6,205
Average Depth	7.5
Volume(Gal)	343,245
Temperature(°F)	78
Heater Capacity(Btuh)	
Heater Fuel Type	
Heater Efficiency	
Hours of Operation	5:30 am to 7:00 pm
Pool Cover Schedule	Covered Every Night
Shading Factor	0%
Wind Shielding Factor	75%
Activity Level	Medium
Pool Cover Make	T-Star
Pool Cover Model	Energy Saver XER
Comments	

ID 5			
Phone Survey Status - Complete **On-Site Complete** - Yes	**PoolCover 1**	**PoolCover 2**	**PoolCover 3**
Age of Existing Pool Cover(Yrs)	UNK	UNK	UNK
Condition of Existing Cover	Delaminating and have tears	Delaminating and have tears	Delaminating and have tears
Surface Area(sf)	6,150	12,300	12,300
Average Depth	3.5	7	8.75
Volume(Gal)	168,000	620,000	720,000
Temperature(°F)	83	80	80
Heater Capacity(Btuh)	800,000	1,500,000	2,000,000
Heater Fuel Type	NG	NG	NG
Heater Efficiency	92%	92%	92%
Hours of Operation	Summer M-F: 6 :00 am to 9:00 pm; Winter and SAT-SUN: 8:00 am to 7:00 pm	Summer M-F: 6 :00 am to 9:00 pm; Winter and SAT-SUN: 8:00 am to 7:00 pm	Summer M-F: 6 :00 am to 9:00 pm; Winter and SAT-SUN: 8:00 am to 7:00 pm
Pool Cover Schedule	Covered Daily During Unoccupied HRS	Covered Daily During Unoccupied HRS	Covered Daily During Unoccupied HRS
Shading Factor	0%	0%	0%
Wind Shielding Factor	75%	25%	50%
Activity Level	High	High	High
Pool Cover Make	Spectrum Aquatics	Spectrum Aquatics	Spectrum Aquatics
Pool Cover Model	Thermal King	Thermal King	Thermal King
Comments			

APPENDIX AA STANDARDIZED HIGH LEVEL SAVINGS

Gross Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SCG	Pool Cover	0	0			
SCG	**Total**	**0**	**0**			
	Statewide	***0***	***0***			

Net Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SCG	Pool Cover	0	0						
SCG	**Total**	**0**	**0**						
	Statewide	***0***	***0***						

Gross Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SCG	Pool Cover	0.0	0.0			
SCG	**Total**	**0.0**	**0.0**			
	Statewide	***0.0***	***0.0***			

Net Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SCG	Pool Cover	0.0	0.0						
SCG	**Total**	**0.0**	**0.0**						
	Statewide	***0.0***	***0.0***						

Gross Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SCG	Pool Cover	1,339.4	1.7	0.0012	0.0%	0.0012
SCG	**Total**	**1,339.4**	**1.7**	**0.0012**	**0.0%**	**0.0012**
	Statewide	***1,339.4***	***1.7***	***0.0012***	***0.0%***	***0.0012***

Net Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SCG	Pool Cover	1,028.6	1.1	0.0011	0.0%	0.77	0.68	0.77	0.68
SCG	**Total**	**1,028.6**	**1.1**	**0.0011**	**0.0%**	**0.77**	**0.68**	**0.77**	**0.68**
	Statewide	***1,028.6***	***1.1***	***0.0011***	***0.0%***	***0.77***	***0.68***	***0.77***	***0.68***

Gross First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SCG	Pool Cover	0	0			
SCG	**Total**	**0**	**0**			
	Statewide	***0***	***0***			

Net First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SCG	Pool Cover	0	0						
SCG	**Total**	**0**	**0**						
	Statewide	***0***	***0***						

Gross First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SCG	Pool Cover	0.0	0.0			
SCG	**Total**	**0.0**	**0.0**			
	Statewide	***0.0***	***0.0***			

Net First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SCG	Pool Cover	0.0	0.0						
SCG	**Total**	**0.0**	**0.0**						
	Statewide	***0.0***	***0.0***						

Gross First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SCG	Pool Cover	239.3	0.3	0.0013	0.0%	0.0013
SCG	**Total**	**239.3**	**0.3**	**0.0013**	**0.0%**	**0.0013**
	Statewide	***239.3***	***0.3***	***0.0013***	***0.0%***	***0.0013***

Net First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SCG	Pool Cover	181.4	0.2	0.0012	0.0%	0.76	0.68	0.76	0.68
SCG	**Total**	**181.4**	**0.2**	**0.0012**	**0.0%**	**0.76**	**0.68**	**0.76**	**0.68**
	Statewide	***181.4***	***0.2***	***0.0012***	***0.0%***	***0.76***	***0.68***	***0.76***	***0.68***

APPENDIX AB STANDARDIZED PER UNIT SAVINGS

Per Unit (Quantity) Gross Energy Savings (kWh)

Report Name	PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
COM_2015_PoolCover	SCG	Pool Cover	0	0.0%	0.0%	5.5	0.0	0.0	0.0

Per Unit (Quantity) Gross Energy Savings (Therms)

Report Name	PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
COM_2015_PoolCover	SCG	Pool Cover	0	0.0%	0.0%	5.5	0.0	0.0	0.0

Per Unit (Quantity) Net Energy Savings (kWh)

Report Name	PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
COM_2015_PoolCover	SCG	Pool Cover	0	0.0%	0.0%	5.5	0.0	0.0	0.0

Per Unit (Quantity) Net Energy Savings (Therms)

Report Name	PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
COM_2015_PoolCover	SCG	Pool Cover	0	0.0%	0.0%	5.5	0.0	0.0	0.0

APPENDIX AC RESPONSE TO RECOMMENDATIONS

EM&V Impact Study Recommendations
Study Title: 2015 Nonresidential Downstream Deemed ESPI Pool Cover Impact Evaluation
Study Manager: CPUC

ID		Section	Conclusion	Recommendation	Disposition (Accepted, Rejected, or Other)	Disposition Notes (e.g. Description of specific program change or Reason for rejection or Under further review)
1	SCG	1.5 and 1.6	17 of the 18 pool cover participants that were evaluated were determined to have no ex post savings from the pool cover measure installation. This was due to either; 1) the installed pool cover having the same level of efficiency as the pre-existing cover, 2) the installed pool cover did not exceed minimum levels of efficiency associated with what is considered standard practice or 3) the pool was empty 9 months of the year and not heated the other 3 months of the year.	Strong consideration should be given to no longer offering the commercial pool cover measure. If this measure continues to be offered, customers should be required to install covers with efficiency levels that exceed both their pre-existing cover, as well as industry standard practice.		