Report by **SBW CONSULTING, INC.**

MAJOR COMMERCIAL CONTRACT GROUP
VOLUME I
FINAL IMPACT EVALUATION REPORT
2006-2008 PROGRAM YEARS

CPU0021.01

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ABSTRACT

Major Commercial is one of ten contract groups developed by the CPUC Energy Division (ED) to organize and manage the impact evaluation of California IOU programs in the 2006-2008 energy efficiency programs. It included an analysis of high impact measures (Custom Lighting, Custom HVAC, Custom Other and Audit) within the following five commercial, industrial and agricultural programs that were implemented by Southern California Edison (SCE), Southern California Gas (SCG) and San Diego Gas and Electric (SDGE).

- SCE2517 – The Standard Performance Contract and non-residential audit portions of the SCE Business Incentives and Services Program (commercial/industrial retrofit)
- SCE3513 – The SCG Business Energy Efficiency Program (commercial/industrial retrofit)
- SDGE3025 - The SDG&E Standard Performance Contract Program (commercial/industrial retrofit)
- SDGE3010 – The SDG&E Energy Savings Bid Program (commercial/industrial retrofit)
- SCG3503 – The SCG Education and Training Program (non-residential audit)

This impact evaluation consisted of three EM&V activities. The first activity was a verification analysis that was performed in two parts; for the first two program years 2006/07 and for all three program years 2006-2008. It was performed on four of the five Major Commercial programs. The other two EM&V activities are relevant to the full impact analysis of high impact measures for program years 2006-2008. The second activity was an analysis of gross savings achieved by high impact measures within the five non-residential retrofit programs included in the Major Commercial contract group. The third activity was an analysis of net savings achieved by high impact measures within these programs. This report documents the methods used and results obtained for activities two and three. The methods and results for the first activity were documented in a previous report.

Table 1 summarizes important results from the analysis of gross and net savings of HIMs and programs that were evaluated. The table shows that significant gross and net savings were realized for programs with Custom HIMs, including SCE2517 SPC, SCG3513, SDGE3025 and SDGE3010. However, very little savings were realized by the audit HIM, including programs SCE2517 NRA and SCG3503.

Table 1: Summary of Important Gross and Net Results

			Gross Ex Post Unit Energy Savings			Gross Savings Realization Rate			Net to Gross Ratios			
Program	HIM1	Sample	kW	kWh	Therms	kW	kWh	Therms	Sample	kW	kWh	Therms
SCE2517 SPC	All	18	41.0	274,897	30	0.82	0.80	N/A	47	0.57	0.59	N/A
SDGE3010 Therm	H	7	0.0	0	98,072	N/A	N/A	0.98	8	N/A	N/A	0.85
SDGE3010 kWh	H, L	9	17.0	112,395	0	0.66	0.67	N/A	33	0.68	0.70	N/A
SDGE3025 kWh	H, L	8	21.0	167,423	71	1.28	1.54	N/A	27	0.56	0.54	N/A
SDGE3025 Therm	H, O	6	0.0	-217	7,679	N/A	N/A	0.33	10	N/A	N/A	0.43
SCG3513	O	19	0.0	0	14,467	N/A	N/A	0.72	33	N/A	N/A	0.54
SCE2517 NRA	A	58	0.6	3,070		0.27	0.27	N/A	31	0.42	0.40	N/A
SCG3503	A	12			4,365	N/A	N/A	0.02	1	N/A	N/A	1.00

1 H stands for custom HVAC; L stands for custom lighting; O stands for custom other; All stands for custom HVAC, custom lighting, and custom other; A stands for audit.

EXECUTIVE SUMMARY

The Major Commercial contract group includes four high impact measures[1] (Custom Lighting, Custom HVAC, Custom Other and Audit) within five commercial, industrial, and agricultural programs that were implemented by Southern California Edison (SCE), Southern California Gas (SCG) and San Diego Gas and Electric (SDGE). The Major Commercial contract group was identified by ED as one of the four contract groups that require a dual approach to the evaluation, which includes both a "verification" level of analysis and "full impact" level of analysis. This report documents the procedures used and results obtained for the full impact analysis. Results from the verification level analysis were documented in a previous report.[2]

Evaluation Goals and Objectives

The primary goal of the full impact evaluation was to assess the gross and net program-specific energy and demand impacts for high impact measures (HIM) and non-residential programs in the Major Commercial contract group. A secondary goal was to increase the quality, reliability and objectiveness of the estimated impacts from the energy efficiency programs. A third goal was to inform the Commission and the program administrators as to where the greatest areas of concern are with regard to high free ridership. Information from the evaluation will be used to improve the effectiveness of acquiring energy efficiency for the IOU ratepayers.

The full impact evaluation accomplished the following objectives:

- Determine the annual and life cycle gross and net energy and peak demand impacts (direct and indirect) associated with high impact measures and programs in the contract group. Estimate savings over the time period the measures are projected to provide energy and demand impacts
- Conduct measure-specific evaluations of savings for sampled cases
- Account for the effects of free-ridership in the estimates of net savings.
- Account for the energy and peak demand effects of spillover
- Explain discrepancies found between the results of this study and the IOU ex-ante savings estimates and recommend ways to minimize these discrepancies in the future
- Provide information necessary to understand how programs can be modified to improve their performance and the overall performance of the portfolios

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[1] High impact measures are defined as those efficiency measures common across IOU programs that contribute greater than one percent to the entire IOU savings portfolio for reductions in electrical consumption, electrical demand or natural gas consumption.

[2] SBW Consulting, Inc., *2008 First Verification Report – Major Commercial Contract Group*, submitted to the California Public Utilities Commission, June, 2008. It can be found at www.energydataweb.com/cpuc.

- Inform future updates to ex-ante energy and peak demand savings estimates (including the DEER database) for program planning purposes
- Provide information that can be used to improve program design and program selection for future program cycles

High Impact Measures Included in This Evaluation

The full evaluation also included analysis of high impact measures (HIMs). Each HIM accounted for at least 1 percent of an IOU's energy, demand or gas savings claims for the 2006-08 program cycle. For the full evaluation, four HIMs were analyzed by the Major Commercial contract group.

Non-residential Audits: The evaluation considered indirect measures claimed by the IOUs for programs SCG3503 and SCE2517 (NRA component).

Custom Lighting: The evaluation considered lighting measures included in the SDGE3010, SDGE3025 and SCE2517 (SPC component) programs. All lighting measures in these programs were considered to be custom because the ex ante savings estimates were customized site-specific analyses.

Custom HVAC: The evaluation considered HVAC measures included in the SCG3513, SDGE3010, SDGE3025 and SCE2517 (SPC component) programs. All HVAC measures in these programs were considered to be custom because the ex ante savings estimates were customized site-specific analyses.

Custom Other: The evaluation considered "other" measures (non-lighting and non-HVAC) included in the SCG3513, SDGE3010, SDGE3025 and SCE2517 (SPC component) programs. Other measures included industrial process changes, boilers, burners and other measures that could not be classified under lighting or HVAC. All "other" measures in these programs were considered to be custom because the ex ante savings estimates were customized site-specific analyses.

Programs Included in This Evaluation

The following Major Commercial programs were included in the impact evaluation.

- SCE2517 – The Standard Performance Contract and non-residential audit portions of the SCE Business Incentives and Services Program (commercial/industrial retrofit)
- SCE3513 – The SCG Business Energy Efficiency Program (commercial/industrial retrofit)
- SDGE3025 - The SDG&E Standard Performance Contract Program (commercial/industrial retrofit)
- SDGE3010 – The SDG&E Energy Savings Bid Program (commercial/industrial retrofit)
- SCG3503 – The SCG Education and Training Program (non-residential audit)

Summary of Findings

Significant gross energy savings were found for three of the four high impact measures (custom lighting, custom HVAC and custom other) associated with the programs or program components with direct measures. Domain-level realization rate results indicate that the ex post gross savings estimated in this evaluation were less than the ex ante savings in most cases. Significant gross savings were not found for the audit HIM. Domain-level realization rate and unit energy savings results indicate that the ex post savings estimated in this evaluation were very small.

The gross savings results are shown in the tables below by HIM within sample domain. Table 2 expresses the results in terms of realization rate and Table 3 expresses the results in terms of unit energy savings. Across the custom HIMs , the realization rates varied from a low of 0.33 for SDGE3025 therms to a high of 1.54 for SDGE3025 kWh. For the audit HIM (programs SCE2517 NRA and SCG3503), the realization rates varied from 0.02 for SCG3503 therms to 0.27 for SCE2517 NRA kW and kWh.

Table 2: Summary Gross Savings Realization Rate

				Gross Savings Realization Rate			90% Relative Precision		
Program	**HIM**	**Population**	**Sample**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
SCE2517 SPC	all custom	1,397	18	0.82	0.80	N/A	0.10	0.15	N/A
SCG3513	custom other	700	19	N/A	N/A	0.72	N/A	N/A	0.74
SDGE3010 kWh	custom HVAC, custom lighting	719	9	0.66	0.67	N/A	0.34	0.34	N/A
SDGE3010 Therm	custom HVAC	14	7	N/A	N/A	0.98	N/A	N/A	0.11
SDGE3025 kWh	custom HVAC, custom lighting	343	8	1.28	1.54	N/A	0.33	0.60	N/A
SDGE3025 Therm	custom HVAC, custom other	24	6	N/A	N/A	0.33	N/A	N/A	0.59
SCE2517 NRA	audit	10,415	58	0.27	0.27	N/A	0.53	0.55	N/A
SCG3503	audit	34	12	N/A	N/A	0.02	N/A	N/A	0.36

Table 3: Summary Gross Ex Post Unit Energy Savings

				Gross Ex Post Unit Energy Savings			90% Relative Precision		
Program	**HIM**	**Population**	**Sample**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
SCE2517 SPC	all custom	1,397	18	41.0	274,897	30	0.10	0.15	0.91
SCG3513	custom other	700	19	0.0	0	14,467	N/A	N/A	0.74
SDGE3010 kWh	custom HVAC, custom lighting	719	9	17.0	112,395	0	0.34	0.34	N/A
SDGE3010 Therm	custom HVAC	14	7	0.0	0	98,072	N/A	N/A	0.11
SDGE3025 kWh	custom HVAC, custom lighting	343	8	21.0	167,423	71	0.33	0.60	1.34
SDGE3025 Therm	custom HVAC, custom other	24	6	0.0	-217	7,679	1.29	1.29	0.59
SCE2517 NRA	audit	10,415	58	0.6	3,070		0.53	0.55	N/A
SCG3503	audit	34	12			4,365	N/A	N/A	0.36

Domain-level net-to-gross ratio (NTGR) results indicate that the ex post net savings estimated in this evaluation were less than the ex ante savings in all cases. The net savings results are shown in Table 4, expressed as net-to-gross ratio (NTGR). Across the custom HIMs, the NTGRs varied from a low of 0.43

for SDGE3025 therms to a high of 0.85 for SDGE3010 therms. For the audit HIM (programs SCE2517 NRA and SCG3503), the NTGRs varied from 0.40 for SCE2517 NRA kWh to 0.83 for SCG3503 therms.

Table 4: Summary Net to Gross Ratios

				Net to Gross Ratios			90% Relative Precision		
Program	**HIM**	**Population**	**Sample**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
SCE2517 SPC	all custom	1,397	47	0.57	0.59	N/A	0.14	0.13	N/A
SCG3513	custom other	700	33	N/A	N/A	0.54	N/A	N/A	0.16
SDGE3010 kWh	custom HVAC, custom lighting	719	33	0.68	0.70	N/A	0.13	0.12	N/A
SDGE3010 Therm	custom HVAC	14	8	N/A	N/A	0.85	N/A	N/A	0.02
SDGE3025 kWh	custom HVAC, custom lighting	343	27	0.56	0.54	N/A	0.13	0.13	N/A
SDGE3025 Therm	custom HVAC, custom other	24	10	N/A	N/A	0.43	N/A	N/A	0.19
SCE2517 NRA	audit	10,415	31	0.42	0.40	N/A	0.26	0.24	N/A

Summary of Recommendations

Important recommendations from this impact evaluation include:

1. **Better inspection and documentation of baseline conditions** –It is recommended that baseline documentation be upgraded (when appropriate) so that an experienced evaluator can understand the energy performance of the baseline equipment.

2. **Improved measure names** –For future program years it is recommended that a statewide standardized measure naming system be put in place that would provide consistency across programs and IOUs.

3. **Improved IOU tracking system data entry** –It is recommended that additional quality control be placed on the IOU tracking database data entry procedures to verify that only measures that were implemented during the program years being evaluated be included in the savings claim.

4. **Do not claim savings for normal replacement measures that are required by Title 20/24 or are standard practice for the facility -** It is recommended for future program cycles that additional care be given to the IOU assessment of savings for normal replacement measures. The application file should provide documentation that discusses the Title 20/24 or standard practice conditions relevant to the affected normal replacement measure and provide proof that the implemented measures exceeded these requirements. The IOU savings claim should be consistent with this logic.

5. **Feedback to ex ante savings estimates** – It is recommended that the IOUs carefully study the differences between the ex ante and ex post savings estimates for the sampled measures in this evaluation and look for opportunities to improve their ability to predict measure performance.

6 **Measure level estimates savings in the indirect IOU tracking system -** It is recommended that for future program cycles all IOUs provide measure level savings estimates in their audit tracking system at a level of detail that is agreed upon with ED.

7 **Definition of peak demand savings** – It is recommended that the IOUs and the CPUC use the same definition of peak demand, if the assessment of peak demand remains an important part of the impact evaluations.

8 **Claimed indirect savings for audit measures** – It is recommended that the CPUC and all IOUs establish a series of rules for inclusion of indirect measures in the savings claim for future program cycles where indirect savings are claimed. It is also recommended that the utilities reconsider whether savings claims should be made at all for indirect measures. The results from this evaluation indicate that the utilities do such a good job of directing audited customers to the financial incentives offered by the direct programs that there is very little indirect savings to be claimed.

9 **Improve staff capabilities –** It is recommended that the programs improve the capability of their implementation staff to materially influence advance commercial and industrial efficiency improvements. It is also recommended that training of program staff be improved to enhance the capability to review submitted projects for compliance with program objectives, enforcement, rules and policies.

10 **Get involved early –** It is recommended that the programs enhance their capability to get involved with projects at the earliest possible stage.

11 **Early Project NTG and Baseline Screening –** It is recommended that that programs provide early project NTG and baseline screening for the largest customers.

1. INTRODUCTION AND PURPOSE OF STUDY

The programs relevant to the Major Commercial impact evaluation were implemented by the utilities and third parties in a 3-year cycle for the years 2006 through 2008. The primary purpose of the evaluation was to increase the quality, reliability, and objectiveness of the estimated impacts of the energy efficiency programs and important measures. Information from the evaluation was used to improve the effectiveness of acquiring energy efficiency for the IOU ratepayers.

To properly manage the completion of the required evaluation, measurement and verification (EM&V) activities for a large number of programs in a timely manner, the CPUC segmented the programs into ten discrete groups (referred to as Contract Groups). The Major Commercial contract group was identified by ED as one of the four contract groups that required a dual approach to the evaluation, which includes both a “verification” level of analysis and “full impact” level of analysis. This report documents the procedures used and results obtained for the full impact analysis. Results from the verification level analysis were previously documented in the First Year Verification Report.

1.1. Programs Included in This Evaluation

The following Major Commercial programs were included in the impact evaluation.

Standard Performance Contract (SPC) (SCE2517 and SDGE3025) - The SPC program is a statewide program administered by the IOUs. All non-residential customers who receive service from an IOU and pay the public goods charge on their utility bill are eligible to participate in this program. In general, projects must be retrofits of existing, operational equipment, and the replaced equipment must be removed from service. For SDGE, SPC is a stand-alone program. For SCE, SPC is one component of the larger Business Incentives and Services Program (BISP).

Non-residential Audits (SCE2517 and SCG3503) - The Non-residential Audits (NRA) is a local program for both SCE and SCG that delivers energy efficiency information, awareness and efficiency project recommendations to commercial and industrial customers. For SCG, non-residential audits are performed as part of the Education and Training program. In addition to audits, SCG intervention under this program includes technical assistance for measures that are not addressed by other SCG non-residential programs. For SCE, NRA is one component of the larger Business Incentives and Services Program (BISP). It only includes audits.

Business Energy Efficiency Program (SCG3513) - This program currently consists of four program elements that meet the diverse needs of SCG’s non-residential gas customers. Participants are guided into the program through multiple channels such as audits, energy efficiency training and education seminars, the commercial support center, account executives and commercial/industrial service technicians.

Energy Savings Bid Program (SDGE3010) - The Energy Savings Bid (ESB) Program is a local non-residential energy efficiency incentive program that is designed for large commercial or industrial efficiency projects that require more flexibility than is offered by the statewide SPC program. A project may include a single customer or an aggregation of customers at multiple sites. The aggregation feature allows for participation from customers who are unable or unwilling to participate in the statewide Express Efficiency or SPC programs.

Express Efficiency (SCE2517) - Express Efficiency is a statewide program that provides rebates for itemized (prescriptive) energy efficiency measures to all nonresidential customers on a seamless statewide basis. For SCE, Express Efficiency is one component of the larger Business Incentives and Services Program (BISP). Offering itemized measures and a simplified process for customers to apply for and receive a prescribed rebate makes it attractive for firms to invest in energy efficiency in the short term in order to lower energy costs in the long term. The Express Efficiency component of SCE2517 was included in the verification analysis but not included in the full impact evaluation of the Major Commercial contract group. It was included in the full impact evaluation of other contract groups.

1.2. Rationale for Grouping EM&V Activities

The measures included in this impact evaluation were grouped in two ways. First, for the evaluation of the IOU programs, the measure groupings were consistent with the program definitions. For the full impact evaluation an exception was made for SCE2517. For this program, measure groupings were based on the three program components. For the verification analysis, all three components were considered. For the full impact evaluation, measures included only in the SPC and audit components were considered. Measures in the Express Efficiency component were included in the full evaluation of other contract groups.

The evaluation also included analysis of high impact measure (HIMs) groups. HIMs are classifications of measures within each IOU that account for most of the utility reported annual energy and demand savings during the 2006/2008 program cycle. For the full evaluation, HIMs were defined as those efficiency measures common across IOU programs that contribute greater than one percent to the entire IOU savings portfolio for reductions in electrical consumption, electrical demand or natural gas consumption.

For the full evaluation, four HIMs were analyzed by the Major Commercial contract group. Collectively, they represent all of the claimed savings for the five programs in the Major Commercial contract group except for the Express Efficiency component of the SCE2517 program.

The HIMs analyzed by the Major Commercial contract group were defined as follows:

Non-residential Audits: The evaluation considered indirect measures claimed by the IOUs for programs SCG3503 and SCE2517 (NRA component). For the SCE2517 NRA program, indirect measures were assumed to be measures that were recommended in an audit performed under this program, claimed for the 2006-08 program years and implemented without an SCE incentive. For the SCG3503 program, indirect measures were assumed to be measures that were recommended in an audit performed under this program, claimed for the 2006-08 program years and implemented without an SCG incentive. For this program indirect measures were also allowed to be non-rebated, implemented measures that did not receive an audit by SCG but did receive significant technical assistance from this program. The assistance had to be significant enough that the measure would not have been implemented without it. The PG&E and SDGE NRA programs were not included because these IOUs did not claim savings from their non-residential audit programs.

Custom Lighting: The evaluation considered lighting measures included in the SDGE3010, SDGE3025 and SCE2517 (SPC component) programs. All lighting measures in these programs were considered to be custom because the ex ante savings estimates were customized site-specific analyses.

Custom HVAC: The evaluation considered HVAC measures included in the SCG3513, SDGE3010, SDGE3025 and SCE2517 (SPC component) programs. All HVAC measures in these programs were considered to be custom because the ex ante savings estimates were customized site-specific analyses.

Custom Other: The evaluation considered "other" measures (non-lighting and non-HVAC) included in the SCG3513, SDGE3010, SDGE3025 and SCE2517 (SPC component) programs. Other measures included industrial process changes, boilers, burners and other measures that could not be classified under lighting or HVAC. All "other" measures in these programs were considered to be custom because the ex ante savings estimates were customized site-specific analyses.

1.3. Summary of EM&V Activities

This impact evaluation consisted of three primary EM&V activities. The first activity was a verification analysis that was performed in two parts; for the first two program years 2006/07 and for all three program years 2006-2008. The verification activity was performed on four of the five Major Commercial programs. The analysis produced installation rates that were used to assess the IOU interim savings claim. The results from the first activity were documented in the first verification report for the first two program years 2006/07 and for all program years 2006-08.

The other two EM&V activities are relevant to the full impact analysis for program years 2006-2008. The second activity was an analysis of gross savings achieved by the five non-residential retrofit programs included in the Major Commercial contract group. The third activity was an analysis of net savings achieved for the contract group. The methodology used for both the verification and full evaluation analyses focused on the assessment of high impact measures (HIMs). Both the gross and net analyses used ED-approved procedures, which satisfied the requirements of relevant CPUC directives. The results from the second and third activities are documented in this report.

Tables 5 and 6 summarize the methods used and parameters estimated for each of the EM&V activities.

Table 5: High Impact Measure Activity Summary

	06/07 Verification	Gross Savings		Net Savings
Evaluation Methods	**Site Inspections**	**Field Measurements**	**Engineering Analysis**	**Participant Self Report**
HIM	**Parameters estimated or evaluation outputs**			
Non-Res Audit	NA	NA	Realization Rate	NTG Ratio
Custom Lighting	Installation Rate	Various per custom M&V plan	Realization Rate	NTG Ratio
Custom HVAC	Installation Rate	Various per custom M&V plan	Realization Rate	NTG Ratio

	06/07 Verification	Gross Savings		Net Savings
Evaluation Methods	**Site Inspections**	**Field Measurements**	**Engineering Analysis**	**Participant Self Report**
Custom Other	Installation Rate	Various per custom M&V plan	Realization Rate	NTG Ratio

Table 6: Program-specific Activity Summary

	06/07 Verification	Gross Savings		Net Savings
Evaluation Methods	**Site Inspections**	**Field Measurements**	**Engineering Analysis**	**Participant Self Report**
Program*		**Parameters estimated or evaluation outputs**		
SDGE3025	Installation Rate	Various per custom M&V plan	Realization Rate	NTG Ratio
SDGE3010	Installation Rate	Various per custom M&V plan	Realization Rate	NTG Ratio
SCG3513	Installation Rate	Various per custom M&V plan	Realization Rate	NTG Ratio
SCG3503	NA	NA	Realization Rate	NTG Ratio
*SCE2517 was not included because the evaluation activities for the Major Commercial contract group considered only the SPC and NRA portions of the program. The Express Efficiency component was performed by other contract groups.				

1.4. Description of EM&V Activities

The approach used for the three EM&V activities is summarized below.

1.4.1. Activity 1: Verification Analysis

Verification was performed on four programs in the Major Commercial contract group. They included:

- SCE2517 - Business Incentives and Services Program (BISP) – all components
- SCG3513 - Business Energy Efficiency Program (BEEP)
- SDGE3010 - Energy Savings Bid Program (ESB)
- SDGE3025 - Standard Performance Contract Program (SPC)

A verification plan was written to describe a complete set of data collection, data analysis and reporting procedures necessary to prepare the verification report. Important aspects of these procedures are summarized below.

Verification Sample Selection. For the first verification report, a sample was drawn, by program, from measures for which incentives were paid through December 31, 2007. Measures in high-impact groups defined by the CPUC were represented in this sample in approximately the same proportions found in the population.

On-Site Data Collection. An on-site survey was performed to document the count of equipment installed and its eligibility and current operational status for sampled measures. This information was used to support the calculation of installation rates for the programs included in the Major Commercial contract group. The survey also collected information necessary to confirm the DEER ID or work paper ID (if applicable) and savings, and verify the measure cost.

Review Ex Ante Savings Estimates. The verification of each measure also included an assessment of the ex-ante savings estimate prepared by the IOUs. The ex-ante estimates came from one of three sources – a custom analysis of the measure savings (documented in the application file), work papers developed by the IOUs or the DEER database. A re-calculation of energy savings was not made as part of the verification study.

First Year Verification Report. The results from the verification performed on program years 2006 and 2007 were documented in the First Year Verification Report. The first year report documented the methodology used and results obtained from the verification activity for the 2006-2007 program years. The verification results were also documented in the Energy Division's verification report for the first two program years 2006-2007.

1.4.2. Activity 2: Full Evaluation Gross Analysis

A full evaluation analysis of gross savings was conducted for each of the five programs in the Major Commercial contract group. They included:

- SCE2517 - Business Incentives and Services Program (BISP) – NRA and SPC components
- SCG3513 - Business Energy Efficiency Program (BEEP)
- SDGE3010 - Energy Savings Bid Program (ESB)
- SDGE3025 - Standard Performance Contract Program (SPC)
- SCG3503 - Education and Training Program

The full evaluation also included an analysis of gross savings for the four HIMs in the Major Commercial contract group. They included:

- Non-residential Audit for SCE2517 NRA and SCG3503
- Custom Lighting for SCE2517 SPC, SDGE3010, SDGE3025
- Custom HVAC for SCE2517 SPC, SCG3513, SDGE3010, SDGE3025
- Custom Other for SCE2517 SPC, SCG3513, SDGE3010, SDGE3025

An evaluation plan and handbook was written to give direction to field staff for proper data collection and analysis procedures necessary to estimate and document gross energy (kWh and therms) savings and peak demand savings for each sampled measure. The handbook is included as Volume 3 of this report.

Important elements of the gross analysis included:

Full-Evaluation Sample Selection. A stratified random sample of high impact direct and/or indirect measures was selected for each of the programs. Energy savings was selected as the parameter for stratification because energy savings is the primary parameter that is being investigated in this impact evaluation.

Baseline conditions. Annual energy (kWh and therms) savings for each measure was computed with respect to an energy consumption baseline. In each case, the baseline conditions were defined with respect to the program rules, equipment condition and the primary reason for installing the equipment. For some measures annual savings were estimated with respect to two baseline conditions.

Gross savings (kWh, kW and therms). All direct and indirect measures in the gross savings sample received an assessment of gross savings (kWh, kW and therms) based on a methodology documented in site-specific M&V plans. For some measures (early replacement measures) two estimates of gross savings were prepared (dual baseline) that differed in the assumed baseline conditions. The direct impact analysis was applied to rebated measures that were implemented during the 2006-08 program cycle. The indirect impact analysis was applied to non-rebated measures implemented during the 2006-08 program cycle that were implemented as a result of audits and technical assistance funded through 2006-08 program budgets. A separate estimate of gross savings was prepared for spillover measures that were identified by the evaluation team and were determined to be significant by the ED contract manager.

1.4.3. Activity 3: Full Evaluation Net Analysis

A full evaluation analysis of net savings was conducted for each of the five programs in the Major Commercial contract group (see activity 2 above).

An evaluation plan and handbook was written to describe a complete set of data collection, data analysis and reporting procedures necessary to estimate and document net energy (kWh and therms) savings and peak demand savings for each sampled measure. Important elements of the net analysis included:

Full-Evaluation Sample Selection. A stratified random sample of high impact direct and/or indirect measures was selected for each of the programs. Energy savings was selected as the parameter for stratification because energy savings is the primary parameter that is being investigated in this impact evaluation. A supplemental sample was also selected to receive only the net analysis (net-only sample).

Net savings (kWh, kW and therms). All selected measures in the net savings sample received an assessment of net savings to estimate the effects of free-ridership. A Net-to-Gross (NTG) ratio was estimated for all measures in the gross savings sample and net-only sample. The NTG ratio was applied to the gross savings values to estimate net savings.

The net analysis was performed using a self-report approach, which involved asking one or more key participant decision-makers a series of structured and open-ended questions about whether they would have installed the same energy efficient equipment in the absence of the program. This information was used to estimate the NTGR in a way that complies with the CPUC's Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report Approaches.

2. 2006-08 Gross Savings

The primary goal of the gross portion of this impact evaluation was to assess the gross program-specific energy and demand impacts for the non-residential programs and high impact measures evaluated by the Major Commercial contract group. A secondary goal was to increase the quality, reliability and objectiveness of the estimated impacts from the energy efficiency programs. Information from the evaluation may be used to improve the effectiveness of acquiring energy efficiency for the IOU ratepayers. The evaluation was conducted in accordance with ED-approved procedures, which satisfied the requirements of relevant CPUC directives.

2.1. Evaluation Objectives

The gross portion of the full impact evaluation accomplished the following objectives:

- Determine the annual and life cycle gross energy and peak demand impacts (direct and indirect) associated with each program and high impact measures in the contract group. Estimate savings over the time period the measures are projected to provide energy and demand impacts
- Conduct measure-specific evaluations of savings for sampled cases
- Account for the energy and peak demand effects of spillover
- Explain discrepancies found between the results of this study and the IOU ex-ante savings estimates and recommend ways to minimize these discrepancies in the future
- Provide information necessary to understand how programs can be modified to improve their performance and the overall performance of the portfolios
- Inform future updates to ex-ante energy and peak demand savings estimates (including the DEER database) for program planning purposes
- Provide information that can be used to improve program design and program selection for future program cycles

2.2. Gross Sample Design and Selection

This section describes the approach used to develop and implement sampling to support the full evaluation of gross savings for the Major Commercial contract group.

2.2.1. Sampling Direct Measures

Sample designs for direct measures were established and an initial wave of samples drawn from the program tracking records submitted by the IOUs in March 2008. That release of the program tracking data documented program accomplishments during 2006-2007. Following release of IOU program tracking data for the full three-year program cycle in March 2009, a second wave of samples were drawn, using the same sample designs. The sampling designs aimed to maximize precision for gross impact estimates, for each program and fuel domain, within the constraint of available budget. All sample designs were stratified, either by kWh or therm savings, based the assumption that ex ante savings estimates serve as a good predictor of the associated ex post savings.

In each wave of sampling the process began by creating a list of program tracking records. For all of these programs, a program tracking record documents a specific measure installed at a customer site. SDGE's programs (SDGE3010 and SDGE3025) had records for measures that saved electricity and separate records for measures that saved gas. Two lists were created for the SDGE program, each having the records that saved one fuel or the other. All measures for each program were listed with the exception of SCE2517. This program consists of three components (SPC, Express and Audit). The Audit component constitutes SCE's indirect savings claim and the sampling of this element is described in the next section. Initially the direct measure sampling included both SPC and Express components. However, in response to the ED's requirement to refocus the evaluation work on HIM's, the Express component was removed from this evaluation. The Express component was evaluated by other contract groups.

Within each program and fuel, direct measures stratified sample listings were defined using the Dalenius-Hodges method described in Section 5A.7 of Sampling Techniques, 3rd Edition, by William G. Cochran. In each list all measures were sorted by their ex ante impacts. The difference between each measure's impact and the next measure's impact was then calculated. Next the square root of differences was taken and these values were summed for the whole list. This sum of square roots was divided by the number of strata, and the resulting value defined the upper bound of the first stratum. That same value was doubled to define the upper boundary for the second stratum and so on. In determining how many strata to employ, the greater precision made possible by added stratification was balanced against the uncertainty introduced by having too few observations in any individual stratum. Care was taken to avoid having any strata with just a single measure.

The stratified sample designs defined by this method and used in selecting the direct measures samples are shown in Table 7. This table shows the number of measures contained within each strata and the sample completed. In addition, it shows the percent of ex ante savings associated with the completed sample. The stratification procedures give measures with the largest savings a high probability of selection even though they are a small fraction of the total population. For example, the 18 sampled measures for SCE2517 are 1 percent of the population, yet they account for 21 percent of the ex ante kWh savings.

Before drawing the strata boundaries, the largest measures from each list were allocated to a certainty stratum. Being in a certainty stratum means that a measure has a 100 percent chance of being selected. The sampling error for this stratum is zero, i.e., it is known with certainty for this stratum that the mean savings for the sample are the same as the mean savings for the population. The certainty stratum allows for greater overall relative precision with a smaller sample for the remaining sites. Unfortunately, due to time constraints and lack of cooperation by some customers, it was not possible to complete work on all measures in some certainty strata, thus they were treated like the other sampled strata. This results in less precision for the overall sample. In the table below the value 9 in the stratum column indicates the intended certainty strata. The certainty objective was achieved when the number of measures in the population and the sample are the same, as is the case for SDGE3010 kWh sample.

In addition to certainty strata, there are three other special strata shown in the table. The first are the strata labeled Excluded. These contain measures with the very smallest ex ante savings. These were excluded from the population before strata boundaries were set, as they accounted for 1 percent or less of the savings and significantly reduced the precision of the ex post estimates. Two other strata were removed from the sampling list. Both are found in SDGE program tracking records. One is labeled M&V Incr. in the table. The other is labeled Interactive. Both of these contain records included by SDG&E which are adjustments to the savings claimed for other program tracking records. M&V Incr. tracking records resulted from SDG&E efforts to true-up savings for certain measures after their installation was complete. The Interactive tracking records resulted from SDG&Es analysis of the heating and cooling interactive effects for selected measures. This is not to be confused with the analysis of interactive heating and cooling effects carried out as part of this evaluation. Given the methods used to compute ex post realization rate for the sample, it was not appropriate to sample either M&V Incr. or Interactive tracking records.

Table 7: Direct Gross Savings Evaluation Samples

			Stratum Boundaries Ex Ante Savings			Measures			% of Ex Ante Savings in Sample		
Program ID	**Program Element**	**Stratum**	**Savings Units**	**Lower**	**Upper**	**Population**	**Sample**	**% in Sample**	**kW**	**kWh**	**Therms**
SCE2517	SPC	2	kWh	36,006	119,005	673	2	0	0	0	NA
SCE2517	SPC	3	kWh	119,191	321,550	456	3	1	1	1	NA
SCE2517	SPC	4	kWh	329,676	911,354	179	2	1	2	1	NA
SCE2517	SPC	5	kWh	911,416	3,339,231	76	2	3	3	4	NA
SCE2517	SPC	9	kWh	3,346,850	35,045,198	13	9	69	77	73	NA
SCE2517	SPC	Excluded	kWh	158	35,952	1,751	0				
SCE2517	**SPC**	**All Sampled**	**kWh**	**158**	**35,045,198**	**1,397**	**18**	**1**	**23**	**21**	**NA**
SCG3513		1	Therm	646	27,758	623	4	1	NA	NA	2
SCG3513		2	Therm	29,125	102,794	54	2	4	NA	NA	3
SCG3513		3	Therm	110,839	228,800	15	6	40	NA	NA	39
SCG3513		9	Therm	339,670	2,177,246	8	7	88	NA	NA	92
SCG3513		Excluded	Therm	1	578	409	0				
SCG3513		**All Sampled**	**Therm**	**1**	**2,177,246**	**700**	**19**	**3**	**NA**	**NA**	**52**
SDGE3010		1	kWh	8,452	132,027	528	2	0	0	0	NA
SDGE3010		2	kWh	135,554	587,155	147	2	1	1	1	NA
SDGE3010		3	kWh	592,703	1,965,560	42	3	7	6	7	NA
SDGE3010		9	kWh	2,429,300	5,412,785	2	2	100	100	100	NA
SDGE3010		Excluded	kWh	0	8,227	682	0				
SDGE3010		M&V Incr.	kWh	-1,134,056	657,521	77	0				
SDGE3010		**All Sampled**	**kWh**	**-1,134,056**	**5,412,785**	**719**	**9**	**1**	**6**	**10**	**NA**
SDGE3010		1	Therm	5,706	69,326	11	6	55	NA	NA	67
SDGE3010		9	Therm	100,462	851,052	3	1	33	NA	NA	8
SDGE3010		**Excluded**	**Therm**	**0**	**2,429**	**7**	**0**				
SDGE3010		M&V Incr.	Therm	-10,430	210,038	7	0				

				Stratum Boundaries Ex Ante Savings		Measures			% of Ex Ante Savings in Sample		
Program ID	Program Element	Stratum	Savings Units	Lower	Upper	Population	Sample	% in Sample	kW	kWh	Therms
SDGE3010		**All Sampled**	**Therm**	**-10,430**	**851,052**	**14**	**7**	**50**	**NA**	**NA**	**14**
SDGE3025		1	kWh	8,441	128,743	256	3	1	2	1	NA
SDGE3025		2	kWh	128,990	546,000	81	3	4	5	4	NA
SDGE3025		9	kWh	548,371	1,673,955	6	2	33	38	25	NA
SDGE3025		Excluded	kWh	275	7,438	21	0				
SDGE3025		Interactive	kWh	1,767	124,102	47	0				
SDGE3025		**All Sampled**	**kWh**	**275**	**1,673,955**	**343**	**8**	**2**	**8**	**6**	**NA**
SDGE3025		**1**	**Therm**	**3,466**	**40,115**	**22**	**4**	**18**	**NA**	**NA**	**14**
SDGE3025		9	Therm	65,922	142,336	2	2	100	NA	NA	100
SDGE3025		Excluded	Therm	137	2,373	21	0				
SDGE3025		**All Sampled**	**Therm**	**137**	**142,336**	**24**	**6**	**25**	**NA**	**NA**	**43**

Table 7 shows the final gross savings sample for direct measures to be 67 cases. These cases were distributed across the four programs for which ex post estimates of gross savings were prepared. Ex post engineering estimates were made for 18 electric measures in the SCE2517 SPC program component. Ex post estimates were also made for 19 gas measures in the SCG3513 program. Both electric and gas measures were sampled from the two SDGE programs. Nine electric measures and seven gas measures were selected from the SDGE3010 program. Eight electric and six gas measures were selected from the SDGE3025 program.

2.2.1.1 Sample Disposition – Direct Measures

Considerable efforts were made to recruit and complete data collection and analysis for each sampled measure. These efforts succeeded for all but four sample points which had to be dropped and replaced in the course of completing this work. These four measures and the reasons for their replacement are shown in Table 8.

Table 8: Reasons for Sample Replacement in Direct Measure Sample

ID	Program	Program Element	Savings Units	Reason for Replacement	Count
M00727	SCE2517	SPC	kWh	Facility no longer in business	1
M24647	SCG3513		Therm	Could not reach a knowledgeable respondent	1
M49173	SCG3513		Therm	Respondent refused to participate	1
M49365	SDGE3025		Therm	Respondent refused to participate	1

2.2.2. Sampling Indirect Audits

Sample designs were established to represent the indirect savings claim associated with the SCE2517 Audit program element and SCG3503. Two stage sample designs were used. The first stage was a telephone interview sample. This interview determined whether the sampled audits resulted in any indirect savings, i.e., measures installed by the customer without a rebate. The telephone survey instrument is provided in Appendix K. The telephone responses were scored and each sampled audit placed into one of two categories: no indirect savings and possible indirect savings. All those scored as possible indirect savings became the list from which the second stage sample was drawn.

A stratification design was developed to increase the sampling efficiency for each of these programs. For the sampling of direct measures, ex ante savings estimates were used to define sampling strata. However, for SCE2517 the ex ante savings were only one of two possible deemed values. These deemed values were assigned by SCE based on the customer's rate classification. These ex ante values were not used to define the sampling strata. Instead, the program estimate of total kWh savings for each audit was chosen. The audit total included all recommendations whether they were implemented or not, with or without a rebate. It was determined to be the best available predictor of ex post indirect savings and thus the best data to use in defining sampling strata. For SCE3503 ex ante savings were used as they were audit-specific estimates of indirect savings.

For SCE2517, a stratified sample listing was defined using the Dalenius-Hodges method described in Section 5A.7 of Sampling Techniques, 3rd Edition, by William G. Cochran. The list audits was sorted by the stratification variable, total audit savings for SCE2517. The difference between each audit's impact and the next audit's impact was then calculated. Next the square root of differences was taken and these values were summed for the whole list. This sum of square roots was divided by the number of strata, and the resulting value defined the upper bound of the first stratum. That same value was doubled to define the upper boundary for the second stratum and so on. For SCG3503, the first stage sample was a census of all cases, thus no stratification was defined. We attempted to completed telephone surveys with each audit listed for SCG3503.

The stratified sample designs defined by this method and used in selecting the audit samples are shown in Table 9. This table shows the number of audits contained within each strata and the sample completed. In addition, it shows the percent of ex ante savings associated with the completed sample.

For SCE2517, before drawing the strata boundaries, the largest audits were allocated from each list to a certainty stratum. By reducing uncertainty from sampling to zero for the largest audits (that is, it is known with certainty for this stratum that the mean savings for the sample are the same as the mean savings for the population), the certainty stratum allows us to attain greater overall relative precision with a smaller sample for the remaining sites.

In addition to certainty strata, there are two other special strata shown in the table. The first are the strata labeled Excluded. These contain audits with the very smallest savings. These were excluded from the population before strata boundaries were set, as they account for 1 percent or less of the savings and significantly reduce the precision of the ex post estimates. One other stratum was removed from the sampling list for SCE2517. This is the one labeled "No Audit Rec." in the table. These are audits that did not provide any recommendations to the customers even though they were included in the program tracking data and assigned an ex ante savings claim.

Table 9: First Stage Indirect Gross Savings Evaluation Samples

			Stratum Boundaries Ex Ante Savings1			Audits			% of Ex Ante Savings in Sample		
Program ID	**Program Element**	**Stratum**	**Savings Units**	**Lower**	**Upper**	**Population**	**Sample**	**% in Sample**	**kW**	**kWh**	**Therms**
SCE2517	Nonres Audits	1	kwh	2,347	25,240	7,318	88	1	1	1	NA
SCE2517	Nonres Audits	2	kwh	25,245	89,059	2,415	123	5	5	5	NA
SCE2517	Nonres Audits	3	kwh	89,134	381,134	601	111	18	19	19	NA
SCE2517	Nonres Audits	9	kwh	382,760	10,686,996	81	42	52	52	53	NA
SCE2517	Nonres Audits	Excluded	kwh	0	2,347	3,003	0				
SCE2517	Nonres Audits	No Audit Rec.	kwh			2,024	0				
SCE2517	Nonres Audits	All Sampled	kwh	0	10,686,996	10,415	364	3	3	3	NA
SCG3503		All Sampled	therm	925	3,000,000	34	12	35	NA	NA	83

1 For SCE2517 Audits, strata boundaries were based on estimate of total savings for audits. This is different than the ex ante savings claim.

Table 10 shows the final first stage sample for indirect measures to be 394 audits. The sample included 364 electric audits for the SCE2517 NRA program distributed across four strata. They were drawn from a population of 10,415 audits. The sample also included 30 gas audits for the SCG3503 program.

Table 10 describes the second stage of sampling. For SCE2517 sampling was stratified, using the same boundaries as were used in the first stage. For SCG3503, the respondents to the telephone survey were placed in strata using the same method as described for the first stage SCE2517 sample. The only difference is that we used the ex ante estimate of savings provide in the program tracking records, as these were SCG's audit-specific estimates of indirect savings.

The first stage telephone respondents that reported possible indirect savings comprised the population for each stratum. The engineering sample comprised all audits that received engineering review by the evaluation team. This included review of the audit documents and as appropriate, telephone follow-up with the customers who received the audits. In 16 cases, the engineering review determined that indirect savings occurred as a result of the audit, which was quantified via on-site data collection and ex post savings analysis. The balance of the engineering sample was determined to have no indirect savings.

Table 10: Second Stage Indirect Gross Savings Evaluation Samples

			Telephone Survey Stratum Boundaries Ex Ante Savings1			Audits			
Program ID	**Program Element**	**Stratum**	**Savings Units**	**Lower**	**Upper**	**Telephone Survey Completions**	**Engineering Sample**	**% in Engineering Sample**	**Engineering Sample with Ex Post Savings**
SCE2517	Nonres Audits	1	kwh	2,347	25,240	88	9	10	2
SCE2517	Nonres Audits	2	kwh	25,245	89,059	123	14	11	3

			Telephone Survey Stratum Boundaries Ex Ante Savings1			Audits			
Program ID	**Program Element**	**Stratum**	**Savings Units**	**Lower**	**Upper**	**Telephone Survey Completions**	**Engineering Sample**	**% in Engineering Sample**	**Engineering Sample with Ex Post Savings**
SCE2517	Nonres Audits	3	kwh	89,134	381,134	111	19	17	7
SCE2517	Nonres Audits	9	kwh	382,760	10,686,996	42	16	38	2
SCE2517	Nonres Audits	Excluded	kwh	0	2,347	0	0		0
SCE2517	Nonres Audits	No Audit Rec.	kwh			0	0		0
SCE2517	Nonres Audits	All Sampled	kwh	0	10,686,996	364	58	16	14
SCG3503		1	therm	16,000	188,600	8	8	100	1
SCG3503		9	therm	338,087	3,000,000	4	4	100	1
SCG3503		Excluded	therm	925	278,324	0	0		0
SCG3503		All Sampled	therm	925	3,000,000	30	12	100	2

1 For SCE2517 Audits, strata boundaries were based on estimate of total savings for audits. This is different than the ex ante savings claim

Table 10 shows the engineering sample for indirect audits to be 70 cases. The sample was distributed across the SCE2517 NRA and SCG3503 programs as 58 audits and 12 audits, respectively. The first stage telephone survey indicated that indirect measures were possible for each of these audits. An attempt was made to conduct on-sites and engineering analysis for all indirect measures associated with these cases. The on-site recruitment process determined that only 14 of the 58 audits selected for the SCE2517 NRA program had indirect electric measures while only two of the 12 audits selected for the SCG3503 program had indirect gas measures. An engineering analysis was performed for all indirect measures found in these 16 cases.

2.2.2.1 Sample Disposition – Indirect Measures

Considerable effort was made to recruit and complete data collection and analysis for the second stage sample. For the SCE 2517 NRA program, a total of 25 cases were dropped and replaced in the course of completing the work. Four audits were dropped because the facility was no longer in business. Eighteen were dropped because the knowledgeable respondent could not be reached. In addition, three were dropped and replaced because the respondent refused to participate. For the SCG3503 program, three second stage sampled cases were replaced because knowledgeable respondents could not be found.

2.3. Methodology and Specific Methods Used

This section describes the methodology that was used to estimate gross energy (kWh and therms) and peak demand savings for each sampled measure in the five Major Commercial programs. The section begins with a discussion of the procedures that were used to recruit the sampled measures. It then describes the procedures used to assign a recruited measure to a site lead. This is followed by the procedures the site lead and other team members used to collect and analyze the data necessary to prepare the evaluation estimate of gross savings for direct, indirect, and spillover measures. The procedures also document the methods used to document the results from the gross analysis for each sampled measure.

2.3.1. Recruitment

The sites associated with each of the sampled measures were recruited to participate in the impact evaluation. The recruitment process also collected contact information for the IOU Representative and customer's staff who were involved in the evaluation work and vendors who may have influenced the customer's decision to participate in the program. The spillover survey was also administered during recruitment. The results from the recruitment process (successful or not) were passed on to the SBW Project Manager.

The evaluation team pre-filled the site workbook with key measure-specific information and key contact information from the IOU tracking database and application files. Recruitment staff reviewed the pre-filled information in the workbook for each sampled measure just prior to the recruitment call and determined the most appropriate recruitment contact. The recruiter then contacted this person and asked them to participate in the evaluation. If the recruitment contact agreed to participate, additional contact information was collected to support the evaluation of gross, net and spillover savings.

After the recruitment contact was completed, the final recruitment disposition was documented, whether the recruitment was successful or not. Documentation also included special conditions that had to be met to successfully recruit the participant and other recruitment-related information that was passed along to the assigned site lead. In addition, a confirmation letter was prepared and sent to appropriate parties.

2.3.2. Spillover Survey

The recruiter also administered a spillover survey for each measure that was successfully recruited. The purpose of the spillover survey was to identify non-rebated measure(s) or measure components implemented during the 2006–08 program cycle that the customer attributed to participation in the 2006–08 program (including audits, education, and training) but that was not specifically recommended. The scope of spillover was determined by the knowledge and influence of the decision maker. Spillover applied to measures or measure components installed at the same site as direct measures and at other facilities of the customer located in any IOU service areas. Due to schedule constraints the spillover survey was not administered to sites with indirect measures.

2.3.3. Rigor Level Assignment

The rigor level was the expected reliability of the savings (gross and net) estimates. Each sampled direct measure was assigned a gross rigor level by the SBW Project Manager in consultation with ED technical advisors. Possible rigor levels for the gross analysis included enhanced and basic. A rigor level was not assigned to indirect measures. Due to project schedule constraints, a simplified analysis was performed for these measures, which was not associated with either the basic or enhanced rigor levels.

Results from analysis performed at a higher rigor level (e.g., enhanced) were expected to be more accurate and precise (i.e., more reliable) than results from analysis performed at a lower rigor level (e.g., basic). In general the evaluation of a measure with an enhanced rigor level was consistent with IPMVP[3] Option B or D. The evaluation of a measure with a basic rigor level was consistent with IPMVP Option A.

2.3.4. Site Assignment

Sampled measures that were successfully recruited were assigned to a Group Manager by the SBW Project Manager. The three Group Managers had management responsibility for measures in the lighting, HVAC and other end uses. The measure was in turn assigned to a site lead, through consultation between the Project Manager and the Group Manager. The selection of the most appropriate site lead was based on factors such as technical expertise, previous experience with similar measures, assigned rigor level and availability to complete the work within the project schedule. The site lead was consulted on the assignment to be sure that he or she was comfortable with their selection. A site lead could complete all data collection, data analysis and documentation activities associated with an assigned measure; or the work could be shared with other team members that assisted the site lead with aspects of the work.

The SBW Group Manager compiled the following information for each sampled measure and made it available to the site lead:

- **Utility Data** – Information relevant to the sampled measure was extracted from the IOU tracking database, E3 calculator and other sources and compiled into a spreadsheet that was made available to the site leads.
- **Site workbook –** A partially completed site workbook was prepared for each measure and provided to the site lead. It contained a completed recruitment form, as well as a partially completed contact log and measure descriptions.
- **Application File** – For all sampled measures the IOUs provided a copy of the application files in PDF format. The site leads were provided with this information.
- **Implementation Calculation Spreadsheet** – For some measures, the IOU provided a calculation spreadsheet that was prepared during implementation to document the final ex ante savings estimate. This spreadsheet was provided to the site lead, when available.
- **Completed Spillover Survey –** In cases where spillover was found during recruitment and determined by ED to be significant, the completed spillover survey was provided to the site lead.
- **Verification workbook** – If the sampled measure was evaluated in the verification portion of the study, a verification site workbook (not to be confused with the evaluation site workbook above) was prepared to document the work performed in the verification. Some of this information was of value to the impact evaluation. The verification workbook was provided to the site lead in cases where it was relevant.

[3] The International Performance Measurement and Verification Protocol that specifies alternative measurement and analysis methods that can be used to estimate gross energy savings from a measure installed under a program being evaluated.

- **DEER Effective Useful Life information** – For sampled measures that were included in the DEER database, the DEER EUL must be used for this study. A listing of the DEER EUL data was provided to the site lead.
- **Site M&V Plan Template** – A Word template to receive all information required to write up the plan was provided to the site leads.
- **Interactions Between Measures** – For some sites the sampled measure interacted with other installed measures that were not sampled. When this occurred, information concerning the interactions was provided to the site lead for consideration in the evaluation gross savings analysis.

2.3.5. Review Project Information to Understand Sampled Measure

The site lead conducted a detailed review of all information provided by the Group Manager during site assignment. During this review, a check was made to see if the sampled measure was eligible under the appropriate program eligibility rules.

In some cases the sampled measure was part of a multi-measure project installed under the program. When this occurred, the application file was reviewed to understand all of the measures in the project. Special attention was paid to energy savings interactions between the sampled measure and other measures in the package. In some cases this required that a full or partial analysis of savings for other non-sampled measure be performed so that savings could be attributed properly across the interacting measures. This interactive measure analysis was documented in the M&V plan.

2.3.5.1 Contact Project Personnel

If questions arose during the review of the project files, the site lead called the site contact to collect further information regarding the performance of the measure. An attempt was made to understand as much as possible about the measure before the M&V plan was prepared.

2.3.6. Baseline Survey

The two-part baseline survey was administered to an appropriate site contact shortly after measure assignment and before the M&V plan was prepared. The survey instrument was documented in the evaluation handbook, which is included as Volume 3 of this report.

2.3.6.1 Part 1: Early/normal replacement survey questions:

Part 1 of the survey was conducted for direct and indirect sampled measures that involved equipment replacement. It was applied to all equipment replacement measures except efficient chillers. Early retirement program rules were used to establish the baseline conditions for efficient chillers. “Add-on” measures[4] were also excluded from Part 1 of the survey. Equipment replacement measures that replaced existing "add-on" equipment were included in the survey. The purpose of Part 1 of the baseline survey was to collect information necessary to determine whether the estimate of baseline (pre-retrofit) energy consumption should be based on early or normal replacement for all relevant equipment replacement measures.

- **Early replacement**. The baseline was defined as early replacement when the program caused a customer to implement the measure **prior** to the end of the useful life of the affected equipment. For this situation, baseline energy consumption was computed with respect to the existing equipment and its operation.
- **Normal replacement**. The baseline was defined as normal replacement when the measure was implemented at the end of the useful life of the affected equipment (from the customer's perspective). This includes equipment that was replaced due to the efficiency improvement and equipment that was replaced as part of a larger remodel or capital construction project. For this situation, baseline energy consumption was computed with respect to code conditions (Title 20/24 or Federal standards) or, if no code applied, standard practice, i.e., the replacement equipment that would have been installed in the absence of the program.

The survey was also used as the basis for an estimate of the remaining useful life (RUL) for the existing equipment, prior to retrofit with the sampled measure. The survey was a series of questions that inquired about the status of the existing equipment at the time that a decision was made to proceed with the measure under the program.

Based upon the responses to these questions provided by the site contact and an analysis of the survey responses, the sampled measure was determined to be either early or normal replacement. If an equipment replacement measure was determined to be early replacement and the RUL of the existing equipment was less than the effective useful life of the efficient equipment, then the gross analysis estimated savings for two baselines (dual baseline).

Conclusions reached from the survey were documented, including the need for a dual baseline for cases where it was relevant. This result was also documented in the M&V plan.

2.3.6.2 Part 2: Standard practice and freeridership questions

Part 2 of the baseline survey was completed for all measures. It was a series of questions asked of the site contact that inquired about alternative energy efficiency improvements that were seriously considered at the time of utility intervention. It included a series of nine specific questions that were asked of the site contact, if they were relevant to the sampled measure. The questions stimulated a discussion of baseline

[4] Add-0n measures are efficiency improvements that are "added on" to existing equipment to improve its operating efficiency and/or shift usage to off-peak periods. Add-on measures are excluded from gut remodels. Examples include lighting or HVAC controls, variable frequency drives, programmable thermostats and system tune-ups or changes in control strategies.

conditions that produced information necessary to evaluate efficiency alternatives that were seriously considered by the customer. The survey results were documented. This information was a useful source of information in assessing standard practice and freeridership.

2.3.7. Spillover Determination

If a spillover measure or measure component was uncovered during the recruitment process, it was documented on the spillover survey. The survey identified measures (or component) but did not attempt to determine their significance in terms of energy savings. The survey results were reviewed by the site lead to determine whether any of the identified measures should be pursued further and quantified with an engineering analysis. Funding for the savings analysis of spillover measures was limited so treatment of spillover in this study was limited to measures or measure components with significant savings, as recommended by the evaluation team and approved by ED. Spillover that were determined to have significant savings and was worthy of continued evaluation was included in the M&V plan.

2.3.8. Preparing the M&V Plan

An M&V plan was prepared after the spillover and baseline surveys were completed. The Plan summarized the program implementer methods, and documented how the evaluation was going to estimate the evaluation gross savings for all direct measures. It also documented how the evaluation analyzed spillover (if any). Due to project schedule constraints, a formal M&V plan was not prepared for the indirect measures. Instead informal discussions were held between the evaluation team and ED Technical Advisors to establish data collection and analysis methods that were suitable for the indirect measures.

2.3.8.1 Dual Baseline

For equipment replacement measures that were determined to be early replacement in the baseline survey and where the RUL of the existing equipment was less than the EUL of the efficient equipment, two annual savings estimates were produced. The two estimates varied by the baseline conditions that were assumed. The early replacement case assumed an existing equipment baseline and the normal replacement case assumed a code, e.g., Title 20/24 or standard practice baseline. The implications of the dual baseline for a sampled measure were determined and documented in the M&V plan.

2.3.8.2 Standard Practice

The results from the baseline survey for some measures required that gross savings be estimated with respect to a standard practice baseline. When this occurred, the appropriate standard practice conditions were established for the sampled measure as part of M&V plan development. Standard practice was most often established though information obtained from the site contact during the baseline survey and interviews with designers, distributors, contractors and/or vendors.

2.3.8.3 Write the Plan

Site-specific M&V plans were prepared for each direct measure. Each plan included:

Summary Information: Contained general site background and contact information. Much of this information was automatically imported from the site workbook.

Section 1 – Goals and Objectives: Described the purpose and objectives for the impact evaluation of the sampled measure.

Section 2 – Measure Description: Documented detailed information concerning the sampled measure and the way it was evaluated. Topics addressed in this section are summarized below:

- **2.1. Evaluated measure**: A description of the sampled measure and how it saved energy.
- **2.2. Gross utility measure savings**: The final ex ante estimate of savings (kW,kWh,therms) prepared by the IOU during program implementation.
- **2.3. Impact type**: Direct, indirect or spillover
- **2.4. Baseline Type**: Early or normal replacement. Need for dual baseline.
- **2.5. Sample type**: Always Post-only
- **2.6. Pre-installation equipment and operation**: Description of the baseline equipment assumed by the IOU in the ex ante savings estimate, its operation and its annual operating schedule.
- **2.7. As-built equipment and operation**: Description of the efficient equipment assumed by the IOU in the ex ante savings estimate, its operation and its annual operating schedule.
- **2.8. Seasonal variability**: Seasonal variations in the operation of the affected equipment, including variations in production.
- **2.9. Measure cost**: The IOU ex ante value for installed measure cost documented in the application file. A breakdown of cost by labor and materials was provided, when available.
- **2.10. Effective useful life**: The lifetime assumed by the IOU during implementation.

Section 3 – Algorithms for Estimating Savings: This section included a description of the algorithms used by the IOUs to prepare the ex ante savings estimate for the sampled measure. It also included information regarding the methodology that was used by the evaluation team to prepare the ex post savings estimate. Topics addressed in this section are summarized below:

- **3.1. Utility Algorithm**: The engineering approach used by the IOU in calculating the ex ante savings.
- **3.2. Level of Rigor**: The assigned rigor level for the evaluation gross analysis– enhanced or basic.
- **3.3. Evaluation Algorithm** – **Energy Savings**: The engineering approach that was used in the evaluation to estimate ex post annual energy savings (kWh, therms). The dual baseline was included, when applicable.

3.4. **Evaluation Algorithm – Peak Demand**: The engineering approach that was used in the evaluation to estimate ex post peak kW savings.

Section 4 – Data Collection: This section included a description of the data collection procedures that were used to support the estimation of ex post gross savings in the evaluation. Important topics addressed in this section are summarized below:

4.1. **Site-specific Parameters**: The parameters that were obtained from site-specific data sources.

4.2. **Data Collection Methods**: The data sources and measurement methods that were used to collect the required site-specific data.

4.3. **Building Characteristics Data**: Facility characteristics data that were collected to support data analysis activities outside of this impact evaluation.

4.4. **Sampling Strategy**: The method that was used to select a sample of devices to observe, when sampling within a measure was necessary.

4.5. **Data Products**: A list of data products that was produced by the evaluation.

4.6. **Data Reporting Formats**: The formats under which the data products were produced in the evaluation.

Section 5 - Spillover Measures: If significant spillover savings were identified during recruitment, this section provided information on the measure(s) or measure component and how it was evaluated in this study. As applicable, the topics addressed in this section were similar to those discussed above.

2.3.8.4 M&V Plan Review

Draft M&V plans were reviewed and approved by the relevant Group Managers. They were then submitted to the CPUC for review by ED technical advisors. Revisions were made to the draft plans in response to CPUC comments. A final version of the plan was approved by the CPUC.

2.3.9. Collecting Data and Analyzing Savings

Collecting and analyzing data from the customer site represented the majority of the impact evaluation effort. This section presents an overview of key aspects of data collection and analysis methods that were applied to the sampled measures. The data collection and analysis procedures were more thoroughly documented in the handbook.

2.3.9.1 Preparing for Onsite Work

Once the site M&V plan was approved, preparations began for the onsite work. Preparatory steps included:

1. **Site Visit Scheduling:** An appointment was made with the site contact for the evaluation team to visit the site and collect the information required in the approved M&V plan. The CPUC and ED Technical Advisors were notified of the site visit in advance in case they wanted to participate.
2. **Sampling within measure (if necessary):** Certain measures affected large numbers of similar pieces of equipment, such as lighting fixtures. If the program documentation included inventories of such equipment, then an evaluation sample was selected in advance. As appropriate, evaluation samples were selected for two purposes – for equipment inspection to confirm equipment counts and for the selection of equipment that was metered to determine short term performance.
3. **Toolkit Preparation:** A custom toolkit was prepared for each sampled measure. The tool kit was equipped with the tools and measurement equipment that was necessary collect the information specified in the approved M&V plan.
4. **Organization for Site Visit:** Relevant documents, forms, maps (or GPS), and plans were prepared for the site visit. The appointment was confirmed a day or two in advance. The M&V plan and program documents were reviewed shortly before the visit so that everyone attending the site visit had a clear understanding of what need to be accomplished during the site visit and the data collection procedures that were to be followed.

2.3.9.2 Conducting On-site Work

On-site data collection activities varied significantly with the requirements of the approved M&V plan. In many cases the field staff dealt with several facilities staff for the different elements of the site work. These individuals ranged from the facility manager, chief engineer, energy manager, controls technician, mechanic, or electrician, to the custodian. Data collection activities typically included:

1. **Interviews:** Interviews usually began with an overview of the evaluation process. This was followed with specific questions about their project. The questions addressed topics such as:
   - **a** The full scope of the sampled measure, including possible implementation in multiple phases across multiple program years.
   - **b** Any changes to the measure (affected equipment or operation) that have occurred since the initial installation was completed and the incentive was paid.
   - **c** Differences in the as-built condition of the measure from what was anticipated.
   - **d** Any future plans that might affect the measure(s).
2. **Quick walkthrough:** A tour with the site contact of the measure-affected areas and equipment. Some aspects of the tour were virtual, as reviewing the EMCS screens, controls, and capabilities. The tour was an opportunity to get oriented with the measure and the facility, and to assess metering

difficulties. During the tour, discussions continued regarding the performance of the sampled measure and general facility operations.

3 **Metering equipment installation:** Metering equipment was installed as specified in the approved M&V plan, to the extent possible. In some cases the metering configuration was adjusted to field conditions. After it was installed, a sample of data was downloaded to ensure that the loggers were recording properly. If the desired metered data came from customer trend logs, then a detailed discussion was conducted with the person responsible for providing this dataset. The discussion included agreement on which parameters were to be trended, the duration of the dataset and a schedule for delivery of the dataset to the lead engineer.

Before leaving the site, arrangements were made for retrieval of metering equipment left by field staff. Either the equipment would be retrieved by the customer and mailed back to the lead engineer or field staff would make a return visit to the site to retrieve the equipment.

2.3.9.3 Summarizing Data

After returning from the site, field staff examined their field notes and thoroughly documented the observations made and other data collected during the site visit. A complete listing of the location of all temporary metering equipment was made to aid in equipment retrieval. Once all trend logs and metering files were in hand, the lead engineer performed a more careful and thorough summarization of the collected data to create an analysis-ready dataset. The data was examined for reasonableness, using guidelines provided in the evaluation handbook. When appropriate, data summaries were prepared and operating patterns were observed to be sure that the dataset was ready to analyze.

2.3.9.4 Analyzing Data

To the extent possible, the collected data for direct measures was analyzed as described in the M&V plan. In cases where the collected data was different than anticipated in the M&V plan, adjustments were made to the analysis to compensate for these differences. The CPUC was notified of significant departures from the M&V plan. The analysis results were fully documented in the site workbook. For indirect measures a simplified analysis of savings was performed using approaches that were agreed to with ED technical advisors.

Heat/Cool interaction factors

Interactive effects were not considered in this evaluation. Further analysis will be conducted to apply factors for interactive effects based on the evaluation results and the method and results will be presented in the Energy Division report.

Typical Weather

For measures whose performance was weather-dependent, local weather was used for model calibration. However, typical weather was used as the basis for the final estimate savings. Typical weather conditions varied by climate zone. Each sampled measure was assigned to one of the sixteen California climate zones. Hourly weather data was available for each of the climate zones.

Estimating Ex Post Savings

The final result from the gross analysis of each sampled measure was an estimate of annual savings, including both annual energy savings (kWh, therms) and peak demand savings (kW). The final evaluation estimate was divided by the ex ante estimate to compute a measure-specific realization rate. For measures that saved electricity, the peak savings were computed with respect to a CPUC-defined peak period.

Peak Savings

The analysis of peak demand used the California Protocol guidelines for estimating peak demand impact at the basic rigor level. It also followed the peak demand guidelines described in decision R.06-06-063, which established peak as it is currently defined in DEER. DEER defines peak kW as the average grid-level impact for the measure between 2 PM and 5 PM during the three consecutive weekday periods containing the weekday with the hottest temperature of the year. These three days varied by climate zone, as shown in Table 11.

Table 11: Peak Days by Climate Zone

Climate Zone	Reference City	Peak Days*
1	Eureka	Sep. 30 – Oct. 2
2	Napa	Jul. 22-24
3	Oakland, San Francisco	Jul. 17-19
4	San Jose	Jul. 17-19
5	Santa Maria	Sep. 3-5
6	Los Angeles (LAX)	Jul. 9-11
7	San Diego	Sep. 9-11
8	Long Beach	Sep. 23-25
9	Los Angeles (Civic Center)	Aug. 6-8
10	Riverside	Jul 8-10
11	Red Bluff	Jul. 31-Aug. 2
12	Stockton	Aug 5-7
13	Fresno	Aug 14-17
14	Barstow	Jul. 9-11
15	Brawley	Jul 30-Aug 1
16	Bishop	Aug. 6-8

*Based on a 1991 reference year for defining weekdays.

Annual Savings Extrapolation

Care was taken in extrapolating short-term results—typically obtained over several weeks to several months—to a typical year. The appropriate extrapolation method, which varied with the circumstances encountered for each measure, was documented in the site M&V plan. Explanatory factors included parameters such as outside air temperatures (dry bulb or wet bulb), building occupancy and production levels.

Interaction Between Measures

For some sites, the sampled measure was one of several measures implemented at a site under one project. In some cases, the sampled measure interacted with other measures in the project. These measure interactions were taken into account so that savings associated with the sampled measure were attributed properly.

2.3.10. Preparing the M&V Report

The final step in the gross savings analysis process for a sampled measure was preparation of the M&V Report, which summarized all findings from the evaluation process. The methodology portion of the report included the approved M&V plan (or approved indirect approaches), updated (if appropriate) to reflect changes made to the evaluation methods during the on-site data collection and analysis. The report added a Findings section, which provided evaluation results in both narrative form and tabular form. Spillover savings (if any) were also discussed in the report.

In addition to the report, any supporting documentation that informed the review of the report was provided. The supporting documentation included data collected in the field and all calculations used in arriving at the final results. Explanations as to the source of data items, the rationale behind assumptions and the flow of calculations through the analysis were also provided.

Draft M&V reports were reviewed and approved by the relevant Group Managers. They were then submitted to the CPUC for review by ED Technical Advisors. Revisions were made to the draft reports in response to CPUC comments. A final version of the report was approved by the CPUC. All site reports were compiled into Volume 2 of this report.

2.4. Confidence and Precision of Key Findings

As noted previously, the sample for the Major Commercial evaluation was designed with the goal of attaining 90/10 relative precision. This expected precision level was calculated for the sample using the Cochran (1977) approach to estimating the variance of a stratified random sample, where the *ex-ante* estimates of kWh savings for sampled cases were used as the basis for the calculation.

The actual precision attained was calculated using several different approaches taken from the *California Evaluation Framework* (TecMarketWorks, 2004), Cochran (1977) and Taylor (1997), with the specific techniques used depending on the type of impacts analyzed. The precision results are provided in section 2.8 (Program-level Results)

Three somewhat different approaches were required to estimate parameters in three categories of program activities. The three types of program activities are:

1 Program elements reporting *ex-ante* savings (kW, kWh, and/or therms) directly into their program tracking systems, where the savings are directly related to what was installed.

2 Program elements that did not make *ex-ante* claims for what was installed. This occurred when an installation was chosen for its fuel-specific benefits, but where other fuel benefits can occur. Where the latter situation applied, the utility typically did not report the other fuel

benefits/savings, but estimates of those savings are a required part of the *ex-post* procedures. An example would be the installation of energy-efficient lighting where the primary savings are in electricity terms, but where there are gas impacts; kW and kWh savings would have been recorded and claimed, but the therm savings were not. Nevertheless, therm savings were estimated in this evaluation.

3 Program elements where recommendations were made, but no incentives were paid (energy audits). In this type of program activity, *ex-ante* energy savings were claimed, but were not directly tied to specific installations.

Following is a general summary of how calculations of required parameters were carried out. The specific equations used, and their references, for calculation of the required parameters can be found in Appendix B.

Somewhat different approaches were required for each type of program activity described above. Required parameters related to the first program activity type were based on the estimation of a realization rate, defined as the ratio of *ex-post* to *ex-ante* savings. As described in the *Framework* (p. 358) and discussed in greater detail in Appendix B, the sample realization rate was calculated both overall and by stratum. The overall realization rate was multiplied by the mean population *ex-ante* savings estimate to calculate the mean *ex-post* UES value. The standard error was calculated for the realization rate and used to determine the 90% confidence band around the realization rate and thus around the UES. The confidence interval was then divided by the sample realization rate to calculate the relative precision of the estimate.

The parameters estimated for program activities of the second type could not be based on ratios as there were no *ex-ante* savings claims. Thus, the approach taken focused on the *ex-post* estimates from the stratified sample. The selected approach is the same one taken from Cochran (p. 95) to calculate relative precision using the *ex-ante* estimates for the sample. This approach involved using stratum weights (the proportion of the total population accounted for by each stratum) to calculate a weighted mean and variance for a stratified random sample. The resulting mean and standard error were used to calculate the error band and relative precision for these cases.

Calculations for the third type of program activity (audits) were based on a two-stage sample. The first stage involved a telephone interview with a sample[5] of audit sites. A second-stage sample was taken from those in the first stage that claimed to have installed one or more of the recommendations, and each second-stage sample site was subjected to engineering analysis to estimate savings realized at each site. This sample was the basis for calculating estimated UESs.

The first-stage sample formed the basis for an installation rate, . The second-stage sample average savings was multiplied by the first-stage installation rate to yield the mean *ex-post* savings for the audit program type. This sample mean was then multiplied by the sample realization rate to form the final UES for the audit program type.

[5] The first-stage sample was stratified for the SCE2517 NRA sample, but not for the SCG3503 NRA sample. For the latter program, a census was attempted at this stage due to a very small population of 34. The second-stage sample was stratified.

Confidence and precision levels based on these sample calculations are reported in the results section. The targets for confidence and precision for this project were 90/10, and sampling was based on this standard. For this reason, all relative precision numbers are reported in those terms.

2.5. Validity and Reliability

In order to maximize the accuracy of the final program-level savings estimate, the evaluation team considered both the sample size and the level of measurement and analysis effort spent on sites within the sample. As discussed further below, there are a number of sources of uncertainty associated with measurement of the key impact parameters of gross energy savings, gross demand savings, and net impacts. These sources of uncertainty are particularly challenging within large nonresidential program evaluations due to the heterogeneity of applications, processes, and energy efficiency measures.

There is an appropriate balance that can be achieved by trading off the sample size against the level of M&V activity (while holding a fixed budget constant) to ensure the best overall reliability of the program savings estimates. For the purposes of the gross impact evaluation, the sample size was constrained to a large degree by the project schedule and availability of experienced analysts, so the analysis of uncertainty focused on elements that contribute to reliability of savings for individual sites. Examples of these elements of uncertainty include variations due to equipment scheduling and variations in occupant behavior and business levels; modeling errors; instrument error (if measurement was conducted); measure sampling error within a site; and planned and unplanned assumptions (according to IPMVP, this category "encompasses all the unquantifiable errors associated with stipulations, and the assumptions necessary for measurement and savings determination.").

Every step of the gross impact analysis both recognized the need to minimize uncertainty and incorporate specific areas of engineering analysis and judgment to increase validity and reliability. This process can be thought of as a continuous and iterative effort to maximize available evaluation resources for valid, reliable results by targeting the evaluation effort to the areas of greatest uncertainty. Even after initial site level M&V plans were developed, it was often necessary to make real-time adjustments to the parameters measured and the techniques used to measure them.

The impact analysis approached each sampled measure as a separate case that required uncertainty to be minimized. The impact for each measure was determined by a variety of parameters, including for example connected load, set points, run time, occupancy, throughput and others. These parameters played varying roles in the algorithms used to calculate savings and they were subject to varying degrees of uncertainty. Connected load could be determined with minimal measurement error; occupancy or throughput might be subject to much greater variation over time and therefore required a greater allocation of resources to gather enough data to minimize uncertainty. The knowledge and judgment of the engineering team were used to make decisions regarding this allocation among parameters.

Site leads had at their disposal a variety of measurement techniques to collect data on the selected parameters, and engineering judgment figured prominently in what kinds of measurements were undertaken or requested in the evaluation. Lighting run time, for example, could be measured using loggers placed at the level of banks controlled by a single switch, by loggers placed one to a floor, or simply by asking the building owner questions regarding hours of occupancy or operation. Similarly, data on the operation of a building's air handling units might be collected by monitoring one, several, or all of the units in the building. Lower cost measurement and analysis techniques might be appropriate for parameters that have a relatively lower degree of uncertainty. On the other hand, a more extensive, higher cost data collection approach might be needed to address parameters with a higher degree of uncertainty. In addition, site leads were acutely conscious of a broader definition of cost that included the customer hassle factor. Particular measurement techniques might yield highly accurate results, but require facility shutdown, extensive use of customer staff time, or other "costs" that could undermine the evaluation effort and cause the engineering team to ultimately lose access to the site. By balancing all costs and uncertainty factors in this manner and then applying both engineering and management judgment, the evaluation team was able to select measurement techniques consistent with available resources in a way that helped minimize uncertainty and increase the validity of the results.

2.6. Detailed Findings for High Impact Measures

This section presents and discusses the full evaluation analysis and findings for high impact measures analyzed under the Major Commercial contract group for the program years 2006-08. The section begins with a discussion of the first year gross realization rates determined in the evaluation for each sampled measure. A separate discussion is provided for the direct and indirect measures. The section then discusses important parameters that were considered in the estimation of gross savings for each HIM. The section ends with a discussion of the reasons for the discrepancies found between the ex ante and ex post annual first year gross savings.

2.6.1. Realization Rates for Sampled Measures

One of the primary objectives of this study was the quantification of gross realization rates for a representative sample of measures within each HIM analyzed by the Major Commercial contract group. Two values were considered in the calculation of realization rate for each sampled measure; the first year ex ante savings and first year ex post savings.

Realization Rate = ex post annual savings/ ex ante annual savings

Ex ante savings were prepared by the IOUs and documented in the IOU tracking database. The ex post savings were prepared by the evaluation team using an engineering analysis that was reviewed and approved by the CPUC.

2.6.1.1 Direct Measures

A realization rate was prepared for each measure in the direct sample. Appendix E provides a table of the realization rate computed for each sampled measure. The values in this appendix are sorted by HIM within each program in the Major Commercial contract group. Gross realization rates were computed for a total of 67 direct measures. These were distributed as 18 sampled measures in the SCE2517 program, 19 sampled measures in the SCG3513 program, 16 sampled measures (electric and gas) in the SDGE3010 program and 14 sampled measures (electric and gas) in the SDGE3025 program.

Examination of the realization rates for the individual measures shows a wide range of values within each HIM. The analysis of the Custom Lighting HIM included 15 sampled measures. Seven of these measures were sampled from the SCE2517 program and four each were sampled from the SDGE3025 and SDGE3010 programs. Across the sampled measures, the kWh realization rates varied from a low of 0.07 for a lighting measure in the SDGE3010 program to a high of 1.59 for a lighting measure in the SDGE3025 program. The kW realization rates varied from a low of 0.0 for a lighting measure in the SDGE3010 program to a high of 1.60 for a lighting measure in the SDGE3010 program.

The analysis of the Custom HVAC HIM included 19 sampled measures. Twelve of these measures (5 electric and 7 gas) were sampled from the SDGE3010 program. Five measures (4 electric and 1 gas) were sampled from the SDGE3025 program. The remaining two measures (both electric) were sampled from the SCE2517 SPC program. Across the sampled gas measures, the therm realization rates varied from a low of 0.1 for HVAC measures in both the SDGE3025 and SDGE3010 programs to a high of 1.6 for a measure sampled from the SDGE3010 program. Across the sampled electric measures, the kWh realization rates varied from a low of -.03 for a measure in the SDGE3025 program to a high of 6.39 for a measure sampled from the SDGE3025 program. The unusually high maximum value was caused by a IOU tracking database data entry error. The unusually low minimum value was caused by poor performance of the installed chiller. The kW realization rates for the electric measures varied from a low of -.03 to a high of 8.67 for HVAC measures in the SDGE3025 program. The unusually high maximum value was caused by reductions in chiller kW that were not captured in the IOU ex ante kW demand savings. The unusually low minimum value was caused by poor performance of the installed chiller.

The analysis of the Custom Other HIM included 33 measures. Nineteen of these measures (all gas) were sampled from the SCG3513 program. Nine measures (all electric) were sampled from the SCE2517 program. The remaining 5 measures (all gas) were sampled from the SDGE3025 program. Across the sampled electric measures, the kWh realization rates varied from a low of 0.0 to a high of 1.2. The kW realization rates varied from a low of 0.0 to a high of 1.07. Across the sampled gas measures, the therm realization rates varied from a low of 0.0 for measures in both the SCG3513 and SDGE3025 programs to a high of 10.5 in the SCG3513 program. This unusually high value was caused by a data entry error for the ex ante value in IOU tracking database.

Additional information regarding the reasons for differences between the ex ante and ex post savings values is provided in section 2.6.3 below.

2.6.1.2 Indirect Measures

The measures analyzed under the Audit HIM were primarily lighting. However, a significant number of HVAC measures were included and a few other measures were considered. Table 12 below shows the frequency of indirect measures evaluated across the sixteen indirect audits where non-zero energy savings were calculated. Lighting measures were analyzed for 9 of the 16 sampled audits. HVAC and Other measures were analyzed for 5 and 4 of the sampled audits, respectively. The table shows that 14 of the 16 analyzed audits were under the SCE2517 NRA program. The remaining two audits were under the SCG3503 program.

Table 12: Measure Types Analyzed for Sampled Indirect Audits

AuditID	Evaluation ID	IOU	Lighting	HVAC	Other
2250	M33901	SCE		X	
21964	M39401	SCE	X		
22051	M39488	SCE	X		
28463	M35511	SCE		X	
28770	M37918	SCE	X		
32765	M42391	SCE		X	
32792	M42418	SCE		X	
33877	M42498	SCE	X		
41513	M43599	SCE	X		
43087	M43353	SCE			X
51344	M48395	SCE	X		
42481	M42147	SCE	X		
28644	M37793	SCE	X	X	X
49951	M47046	SCE	X		
SCG_009	M49994	SCG			X
SCG_012	M49998	SCG			X

A realization rate was prepared for each audit (one or more measures) in the indirect sample. Appendix F provides a listing of the realization rate computed for each sampled audit. For 44 sampled audits the realization rate was zero because on-site recruitment determined that indirect measures were not implemented. Across the 14 electric audits where indirect measures were found and non-zero energy savings were calculated, realization rates ranged from 0.02 to 13.92 for kWh and 0.0 to 9.41 for kW. This wide range was observed because the ex ante claimed savings for the NRA component of the SCE 2517 program were based on a deemed unit savings value which did not reflect a site-specific assessment of expected savings. The realization rates for the two SCG3503 audits with non-zero savings in the sample were 0.1 to 1.2 for therms. This range was much less because both the ex ante and ex post estimates were site-specific.

2.6.2. Results for Important Measure Performance Parameters

The analysis of each HIM revealed that certain parameters were influential in the estimate of ex post annual savings. For some sampled measures, the ex ante and ex post values for these parameters were similar. In other cases, there was a significant difference between the ex ante and ex post values. These differences caused both increases and decreases in the realization rates. The reasons for these differences are discussed in Section 2.6.3. Below is a discussion of the important parameters studied for each HIM for which there were significant differences between the ex ante and ex post values.

2.6.2.1 Custom Lighting

The analysis of the custom lighting HIM considered four important energy savings parameters for each sampled measure. They included annual operating hours, fixture (or lamp) quantity, watts/fixture (or lamp) and fixture utilization factor. For measures that required a dual baseline, both early and normal replacement conditions were considered for some parameters.

A comparison of the ex ante and ex post gross savings results across sampled measures revealed that differences between the ex ante and ex post values occurred most frequently for two of these parameters; annual operating hours and fixture quantity. Tables 13 and 14 below summarize the ex ante and ex post values computed for operating hours and fixture quantity for cases where there was a significant difference between the ex ante and ex post assumptions. These values reflect results for the first year savings estimates. These tables also list the evidence that was used in the ex post analysis to support these differences.

Table 13: Summary of Ex Ante and Ex Post Assumptions for Key Parameters Lighting Operating Hours

Program	Evaluation ID	Program ID	Site type	Usage Group	Ex Ante Value (hrs)	Evidence to Support Change	Ex Post Value (hrs)
SDGE3025	M49216	2008-3475	Car Dealership	Exterior	6566	measurement	8760
SDGE3025	M49261	2008-3562	School	Exterior	4386	measurement	452
			School	Offices	2652	measurement	2427
			School	Class/Other	2652	measurement	1536
SDGE3025	M01313	2007-3179	Stadium	Photocell	4380	measurement	4430 & 8760
			Stadium	BMS	2532	measurement	540
SDGE3010	M00965	2006-2305	Manufacturing	Hall	3770	measurement	248
SDGE3010	M01073	2006-1758	Vehicle Maintenance	Emergency	8760	measurement	8760
			Vehicle Maintenance	Non-emergency	8760	measurement	7147
SDGE3010	M48676	2008-2287	School	Classroom	3863	measurement	1603
SDGE3010	M49013	2008-2892	Car Dealership	Display	3650	measurement	4187
			Car Dealership	Security	3650	measurement	2475
SCE2517	M00437	2006-837	Manufacturing	Manufacturing	4131	measurement	4437
SCE2517	M00516	2006-91	Warehousing	Warehousing	2860	measurement	6265
	M00516	2006-91	Warehousing	Warehousing 2	2860	measurement	8712
SCE2517	M00649	2006-113	Manufacturing	Office	7488	measurement	3872
			Manufacturing	High Bay	7488	measurement	3992
			Manufacturing	Low Bay	8760	measurement	8760
SCE2517	M00665	2006-561	Warehousing	Warehouse	8760	measurement	6028
SCE2517	M24332	2007-156	Office	Office	2613	measurement	4278
			Office	Garage	2860	measurement	5000
			Office	Exterior	4380	measurement	4568
SCE2517	M24773	2008-523	Warehousing	Picking	3754	measurement	3096
			Warehousing	Storage	3754	measurement	2328
SCE2517	M25314	2007-0124	Manufacturing	Non-Occupancy Sensor	8736	measurement	5173

Differences between ex ante and ex post values occurred most frequently for annual operating hours. Significant differences were found for 14 of the 15 direct custom lighting measures. Table 13 shows that the ex post annual operating hours for one or more usage groups were less than the corresponding ex ante value in 8 of the 14 cases. The ex post operating hours were greater for one or more usage groups in 6 cases. The difference in operating hours across all usage groups ranged from a decrease of 93 percent to an increase of more than 200 percent. This wide range is due to the fact that the actual operating hours in the post-retrofit period, in some cases, is significantly different than the hours anticipated during the preparation of the ex ante savings estimates.

There were also a significant number of sampled measures with differences between ex ante and ex post values for fixture (or lamp) quantity; although a much smaller number than for operating hours. Table 14 below shows significant differences in quantity for five sites, with a least one site in each of the three programs with direct custom lighting measures. The ex post quantity was greater for one of the five cases. The ex post value was less for the remaining four cases. The difference in quantity across these cases ranged from a decrease of 17 percent to an increase of 4 percent; a much narrower range than for operating hours.

Table 14: Summary of Ex Ante and Ex Post Assumptions for Key Parameters Custom Lighting Quantity

Program	Evaluation ID	Program ID	Fixture/lamp type	Ex Ante Quantity	Evidence to Support Change	Ex Post Quantity
SDGE3025	M49261	2008-3562	various	638	On-site count	628
SDGE3010	M48676	2008-2287	2 lamp F32T8	208	On-site count	172
SDGE3010	M49013	2008-2892	4 lamp F54T5	72	On-site count	70
SCE2517	M00437	2006-837	6 lamp F32T8	23	On-site count	24
SCE2517	M00665	2006-561	6 lamp F32T8	491	On-site count	474

2.6.2.2 Custom HVAC

The important energy savings parameters considered in the analysis of the Custom HVAC HIM varied with the type of HVAC measure analyzed. Four of these parameters were relevant to multiple measures, whose ex ante and ex post values can be compared. They include operating hours, fan kW, fan CFM savings and kW/ton. Table 15 below summarize the ex ante and ex post values computed for these parameters for where there was a significant difference between the ex ante and ex post assumptions. These values reflect results for the first year savings estimates. These tables also list the evidence that was used in the ex post analysis to support these differences.

Significant differences between ex ante and ex post values for annual operating hours occurred for four sampled measures. Table 15 below shows that the ex post annual operating hours were less than the corresponding ex ante value in two of the four cases. The ex post operating hours were also greater in two cases. The difference in operating hours across all affected measures ranged from a decrease of 66 percent to an increase of nearly 600 percent. This wide range is due to the fact that the actual operating hours in the post-retrofit period, in some cases, is significantly different than the hours anticipated during the preparation of the ex ante savings estimates.

Table 15: Summary of Ex Ante and Ex Post Assumptions for Key Parameters Custom HVAC Operating Hours

Program	Program ID	Evaluation ID	System Type	Ex Ante Value (hrs)	Evidence to Support Change	Ex Post Value (hrs)
SDGE3010	06-1767	M01157	Garage Fans	438	measurement	2909
SDGE3010	06-2059	M01180	Garage Fans	438	measurement	2365
SDGE3025	06-3232	M01195	Ventilation Fans	4316	measurement	1706
SDGE3025	08-3357	M49153	Chiller	8760	measurement	2957

There were also a significant number of sampled measures with differences between ex ante and ex post values for HVAC system efficiency (kW/Ton); although a smaller number than for operating hours. Table 16 below shows that significant differences in system efficiency (kW/Ton) were found for four measures, with a least one site in each of the three programs with direct Custom HVAC measures. The ex post kW/ton was greater for two of the four cases. The ex post value was less for the remaining two cases. The difference in kW/ton across these cases ranged from a decrease of 46 percent to an increase of 110 percent.

Table 16: Summary of Ex Ante and Ex Post Assumptions for Key Parameters Custom HVAC kW/Ton

Program	Evaluation ID	Program ID	System Type	Ex Ante Value (kW/ton)	Evidence to Support Change	Ex Post Value (kW/ton)
SDGE3010	M01158	06-1595	VAV System	0.95	measurement	0.24
SDGE3025	M01357	06-3216	Chiller	0.6	measurement	1.26
SCE2517	M25098	07-703	Chiller	0.54	measurement	0.77
SDGE3010	M48711	08-2411	Chiller	1.34	measurement	0.73

There were several sampled measures with differences between ex ante and ex post values for HVAC fan CFM (flow volume in cubic feet per minute) savings. Table 17 below shows that significant differences in fan CFM savings were found for three sampled measures. All three of the cases were for measures in the SDGE3010 program. The ex post fan CFM was less than the ex ante value for all three cases. The difference in fan CFM savings across these cases ranged from a decrease of 12 percent to a decrease of 60 percent.

Table 17: Summary of Ex Ante and Ex Post Assumptions for Key Parameters Custom HVAC Fan CFM Savings

Program	Evaluation ID	Program ID	System Type	Ex Ante Value (CFM)	Evidence to Support Change	Ex Post Value (CFM)
SDGE3010	M01182	07-1520	Fume Hoods	3388	measurement	1362

Program	Evaluation ID	Program ID	System Type	Ex Ante Value (CFM)	Evidence to Support Change	Ex Post Value (CFM)
SDGE3010	M01193	06-1907	Fume Hoods	66323	measurement	55968
SDGE3010	M48734	08-2507	Fume Hoods	19159	measurement	16802

There were two sampled measures with differences between ex ante and ex post values for HVAC fan kW. Table 18 below shows that significant differences in fan kW were found for two sampled measures. Both of the cases were for measures in the SDGE3010 program. The ex post fan kW was less than the ex ante value for both cases. The difference in fan kW across these cases ranged from a decrease of 68 percent to a decrease of 80 percent.

Table 18: Summary of Ex Ante and Ex Post Assumptions for Key Parameters Custom HVAC Fan kW

Program	Program ID	Evaluation ID	System Type	Ex Ante Value (kW)	Evidence to Support Change	Ex Post Value (kW)
SDGE3010	06-1767	M01157	Garage Fans	221	measurement	70.9
SDGE3010	06-1431	M01181	Garage Fans	79	measurement	16

2.6.2.3 Custom Other

The important energy savings parameters considered in the analysis of the Custom Other HIM varied with the type of Other measure analyzed. Three of these parameters were relevant to multiple measures, whose ex ante and ex post values can be compared. They include operating hours, production changes and system efficiency. The tables below summarize the ex ante and ex post values computed for these parameters for where there was a significant difference between the ex ante and ex post assumptions. These values reflect results for the first year savings estimates. These tables also list the evidence that was used in the ex post analysis to support these differences.

Significant differences between ex ante and ex post values occurred most frequently for production changes. Significant differences were found for 11 of the 33 direct Custom Other measures. Table 19 below shows that the ex post production rates were less than the corresponding ex ante value in eight of the ten cases. The ex post production rates were greater in the remaining three cases. The difference in production rates across all affected measures ranged from a decrease of 86 percent to an increase of 33 percent.

Table 19: Summary of Ex Ante and Ex Post Assumptions for Key Parameters Custom Other Production Changes

Program	Program ID	Evaluation ID	Units	Ex Ante Value	Evidence to Support Change	Ex Post Value	Comments	Facility Type
SDGE3025	3340-1-1	M01359	lbs laundry /day	2200	Measurement	1210	Incorrect value used in ex-ante algorithm	Hotel

Program	Program ID	Evaluation ID	Units	Ex Ante Value	Evidence to Support Change	Ex Post Value	Comments	Facility Type
SDGE3025	3458-1-1	M49205	gal/year	104,000,000	Measurement	30,000,000	Incorrect value used in ex-ante algorithm	Food processing
SCG3513	3018-7946-1	M49367	lbs aluminum/year	600,000	Measurement	320,000	Incorrect value used in ex-ante algorithm	Metals die casting
SCE2517	2006-00467	M00720	tons/day O2 & N2	589.4	Plant records	652.5	Measure allowed retention of more product, offsetting production at other plants	Chemicals plant
SCG3513	3433-70000-1	M49886	mmscfd Hydrogen	60	Measurement	80	Production levels changed due to customer decisions	Chemicals plant
SCG3513	3018-9177-1	M49388	lbs aluminum/week	171,280	Measurement	23,682	Production levels changed due to market conditions	Metals die casting
SCG3513	3434-30026-1	M49914	lbs aluminum/week	74,111	Measurement	48,286	Production levels changed due to market conditions	Metals die casting
SCE2517	2006-00794	M00722	tons cement/year	1,930,836	Customer M&V report	1,759,286	Production levels changed due to market conditions	Cement plant
SCE2517	2008-643	M25150	tons finish grind/year	1,354,577	Measurement	1,219,119	Production levels changed due to market conditions	Cement plant
SDGE3025	3570-3-1	M49268	Burner hours/year	839	Plant records	924	Production levels changed due to market conditions	Asphalt plant
SCG3513	3018-8322-1	M00919	Hours of operation/yr	5880	Interview	3813	Production levels changed due to market conditions, 92% reduction in production	Food processing

There were also a significant number of sampled measures with differences between ex ante and ex post values for operating hours; although a smaller number than for production changes. Table 20 below shows that significant differences in operating hours were found for four measures; two measures from the SCE2517 program and two measures in the SCG3513 program. The ex post operating hours were less for three of the four cases. The ex post value was greater for the remaining case. The difference in operating hours across these cases ranged from a decrease of 35 percent to an increase of 12 percent.

Table 20: Summary of Ex Ante and Ex Post Assumptions for Key Parameters Custom Other Operating Hours

Program	Program ID	Evaluation ID	Ex Ante Value (hrs/year)	Evidence to Support Change	Ex Post Value (hrs/year)	Facility	Equipment
SCE2517	2006-0057	M00715	8760	Measurement	8445	Heavy manufacturing	Compressed air
SCE2517	2007-00044	M00718	7708	Measurement	5869	Oil pipeline	Pumping station
SCG3513	3018-5887-1	M00724	2716	Interview (Process); eQuest Model (Space Heat)	3030	Nursery	Steam boiler
SCG3513	3018-8322-1	M00919	5880	Interview	3813	Food processing	Hot water boiler

There were also a significant number of sampled measures with differences between ax ante and ex post values for equipment efficiency. Table 21 below shows that significant differences in equipment efficiency were found for six measures; four measures from the SCE2517 program and two measures in the SCG3513 program. The ex post equipment efficiency values were greater for four of the six cases. The ex post value was less for the remaining two cases. The difference in equipment efficiency across these cases ranged from a decrease of 5 percent to an increase of 272 percent.

Table 21: Summary of Ex Ante and Ex Post Assumptions for Key Parameters Custom Other Equipment Efficiency

Program	Program ID	Evaluation ID	Units	Ex Ante Value (%)	Evidence to Support Change	Ex Post Value (%)	Facility Type
SCE2517	2006-794	M00722	kWh/ton % improvement	49.3	Trend data	51.9	Cement plant
SCE2517	2007-643	M25150	kWh/ton % improvement	45.7	Trend data	35.4	Cement plant
SCE2517	2006-6512	M25368	kWh/ton % improvement	10.2	Trend data	27.7	Cement plant
SCE2517	2006-467	M00720	kWh/ton % improvement	6.0	Plant records	5.7	Chemical plant
SCG3513	2006-6318	M00961	Combustion Efficiency % improvement	14.6	Measurements	23.3	Food processing
SCG3513	2008-7946	M49367	BTU/lb % improvement	46.3	Industry expert BTU/lb estimates	67.5	Metals die casting

2.6.2.4 Non-Residential Audit (Indirect)

A comparison of energy saving parameters, similar to that described above for direct measures, could not be made for the sampled measures analyzed under the SCE2517 NRA program because the SCE claimed savings for these cases reflected an averaged deemed value and not a site-specific savings analysis. A comparison of parameters was not made for the SCE3503 program because ex post savings were estimated for only two sampled measures.

2.6.3. Reasons for Realization Rates not Equal to One (Direct)

A secondary objective of the full evaluation was to determine the reasons why the realization rates for the sampled direct measures were not equal to one. During the analysis of gross savings, the reasons for differences between the ex ante and ex post energy (kWh or therms) savings estimates were noted and documented in the individual site reports. For some sampled measures a single reason was noted. For many measures multiple reasons were found.

The reasons were compiled and are summarized in Appendix D. This appendix lists the reasons for differences for each direct sampled measure. For each case, the primary reason is noted with a "P" and the one or more secondary reasons are noted with an "S". The list of reasons was aggregated by HIM across programs. The frequency of each reason (primary and secondary) within each HIM are provided in the table below. The table shows that reasons for the discrepancies were noted for all three direct HIMs.

Table 22: Frequency of Reasons for Realization Rates Not Equal to 1 Direct Measures

HIM	Reason for Discrepancy with ex-ante savings	Frequency
Custom Lighting	Operating hours	14
	Fixture wattage	4
	Fixture count	5
	Utilization factor	3
Custom HVAC	Operating hours	4
	Chiller efficiency	4
	Fan power	2
	Fan flowrate	3
	Other	14
Custom Other	Inappropriate algorithm	10
	Standard practice or code installed	6
	Operating hours	5
	Production changes	9
	Equipment efficiency	6
	Measure not installed	3
	Other	8

For the Custom Lighting HIM differences in ex ante and ex post operating hours were found most frequently. Operating hours were noted as a reason for 14 of the 15 sampled measures analyzed under this HIM. Section 2.6.2.1 above provides additional discussion on the variation in operating hours that was observed. The table also shows that differences in fixture wattages, fixture counts and lighting utilization factor were found to be a reason in a smaller number of cases.

For the Custom HVAC HIM four significant reasons were found that explained the difference in ex ante and ex post savings. They include operating hours, chiller efficiency, fan power and fan flow rate (CFM).

A more detailed discussion of observed differences in values assumed for each of these parameters is provided in Section 2.6.2.2. For this HIM a variety of less frequent reasons for the discrepancies were noted. They are combined in the above table into the 14 reasons noted under the "other" category.

For the Custom Other HIM six significant reasons were found that explained the difference in ex ante and ex post savings. They include inappropriate ex ante algorithm, installation of standard practice or code, operating hours, production changes, equipment efficiency and measure not installed. In cases where standard practice or code was implemented zero gross savings were assigned in the evaluation. A more detailed discussion of the observed differences in values assumed for these parameters is provided in Section 2.6.2.3. For this HIM a variety of less frequent reasons for the discrepancies were noted. They are combined in the above table into the eight reasons noted under the "other" category.

2.7. Program-Specific Results

Section 2.6 above discussed the realization rate results for the individual sampled measures and audits from an HIM perspective. This section discusses the gross savings results from a program perspective. This section discusses aggregations of the results at the strata level. However, it does not present the final program level savings estimates. The final estimates will be produced by the Evaluation Reporting Tool (ERT) at a later date. The program results will be documented in the final CPUC report in March, 2010. The program level results will be based on savings estimates produced from this study for all programs in the Major Commercial contract group except for SCE2517. For this program, the ERT will combine the results produced in this study for the SPC and NRA components with the results for the Express component produced by other contract groups.

This section provides a separate discussion of the strata-level results for direct and indirect measures by program or program component. The discussion focuses primarily on the first year energy saving results. However, a discussion is also provided for both energy savings estimates prepared for the dual baseline cases. The section ends with a discussion of the savings realized for the limited spillover that was found at the direct measure sites.

2.7.1. Strata-level Results by Program (Direct)

Strata level results were computed by averaging the individual measure results within their respective stratum. The strata level results, expressed as both realization rate and unit energy savings (average savings per measure), are presented in Tables 23 to 26. The tables also provide the sampling statistics for each program. The statistics include standard error, 90% confidence interval and relative precision. A discussion of observations made for each program or program component is provided below.

2.7.1.1 SCE 2517 SPC Strata-level Results

Table 23 shows the strata-level results for the 18 sampled measures were analyzed for the SCE2517 SPC program. As expected, the average electric unit energy savings varied across the strata from a low in stratum 2 to a high in stratum 9. An average gas unit energy savings of 3,235 therms is noted for stratum 9. This occurred because one of the sampled Custom HVAC had both electric and gas savings. The gas savings were not claimed by the IOU. The kWh gross realization rates ranged from a low of 0.62 in stratum 5 to a high of 1.48 in stratum 2. The kW realization rates ranged from a low of 0.65 in stratum 2 to a high of 0.97 in stratum 5. The kWh and kW realization rates across all strata were 0.80 and 0.82, respectively. A realization rate could not be calculated for therms because there was no ex ante value.

The sample statistics for this program are shown at the bottom of the table. For both unit energy savings and realization rate, the relative precision for kW and kWh was calculated to be 0.1 and 0.15, respectively. The relative precision for the unit energy savings therms was estimated to be 0.91.

Table 23: SCE 2517 SPC First Year Gross Savings Parameters by Stratum with Domain Statistics

		SPC		Stratum Boundaries Audit Total Recommended Savings (kWh)		Gross Ex Post Unit Energy Savings1			Gross Savings Realization Rate1		
Program ID	**Stratum**	**Population**	**Sample**	**Lower**	**Upper**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
SCE2517	2	673	2	36,006	119,005	12	85,225	0	0.85	1.48	
SCE2517	3	456	3	119,191	321,550	18	123,514	0	0.65	0.68	
SCE2517	4	179	2	329,676	911,354	106	591,742	0	0.84	0.90	
SCE2517	5	76	2	911,416	3,339,231	222	1,263,864	0	0.97	0.62	
SCE2517	9	13	9	3,346,850	35,045,198	1,356	8,991,565	3,235	0.77	0.81	
SCE2517	Excluded	1,751	0	158	35,952						
SCE2517	**All Sampled**	**1,397**	**18**	**158**	**35,045,198**	**41**	**274,897**	**30**	**0.82**	**0.80**	
					Statistics						
					Standard Error	**3**	**25,592**	**17**	**0.05**	**0.07**	
					90% Confidence Interval	**4**	**42,099**	**27**	**0.09**	**0.12**	
					Relative Precision	**0.1**	**0.15**	**0.91**	**0.10**	**0.15**	

1 Stratum level results are based on sampled sites only.

2.7.1.2 SCG3513 Strata-level Results

Table 24 shows the strata-level results for the 19 sampled measures were analyzed for the SCG3513 program. As expected, the average therm unit energy savings varied across the strata from a low in stratum 1 to a high in stratum 9. The therm gross realization rates ranged from a low of .24 in stratum 9 to a high of 1.56 in stratum 1. The therm realization rate across all strata was 0.72. This realization rate was negatively affected by nine sampled measures having zero gross savings, caused primarily by claiming savings for measures not installed and implementation of measures that were standard practice.

The sample statistics for this program are shown at the bottom of the table. For both unit energy savings and realization rate, the relative precision for therms was calculated to be 0.74.

Table 24: SCG 3513 First Year Gross Savings Parameters by Stratum with Domain Statistics

		Measures		Stratum Boundaries Ex Ante Savings (Therms)		Gross Ex Post Unit Energy Savings[1]			Gross Savings Realization Rate[1]		
Program ID	Stratum	Population	Sample	Lower	Upper	kW	kWh	Therms	kW	kWh	Therms
SCG3513	1	623	4	646	27,758	0	0	14,928			1.56
SCG3513	2	54	2	29,125	102,794	0	0	13,753			0.38
SCG3513	3	15	6	110,839	228,800	0	0	47,213			0.33
SCG3513	9	8	7	339,670	2,177,246	0	0	228,180			0.24
SCG3513	Excluded	409	0	1	578						
SCG3513	**All Sampled**	**700**	**19**	**1**	**2,177,246**	**0**	**0**	**14,467**			**0.72**
					Statistics						
					Standard Error			**6,547**			**0.32**
					90% Confidence Interval			**10,770**			**0.53**
					Relative Precision			**0.74**			**0.74**

1 Stratum level results are based on sampled sites only.

2.7.1.3 SDGE3025 Strata-level Results

Table 25 shows the strata-level results for the 8 electric and 6 gas measures analyzed for the SDGE3025 program. The average electric unit energy savings varied somewhat across the strata. A gas unit energy savings of 4,073 therms is noted for stratum 9. This occurred because one of the sampled Custom HVAC measures had both electric and gas savings. The gas savings were not claimed by the IOU. The kWh gross realization rates ranged from a low of .11 in stratum 9 to a high of 2.24 in stratum 1. KW realization rates ranged from a low of 0.13 in stratum 9 to a high of 1.70 in stratum 1. The kWh and kW realization rates across all strata were 1.54 and 1.28, respectively. These realization rates were higher than expected primarily because of IOU tracking database data entry errors. A realization rate could not be calculated for therms because there was no ex ante value.

The sample statistics for the electric portion of this program are shown at the bottom of the electric portion of the table. For both unit energy savings and realization rate, the relative precision for kW and kWh was calculated to be 0.33 and 0.60, respectively. The relative precision for the unit energy savings therms was estimated to be 1.34.

For the gas measures the unit energy savings across the strata as expected from a low in stratum 1 to a high in stratum 9. An electric unit energy savings of -237 kWh is noted for strata 1. This occurred because one of the sampled Custom Other measures had both electric and gas savings. This gas measure increased electric consumption in addition to reducing the gas consumption. The negative electric savings were not claimed by the IOU. The therm gross realization rate for all strata was 0.33. This lower than expected realization rate was caused primarily by overly optimistic ex ante savings estimates and a measure being defeated by the customer.

The sample statistics for the gas portion of this program are shown at the bottom of the table. For both unit energy savings therms and realization rate therms, the relative precision was calculated to be 0.59. The relative precision for the unit energy savings kW and kWh was estimated to be 1.29.

Table 25: SDGE 3025 First Year Gross Savings Parameters by Stratum with Domain Statistics

		Measures		Stratum Boundaries Ex Ante Savings			Gross Ex Post Unit Energy Savings[1]			Gross Savings Realization Rate[1]		
Program ID	**Stratum**	**Population**	**Sample**	**Savings Units**	**Lower**	**Upper**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
SDGE3025	1	256	3	kWh	8,441	128,743	17	124,738	0	1.70	2.24	
SDGE3025	2	81	3	kWh	128,990	546,000	62	373,027	0	1.25	1.35	
SDGE3025	9	6	2	kWh	548,371	1,673,955	17	71,125	4,073	0.13	0.11	
SDGE3025	Excluded	21	0	kWh	275	7,438						
SDGE3025	Interactive	47	0	kWh	1,767	124,102						
SDGE3025	**All Sampled**	**343**	**8**	**kWh**	**275**	**1,673,955**	**21**	**167,423**	**71**	**1.28**	**1.54**	
						Statistics						
						Standard Error	**4**	**61,556**	**58**	**0.26**	**0.57**	
						90% Confidence Interval	**7**	**101,260**	**96**	**0.43**	**0.93**	
						Relative Precision	**0.33**	**0.6**	**1.34**	**0.33**	**0.60**	
SDGE3025	1	22	4	Therm	3,466	40,115	0	-237	3,966			0.32
SDGE3025	9	2	2	Therm	65,922	142,336	0	0	34,754			0.33
SDGE3025	Excluded	21	0	Therm	137	2,373						
SDGE3025	**All Sampled**	**24**	**6**	**Therm**	**137**	**142,336**	**0**	**-217**	**7,679**			**0.33**
						Statistics						
						Standard Error	**0.02**	**170**	**2,747**			**0.12**
						90% Confidence Interval	**0.03**	**280**	**4,519**			**0.19**
						Relative Precision	**1.29**	**1.29**	**0.59**			**0.59**

1 Stratum level results are based on sampled sites only.

2.7.1.4 SDGE3010 Strata-level Results

Table 26 shows the strata-level results for the 9 electric and 7 gas measures analyzed for the SDGE3010 program. As expected, the average electric unit energy savings varied across the strata from a low in stratum 1 to a high in stratum 9. The kWh gross realization rates ranged from a low of .31 in stratum 9 to a high of 0.80 in stratum 3. KW realization rates ranged from a low of 0.35 in stratum 2 to a high of 0.93 in stratum 1. The kWh and kW realization rates across all strata were 0.67 and 0.66, respectively.

The sample statistics for the electric portion of this program are shown at the bottom of the electric portion of the table. For both unit energy savings and realization rate, the relative precision for kW and kWh was calculated to be 0.34.

For the gas measures the unit energy savings across the strata as expected from a low in stratum 1 to a high in stratum 9. The therm gross realization rate for all strata was 0.98. The sample statistics for the gas portion of this program are shown at the bottom of the table. For both unit energy savings therms and realization rate therms, the relative precision was calculated to be 0.11.

Table 26: SDGE 3010 First Year Gross Savings Parameters by Stratum with Domain Statistics

		Measures		Stratum Boundaries Ex Ante Savings			Gross Ex Post Unit Energy Savings1			Gross Savings Realization Rate1		
Program ID	**Stratum**	**Population**	**Sample**	**Savings Units**	**Lower**	**Upper**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
SDGE3010	1	528	2	kWh	8,452	132,027	8	20,139	0	0.93	0.41	
SDGE3010	2	147	2	kWh	135,554	587,155	15	202,436	0	0.35	0.77	
SDGE3010	3	42	3	kWh	592,703	1,965,560	111	863,054	0	0.84	0.80	
SDGE3010	9	2	2	kWh	2,429,300	5,412,785	139	1,213,304	0	0.51	0.31	
SDGE3010	Excluded	682	0	kWh	0	8,227						
SDGE3010	M&V Incr.	77	0	kWh	-1,134,056	657,521						
SDGE3010	**All Sampled**	**719**	**9**	**kWh**	**-1,134,056**	**5,412,785**	**17**	**112,395**	**0**	**0.66**	**0.67**	
						Statistics						
						Standard Error	**3**	**23,416**		**0.14**	**0.14**	
						90% Confidence Interval	**6**	**38,519**		**0.22**	**0.23**	
						Relative Precision	**0.34**	**0.34**		**0.34**	**0.34**	
SDGE3010	1	11	6	Therm	5,706	69,326	0	0	27,948			1.16
SDGE3010	9	3	1	Therm	100,462	851,052	0	0	82,945			0.83
SDGE3010	Excluded	7	0	Therm	0	2,429						
SDGE3010	M&V Incr.	7	0	Therm	-10,430	210,038						
SDGE3010	**All Sampled**	**14**	**7**	**Therm**	**-10,430**	**851,052**	**0**	**0**	**98,072**			**0.98**
						Statistics						
						Standard Error			**6,657**			**0.07**
						90% Confidence Interval			**10,951**			**0.11**
						Relative Precision			**0.11**			**0.11**

1 Stratum level results are based on sampled sites only.

2.7.2. Strata-level Results by Program (Indirect)

Strata level results were computed by averaging the individual audit results within their respective stratum. The strata level results, expressed as both realization rate and unit energy savings (average savings per measure), are presented in Tables 27 and 28. The tables also provide the sampling statistics for each program. The statistics include standard error, 90% confidence interval and relative precision. A discussion of observations made for each program or program component is provided below.

2.7.2.1 SCE2517 NRA Strata-level Results

Table 27 shows the strata-level results for the 14 sampled measures were analyzed for the SCE2517 NRA program. The average electric unit energy savings across the strata ranged from 231 kWh to 10,758 kWh. The kW savings ranged from 0.1 kW to 1.4 kW. The unit energy savings across all strata was 0.6 kW and 3,070 kWh. The kWh gross realization rates ranged from a low of 0.02 in stratum 2 to a high of 0.60 in stratum 9. The kW realization rates ranged from a low of 0.02 in stratum 2 to a high of 0.52 in stratum 3. The kWh and kW realization rates across all strata were 0.27. The sample statistics for this program are shown at the bottom of the table. For the realization rate, the relative precision for kW and kWh was calculated to be 0.53 and 0.55, respectively.

Table 27: SCE2517 NRA First Year Gross Savings Parameters by Stratum with Domain Statistics

		Audits		Stratum Boundaries Audit Total Recommended Savings (kWh)		Gross Ex Post Unit Energy Savings1			Gross Savings Realization Rate1		
Program ID	**Stratum**	**Population**	**Sample**	**Lower**	**Upper**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
SCE2517	1	7,318	88	2,347	25,240	0.3	361		0.16	0.04	
SCE2517	2	2,415	123	25,245	89,059	0.1	231		0.02	0.02	
SCE2517	3	601	111	89,134	381,134	1.4	7,551		0.52	0.50	
SCE2517	9	81	42	382,760	10,686,996	1.3	10,758		0.44	0.60	
SCE2517	Excluded	3,003	0	0	2,347						
SCE2517	No Audit Rec.	2,024	0								
SCE2517	**All Sampled**	**10,415**	**364**	**0**	**10,686,996**	**0.6**	**3,070**		**0.27**	**0.27**	
					Statistics						
					Standard Error	**0.18**	**1,034**		**0.09**	**0.09**	
					90% Confidence Interval	**0.30**	**1,701**		**0.14**	**0.15**	
					Relative Precision	**0.53**	**0.55**		**0.53**	**0.55**	

1 Stratum level results are based on sampled sites only.

2.7.2.2 SCG3503 Strata-level Results

Table 28 shows the strata-level results for the 2 sampled measures were analyzed for the SCG3503 program. The average gas unit energy savings across the strata ranged from 3,938 to 20,593 therms. The gas unit energy savings across all strata was 4,365 therms. The therm gross realization rates ranged from 0.02 to 0.05 across the two stratum. The therm realization rate across all strata was 0.02. The sample statistics for this program are shown at the bottom of the table. For unit energy savings and realization rate, the relative precision for therms was calculated to be 0.36.

Table 28: SCG3503 First Year Gross Savings Parameters by Stratum with Domain Statistics

		Measures		Stratum Boundaries Ex Ante Savings (Therms)		Gross Ex Post Unit Energy Savings1			Gross Savings Realization Rate1		
Program ID	**Stratum**	**Population**	**Sample**	**Lower**	**Upper**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
SCG3503	1	19	8	16,000	188,600			3,938			0.05
SCG3503	9	4	4	338,087	3,000,000			20,593			0.02
SCG3503	Excluded	11	0	925	278,324						
SCG3503	**All Sampled**	**34**	**12**	**925**	**3,000,000**			**4,365**			**0.02**
					Statistics						
					Standard Error			**960**			**0.00**
					90% Confidence Interval			**1,578**			**0.01**
					Relative Precision			**0.36**			**0.36**

1 Stratum level results are based on sampled sites only.

2.7.3. Dual Baseline Gross Savings Results

Two estimates of annual energy savings were made for 20 of the direct measures and 8 of the indirect measures. This number represents 30 and 50 percent of the sampled measures, respectively, for these two measure types. The two estimates were computed with respect to both early replacement and normal replacement baselines. The early replacement annual savings (first year) savings were reported in sections 2.7.1 and 2.7.2 above. These savings will be applied to the savings stream throughout the remaining useful life (RUL) of the existing equipment. The normal replacement baseline will applied beginning the year after the RUL and continue until the end of the effective useful life (EUL) of the new equipment. Appendix I provides a listing of the early replacement and normal replacement estimates for each of these cases. The listing is sorted by HIM within each of the programs where dual baselines were evaluated. For each affected measure the appendix tables show the early and normal replacement results expressed as annual gross savings and gross realization rate. The table also provides the estimated RUL for each dual baseline measure.

A comparison of the early replacement and normal replacement annual savings and realization rates reveals that, in nearly all of the cases, the normal replacement savings are significantly less than or equal to the early replacement results because the savings estimates under the normal replacement baseline were made with respect to the energy code or standard practice. In several cases the normal replacement savings goes to zero because the measure complies with standard practice or the energy code.

The remaining useful life for the dual baseline measures was based on self report information. In cases where the customer could not estimate the remaining useful life, the assigned value was one-third of the effective useful life of the existing equipment, as specified in the DEER database. The RULs ranged from 1 to 10 years across the affect programs. The average RUL was calculated to be about 4 years for the direct dual baseline measures and 5 years for the indirect dual baseline measures.

2.7.4. Spillover Results

A spillover survey was administered to an appropriate site contact for each sampled direct measure during recruitment. Due to schedule constraints, the spillover survey was not administered to site contacts for the sampled indirect audits. The spillover survey for the direct measures revealed only two sites with significant spillover. For these two cases, the CPUC authorized an analysis of energy savings using methods that were more simplified than the direct measures because spillover quantification was a secondary objective of the study. A third spillover measure component was uncovered during the ED review of the savings analysis at one additional site.

The two spillover measures uncovered in the survey were found at industrial manufacturing facilities, which also implemented direct measures under the SCG3513 program. The first spillover measure significantly improved the energy efficiency of the furnaces through the installation of improved controls. The spillover measure did not receive an incentive and was not specifically recommended by the utility. The site contact stated that their experience in SCG’s efficiency program had a very significant effect on the decision to implement this spillover measure because it made them more aware of how they were using energy and how they might change their operations to be more efficient. The annual energy savings associated with this spillover measure was estimated by the evaluation team to be 29,141 therms.

The second spillover measure involved the expansion of an implemented direct measure at a later date, after the performance of the measure was observed. The measure included the installation of a heat exchanger that allowed for four pieces of equipment to be removed from service. After a period of observing the performance of the new heat exchanger, the customer removed additional equipment from service. The annual energy savings associated with this spillover measure was estimated by the evaluation team to be 34,761 therms.

A third spillover measure was uncovered during ED review of the savings analysis performed at a commercial site in the SCGE3025 program. The measure included the installation of an HVAC control system. It was a component of a larger HVAC upgrade at the facility. The control system did not receive an incentive under the SDGE3025 program so it was determined to be spillover. The savings for the control system was 120,153 kWh and 46.0 kW.

2.8. Conclusions and Recommendations

From the results of the full evaluation of gross savings for the 2006-08 program years, the following key conclusions were drawn.

1 **Gross savings realized** –Significant gross energy savings were found for three of the four high impact measures (custom lighting, custom HVAC and custom other) associated with the programs or program components with direct measures. Domain-level realization rate results indicate that the ex post savings estimated in this evaluation were less than the ex ante savings in most cases, i.e., the realization rates were less than unity. Significant gross savings were not found for either program or program component associated with the audit HIM. Domain-level realization rate and unit energy savings results indicate that the ex post savings estimated in this evaluation were very small.

2 **Program or program component-level realization rates and unit energy savings (direct measures)** – The unit energy savings (UES) and realization rates estimated in the evaluation varied widely across the programs or program components with direct measures. For kW savings, the values ranged from a low of 0.66 realization rate for the SDGE3010 program to a high of 1.28 realization rate for the SDGE3025 program. For kWh savings, the values ranged from a low of 0.67 realization rate for the SSDG3010 program to a high of 1.54 realization rate for the SDGE3025 program. For therm savings, the values ranged from a low of 0.33 realization rate for the SDGE3025 program to a high of 0.98 realization rate for the SDGE3010 program.

3 **Limited indirect audit savings** – The evaluation team discussed the implementation of indirect measures with several hundred customers that received energy audits. These conversations revealed that the energy audits are a valuable service provided by the IOUs. They generate many ideas for efficiency improvements and effectively communicate possible financial incentives that are offered by the IOUs to offset some of the implementation cost. In fact they do such a good job of directing customers to the financial incentives that very few indirect measures (recommended

measures without incentives) were found. Indirect measures were found in the few cases where the customer decided to implement recommended measures without an incentive for reasons such as low cost/low savings measures that did not justify the time required to interface with the program or an implementation process did not lend itself to incentive applications. The realization rates (0..27 kWh and 0.27 kW) and unit energy savings (0.6 kW and 3,070 kWh) for indirect measures were very low for the SCE2517 NRA program. The therm realization rate of 0.02 and unit energy savings of 4,365 therms for the SCG3503 program were also very low.

4 **Direct measures with no ex post savings** – Some direct measures were assigned zero first year savings in the impact evaluation. Measures received zero savings for one of two possible reasons. These reasons included the installation of normal replacement measures that were standard practice or compliant with the energy code (or Federal standard) or other mandatory regulatory requirements; and IOU tracking database errors that claimed measures that were not yet installed.

5 **Major reasons for differences between ex ante and ex post savings**– The analysis performed on each direct measure included an examination of the reasons for discrepancies between the ex ante and ex post savings estimates. The most common reason for discrepancies was the difference in the annual operating hours of the affected equipment. This reason was observed for all for HIMs. Inappropriate ex ante algorithms and production changes were the other reasons most commonly cited.

6 **Correct allocation of savings in other fuels and end uses -** The evaluation considered the gross impacts of all fuels and end uses associated with the sampled measures. In some cases, this resulted in assigning ex post savings to fuels and end uses that were not considered in the ex ante claim. In some cases this resulted in an increase in savings.

7 **Production impacts on ex post annual energy savings** – For 8 of the 33 direct measures in the Custom Other HIM, the ex post savings were negatively impacted by production changes. In most cases this was caused by the slowdown in the economy that has occurred during the evaluation period. Since the magnitude of the savings in these cases was directly related to the production output, the ex post savings values were significantly less than would have been computed under the ex ante production assumptions.

8 **Dual baseline for some measures** – For 20 of the 67 direct measures and 8 of the 16 indirect measures where non-zero savings were found, two estimates of annual energy savings were computed. They differed in the assumed baseline assumptions. Early replacement savings were assigned to each year in the savings stream thorough the remaining useful life of the existing equipment. Normal replacement savings were assigned to the remaining years in the effective useful life of the efficient equipment. Normal replacement savings were generally less than the early replacement savings.

9 **Limited spillover savings** – Only three spillover measures or measure components were found at the sites that received an analysis of savings for direct measures. Two measures were found at industrial facilities, which also implemented direct measures under the SCG3513 program. Annual estimated energy savings for these two measures were 29,141 and 34,761 therms. The

third measure component was found at a commercial facility the participated in the SDGE3025 program. Annual estimated energy savings for this measure was 120,153 kWh and 46.0 kW.

From this impact evaluation of gross savings, the following recommendations are made:

1 **Better inspection and documentation of baseline conditions** – For post-only evaluations, such as this study, the evaluation team relied heavily on documentation in the application file to support their assessment of the baseline conditions. This reliance is necessary because the baseline condition no longer exists and the baseline equipment has been removed from the site; so the baseline can not be directly observed or measured. Important baseline documentation includes the results from the IOU baseline inspection of the existing conditions, manufacturer's product literature of the baseline system (if available) and other interview and system performance information provided by the customer during project development. In many cases adequate baseline information is provided by the IOUs. However, several instances of inadequate baseline documentation were found for the measures sampled in this evaluation. In particular there was a lack of adequate baseline inspection documentation. It is not sufficient for a baseline inspection documentation to state that the efficiency measure was not installed. It must go on to document in detail the baseline energy system physical and operational characteristics. It is recommended that baseline documentation be upgraded (when appropriate) so that an experienced evaluator can understand the energy performance of the baseline equipment.

2 **Improved measure names** – Most measure names in the IOU tracking system provided a description of the claimed measures that could be understood by a third party. However, some measure names were too cryptic and did not provide an adequate description. Examples include "equipment modernization" and "GPM". For these cases an understandable measure name could only be assigned after the evaluation team examined the IOU application files. For future program years it is recommended that a statewide standardized measure naming system be put in place that would provide consistency across programs and IOUs. If that is not possible, then it is recommended improved IOU tracking database quality control procedures be put in place that identify cryptic measure names and assign measure names that can be understood by an experienced evaluator.

3 **Improved IOU tracking system data entry** – During the analysis of the sampled measures, the evaluation team identified several instances where measures claimed under the 2006-08 program years were not yet implemented at the sites. It is recommended that additional quality control be placed on the IOU tracking database data entry procedures to verify that only measures that were implemented during the program years being evaluated be included in the savings claim.

4 **Do not claim savings for normal replacement measures that are required by Title 20/24 or are standard practice for the facility** - Most measures claimed by the IOUs were early replacement, where the IOU influenced the customer to implement the measure before the end of the effective useful life of the existing affected energy system. However, the evaluation determined for some claimed measures that the existing equipment was at the end of its effective useful life. For the IOUs to claim savings for these measures, they had to influence the customer to implement an increment of energy efficiency that was beyond the requirements of Title 20/24,

standard practice (if Title 20/24 was not applicable) or any other regulations (e.g., air quality standards). The evaluation found several cases where the claimed efficiency improvement for normal replacement measures was Title 20/24 (or Federal standards) or standard practice and offered no savings increment above these levels. The evaluation assigned zero savings to these measures. It is recommended for future program cycles that additional care be given to the IOU assessment of savings for normal replacement measures. The application file should provide documentation that discusses the Title 20/24 or standard practice conditions relevant to the affected normal replacement measure and provides proof that the implemented measures exceeded these requirements. The IOU savings claim should be consistent with this logic.

5 **Feedback to ex ante savings estimates** – The ex ante savings estimates have the disadvantage of having to predict the future performance of a measure before it is installed. Ex post savings have the advantage of estimating performance of a measure after it is installed and performance measurements have been made. Because of these different perspectives, the ex ante and ex post estimates are often different, resulting is realization rates other than one. Differences in realization rates caused by post performance that could not be predicted before measure installation are unavoidable. However, studying these differences between predicted and actual measure performance can, in some cases, improve the ability of the IOUs to make future predictions for similar measures within similar facility types.

Realization rates can be affected by differences in algorithms, baseline definition and measure performance specification that can be known and considered during the preparation of the ex ante savings estimates. Studying measures in the evaluation sample where these issues were found to result in significant differences in the ex ante and ex post savings estimates can also improve the ability of the IOUs to predict savings for future measures that will result in realization rates closer to one. It is recommended that the IOUs carefully study the differences between the ex ante and ex post savings estimates for the sampled measures in this evaluation and look for opportunities to improve their ability to predict measure performance.

6 **Measure level estimates savings in the indirect IOU tracking system -** The SCG tracking system does provide indirect measure ex ante savings at the measure level. The SCE tracking system provides total savings for the individual audits but does not provide savings for the individual measures that were recommended in the audit. Examination of the SCE audit reports shows that measure level savings estimates are often not documented. This lack of measure-level documentation hampers the ability of evaluators to select a representative sample of indirect measures to evaluate. It also creates increased uncertainty around the program level savings estimate. It is recommended that for future program cycles all IOUs provide measure level savings estimates in their audit tracking system. If this is not reasonable, then the IOUs and ED should consult on the measure level data (if any) that is reasonable to include in the database.

7 **Definition of peak demand savings** – The definition of peak demand savings used by the IOUs in their ex ante savings estimates is different than the definition used by the CPUC in this impact evaluation. This creates differences in the demand realization rate that are caused by the definition of this parameter in addition to the difference between predicted and actual measure

performance. It is recommended that the IOUs and the CPUC use the same definition of peak demand, if the assessment of peak demand remains an important part of the impact evaluations.

8 **Claimed indirect savings for audit measures** – The 2006-08 savings claim for the SCG3503 program included non-rebated measures (indirect measures) with a wide range of utility influence. For indirect measures to be considered in this evaluation there had to be a high degree of utility influence on measure implementation. All non-rebated measures that were implemented as a result of a recommendation made by SCG in an audit performed under this program were considered. In addition non-rebated measures that were not specifically recommended by SCG but whose successful implementation were highly dependent on technical assistance provided by SCG were considered (i.e., the measure would not have been implemented without SCG technical support). Some savings were found for measures that fell into these two categories. However, several claimed measures were not evaluated because the evaluators determined that there was not a high degree of utility influence. It is recommended that the CPUC and all IOUs establish a series of rules for inclusion of indirect measures in the savings claim for future program cycles where indirect savings are claimed.

It is also recommended that SCG reconsider whether savings claims should be made at all for indirect measures. The results from this evaluation indicate that there is very little indirect savings to be claimed from the SCG3503 program.

3. 2006-08 Net Savings

The primary goal of the net portion of this impact evaluation was to assess the net program-specific energy and demand impacts for the non-residential programs and high impact measures in the Major Commercial contract group. A secondary goal was to increase the quality, reliability and objectiveness of the estimated impacts from the energy efficiency programs. A third goal was to inform the Commission and the program administrators as to where the greatest areas of concern are with regard to high free ridership. Information from the evaluation will be used to improve the effectiveness of acquiring energy efficiency for the IOU ratepayers. It will also be used as the basis for payment of earnings to the IOUs. The evaluation was conducted in strict accord with ED-approved procedures, which satisfied the requirements of relevant CPUC directives.

3.1. Evaluation Objectives

The net portion of the full impact evaluation accomplished the following objectives:

- Determine the annual and life cycle net energy and peak demand impacts (direct and indirect) associated with each program in the contract group for which there are claimed savings. Estimate savings over the time period the measures are projected to provide net energy and demand impacts
- Conduct measure-specific evaluations of savings for sampled cases
- Account for the effects of free-ridership in the estimates of net savings
- Explain discrepancies found between the results of this study and the IOU ex-ante net savings estimates and recommend ways to minimize these discrepancies in the future
- Provide information necessary to understand how programs can be modified to improve their performance and the overall performance of the portfolios
- Inform future updates to ex-ante energy and peak demand savings estimates (including the DEER database) for program planning purposes
- Provide timely information that can be used to improve program design and program selection for future program cycles

3.2. Net Sample Design and Selection

This section describes the approach that was used to develop and implement sampling to support the full evaluation of net savings for the Major Commercial contract group.

3.2.1. Sampling Direct Measures

Table 29 describes the completed samples used in estimating NTGR for direct measures. The definition of sampling lists (program by fuel) and strata was the same as that used for the direct gross savings sample.

The only difference was that data collection and analysis was completed for more measures in each stratum.

Table 29: Direct NTGR Evaluation Samples

			Stratum Boundaries Ex Ante Savings			Measures			% of Ex Ante Savings in Sample		
Program ID	Program Element	Stratum	Savings Units	Lower	Upper	Population	Sample	% in Sample	kW	kWh	Therms
SCE2517	SPC	2	kWh	36,006	119,005	673	8	1	2	1	NA
SCE2517	SPC	3	kWh	119,191	321,550	456	14	3	3	3	NA
SCE2517	SPC	4	kWh	329,676	911,354	179	9	5	6	6	NA
SCE2517	SPC	5	kWh	911,416	3,339,231	76	6	8	9	9	NA
SCE2517	SPC	9	kWh	3,346,850	35,045,198	13	10	77	94	91	NA
SCE2517	SPC	Excluded	kWh	158	35,952	1,751	0				
SCE2517	**SPC**	**All Sampled**	**kWh**	**158**	**35,045,198**	**1,397**	**47**	**3**	**30**	**29**	**NA**
SCG3513		1	Therm	646	27,758	623	17	3	NA	NA	5
SCG3513		2	Therm	29,125	102,794	54	6	11	NA	NA	10
SCG3513		3	Therm	110,839	228,800	15	6	40	NA	NA	37
SCG3513		9	Therm	339,670	2,177,246	8	4	50	NA	NA	69
SCG3513		Excluded	Therm	1	578	409	0				
SCG3513		**All Sampled**	**Therm**	**1**	**2,177,246**	**700**	**33**	**5**	**NA**	**NA**	**43**
SDGE3010		1	kWh	8,452	132,027	528	8	2	2	2	NA
SDGE3010		2	kWh	135,554	587,155	147	8	5	6	5	NA
SDGE3010		3	kWh	592,703	1,965,560	42	15	36	38	36	NA
SDGE3010		9	kWh	2,429,300	5,412,785	2	2	100	100	100	NA
SDGE3010		Excluded	kWh	0	8,227	682	0				
SDGE3010		M&V Incr.	kWh	- 1,134,056	657,521	77	0				
SDGE3010		All Sampled	kWh	- 1,134,056	5,412,785	719	33	5	20	22	NA
SDGE3010		1	Therm	5,706	69,326	11	5	45	NA	NA	51
SDGE3010		9	Therm	100,462	851,052	3	3	100	NA	NA	100
SDGE3010		**Excluded**	**Therm**	**0**	**2,429**	**7**	**0**				
SDGE3010		M&V Incr.	Therm	-10,430	210,038	7	0				
SDGE3010		**All Sampled**	**Therm**	**-10,430**	**851,052**	**14**	**8**	**57**	**NA**	**NA**	**76**
SDGE3025		1	kWh	8,441	128,743	256	12	5	5	5	NA
SDGE3025		2	kWh	128,990	546,000	81	11	14	17	18	NA
SDGE3025		9	kWh	548,371	1,673,955	6	4	67	74	56	NA
SDGE3025		Excluded	kWh	275	7,438	21	0				
SDGE3025		Interactive	kWh	1,767	124,102	47	0				
SDGE3025		All Sampled	kWh	275	1,673,955	343	27	8	20	19	NA
SDGE3025		**1**	**Therm**	**3,466**	**40,115**	**22**	**8**	**36**	**NA**	**NA**	**38**
SDGE3025		9	Therm	65,922	142,336	2	2	100	NA	NA	100
SDGE3025		Excluded	Therm	137	2,373	21	0				
SDGE3025		**All Sampled**	**Therm**	**137**	**142,336**	**24**	**10**	**42**	**NA**	**NA**	**58**

3.2.2. Sample Disposition – Direct Measures

Considerable efforts were made to recruit and complete net data collection and analysis for each sampled measure. These efforts succeeded for the 158 measures with completed NTG surveys. However, 113 sample points were dropped and replaced in the course of completing the work. There were several reasons for dropping sample points. They are listed in Table 30 along with their frequency of occurrence.

Table 30: Disposition of NTGR Interview Calls

	Number of Sampled Measures			
Disposition	Total Basic Rigor	Total Standard Rigor	Total Std Very Large	Total
Completed	106	34	18	158
Refused to participate	2	0	0	2
Disconnected or wrong phone number	33	4	0	37
Could not be reached after 5 attempts	43	6	0	49
Designated Respondent not available or no one knows about the program	17	4	2	23
Language skills or disability made interview impossible	2	0	0	2
Total Not Completed	**97**	**14**	**2**	**113**

3.2.3. Sampling Indirect Audits

Table 31 describes the completed samples used in estimating NTGR for indirect audits. The definition of sampling lists and strata was the same as that used for the second stage indirect gross savings sample. The only difference was that data collection and analysis was completed for more measures in each stratum.

Table 31: Indirect NTGR Evaluation Samples

			Telephone Survey Stratum Boundaries Ex Ante Savings1			Audits		
Program ID	Program Element	Stratum	Savings Units	Lower	Upper	Telephone Survey Completions	NTGR Sample	% in Sample
SCE2517	Nonres Audits	1	kwh	2,347	25,240	88	5	6
SCE2517	Nonres Audits	2	kwh	25,245	89,059	123	14	11
SCE2517	Nonres Audits	3	kwh	89,134	381,134	111	10	9
SCE2517	Nonres Audits	9	kwh	382,760	10,686,996	42	2	5
SCE2517	Nonres Audits	Excluded	kwh	0	2,347	0	0	
SCE2517	Nonres Audits	No Audit Rec.	kwh			0	0	
SCE2517	**Nonres Audits**	**All Sampled**	**kwh**	**0**	**10,686,996**	**364**	**31**	**9**
SCG3503		1	therm	16,000	188,600	8	1	13
SCG3503		9	therm	338,087	3,000,000	4	0	0

			Telephone Survey Stratum Boundaries Ex Ante Savings1			Audits		
Program ID	Program Element	Stratum	Savings Units	Lower	Upper	Telephone Survey Completions	NTGR Sample	% in Sample
SCG3503		Excluded	therm	925	278,324	0	0	
SCG3503		**All Sampled**	**therm**	**925**	**3,000,000**	**12**	**1**	**8**

1 For SCE2517 Audits, strata boundaries were based on estimate of total savings for audits. This is different than the ex ante savings claim.

3.3. Net Savings Methodology

This section describes the methodology that was used to estimate net energy (kWh and therms) and peak demand savings for each sampled measure and prepare program-level estimates of net savings for each of the five programs. The section begins with a discussion of the rigor levels that were employed in conducting the net analysis. This is followed by a description of the possible sources of information used for each rigor level and the interview process that was used to collect information from these data sources. This section also documents the framework that was used to derive a NTGR for each sampled case. A description of the methods used for preparing program-level estimates of gross and net savings is also included.

Each sampled measure that received an analysis of gross savings also received an analysis of net savings. The net analysis assessed the change in energy consumption and peak demand that was attributable to program influenced free-ridership. The net savings were computed by multiplying the gross savings by the net-to-gross (NTG) ratio. The net-to-gross ratio was estimated by applying a scoring algorithm to the results of one or more self-report surveys that were administered to program participants and other related individuals who exerted influence over the decision to implement the sampled measure.

All five of the Major Commercial programs had an additional net-only sample, which received an analysis of net savings but did not receive an estimate of gross savings. The net-only samples were added to bolster the accuracy of the net analysis. The design of the net-only samples was discussed in Section 3.2 above.

The net savings methodology used in this evaluation was developed as a cooperative effort across all of the contract groups that evaluated non-residential programs. As part of the evaluation of the 2006-08 energy efficiency programs designed and implemented by the four investor-owned utilities and third parties, the Energy Division of the California Public Utilities Commission (CPUC) formed a nonresidential net-to-gross ratio working group that was composed of experienced evaluation professionals. The main purpose of this group was to develop a standard methodological framework, including decision rules, for integrating in a systematic and consistent manner the findings from both quantitative and qualitative information in estimating net-to-gross ratios.

This methodology 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 domain-level Net-to-Gross Ratios (NTGRs), since other available methods and research designs are generally not feasible for large nonresidential customer programs. 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) as demonstrated in Appendix C.

The method used a 0 to 10 scoring system for key questions used to estimate the NTGR rather than using fixed categories that were assigned weights. It asked 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 reflected the complex nature of the real-world decision making and helps to ensure that all non-program influences were taken into account in assessing the unique contribution of the program as reflected in the NTGR.

There were three levels of free-ridership analysis. The most detailed level of analysis, the **Standard – Very Large** Project NTGR, was applied to the largest and most complex projects (representing 10 to 20% of the total) with the greatest expected levels of gross savings The **Standard** NTGR, involving a somewhat less detailed level of analysis, was applied to projects with moderately high levels of gross savings. The least detailed analysis, the **Basic** NTGR, was applied to all remaining projects. The incentive amount was the primary determinant of the assigned rigor level. Sites with measure incentives totaling $200,000 or more were assigned the Standard Very Large rigor level. Sites with measure incentives totaling less than $50,000 were assigned the basic rigor level. All other cases were assigned the standard rigor level.

3.3.1. Data Sources

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

Table 32 below shows the data sources that were 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 was utilized in the analysis varied. For example, all three levels of analysis obtain core question data from the Decision Maker survey.

Table 32: Information Sources for Three Rigor Levels

	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.

3.3.2 NTGR Questions and Scoring Algorithm

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

1. **A Timing and Selection** score that reflected 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 was also incorporated in this score, if a vendor interview has been triggered.
2. **A Program Influence** score that captured 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 was 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 was adjusted (i.e., divided by 2), if respondents said they had already made their decision to install the specific program qualifying measure before they learned about the program.
3. **A No-Program** score that captured 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). This score also accounted for deferred free ridership by incorporating the likelihood that the customer would have installed program-qualifying measures at a later date, if the program had not been available.

When there were multiple questions that feed into the scoring algorithm, as is the case for both the Timing and Selection and No-Program scores, the maximum score was always used. The rationale for using the maximum value was to capture the most important program element in the participant's decision making. Thus, each score was always based on the strongest influence indicated by the respondent. However, high scores that were inconsistent with other previous responses triggered consistency checks and could lead to follow-up questions to clarify and resolve the discrepancy.

When there are missing data or 'don't knows', to critical elements of each score, one of two options was used. The missing element may have been backfilled with a value that represented the average of the lowest and highest extreme values. Alternatively, if it was one of several other elements that were considered in the algorithm, the missing element might simply have been excluded from consideration.

The self-reported core NTGR in most cases was simply the average of the Program Influence, Timing and Selection, and No-Program Scores, divided by 10. The one exception to this was when the respondent indicated 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 was based on the average of the Program Influence and No-Program scores only.

3.3.3 Data Analysis and Integration

The calculation of the Core NTGR was fairly mechanical and was 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 required 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, all of this information was integrated into an internally consistent and coherent story that supports a specific NTGR.

Sometimes, all the quantitative and qualitative data clearly pointed in the same direction while, in others, the preponderance of the data pointed in the same direction. Other cases were more ambiguous. In all cases, in order to maximize reliability, it was essential that more than one person be involved in analyzing the data. Each person analyzed the data separately and then compared and discussed the results. Important insights emerged from the different ways in which two analysts looked at the same set of data. Ultimately, differences were resolved and a case made for a particular NTGR. Careful training of analysts in the systematic use of rules was essential to ensure inter-rater reliability.

Once the individual analysts completed their review, they discussed their respective findings and presented their respective rationales for any recommended changes to the Calculator-derived NTGR. The outcome of this discussion was the final NTGR for a specific project.

3.4. Confidence and Precision Methods

Calculation of the achieved precision for the net results was done using the Cochran (1977) method of calculating means and standard errors for a stratified random sample. This approach involved using stratum weights (the proportion of the total population accounted for by each stratum) to calculate a weighted mean, variance and standard error. The resulting mean and standard error were used to calculate the error band and relative precision for the NTGR.

To calculate a net UES, the NTGR was multiplied by the mean gross UES derived as explained in Section 2.4. To calculate the standard error and precision of the net UES, the realization rate standard error and the NTGR standard error were combined using the equation presented by Taylor (1997) and in the IPMVP. This standard error was then used to calculate 90% confidence bounds and the relative precision of the net UES estimate. A more detailed description of the calculation of the confidence and precision methods is presented in Appendix B.

3.5. Validity and Reliability

As discussed in the Section 3.3, the self report approach (SRA) was selected for this evaluation as the best method for estimating net effects of the program or programs evaluated. The term "self-report" as applied to the nonresidential sectors understates the methodological complexity of this approach as applied in the current evaluation, which has deep roots in the social sciences and is widely used by the evaluation community. To suggest that it only involves asking one key decision maker to hypothesize about what equipment they would have installed in the absence of the program is misleading.

More specifically, the SRA as applied in this evaluation is a mixed method approach that involves asking key decision makers and decision influencers a series of structured and open-ended questions about their motivations for pursuing the efficiency project and whether they would have pursued the same project in the absence of the program. A central component of this approach is to ask questions that attempt to rule out rival explanations for the efficiency activity. In the case of large nonresidential participants, the SRA was strengthened by the inclusion of additional quantitative and qualitative information, including, among others, in-depth, open-ended interviews, direct observation, review of customer and program records and analysis of industry and company data. Such qualitative data regarding the customer's decision and the decision process itself can be very useful in supporting or modifying quantitatively-based results and can help increase the reliability of results.

There have been a number of challenges to the SRA because participants were not only asked to recall what has happened in the past, but were asked, among other things, to report on a hypothetical situation; that is, what they would have done in the absence of the program. In many cases, the respondent may simply not know and/or cannot know what would have happened in the absence of the program. Even if the customer has some idea of what would most likely have happened, there is, of necessity, uncertainty about it. The situation just described creates potential for invalid answers (low construct validity) and answers with low reliability, where reliability is defined as the likelihood that a respondent will give the same answer to the same question whenever or wherever it is asked. Where the participant was asked for motivations and processes in hypothetical situations that occurred one or two years ago, there was room for bias. Examples include the following:

- Some respondents may believe that claiming no impact for the program is likely to cause the program to cease, thus removing future financial opportunities from the respondent, which would lead them to overstate the degree of program influence and raise the NTGR.
- On the other hand, some people may want to portray themselves in a positive light in that they would have installed energy-efficient equipment without any incentive (the socially desirable response), which could result in an artificially low net-to-gross ratio.
- The third hypothesized source of bias involves an interaction between the positive perception of taking energy efficiency actions, the often observed difference between stated intentions and actual behaviors, and the fact that the counterfactual outcome cannot be viewed by the participant or outsiders.
- Another hypothesized source of bias arises when participants are asked to identify the reasons why they installed the energy efficient measures, since respondents might not always be able recall all the possible reasons and influences and rank each in terms of its importance.

In designing the approach to the calculation of the NTGR for this study, the evaluation team was very aware of these issues and took a number of actions to mitigate potential problems. Specifically, the team followed the steps outlined in the *Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report*

Approaches, which was commissioned by the Energy Division of the California Public Utilities Commission (CPUC) to address the challenges listed earlier with respect to reliability and validity. Among the steps noted in the Guidelines were the following: building in consistency checks, using multiple questions, employing triangulation, ruling out of rival hypotheses, using a combination of quantitative and qualitative data, conducting sensitivity analysis, incorporating other documentation such as a company's procurement policies and standard practice in a particular industry, and, for situations when substantial savings are being claimed, using two analysts to independently review the data collected. These recommendations were all incorporated into the non-residential SRA as applied to this evaluation.

For sampled measures with the standard-very large rigor level, the evaluation team also incorporated interviews with program staff and/or account reps, reviewed the application files and talked with site leads as needed both to ensure that the right respondent was reached and to provide context for the overall decision. This enabled the team to develop an internally consistent, plausible "story" behind each project. Both by incorporating input from multiple other sources (account reps, vendors, industry data) and by encouraging the decision maker to think about and weigh the full range of factors influencing their equipment installation decision and give them the opportunity to fully explain their situation, the likelihood of bias in survey responses was minimized and the reliability of the results was enhanced.

3.6. Program-Specific Results

This section discusses the net savings results from a program perspective, including aggregations of the results at the strata level. However, it does not present the final program level savings estimates. The final estimates will be produced by the Evaluation Reporting Tool (ERT) at a later date. The final program results will be documented in the final CPUC report in March, 2010. The program level results will be based on savings estimates produced from this study for all programs in the Major Commercial contract group except for SCE2517. For this program, the ERT will combine the results produced in this study for the SPC and NRA components with the results for the Express component produced by other contract groups.

This section provides a discussion of the strata-level results for direct and indirect measures by program or program component. A separate discussion of the net analysis is provided for each of the programs assigned to the Major Commercial Contract group.

3.6.1. Direct Measures

Strata level results were computed by weighting the individual measure results within their respective stratum. The measures were weighted by the size of their respective kWh or therm impacts and by the proportion of the total program impacts represented by each stratum. The strata level NTGR results are presented in Tables 33 to 36. The tables also provide the sampling statistics for each program. The statistics include standard error, 90% confidence interval and relative precision. A discussion of observations made for each program or program component is provided below.

3.6.1.1 SCE2517 SPC Strata-level Results

Table 33 summarizes the strata-level results for the 47 sampled measures analyzed for the SCE2517 SPC program. The kWh net-to-gross ratio (NTGR) ranged from a low of 0.55 in stratum 2 to a high of 0.76 in stratum 9. The kW NTGR ranged from a low of 0.48 in stratum 3 to a high of 0.75 in stratum 9. The kWh and kW NTGRs across all strata were 0.59 and 0.57, respectively.

The sample statistics for this program are shown at the bottom of the table. The NTGR standard error was computed to be 0.05 for both kW and kWh. The 90 percent confidence interval was estimated to be 0.08 for both kW and kWh. The relative precision was estimated to be 0.14 for kW and 0.13 for kWh.

Table 33: SCE 2517 SPC NTGR Parameters by Stratum with Domain Statistics

		Measures		Stratum Boundaries Ex Ante Savings (kWh)		NTGR Weighted by…			
Program ID	**Stratum**	**Population**	**Sample**	**Lower**	**Upper**	**Case Weight**	**kW**	**kWh**	**Therms**
SCE2517	2	673	8	36,006	119,005	0.53	0.52	0.55	
SCE2517	3	456	14	119,191	321,550	0.66	0.67	0.68	
SCE2517	4	179	9	329,676	911,354	0.60	0.52	0.59	
SCE2517	5	76	6	911,416	3,339,231	0.40	0.48	0.46	
SCE2517	9	13	10	3,346,850	35,045,198	0.72	0.75	0.76	
SCE2517	Excluded	1,751	0	158	35,952				
SCE2517	**All Sampled**	**1,397**	**47**	**158**	**35,045,198**	**0.58**	**0.57**	**0.59**	
						Statistics			
						Standard Error	**0.05**	**0.05**	
						90% Confidence Interval	**0.08**	**0.08**	
						Relative Precision	**0.14**	**0.13**	

3.6.1.2 SCG3513 Strata-level Results

Table 34 summarizes the strata-level results for the 33 sampled measures analyzed for the SCE2517 SPC program. The therm net-to-gross ratio (NTGR) ranged from a low of 0.53 in stratum 1 to a high of 0.71 in stratum 9. The therm NTGR across all strata was 0.54.

The sample statistics for this program are shown at the bottom of the table. The therm NTGR standard error was computed to be 0.05. The 90 percent confidence interval was estimated to be 0.09. The relative precision was estimated to be 0.16.

Table 34: SCG 3513 NTGR Parameters by Stratum with Domain Statistics

		Measures		Stratum Boundaries Ex Ante Savings (Therms)		NTGR Weighted by…			
Program ID	**Stratum**	**Population**	**Sample**	**Lower**	**Upper**	**Case Weight**	**kW**	**kWh**	**Therms**
SCG3513	1	623	17	646	27,758	0.38			0.53

		Measures		Stratum Boundaries Ex Ante Savings (Therms)		NTGR Weighted by…			
Program ID	**Stratum**	**Population**	**Sample**	**Lower**	**Upper**	**Case Weight**	**kW**	**kWh**	**Therms**
SCG3513	2	54	6	29,125	102,794	0.57			0.58
SCG3513	3	15	6	110,839	228,800	0.69			0.70
SCG3513	9	8	4	339,670	2,177,246	0.63			0.71
SCG3513	Excluded	409	0	1	578				
SCG3513	**All Sampled**	**700**	**33**	**1**	**2,177,246**	**0.41**			**0.54**
						Statistics			
						Standard Error			**0.05**
						90% Confidence Interval			**0.09**
						Relative Precision			**0.16**

3.6.1.3 SDGE3025 Strata-level Results

Table 35 summarizes the strata-level results for the 37 sampled measures considered for the SDGE3025 program. The sample included 27 electric measures and 10 gas measures. The kWh net-to-gross ratio (NTGR) ranged from a low of 0.28 in stratum 9 to a high of 0.67 in stratum 2. The kW NTGR ranged from a low of 0.29 in stratum 9 to a high of 0.69 in stratum 2. The kWh and kW NTGRs across all strata were 0.54 and 0.56, respectively.

The sample statistics for this program are shown at the bottom of the electric portion of the table. The NTGR standard error was computed to be 0.04 for both kW and kWh. The 90 percent confidence interval was estimated to be 0.07 for both kW and kWh. The relative precision was estimated to be 0.13 for both kW and kWh.

For the gas measures the strata-level NTGRs were 0.4 for stratum 1 and 0.76 for stratum 9. The therm NTGR across all strata was 0.43. The therm NTGR standard error was computed to be 0.05. The 90 percent confidence interval was estimated to be 0.08. The relative precision was estimated to be 0.19.

Table 35: SDGE 3025 NTGR Parameters by Stratum with Domain Statistics.

		Measures		Stratum Boundaries Ex Ante Savings			NTGR Weighted by…			
Program ID	**Stratum**	**Population**	**Sample**	**Savings Units**	**Lower**	**Upper**	**Case Weight**	**kW**	**kWh**	**Therms**
SDGE3025	1	256	12	kWh	8,441	128,743	0.53	0.52	0.50	
SDGE3025	2	81	11	kWh	128,990	546,000	0.63	0.69	0.67	
SDGE3025	9	6	4	kWh	548,371	1,673,955	0.32	0.29	0.28	
SDGE3025	Excluded	21	0	kWh	275	7,438				
SDGE3025	Interactive	47	0	kWh	1,767	124,102				
SDGE3025	**All Sampled**	**343**	**27**	**kWh**	**275**	**1,673,955**	**0.55**	**0.56**	**0.54**	
							Statistics			
							Standard Error	**0.04**	**0.04**	

		Measures		Stratum Boundaries Ex Ante Savings			NTGR Weighted by…			
Program ID	Stratum	Population	Sample	Savings Units	Lower	Upper	Case Weight	kW	kWh	Therms
							90% Confidence Interval	**0.07**	**0.07**	
							Relative Precision	**0.13**	**0.13**	
SDGE3025	1	22	8	Therm	3,466	40,115	0.44			0.40
SDGE3025	9	2	2	Therm	65,922	142,336	0.70			0.76
SDGE3025	Excluded	21	0	Therm	137	2,373				
SDGE3025	**All Sampled**	**24**	**10**	**Therm**	**137**	**142,336**	**0.46**			**0.43**
							Statistics			
							Standard Error			**0.05**
							90% Confidence Interval			**0.08**
							Relative Precision			**0.19**

3.6.1.4 SDGE3010 Strata-level Results

Table 36 summarizes the strata-level results for the 41 sampled measures were analyzed for the SDGE3010 program. The sample included 33 electric measures and 8 gas measures. The kWh net-to-gross ratio (NTGR) ranged from a low of 0.54 in stratum 2 to a high of 1.0 in stratum 9. The kW NTGR ranged from a low of 0.50 in stratum 2 to a high of 1.0 in stratum 9. The kWh and kW NTGRs across all strata were 0.70 and 0.68, respectively.

The sample statistics for this program are shown at the bottom of the electric portion of the table. The NTGR standard error was computed to be 0.05 for both kW and kWh. The 90 percent confidence interval was estimated to be 0.13 for kW and 0.12 for kWh. The relative precision was estimated to be 0.13 for kW and 0.12 for kWh.

For the gas measures the strata-level NTGRs were 0.88 for stratum 1 and 0.74 for stratum 9. The therm NTGR across all strata was 0.85. The therm NTGR standard error was computed to be 0.01. The 90 percent confidence interval was estimated to be 0.02. The relative precision was estimated to be 0.02.

Table 36: SDGE 3010 NTGR Parameters by Stratum with Domain Statistics

		Measures		Stratum Boundaries Ex Ante Savings			NTGR Weighted by…			
Program ID	Stratum	Population	Sample	Savings Units	Lower	Upper	Case Weight	kW	kWh	Therms
SDGE3010	1	528	8	kWh	8,452	132,027	0.67	0.73	0.74	
SDGE3010	2	147	8	kWh	135,554	587,155	0.52	0.50	0.54	
SDGE3010	3	42	15	kWh	592,703	1,965,560	0.67	0.64	0.67	
SDGE3010	9	2	2	kWh	2,429,300	5,412,785	1.00	1.00	1.00	
SDGE3010	Excluded	682	0	kWh	0	8,227				
SDGE3010	M&V Incr.	77	0	kWh	-1,134,056	657,521				
SDGE3010	**All Sampled**	**719**	**33**	**kWh**	**-1,134,056**	**5,412,785**	**0.64**	**0.68**	**0.70**	

		Measures		Stratum Boundaries Ex Ante Savings			NTGR Weighted by…			
Program ID	**Stratum**	**Population**	**Sample**	**Savings Units**	**Lower**	**Upper**	**Case Weight**	**kW**	**kWh**	**Therms**
							Statistics			
							Standard Error	**0.05**	**0.05**	
							90% Confidence Interval	**0.09**	**0.08**	
							Relative Precision	**0.13**	**0.12**	
SDGE3010	1	11	5	Therm	5,706	69,326	0.86			0.88
SDGE3010	9	3	3	Therm	100,462	851,052	0.74			0.74
SDGE3010	Excluded	7	0	Therm	0	2,429				
SDGE3010	M&V Incr.	7	0	Therm	-10,430	210,038				
SDGE3010	**All Sampled**	**14**	**8**	**Therm**	**-10,430**	**851,052**	**0.84**			**0.85**
							Statistics			
							Standard Error			**0.01**
							90% Confidence Interval			**0.02**
							Relative Precision			**0.02**

3.6.1.5 Program-level Observations – Direct

Overall, net-to-gross ratios (NTGRs) for each of the utility program-level sampling domains are moderate, for all programs except SDGE3010 (Energy Savings Bid) where the program NTGRs for each energy metric are significantly higher. That program has a substantially different delivery strategy than the other 3 programs, involving third party delivery and allowing for aggregation of smaller projects allows for participation from customers who are unable or unwilling to participate in the statewide Express Efficiency or SPC programs. The level of proactive program involvement is also greater than that in the other three programs, resulting in higher program influence.

NTGR values for the remaining three programs (SCE2517, SCG3513, and SDGE3025) range from 0.54 to 0.59 depending on the program and energy metric. Sampled projects for two of these three programs, SCE2517 and SDGE3025, reflect the Standard Performance Contracting (SPC) program delivery model. The third program, SCG's Business Energy Efficiency program (SCG3513), also uses a delivery approach that is substantially the same as the SPC model. These NTGR values are very similar to the estimate of net-of-free-ridership of 0.54 (for source BTU) for the statewide Standard Performance Contracting (SPC) program in the PY2004-2005 evaluation. In addition, they are very similar to the NTGR estimates made in prior SPC evaluations conducted for each program year since the program's inception in 1998. These values are also in-line with those found for the Northern California Industrial contract group report, which reflects programs that are largely based on the SPC approach.

There are many reasons for low-to-moderate program influence under the SPC approach. These have been well-documented in previous SPC evaluations and have been found to be present in the current 2006-08 evaluations. They include the following:

- Program incentives were frequently offered for measures and technologies that are known to be industry standard practice (thus significantly increasing the odds of free ridership in any given application). Across all the net-to-gross interviews conducted, the average score given to ‘standard practice’ as a reason for project installation was nearly 7 on a 0-to-10 point importance scale.

- Similarly, program claims were made on a number of projects that customers initiated for non-energy savings reasons and for which there was no alternative ever considered. In many cases, the replaced equipment was old and needed to be replaced anyway. In other cases, the payback on the project was already sufficient without consideration of program incentives.
- Program implementers often arrived late in the decision making process and offered incentives for projects that had obviously already been decided upon. This is a form of cream skimming that may be associated with account reps and other implementers being incented on gross rather than net savings, resulting in weak or non-existent screening of projects.
- Many companies already have existing policies in place to reduce environmental emissions or energy use (e.g., "buy green" or use sustainable approaches to business investments), and these are a prime motivation for doing the project.

While the evaluation team is sensitive to the fact that it is not easy to provide the level of expertise needed at the right time to move commercial and industrial customers to higher levels of efficiency given their complex production- and site-specific processes, it was observed that very few identifiable steps have been taken by the programs with the specific goal of reducing free ridership. Previous evaluations of the SPC and prior industrial programs all raised concern regarding the relatively high levels of free ridership and provided recommendations for reducing these levels. These findings occurred in both low and high goals environments. However, over many program cycles, it appears that little effort has been expended on trying to develop and implement approaches to improve the industrial free ridership situation. This issue needs significant CPUC and utility management attention given the long-term pervasiveness of this issue.

3.6.2. Indirect Measures

Strata level results were computed for SCE2517 NRA by weighting the individual audit NTGR results within their respective stratum. The audits were weighted by the size of their respective kWh or therm impacts and by the proportion of the total program impacts represented by each stratum. The strata level NTGR results are presented in Table 37. The table also provides sampling statistics for this program. The statistics include standard error, 90% confidence interval and relative precision. A discussion of observations made for this program component is provided below. Similar statistics could not be estimated for the SCG3503 program because there was only one NTGR sample point.

3.6.2.1 SCE2517 NRA Strata-level Results

A total of 31 sampled audits were analyzed for the SCE2517 SPC program. The sample was distributed across the strata as shown in the table below. The kWh net-to-gross ratio (NTGR) ranged from a low of 0.33 in stratum 1 to a high of 0.82 in stratum 9. The kW NTGR ranged from a low of 0.37 in stratum 1 to a high of 0.82 in stratum 9. The kWh and kW NTGRs across all strata were 0.42 and 0.40, respectively.

The sample statistics for this program are shown at the bottom of the table. The NTGR standard error was computed to be 0.06 for kWh and 0.07 for kW. The 90 percent confidence interval was estimated to be 0.10 for kWh and 0.11 for kW. The relative precision was estimated to be 0.26 for kW and 0.24 for kWh

Table 37: SCE2517 NRA First Year Gross Savings Parameters by Stratum with Domain Statistics

		Audits		Stratum Boundaries Audit Total Recommended Savings (kWh)		NTGR Weighted by…			
Program ID	**Stratum**	**Population**	**Sample**	**Lower**	**Upper**	**Case Weight**	**kW**	**kWh**	**Therms**
SCE2517	1	7,318	5	2,347	25,240	0.47	0.37	0.33	
SCE2517	2	2,415	14	25,245	89,059	0.49	0.50	0.50	
SCE2517	3	601	10	89,134	381,134	0.67	0.70	0.71	
SCE2517	9	81	2	382,760	10,686,996	0.82	0.82	0.82	
SCE2517	Excluded	3,003	0	0	2,347				
SCE2517	No Audit Rec.	2,024	0						
SCE2517	**All Sampled**	**10,415**	**31**	**0**	**10,686,996**	**0.49**	**0.42**	**0.40**	
						Statistics			
						Standard Error	**0.07**	**0.06**	
						90% Confidence Interval	**0.11**	**0.10**	
						Relative Precision	**0.26**	**0.24**	

3.6.2.2 SCG3503 Strata-level Results

Only one sampled measure was analyzed for the SCG3503 net analysis. The NTGR for this measure was 0.83. A statistical analysis was not performed for the net analysis of this program because of the low sample size.

3.6.2.3 Program-level Observations – Indirect

The Net-to-Gross surveys of customers receiving audits likewise revealed significant levels of free ridership (and related low-to-moderate program influence) among those customers who installed measures identified by the audit, but outside of any rebate program. The average NTG ratios for installed measures were 0.44 (kWh) and 0.42 (kW), which is substantially lower than the NTG ratios for the rebate programs summarized earlier in this report.

To assess free ridership and Audit program influence, these customers were asked a series of questions, similar to those for rebate programs, but instead focused on the importance of the information provided by the audit program in their ultimate decision to install energy efficiency measures. They were asked to rate the importance, using a 1 to 10 importance rating scale, of a wide range of factors, covering both program and non-program elements.

The findings indicate that the two strongest decision influences were non-program factors, the age/condition of existing equipment and the overall payback on the energy efficiency project. Audit program influences (verbal information provided by the SCE auditor during the site visit, and written information provided in the audit report) received more moderate ratings, averaging between 6 and 7 on a 10-point scale in importance. Information or recommendations from trade allies such as design/consulting engineers and equipment vendors, were considered almost as important as the information provided by the audit program.

Across all customers surveyed, the following were most highly rated factors in their decision:

- **The age or condition of the old equipment** which received an average importance rating of 7.6 out of 10.
- **The payback on the investment**, also rated an average of 7.6.
- **Verbal information or guidance provided by the SCE auditor during the site visit**, given an average rating of 6.5.
- **Documentation provided in the Audit Report of the energy saving opportunities from installing the measure**, which received an average rating of 6.2.
- **A recommendation from a design or consulting engineer**, also rated an average of 6.2.
- **A recommendation from an equipment vendor that sold you the measure and/or installed it**, which received an average rating of 6.0.

Participants were also asked to score the relative importance of the program versus non-program factors in their installation decision, and were given a total of 10 points to split between these two elements. Both the program and non-program factors received approximately the same importance ratings, an average rating of 5.4 for program importance and 4.6 for non-program factors.

Finally, respondents were asked to rate the likelihood of installing the exact same equipment at the same time absent the program. This ‘no program’ rating averaged 5.5 on a 0 to 10 likelihood scale. This suggests that roughly half of the projects would have likely gone forward on their own, without the information and technical assistance provided through the audit program.

3.7. Conclusions and Recommendations

From the results of the full evaluation of net savings for the 2006-08 program years, the following key conclusions and recommendations were drawn from the net analysis. These are in addition to those discussed in Section 2.8 above for gross savings.

1. **Net savings realized for direct measures -** The evaluation-based estimates of overall net program savings realized were below those estimated by the utilities. They varied across the programs or program components with direct measures. For kW savings the NTGR values ranged from a low of 0.56 for the SDGE 3025 program to a high of 0.68 for the SDGE3010 program. For kWh savings the values ranged from a low of 0.54 for the SDGE3025 program to a high of 0.70 for the SDGE 3010 program. For therm savings, the values ranged from a low of 0.43 for the SDGE3025 program to the high of 0.85 for the SDGE3010 program. These quantitative results indicate that the programs are significantly overestimating their net savings claims for direct measures.
2. **Net savings realized for indirect measures -** The evaluation-based estimates of overall net program savings realized were below those estimated by the utilities. They varied across the programs or program components with indirect measures. For kW and kWh savings the NTGR values were estimated to be 0.42 and 0.40, respectively for the SCE2517 NRA program. For therm savings the NTGR was estimated to be 0.83 for the SCG3503 program. These quantitative results indicate that the programs are significantly overestimating their net savings claims for indirect measures.

From the impact evaluation of net savings, the following recommendations are made in addition to those discussed in Section 2.8 above for gross savings.

1. **Improve staff capabilities –** It is recommended that the programs improve the capability of their implementation staff to materially influence advance commercial and industrial efficiency improvements. Influencing large commercial and industrial customers to implement energy efficiency projects that go beyond their normal practices and plans is extremely difficult in practice. To move these customers further along the efficiency spectrum takes time and advanced levels of technical expertise, often requiring expertise in specific production practices and options. In addition, even with the right level of expertise on hand, increasing program influence requires providing advanced energy efficiency options directly to end users at the earliest stages of their equipment or facility modification decision making.

   There is already significant expertise available at the utility and third-party contractors. This expertise should be built upon and further increased. Development of the depth of technical expertise required to increase the net effects of the programs is a long term endeavor that requires both utility and regulatory support. Commercial and Industrial technical experts need to know that there will be consistent support over time for efficiency programs if they choose to invest significant portions of their careers in program implementation. End users need to be confident that the suggestions of program staff will work to achieve the targeted savings while also meeting their various production and business requirements.

   A related recommendation is to improve the training of Program Staff to enhance their capability to review submitted projects for compliance with program objectives, rules and policies. Training should be provided to address proper baseline specification, enforcement of program and policy rules, reasonableness of claims, and increasing program influence on end user's efficiency-related decisions.
2. **Get involved early –** It is recommended that the programs enhance their capability to get involved with projects at the earliest possible stage. Program involvement after the decision to install energy

efficient equipment had been made was seen in several projects and is obviously problematic. Program involvement at an early stage to identify large equipment and facility changes helps ensure efficiency opportunities are appropriately considered and maximizes chances of program influence. Utilization of sales or related tracking systems helps prevent projects from becoming lost opportunities.

The CPUC's *Continuous Energy Initiative* provides program implementers with another promising model for early and ongoing project involvement. Early feedback from customers involved with the trial use of this procedure has been very positive. These customers have also mentioned how this approach has led them to consider new projects that they hadn't conceived on their own, most of which are being funded in the PY2009-12 cycle, providing an early indication of positive utility and program influence.

3 **Provide continuity in account representative assignments –** It is recommended that the programs provide continuity in account representative assignments, particularly for the largest customers. Another 'touch point' of program influence is the utility account representative. Unfortunately, many instances were found where the utility account reps had been reassigned multiple times in the course of the project. The likelihood of utility program influence is weakened in such cases, because the assigned rep lacks the long-term relationship and continuity needed to provide a significant influence on the installed project. Utilities should seek to provide continuity in these account rep assignments, particularly for their largest customers.

4 **Build Upon Market-Driven Efficiency –** It is recommended that the programs continue to build upon market-driven efficiency. In some cases, high free ridership can be viewed as a positive indicator of strong market driven efficiency. A challenge for the programs is to influence these customers to go even further in their efficiency plans than they would otherwise due to their own internal policies and financial criteria. In one sense, this means setting baselines higher – which can be accomplished by using industry standard practice rather than in situ practice – as the basis for program participation and incentives. It can also mean developing customer specific baselines based on the plans the customer had at the initial point of program interaction.

5 **Early Project NTG and Baseline Screening –** It is recommended that that programs provide early project NTG and baseline screening for the largest customers. The CPUC should strongly consider using early project NTG and baseline screening prior to the incentive being approved for the largest projects and those with significant policy issues such as fuel switching, self generation, and greenhouse gas impacts. Such screening for the largest projects, whereby the baseline claim is reviewed and NTG interviews are conducted just after the implementation decision is made, would help to obtain critical information regarding program influence that may lead to the project being re-defined or dropped.

6 **Other recommendations -** The following are overarching free-ridership-related recommendations from previous SPC program evaluations that continue to be relevant:

- **Consider Limiting or Excluding Incentive Payments to Known Free Riders**

When program administrators are incented and permitted to simply exclude known free riders, scarce program funds can instead be utilized on projects that provide net benefits.

- **Consider Using Incremental Costs to Benchmark and Limit Payments**

  Limiting payments so that they do not exceed a pre-determined portion of average or customer-specific incremental cost estimates is critical to avoiding grossly overpaying for savings.

- **Consider Incorporating a Payback Floor**

  The use of a payback floor (minimum payback level based on energy savings alone) helps to ensure that project generates meaningful and significant energy savings. With a payback floor, the program avoids incenting projects that are primarily being done for reasons other than energy savings (modernization, production efficiency, environmental compliance, etc.)

- **Set Incentive Levels to Maximize Net, not Gross Program Impacts**

  Free riders dilute the market impact of program dollars. Payback floors and increasing incentives with increasing payback levels are one approach. Another is to tie incentive levels to individual measures or types of measures that are known to have extremely high or low naturally occurring adoption levels.

- **Consider Tying Staff Performance to Independently Verified Net Results**

  Tying performance reviews and bonuses of program staff to verified savings as reported through an independent M&V or impact evaluation process is likely to increase project quality and the accuracy of initial savings estimates. Marketing staff, in particular, should have any financial incentives tied to savings that are independently verified.

APPENDICES

A: Glossary of Acronyms

ACE-The ACE Project software is used by the evaluation to store and exchange important information between evaluation team members. For example the M&V plans and reports prepared for each sampled measure are uploaded to ACE for MECT/DMQC review, CPUC approval and sharing between contract groups.

BEEP (Business Energy Efficiency Program)-This local non-residential program consists of four program elements that meet the diverse needs of SCG's non-residential gas customers.

BISP (Business incentive and Services Program)-This non-residential conservation program, offered by SCE to its non-residential customers, consists of three components – Standard Performance Contract (SPC), Express Efficiency (EE) and Non-residential Audit (NRA).

CPUC (California Public Utilities Commission), the sponsor of the evaluation.

DEER (Database for Energy Efficient Resources) database-The California Energy Commission and California Public Utilities Commission (CPUC) sponsors this database designed to provide well-documented estimates of energy and peak demand savings values, measure costs, and effective useful life (EUL) all with one data source. DEER has been has been designated by the CPUC as its source for deemed and impact costs for program planning.

DMQC (The Data Management and Quality Control Contractor)-A group of consultants with specialized expertise in important aspects of program impact evaluation that are technical advisors to ED staff and MECT on issues related to data management and quality control.

ED Energy Division of the CPUC

EM&V Evaluation, Measurement, Monitoring and Verification.

ERT (Evaluation Reporting Tool)-The database application that was created by ED to support the final estimates of program level life cycle costs and savings for the 2006-08 program cycle.

ESB (Energy Savings Bid)-A local non-residential energy efficiency incentive program that is designed for large commercial or industrial efficiency projects that require more flexibility than is offered by the statewide SPC program. A project may include a single customer or an aggregation of customers at multiple sites.

EUL (Effective Useful Life)-An estimate of the median number of years that the measures installed under a program are still in place and operable.

HIM (High-Impact Measure)-A group of measures within each IOU that account for the majority of utility reported annual energy and demand savings during the 2006/2008 program cycle.

HVAC (Heating, Ventilation and Air-Conditioning)-End use classification of mechanical equipment that is used to condition spaces in commercial and industrial facilities.

IOU (Investor Owned Utilities)-They include Pacific Gas and Electric (PG&E), Southern California Edison (SCE)-San Diego Gas and Electric (SDG&E) and Southern California Gas.

IPMVP-The International Performance Measurement and Verification Protocol that specifies alternative measurement and analysis methods that can be used to estimate gross energy savings from a measure installed under a program being evaluated.

MECT (Master Evaluation Contractor Team)-A group of consultants with specialized expertise in important aspects of program impact evaluation that are technical advisors to ED staff and assist the evaluation contractors with development and execution of the verification and evaluation plans.

NRA (Non-residential Audits) One of the conservation programs offered by Southern California Edison to its non-residential customers. It is offered as one of the components of the SCE2517 program. Non-residential audits are also offered as part of the SCG3503 Education and Training program.

NTG (Net-to-Gross) Ratio A ratio that is estimated from a free-ridership analysis and applied to gross savings to calculate net savings.

PGC (Public Goods Charge)-Per Assembly Bill (AB) 1890, a universal charge applied to each electric utility customer's bill to support the provision of public goods. Public goods covered by California's electric PGC include public purpose energy efficiency programs, low-income services, renewables, and energy-related research and development.

SCE (Southern California Edison)-One of the three investor owner utilities that are regulated by the California Public Utilities Commission.

SCG (Southern California Gas)-A gas utility owned by Sempra. Sempra is one of the three investor owner utilities that are regulated by the California Public Utilities Commission.

SDG&E (San Diego Gas and Electric)-A gas and electric utility owned by Sempra. Sempra is one of the three investor owner utilities that are regulated by the California Public Utilities Commission.

SPC (Standard Performance Contract)-A statewide conservation program offered by the investor owned utilities to their non-residential customers. This program meets customer needs by being open to an unlimited variety of energy efficiency retrofit projects involving commercial, industrial, and agricultural facilities.

Title 20/24-California's 2005 Building Energy Efficiency Standards (Title 24), and Appliance Efficiency Regulations (Title 20), specify minimum energy efficiency standards for new installations or remodels of sufficient scope to require a permit. The 2005 Title 24 regulations were in effect during the entire period covered by the Evaluation. The 2005 Title 20 standards were amended in December, 2007.

TRC (Total Resource Cost) test-A cost-effectiveness test used by the California Public Utilities Commission to assess the overall cost-effectiveness of energy efficiency programs from a societal perspective.

VRT (Verification Reporting Template) The database application that was created by ED to support the first and second year verification reports.

UES (Unit Energy Savings)-Energy savings for an efficiency measure, expressed as annual savings divided by the total equipment count.

B: Statistical Estimation Procedures

A rigorous set of statistical procedures were used in the evaluation of both the gross and net savings. They were ED-approved procedures, which satisfied the requirements of relevant CPUC directives. This appendix provides a detailed description of these procedures. Section B.1 describes the statistical procedures that were used to support the gross analysis. Section B.2 describes procedures that were used to support the net analysis.

B.1. Gross Impact Evaluation Statistical Procedures

Two different approaches were required to estimate parameters for two different types of impacts analyzed.

- Impacts where ex-ante savings (kW, kWh, and/or therms) were reported directly into the program tracking systems, where the savings are directly related to what was installed.
- Impacts where no ex-ante claims were made for what was installed. This situation arises when one fuel constituted the only savings claimed, but where savings from another fuel were possible. In this situation, the utility typically did not report the other fuel benefits/savings, but the evaluators were required to include estimates of those savings in the ex-post procedures.

The actual precision attained was calculated using several different approaches taken from the *California Evaluation Framework* (TecMarket Works, 2004), Cochran (1977) ,Taylor (1997) and IPMVP (2002), with the specific techniques used depending on the type of impacts analyzed.

Procedures for program elements with direct savings

For sites where all gross savings parameters had *ex-ante* and *ex-post* values (i.e., kW, kWh, and/or therms), precision was based on the estimation of a realization rate, defined as the ratio of gross *ex-post* to gross *ex-ante* savings. The methods used were based on the *California Evaluation Framework* (2004, p. 358) and estimated and reported the following parameters:

- Overall and per-stratum realization rate
- Standard error of overall realization rate
- 90% confidence interval for realization rate
- Gross UES
- Standard error for Gross UES
- 90% confidence interval for Gross UES

Calculations followed the following steps:

Step 1: Calculate the sample-based realization rate using this equation:

$$b = \frac{\sum_{i=1}^{n} w_i y_i}{\sum_{i=1}^{n} w_i x_i}$$

Where:

b= the realization rate

wi=case weights, defined as the population count divided by the sample count for each stratum

y_i=sample ex-post savings for case *i*

x_i=sample ex-ante savings for case *i*

Step 2: Calculate the standard error of b, including the finite population correction factor:

$$se(b) = \frac{\sqrt{\sum_{i=1}^{n} w_i (w_i - 1) e_i^{\,2}}}{\sum_{i=1}^{n} w_i x_i} \sqrt{1 - \frac{n}{N}}$$

Where:

e= the *ex-post* value minus b times the *ex-ante* value

Step 3: Calculate the error bound at the 90% level of confidence of the realization rate, *b*, by multiplying the appropriate t-statistic (1.645) by the standard error of the realization rate, *se(b)*. The upper and lower bound of the realization rate, *b*, were then calculated by adding and subtracting the 90% error bound from the realization rate.

CI=*b* +/- (1.645 x *se(b)*)

Step 4: Calculate the ex-post gross UES by multiplying the mean population savings by the realization rate.

Step 5: Calculate the upper and lower bound of the ex-post gross UES by multiplying the ex-post gross UES by the upper and lower bounds of the realization rate.

Step 6: Calculate the 90% relative precision (rp) of the realization rate estimate:

$$rp = 1.645 \frac{CI}{b}$$

Procedures for program elements where no ex-ante savings were claimed

This situation arises when one fuel constituted the only savings claimed, but where savings from another fuel were possible. The evaluation team calculated *ex-post* savings in these cases, and these calculations were the basis for gross UES savings and their associated standard errors, as well as relative precision estimates. As indicated above, no realization rate is possible in these cases. The California Evaluation Framework (2004) does not provide guidance in this situation. Therefore, Cochran's (1977) approach to estimating stratified means and standard errors was followed. The steps involved in these calculations are as follows:

Step 1: Calculate the sample-based ex-post, stratified mean UES using the following equation (5.1):

$$\bar{y}_{str} = \frac{\sum_{h=1}^{L} N_h \bar{y}_h}{N}$$

Where:

y_{st} = the stratified mean

N_h = the stratum population

y_h = the stratum mean

N = the total population

Step 2: Calculate the standard error for a stratified sample mean by taking the square root of the variance (s^2), calculated using Cochran's equation 5.13, with the term on the right representing the finite population correction (fpc):

$$s^2\left(\bar{y}_{str}\right) = \sum_{h=1}^{L} \frac{W_h^2 s_h^2}{n_h} - \sum_{h=1}^{L} \frac{W_h s_h^2}{N}$$

Where:

y_{st} = the stratified mean

W_h = the stratum weight (N_h /N)

s_h^2 = the variance for stratum h

n_h = the sample size for stratum h

N = the total population

Step 3: Calculate the relative precision using the following equation:

$$rp = \frac{1.645 se\left(\bar{y}_{str}\right)}{\bar{y}_{str}}$$

The calculated UES from Step 1 was assigned to all claims in the population

Procedures for program elements where ex-ante claimed savings were assigned to audits without knowledge of what recommendations were implemented

The evaluation process for this program element followed a two-stage sampling method (see Section 2.2.2 for a more complete description). A sample of audits was randomly selected from strata defined in a previous section of this report and telephone interviews established whether or not any installation occurred following the recommendations. This step produced a Stage 1 installation rate. Another sample was taken from those sites (claiming at least one installation), and this group was subjected to an engineering analysis, often involving a site visit. The savings determined from the engineering analyses were analyzed to produce a stratified mean of the sample for both *ex-post* and *ex-ante* savings. They were calculated based on the Cochran (1977) method of estimating stratified means, one for *ex-ante*, and one for *ex-post* savings and dividing the mean *ex-post* by the mean *ex-ante*. This ratio, an engineering realization rate, was then multiplied by the installation rate, which produced the final realization rate; the final realization rate was applied to the mean population *ex-ante* savings to produce the gross UES.

The standard error for the engineering realization rate was calculated using the Framework (TecMarket Works, 2004) method described in Step 2 above. The relative precision and confidence intervals were also calculated in the same manner. The standard error for the installation rate was calculated using the Cochran (1977, eq 5.52 and 5.57) method of estimating stratified ratios and their standard errors.

The standard error of the final realization rate consisted of two parts: the standard error for the installation rate, and one for the engineering realization rate that was based on a ratio of ex-post to ex-ante savings. To incorporate the propagation of errors generated by combining two standard errors, the following equation was used based on Taylor (1997) and IPMVP (2002):

$$\delta p = \left(\sqrt{\left(\frac{\delta q}{|q|}\right)^2 + \left(\frac{\delta a}{|a|}\right)^2} \right) p$$

Where:

δp =standard error of final realization rate

δq = standard error of engineering realization rate

δa =standard error of installation rate

q =engineering realization rate

a =installation rate

p = final realization rate

The evaluation process for this program element followed a two-stage sampling method (see Section **Error! Reference source not found.** for a more complete description). A sample of audits was randomly selected from strata defined in a previous section of this report and telephone interviews established whether or not any installation occurred following the recommendations. This step produced a Stage 1 installation rate. Another sample was taken from those sites (claiming at least one installation), and this group was subjected to an engineering analysis, often involving a site visit. The savings determined from the engineering analyses were analyzed to produce a stratified mean of the sample for both *ex-post* and *ex-ante* savings. They were calculated based on the Cochran (1977) method of estimating stratified means, one for *ex-ante*, and one for *ex-post* savings and dividing the mean *ex-post* by the mean *ex-ante*. This ratio, an engineering realization rate, was then multiplied by the installation rate, which produced the final realization rate; the final realization rate was applied to the mean population *ex-ante* savings to produce the gross UES.

The standard error for the engineering realization rate was calculated using the Framework (TecMarket Works, 2004) method described inStep 2 above. The relative precision and confidence intervals were also calculated in the same manner. The standard error for the installation rate was calculated using the Cochran (1977, eq 5.52 and 5.57) method of estimating stratified ratios and their standard errors.

The standard error of the final realization rate consisted of two parts: the standard error for the installation rate, and one for the engineering realization rate that was based on a ratio of ex-post to ex-ante savings. To incorporate the propagation of errors generated by combining two standard errors, the following equation was used based on Taylor (1997) and IPMVP (2002):

$$\delta p = \left(\sqrt{\left(\frac{\delta q}{|q|}\right)^2 + \left(\frac{\delta a}{|a|}\right)^2} \right) p$$

Where:

δp =standard error of final realization rate

δq = standard error of engineering realization rate

δa =standard error of installation rate

q =engineering realization rate

a =installation rate

p = final realization rate

B.2. Net Evaluation Procedures

The core of the net evaluation procedures is the measurement and calculation of the net-to-gross ratio (NTGR). The procedures for deriving site-level and/or measure-level NTGRs were described in Section 2.3. The parameters estimated by the following methods are:

1. Net-to-gross ratio (NTGR)
2. NTGR standard error
3. 90% confidence interval for NTGR
4. Relative precision for NTGR

NTGRs were calculated for each fuel type for each sampling domain (IOU). Within each stratum, the project-specific NTGRs were weighted according to their contribution to stratum level gross ex-ante savings for each fuel type in calculation of the NTGR for that fuel type.

The procedures for calculating NTGR statistics involved several steps:

Step 1: Calculate a weighted mean NTGR for each stratum, with the NTGRs for individual cases weighted by their contribution to the total ex-ante fuel savings for that stratum. For example, if case 1 of 10 cases in stratum n accounts for 130 kWh of the 1,000 kWh total ex-ante savings in that stratum, the NTGR for that case is multiplied by .13. If Case 2 accounts for 80 kWh of the 1,000 kWh total, its NTGR is multiplied by .08, and so on. The sum of these products is the savings-weighted mean NTGR for the stratum.

Step 2: Calculate a stratified mean NTGR using Cochran's equation 5.1:

$$\overline{y}_{str} = \frac{\sum_{h=1}^{L} N_h \overline{y}_h}{N}$$

Where:

y_{st} = the stratified mean NTGR

N_h = the stratum population

y_h = the stratum mean NTGR, calculated as described in Step 1.

N = the total population

Step 3: Calculate the standard error for the NTGR by taking the square root of the variance (s^2), calculated using Cochran's equation 5.13, with the term on the right representing the finite population correction (fpc):

$$s^2\left(\overline{y}_{str}\right) = \sum_{h=1}^{L} \frac{W_h^2 s_h^2}{n_h} - \sum_{h=1}^{L} \frac{W_h s_h^2}{N}$$

Where:

y_{st} = the stratified mean NTGR

W_h = the stratum weight (N_h /N)

s_h^2 = the variance for stratum h, calculated as: $\sum_{i=1}^{n_h} w_i (x_i - \overline{x}_w)^2$

where:

w_i = the savings weight for case *i* in stratum h

x_i= the NTGR for case *i* in stratum h

x_w= the savings weighted NTGR for stratum h

n_h = the sample size for stratum h

N = the total population

Step 4: Calculate confidence interval around the NTGR by multiplying the standard error by the critical t value for 90% confidence: 1.645.

Step 6: Calculate the relative precision of the NTGR using the following equation:

$$rp = \frac{1.645 se\left(\overline{y}_{str}\right)}{\overline{y}_{str}}$$

These NTGRs were applied to all claims in the tracking file.

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

Acknowledgments

As part of the evaluation of the 2006-08 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) formed a nonresidential net-to-gross ratio working group that was composed of experienced evaluation professionals. The main purpose of this group was to develop a standard methodological framework, including 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, was composed of the following evaluation professionals:

- Michael Baker, SBW Consulting
- Fred Coito, KEMA
- Kevin Cooney, Summit Blue Consulting
- Tim Drew, Energy Division, CPUC
- Jennifer Fagan, Itron, Inc.
- Miriam Goldberg, KEMA
- Nick Hall, TecMarket Works
- Kay Hardy, Energy Division, CPUC
- Ken Keating
- John Reed, Innovologie LLC
- Richard Ridge, Ridge & Associates
- Mike Rufo, Itron, Inc.
- Eric Swan, KEMA (formerly of RLW Analytics, Inc.)
- Christina Torok, Itron, Inc.
- 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 November 2008

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), as demonstrated in Appendix D.

This approach preserves the most important elements of the approaches previously used to estimate the NTGRs in large nonresidential customer programs[6] . However, it also incorporates several enhancements that are designed to improve upon that approach, for example:

- The method introduces a 0 to 10 scoring system for key questions used to estimate the NTGR, rather than using fixed categories that were assigned weights (as was done previously).
- 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 might need to be somewhat customized to reflect the unique nature of the individual programs.

6 Such as, for example, the NTGR method used to evaluate NTGRs for the California Standard Performance Contracting Program.

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). [7]

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[8] 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

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

[8] 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.

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.

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 recommendation 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 38 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 38: 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.

Appendix B provides the full battery of Decision Maker and Vendor survey questions along with notes, for each NTGR level, regarding which questions are asked (denoted by an "X"), and the intended uses of the information in the NTGR analysis. In the case of Basic sites, "TRIGGER" means that a vendor influence score greater than the maximum of other program element scores (N3b, N3c, N3g, N3h, N3l) triggers a vendor survey. In the case of Standard and Standard-Very Large NTGR sites, "TRIGGER" means that a score of 6 or greater triggers a further investigation. A copy of the complete survey forms (with lead-in text and skip patterns) are contained in Final Large Nonresidential NTGR Survey Instruments.XLS that is 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. The NTGR includes the effects of deferred free ridership (i.e., accelerated adoption).

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.

1. A **Timing and Selection** 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.
2. A **Program Influence** 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.
3. A **No-Program** 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). This score also accounts for deferred free ridership by incorporating the likelihood that the customer would have installed program-qualifying measures at a later date if the program had not been available.

When there are multiple questions that feed into the scoring algorithm, as is the case for both the **Timing and Selection** and **No-Program** 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. For a detailed explanation of the scoring algorithm, including examples, see Appendix C.

Timing and Selection 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
- 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 Timing and Selection Score is calculated as:
The highest of the responses to the first four decision maker questions 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. Program Influence 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 Program Influence 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. No-Program Score

The questions asked are:

1 Regarding 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" how likely is it that you would have installed exactly the same item/equipment, using a 0 to 10 scale, where 0 is not at all likely and 10 is extremely likely?

2 IF 1>0. You indicated that there was an "X" in 10 likelihood that you would have installed the same equipment if the PROGRAM had not been available. When do you think you would have installed this equipment? Please express your answer in months

a. _____ ____ within 6 months? (Deferred NTG Value=0)

b. _____ ____ 7 to 47 months later (Deferred NTG Value=(months-6)*.024)

c. _____ ____ 48 or more months later (Deferred NTG Value =1)

d. _____ ____ Never (Deferred NTG Value=1)

Note: The value 0.024 is 1 divided by 41 (41 is calculated as 47 – 6). This assumes that the deferred NTG value is a linear function beginning in month 7 through month 47, increasing 0.024 for each month of deferred installation.

The No-Program Score is calculated as:

10 minus (the likelihood of installing the same equipment multiplied by one minus the deferred net-to-gross value associated with the timing of that installation).

5.1.4. The Core NTGR

The self-reported core NTGR in most cases is simply the average of the Program Influence, Timing and Selection, and No-Program 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 Program Influence and No-Program 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[9].

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 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.

[9] 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.

- 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, as demonstrated in Appendix D.

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Appendix B Net-to-Gross Questions and Uses of Data by Level of NTGR Analysis

Note: A more detailed version of this survey, with skip patterns and complete response categories, is available in Excel format from the NTG Working Group or at http://www.energydataweb.com/cpuc/default.aspx

	Question Text	**Basic**	**Standard and Standard – Very Large**
	Introduction Hello, my name is ______ from COMPANY NAME and I am calling about your recent participation in PROGRAM NAME. Are you the person who was most involved with the decision to participate in the PROGRAM NAME? [IF YES, CONTINUE]. We are interviewing firms that participated in the PROGRAM NAME in 2006 and 2007 to discuss the factors that may have influenced your decision to participate in the program. The interview will take about 20 minutes. The questions on this survey pertain to work completed by your company at this current address, excluding other locations.		
	WARM-UP QUESTIONS		
A1	First, according to our records, you participated in PROGRAM NAME on (approximate date). [READ: Program Description. PROGRAM NAME promotes energy efficiency improvements in commercial/industrial facilities. The program offers (choose all that apply): energy audits to help identify applicable measures, feasibility studies to analyze the energy and cost savings of recommended measures, incentives to help cover a portion of the cost of implementing energy efficient measures, etc. Is that correct?	X	X
	Yes, No, DK, Refused		
A2	Next, I'd like to confirm the following information regarding the measures you implemented through the program: (READ: PROJECT DETAILS INCLUDING SERVICES RECEIVED, MEASURES INSTALLED, KEY DATES, PARTICIPATING VENDORS, ETC.) Does that sound right?	X	X
	Yes, No, DK, Refused		
A3	Why did you decide to implement MEASURE NAME? Were there any other reasons?	X	X
	a. Record VERBATIM		
	b. DK/Refused		
	NET-TO-GROSS BATTERY		

N1	When did you first learn about PROGRAM? Was it BEFORE or AFTER you first began to **think about implementing MEASURE**?	X	X
	a. Before (Skip to N3)		
	b. After		
	c. DK/Refused		
N2	Did you learn about PROGRAM BEFORE or AFTER you **decided to implement** the specific MEASURE that was eventually adopted or installed?	X	X
	a. Before		
	b. After		
	c. DK/Refused		
	READ: Program Description: *As I mentioned earlier, [PROGRAM NAME] promotes energy efficiency improvements in commercial/industrial facilities. The program offers (choose all that apply): energy audits to help identify applicable measures, feasibility studies to analyze the energy and cost savings of recommended measures, incentives to help cover a portion of the cost of implementing energy efficient measures, etc. 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.*		
N3	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. [CUSTOMIZE LIST OF FACTORS FOR PROGRAM BEFORE ASKING THEM TO SCORE THE FULL LIST. ROTATE PRESENTATION OF ITEMS. FOLLOW UP WITH "And is there anything else that I may have missed?" RECORD AS p. Other (SPECIFY)]		
	a. The age or condition of the old equipment	X	X
	b. Availability of the PROGRAM rebate	X	X
	c. Information provided through a recent feasibility study, energy audit or other types of technical assistance provided through the PROGRAM (probe on when and by whom?)	X	X
	d. Recommendation from a vendor/supplier (If >5, Vendor interview may be triggered)	TRIGGER	TRIGGER
	e. Previous experience with PROGRAM?	X	X
	f. Previous experience with this MEASURE?	X	X
	g. Information from PROGRAM training course?	X	X
	h. Information from other PROGRAM marketing materials?	X	X
	i. A recommendation from an auditor or consulting engineer	X	X
	j. Standard practice in our business/industry (IF >5, ask standard practice battery)	X	TRIGGER
	k. Endorsement or recommendation by PROGRAM staff, PROGRAM vendor, or UTILITY representative	X	X
	l. Corporate policy or guidelines (If >5 ask Policy questions)	X	TRIGGER
	m. Payback on the investment (If >5 ask payback battery)	X	TRIGGER
	n. General concerns about the environment	X	X
	o. Specific concerns about global warming	X	X

	p. Specific concerns about achieving energy independence	X	X
	q. Other (SPECIFY)_______________________________	X	X
N4	Now I'd like to ask you a last question about the importance of the program to 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 other factors we just discussed in your decision to implement the specific MEASURE. I'd like you to give me a 0 to 10 score for the PROGRAM's influence and a 0 to 10 score for the influence of the most important other factor so that the two scores total 10.	X	X
	a. ________rating of the importance of PROGRAM NAME	X	X
	b. ________rating of the importance of Other Factors	X	X
	Now I would like you to think about the action you would have taken with regard to the installation of this equipment PROGRAM had not been available.		
N5	Regarding the installation of this equipment if the PROGRAM had not been available, how likely is it that you would have installed exactly the same item/equipment, using a 0 to 10 likelihood scale, where 0 is not at all likely and 10 is extremely likely?	X	X
N6	*IF N5>0.* You indicated in your previous responses that there was a X in 10 likelihood that you would have installed the same equipment if the PROGRAM had not been available.	X	X
	When do you think you would have installed this equipment? (Please answer in months)________		
	a. _____ _____ ..within 6 months? NTGR = 0		
	b. _____ _____.. 6 – 47 months later (NTGR=(months-6)*.024)		
	c. _____ _____ ..4 or more years later (NTGR=1)		
	g. _____ _____ ..Never (NTGR=1)		
	PARTIAL FREE RIDERSHIP BATTERY	**GROSS IMPACT**	**GROSS IMPACT**
P1	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 high efficiency units (e.g., controls, VFDs, lights) b. Install standard efficiency equipment or whatever required by code c. Install equipment more efficient than code, but less efficient than we installed through the program d. Repair/rewind/refurbish the existing equipment e. do nothing (keep the existing equipment as is) f. Something else (specify)		
P4	If P1=a: How many units would you have installed? Record number of units or percentage of units actually installed		
P5			
P6	If P1=c: 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)		
P7	If P1=d: How long do you think the repaired/rewound/refurbished equipment		

	would have lasted before requiring replacement?		
P8			
P9			
	Additional Decision Maker Questions		
	PAYBACK BATTERY (If payback importance >5)		
N10	What financial calculations does your company make before proceeding with installation of a MEASURE like this one?		X
N11	What is the cut-off point your company uses before deciding to proceed with the investment?		X
N12	What was the result of the calculation for MEASURE: a) with the rebate? b) without the rebate?		X
	INVESTIGATE INCONSISTENT RESPONSE		
N13	What competing investments, if any, were considered for the funds that were allocated to the adoption of MEASURE?		X
N14	Why was MEASURE chosen over these other investments		X
	CORPORATE POLICY BATTERY (If corporate policy importance >5)		
N15	Does your organization have a corporate environmental policy to reduce environmental emissions or energy use? Some examples would be to "buy green" or use sustainable approaches to business investments.		X
N16	What specific corporate policy influenced your decision to adopt or install MEASURE?		X
N17	Had that policy caused you to adopt the MEASURE at this facility before participating in this program?		X
N18	Had that policy caused you to adopt the MEASURE at other facilities before participating in this program? When and where?		X
N19	Did you receive an incentive for a previous [MEASURE]? If so, please describe.		X
	STANDARD PRACTICE BATTERY (If standard practice importance >5)		
N20	How long has MEASURE been standard practice in your industry?		X
N21	Does your company ever deviate from the standard practice? If yes, under what conditions?		X
N22	How did this standard practice influence your decision to install the energy efficiency equipment		X
N23	What industry group or trade organization do you look to establish standard practice for your industry?		X
N24	How do you and other firms/facilities receive information on updates in standard practice?		X
	OTHER INFLUENCES BATTERY		
N25	Who provided the most assistance in the design or specification of MEASURE? Designer or Consultant, Equipment Distributor or Mfr Rep, Installer, Utility rep, or Internal staff	X	X
N26	Please describe the type of assistance that they provided.	X	X
N27	Please state, in your own words, any other factors that influenced your decision to go ahead on this energy efficient equipment/project.	X	X

VENDOR SURVEY

	Question Text	Basic	Standard and Standard Very Large
	Warm Up		
A1	The CUSTOMER indicates that you recommended the installation of [EFFICIENT MEASURE] at their facility at [CUSTOMER LOCATION] on [DATE]. Do you recall making this recommendation?	X	X
	a .Yes		
	b. No		
	c. DK (-8)		
	d. Refused (-9)		
	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.		
V1	Using this 0 to 10 scale where 0 is 'Not at all important" and 10 is "Very Important" , how important was 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?	X	X
V2	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?	X	X
V3	Now, using a 0 to 100 percent scale, in what percent of sales situations did you recommend MEASURE before you learned about the [PROGRAM]?	X	X
V4	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]?	X	X
V4a	In what other ways have your recommendations regarding MEASURE been influenced? [For each mention, ask: And using the same 0 to 10 scale, where 0 is "Not at all important" and 10 is "Very important", how important in influencing your recommendations. . . (INSERT FIRST MENTION, INSERT SECOND MENTION ETC.)]	X	X
V5	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?	X	X
	b. Information provided by the UTILITY website?	X	X
	c. Your firm's past participation in a rebate or audit program sponsored by UTILITY?	X	X
	Optional:		

V6	Approximately what percentage of your sales of MEASURE in UTILITY'S service territory are energy efficient models that qualify for incentives from the UTILITY program.	X	X
V7	On a 0 percent to 100 percent scale, in what percent of sales situations do you encourage your customers in UTILITY territory to purchase program qualifying [MEASURES]?	X	X
V8.	(IF LESS THAN 100) In what situations do you NOT encourage your customers to purchase energy efficient models if they qualify for a rebate? Why is that?	X	X
V9	Of those installations of EQUIPMENT in UTILITY service territory that qualify for incentives, approximately what percentage do not receive the incentive?	X	X
V10	Why do they not receive the incentive (open end?)	X	X
V11	Do you also sell MEASURE in areas where customers do not have access to incentives for energy efficient models?	X	X
V12	About what percent of your sales of MEASURE are represented by these areas where incentives are not available?	X	X
V12a	IF AT LEAST 10%: And approximately what percentage of your sales of MEASURE in these areas are the energy efficient models that would qualify for incentives in UTILITY'S service territory?	X	X
V13	Have you changed your stocking practices as a result of the UTILITY program? If yes, how?	X	X
V14	Do you promote energy efficient models equally in areas with and without incentives?	X	X

Appendix C-NTGR Scoring Algorithm and Example

The calculation of the self-report-based core NTGR is described below. The NTGR is calculated as an average of three scores representing responses to one or more questions about the decision to install a program measure.

1. A Timing and Selection score that captures the influence of the most important of various program and program-elated elements in influencing the customer to select the specific program measure at this time. Program influence through vendor recommendations is also captured in this score.

2. An overall Program Influence score that captures the perceived importance of the program (whether rebate, recommendation, or other information) in the decision to implement the specific measure that that was eventually adopted or installed. The overall program influence score is reduced by half if the respondent says they learned about the program only after they decided to install the program qualifying measure.

3. A No-Program 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. This score accounts for deferred free ridership by capturing the likelihood that the customer would have installed program qualifying measures at a later date if the program had not been available.

Calculation of each of the above scores is discussed below. For each score, the questions contributing to the calculation are presented, the calculation is described, and an example is provided.

Timing and Selection Score

For the decision maker, the questions asked are:

Using a 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 the PROGRAM
- Information from PROGRAM training course
- Information from other PROGRAM marketing materials
- Recommendation from a vendor/supplier (If >5, a vendor interview is triggered)

For the vendor, the questions asked if the interview is triggered are:

1. On a 0 to 10 scale where 0 is Not at all important" and 10 is "Very important", how important was 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 "Extremely 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 this 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 this 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 "Extremely 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 5 a.
5. The response to question 5b.
6. The response to question 5c.

The Timing and Selection Score is calculated as:

The highest of the responses to the first four decision maker questions and, if the vendor interview has been triggered, the VMAX score multiplied by the score the decision makers assigned to the vendor recommendation.

Example:

The decision maker provides responses of 5 for the importance of the rebate, 6 for an audit or feasibility study, 3 for training, 2 for other marketing materials, and 7 for the vendor recommendation, which means a vendor interview is triggered.

The vendor responses are 8 for the significance of the program, 5 for the likelihood of recommending the measure in the absence of the program, 40% for how often the measure was recommended before program awareness and 60% for how often it is recommended after program awareness, 3 for the importance of training, 2 for the importance of the website and 5 for the importance of previous participation. The VMAX score is the greatest of 8, (10-5), (60-40)/10, 3, 2 and 5. So VMAX is 8. This score is multiplied by the importance of the vendor recommendation, to which the decision maker assigned a 7, so the vendor score is 5.6.

The timing and selection score is the maximum of the four decision maker responses (5, 6, 3, and 2) and the vendor score (5.6). Even though the vendor interview was triggered, the vendor score is not as high as the 6 assigned to the importance of the audit or feasibility study, so the timing and selection score is 6.

Program Influence 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. 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 program influence score is calculated as:

The program importance response, on the 0 to 10 scale, to question 2. This score is reduced by half if the respondent became aware of the program only after having decided to adopt the program qualifying measure.

Example:

The decision maker says they became aware of the program before deciding to implement the measure, and provides a response of 7 to question 2, which becomes the program influence score.

No-Program Score

The questions asked are:

1. Regarding the installation of this equipment if the PROGRAM had not been available, how likely is it that you would have installed exactly the same item/equipment, using a 0 to 10 likelihood scale, where 0 is not at all likely and 10 is extremely likely?
2. IF 1>0. You indicated in your previous responses that there was an "X" in 10 likelihood that you would have installed the same equipment if the PROGRAM had not been available. When do you think you would have installed this equipment? Please express your answer in months

   a. _____ ____ Within 6 months? (Deferred NTG Value=0)

   b. _____ ____ 7 to 47 months later (Deferred NTG Value=(months-6)*.024)

   c. _____ ____ 48 or more months later (Deferred NTG Value =1)

   d. _____ ____ Never (Deferred NTG Value=1)

   Note: The value 0.024 is 1 divided by 41 (41 is calculated as 47 – 6). This assumes that the deferred NTG value is a linear function beginning in month 7 through month 47, increasing 0.024 for each month of deferred installation.

The No-Program Score is calculated as:

10 minus (the likelihood of installing the same equipment multiplied by one minus the deferred net-to-gross value associated with the timing of that installation).

Example

The respondent says there is a 4 in 10 likelihood that they would have installed the same equipment. In response to question 5, the decision maker says they would have installed the qualifying equipment 18 months later, which has a NTGR value of (18-6)*.024, or .29 associated with it.

The No-Program score is 10 minus (4*(1-.29)), which is 10 minus 4*.71 or 7.16.

Core NTG Ratio

The self-reported core NTGR in most cases is simply the average of the Program Influence, Timing and Selection, and No-Program 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 Program Influence and No-Program scores only.

Example (Core NTGR)

The NTGR is the average of 6, 8 and 7.2, or 7.1 divided by 10 = .71. This figure is then applied to adjusted gross savings to yield net savings

Appendix D-Demonstration of Compliance with the CPUC/ED and MEC's Guidelines for Estimating Net-to-Gross Ratios Using the Self-Report Approach

1 Timing of the interview

To minimize problems of recall, every effort should be made to conduct the NTGR interview as close to project completion as possible.

2 Identifying the correct respondent

The survey form includes some initial probing on the respondent's role in the completed project, to confirm their involvement in the decision to implement the energy efficiency measures. In addition, both the utility or third party representative and any trade allies involved should be asked to confirm they are the correct contact. If multiple decision makers are identified, each one should be interviewed and the results pooled.

In the unfortunate circumstance where the key decision maker has left the company, that sample point should be discarded and replaced with a respondent from within the same stratum in the backup sample.

3 Set-up questions

The survey includes a series of warm-up questions that serve to remind the respondent about the circumstances and motivations surrounding the project, the project scope (including installed measures), incentives paid, and the project schedule. This information also helps to build the "story" to substantiate the NTGR responses given.

4 Use of multiple questions

The NTGR scoring algorithm relies on responses from several questions to determine the final NTGR score. The scoring is a function of:

- The timing of their program awareness relative to their decision to implement the installed measure
- The importance of program versus non-program influences in their decision making
- The importance of specific influences in the participant's general decision to implement the measure and that led them to implement the specific measure at the time they did rather than an alternative
- Without the program, the probability of alternative actions to implementing the selected measure

5 Validity and reliability

The proposed NTGR method is designed to produce valid and reliable NTGR results, based on the use of:

- "*Tried and true" question wording*. Many of the core questions used in NTGR scoring are substantially the same as those that have been used extensively in previous large C&I program evaluations, such as the last several rounds of evaluation for the California Standard Performance Contracting Program. While the question construct is somewhat different from in the past, the wording used is essentially the same as has been used previously.

- *Information from supplemental questions and multiple data sources to corroborate and triangulate on the NTGR "story"*. In addition to self-reported information, the NTGR findings for Standard and Standard – Very Large NTGR sites include responses to a number of supplemental questions surrounding the project (e.g., corporate policy, standard industry practice and payback), and the results from an interview with the vendor(s) involved in the project. These findings will be used to converge on a plausible estimate of the NTGR and to help tell the "story" behind the project and its context.
- *Multiple reviewers. Standard - Very Large customer projects are reviewed by two experienced analysts*. The two reviewers seek to develop a NTGR consensus on the project, and resolve any differences of opinion.
- *Identification and explicit consideration of alternate hypotheses*. Respondents are asked about the relative influence of a variety of program and non-program factors.

During the pre-test of the NTGR survey instrument, reliability tests should be conducted using the CATI software. Any problem areas detected should be corrected.

6 Consistency checks

Questions within the NTGR battery that are more likely to produce inconsistent responses have been flagged. These include questions regarding the program's reported importance in the decision to implement the specified measure, alternative actions in the program's absence, questions reporting the motivations for doing the project, as well as any closely related supplemental questions. The CATI software should be specifically programmed to flag any inconsistencies, and include follow-up prompts when they are found. Interviewers should be instructed how to administer these follow-up questions to resolve these inconsistencies. Interviewers should make every effort to resolve any inconsistencies before concluding the interview. Examples of the procedures for checking consistency of responses are provided in Section 3.

7 Making the Questions Measure-Specific

In general, most projects involve one type or class of measure. However, there are a few instances where the project consists of multiple types of measures, but usually, one measure predominates. In such cases, the interview should be conducted around the dominant measure with the greatest share of savings. If there are projects with multiple types of measures and no one measure class predominates, the NTGR sequence should be repeated for each significant measure class (e.g., once for lighting and once for process measures). At the beginning of each interview, there is a prompt with a description of the measure class that the questions pertain to so that it is clear in the minds of the respondent which measures they are being asked about.

8 Partial free-ridership

Questions P1-P9 are designed to collect the information necessary to adjust for any partial free-ridership. However, this adjustment is be made to the gross savings estimates and not to the NTGR.

9 Deferred free-ridership

Question N6 addresses deferred free ridership, and provides specific adjustment factors for each response category. The NTGR algorithm (See Section 5 and Appendix C) text fully explains the specifics of this adjustment.

10 Scoring algorithms

The methodology includes a specific algorithm for developing a NTGR based on responses received. The results of the 0 to 10 scoring are used to develop specific values for each question used to score the NTGR. A description of the scoring algorithm is provided in Section 5 and in Appendix C.

11 Handling unit and item non-response

Every effort should be made to discourage non-responses (i.e., refusals and terminates). For example, in California, the interviewer points out that the energy efficiency program requires the project to be evaluated as a condition of participation. Absent such a requirement, interviewers should stress such things as the importance of evaluation in improving program design and delivery. In some cases, incentives can be offered to respondents. In the event various strategies are not successful, the non-responding customer should be replaced by another customer within the same stratum. While efforts to minimize item non-response ("don't knows" and "refusals") should be made using a variety of available techniques, one should recognize that forcing a response can distort the respondent's answer and introduce bias.

12 Weighting the NTGR

The mean NTGR for a given measure, end use or program should be weighted to take into account the size of the ex post gross impacts.

13 Ruling out rival hypotheses

The core NTGR questions, particularly question 4 of the Decision Maker survey, have been carefully constructed to try to rule out rival hypotheses. 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.

14 Precision of the NTGR

The calculation of the achieved relative precision of the NTGRs (for program-related measures and practices and non-program measures and practices) is expected to be straightforward. However, the inclusion of more complicated situations involving multiple participant and vendor interviews as well as the inclusion of additional qualitative information means that the NTGR standard errors may underestimate the uncertainty surrounding the NTGR estimate.

15 Pre-testing the questionnaire

The NTGR survey should be carefully and extensively pre-tested and adjusted in response to pre-test findings before it is fielded.

16 Incorporation of additional qualitative and quantitative data in estimating the NTGR (data collection, rules for data integration, analysis)

Specific rules have been established for data integration and these are described in Section 3.

17 Qualified interviewers

The NTGR surveys should be fielded by highly experienced interviewers. High level professional interviewers should be used for the largest and most complex projects, while less experienced professional interviewers should be used for smaller, simpler projects. A CATI approach should be used for all but the very largest and most complex projects.

D: Reasons for Realization Rates not Equal to 1

This appendix provides a detailed list of the reasons for differences between the ex ante and ex post first year energy savings estimates. Tables 39 to 44 provide a list of reasons sorted by HIM within program or program component. A separate list of reasons is given for the HVAC, lighting and Other measures. A "P" is used to indicate the primary reason for a difference between the ex ante and ex post savings values. An "S" is used to indicate a secondary reason for the difference. In cases where there is only one significant reason for the difference, only a "P" is provided. In cases where there were secondary reasons, one or more "S"s are provided.

Table 39: SCE2517-SPC Reasons for Differences

							MC LIGHTING Reasons for Differences in Savings (P=Primary, S=Secondary)				MC HVAC Reasons for Differences in Savings					MC OTHER Reasons for Differences in Savings						
SBW ID	IOU ID	HIM	Case Weight	Measure Description	Program ID	Program Type	Operating Hours	Fixture Wattage	Fixture Count	Utilization Factor	Operating Hours	Chiller Efficiency	Fan Power	Fan Flowrate	Other	Inappropriate algorithm	Standard practice or code installed	Operating hours	Production changes	Equipment efficiency	Measure not installed	Other
M24431	2007-456	Custom HVAC	1.4	EMS upgrade to DDC	SCE2517	SPC									P, S							
M25098	2007-703	Custom HVAC	152.0	Replace two 265 ton chillers with new VSD chillers	SCE2517	SPC						P										
M00437	2006-837	Custom Lighting	336.5	T12 to T8 fixture replacement with controls	SCE2517	SPC	P		S													
M00516	2007-91	Custom Lighting	152.0	MH to T5 fixture replacement	SCE2517	SPC	P			S												
M00649	2006-113	Custom Lighting	89.5	T12 and HID to T8 fixture replacement and exit signs	SCE2517	SPC	P															
M00665	2006-561	Custom Lighting	38.0	Replace MH fixtures with 6 lamp, T8 fixtures with electronic ballast.	SCE2517	SPC	P		S	S												
M24332	2007-156	Custom Lighting	336.5	T8 lamps to more efficient T8 lamps and exterior HID to T5 fixture replacement and exit signs	SCE2517	SPC	P															
M24773	2008-523	Custom Lighting	89.5	MH to T8 fixture replacement	SCE2517	SPC	P															
M25314	2007-124	Custom Lighting	38.0	Lighting - Indoor System Replacement	SCE2517	SPC	P															
M00471	2006-618	Custom Other	152.0	Add VSDs to pumps at new pumping station	SCE2517	SPC											P					
M00715	2006-57	Custom Other	1.4	Replace 900-hp centrifugal comrpessor with 350-hp centrifugal	SCE2517	SPC												P				

							MC LIGHTING Reasons for Differences in Savings (P=Primary, S=Secondary)				MC HVAC Reasons for Differences in Savings					MC OTHER Reasons for Differences in Savings						
SBW ID	IOU ID	HIM	Case Weight	Measure Description	Program ID	Program Type	Operating Hours	Fixture Wattage	Fixture Count	Utilization Factor	Operating Hours	Chiller Efficiency	Fan Power	Fan Flowrate	Other	Inappropriate algorithm	Standard practice or code installed	Operating hours	Production changes	Equipment efficiency	Measure not installed	Other
M00716	2006-804	Custom Other	1.4	Replacement of pump motors and mag-drives with new motors and VFDs	SCE2517	SPC											P					
M00718	2007-44	Custom Other	1.4	Gas oil pump impeller destaging	SCE2517	SPC										S		P				
M00720	2006-467	Custom Other	1.4	Optimization control system installation	SCE2517	SPC													P	S		S
M00722	2006-794	Custom Other	1.4	Replacement of cement plant raw grind mill	SCE2517	SPC													S	P		
M25150	2007-643	Custom Other	1.4	Replace multiple 1-stage ball mills with 2-stage ball mill at cement plant	SCE2517	SPC													S	P		
M25175	2007-652	Custom Other	1.4	Variable speed drives on mechanical vapor recompression units	SCE2517	SPC											P					
M25368	2006-850	Custom Other	1.4	Adjustable speed drive on large kiln exhaust fan	SCE2517	SPC														P		

Table 40: SCG 3513 Reasons for Differences

							MC LIGHTING Reasons for Differences in Savings (P=Primary, S=Secondary)				MC HVAC Reasons for Differences in Savings					MC OTHER Reasons for Differences in Savings						
SBW ID	IOU ID	HIM	Case Weight	Measure Description	Program ID	Program Type	Operating Hours	Fixture Wattage	Fixture Count	Utilization Factor	Operating Hours	Chiller Efficiency	Fan Power	Fan Flow Rate	Other	Inappropriate Algorithm	Standard practice or Code Installed	Operating hours	Production Changes	Equipment efficiency	Measure not Installed	Other
M00724	3018-5887-1	Custom Other	155.8	Steam boiler retube	SCG3513	NRF4												P				
M00726	3018-5953-1	Custom Other	155.8	Oil still burner replacement	SCG3513	NRF4											P					
M00919	3018-8322-1	Custom Other	27.0	Steam kettles replaced with steam-to-water heat exchanger	SCG3513	NRF4										S		P				
M00953	3018-6335-1	Custom Other	2.5	Boiler rebuild	SCG3513	NRF4										P						
M00959	3018-5565-1	Custom Other	1.1	Burner replacement on rotary dryer	SCG3513	NRF4											P					
M00961	3018-6318-1	Custom Other	1.1	Process Steam Boiler replacement	SCG3513	NRF4														S		P
M49367	3018-7946-1	Custom Other	155.8	Replace reverberatory aluminum melting furnace with crucible furnace	SCG3513	NRF4													S	S		P
M49386	3018-8846-1	Custom Other	155.8	Replace two burners on process heat boiler	SCG3513	NRF4																P
M49388	3018-9177-1	Custom Other	2.5	Replace reverberatory aluminum melting furnace with a stack-melt furnace	SCG3513	NRF4													P			
M49488	3431-50039-1	Custom Other	2.5	Install condensing boiler	SCG3513	CPI4															P	
M49493	3431-50047-1	Custom Other	2.5	Replace heat exchanger	SCG3513	CPI4																P
M49886	3433-70000-1	Custom Other	1.1	Replace heat exchanger in fossil fuel reforming hydrogen process	SCG3513	GRP4										S			P			

							MC LIGHTING Reasons for Differences in Savings (P=Primary, S=Secondary)				MC HVAC Reasons for Differences in Savings					MC OTHER Reasons for Differences in Savings						
SBW ID	IOU ID	HIM	Case Weight	Measure Description	Program ID	Program Type	Operating Hours	Fixture Wattage	Fixture Count	Utilization Factor	Operating Hours	Chiller Efficiency	Fan Power	Fan Flow Rate	Other	Inappropriate Algorithm	Standard practice or Code Installed	Operating hours	Production Changes	Equipment efficiency	Measure not Installed	Other
M49887	3433-70001-1	Custom Other	1.1	Replace 2 Rotary Furnaces	SCG3513	GRP4															P	
M49888	3433-70002-1	Custom Other	1.1	Pipe Insulation / Tank Insulation, new high efficiency condensing boiler	SCG3513	GRP4										P						
M49890	3433-70004-1	Custom Other	1.1	Add insulation to kiln exhaust ductwork	SCG3513	GRP4										S						P
M49891	3433-70005-1	Custom Other	1.1	Replacement of afterburner with regenerative thermal oxidizer	SCG3513	GRP4										P						
M49896	3434-30005-1	Custom Other	27.0	Replace recuperative thermal oxider (RTO) with regenerative RTO	SCG3513	PER4															P	
M49897	3434-30006-1	Custom Other	2.5	Boiler replacement	SCG3513	PER4											P					
M49914	3434-30026-1	Custom Other	2.5	Replace reverberatory aluminum melting furnace with a stack-melt furnace	SCG3513	PER4													P			

Table 41: SDGE 3025 Electric Reasons for Differences

							MC OTHER Reasons for Differences in Savings (P=Primary, S=Secondary)				MC HVAC Reasons for Differences in Savings					MC OTHER Reasons for Differences in Savings						
SBW ID	IOU ID	HIM	Case Weight	Measure Description	Program ID	Program Type	Operating Hours	Fixture Wattage	Fixture Count	Utilization Factor	Operating Hours	Chiller Efficiency	Fan Power	Fan Flow Rate	Other	Inappropriate Algorithm	Standard practice or code installed	Operating Hours	Production Changes	Equipment efficiency	Measure not Installed	Other
M01195	3232-1-1	Custom HVAC	85.3	Upgrade of three constant volume AHUs including converting to VAV, economizer controls and schedule controls.	SDGE3025	SPC									P							
M01196	3197-1-3	Custom HVAC	85.3	High Efficiency Chiller - 300 ton	SDGE3025	SPC									P							
M01357	3216-1-1	Custom HVAC	3.0	1- 365 ton Chiller Replacement	SDGE3025	SPC						P										
M49153	3357-1-1	Custom HVAC	3.0	chiller replacement	SDGE3025	SPC					S				P							
M01313	3179-1-1	Custom Lighting	27.0	Photocell controll added to emergency Circuits and building management system controls added to an additional number of circuits.	SDGE3025	SPC	P	S														
M01314	3031-2-1	Custom Lighting	27.0	Halogen wattage reduction and halogen to metal halide fixture replacement	SDGE3025	SPC	no reasons 100% RR															
M49216	3475-1-1	Custom Lighting	27.0	Replace incandescant electronic message board with LED message board	SDGE3025	SPC	P	S														
M49261	3562-1-1	Custom Lighting	85.3	T12 to T8 fixture replacement and T8 lamps to more efficient T8 lamps plus thermostat replacements	SDGE3025	SPC	P	S	S													

Table 42: SDGE 3025 Gas Reasons for Differences

							MC LIGHTING Reasons for Differences in Savings (P=Primary, S=Secondary)				MC HVAC Reasons for Differences in Savings					MC OTHER Reasons for Differences in Savings						
SBW ID	IOU ID	HIM	Case Weight	Measure Description	Program ID	Program Type	Operating Hours	Fixture Wattage	Fixture Count	Utilization Factor	Operating Hours	Chiller Efficiency	Fan Power	Fan Flowrate	Other	Inappropriate algorithm	Standard practice or code installed	Operating hours	Production changes	Equipment efficiency	Measure not installed	Other
M01358	3034-1-1	Custom HVAC	5.5	Replacement of a 4,000 MBH hot water boiler with a 5,400 MBH boiler	SDGE3025	SPC									P,S							
M01359	3340-1-1	Custom Other	5.5	Laundry Ozone Washing	SDGE3025	SPC													P			S
M01360	3077-1-1	Custom Other	5.5	Aqueous pool cover & solar heating	SDGE3025	SPC																P
M01369	3049-1-1	Custom Other	1.0	Thermal Cover for Pool	SDGE3025	SPC										P						
M49205	3458-1-1	Custom Other	1.0	Install new boiler and heat exchanger	SDGE3025	SPC										P			S			
M49268	3570-3-1	Custom Other	5.5	Insulation of aggregate-drying drum	SDGE3025	SPC										P		S				

Table 43: SDGE 3010 Electric Reasons for Differences

							MC LIGHTING Reasons for Differences in Savings (P=Primary, S=Secondary)				MC HVAC Reasons for Differences in Savings					MC OTHER Reasons for Differences in Savings						
SBW ID	IOU ID	HIM	Case Weight	Measure Description	Program ID	Program Type	Operating Hours	Fixture Wattage	Fixture Count	Utilization Factor	Operating Hours	Chiller Efficiency	Fan Power	Fan Flowrate	Other	Inappropriate algorithm	Standard practice or code installed	Operating hours	Production changes	Equipment efficiency	Measure not installed	Other
M01157	3518-1767-1	Custom HVAC	14.0	CO Sensor System for lower level Parking Garage to control the ventilation system, which includes 4-40 hp motors and 2-60 hp motors	SDGE3010	ESB					S		P									
M01158	3518-1595-3	Custom HVAC	14.0	Convert 4 air handlers to from constant volume to variable volume with reduced air flows serving medical research facility.	SDGE3010	ESB						S			P							
M01180	3518-2059-1	Custom HVAC	1.0	CO sensors were added to 5 supply fans and 4 exhaust fans located in the parking garage of the One America Building.	SDGE3010	ESB					P											
M01181	3518-1431-1	Custom HVAC	1.0	CO Systems for Parking Garages	SDGE3010	ESB							P									
M48711	3518-2411-1	Custom HVAC	14.0	Retrofit with Turbocor chiller	SDGE3010	ESB						S			P							
M00965	3518-2305-1	Custom Lighting	264.0	MH to 6 lamp T8 fixture replacement	SDGE3010	ESB	P															
M01073	3518-1758-1	Custom Lighting	73.5	Replace HPS fixtures with 6-lamp T8 fixtures	SDGE3010	ESB	P			S												
M48676	3518-2287-1	Custom Lighting	264.0	Replace T12 with T8 lighting	SDGE3010	ESB	P	S	S													
M49013	3518-2892-1	Custom Lighting	73.5	Exterior MH to T5 lighting retrofit	SDGE3010	ESB	P		S													

Table 44: SDGE 3010 Gas Reasons for Differences

							MC LIGHTING Reasons for Differences in Savings (P=Primary, S=Secondary)				MC HVAC Reasons for Differences in Savings					MC OTHER Reasons for Differences in Savings						
SBW ID	IOU ID	HIM	Case Weight	Measure Description	Program ID	Program Type	Operating Hours	Fixture Wattage	Fixture Count	Utilization Factor	Operating Hours	Chiller Efficiency	Fan Power	Fan Flow Rate	Other	Inappropriate algorithm	Standard practice or code installed	Operating hours	Production changes	Equipment efficiency	Measure not installed	Other
M01182	3518-1520-102	Custom HVAC	1.8	Building F Zone Presence Sensor retrofit to reduce fume hood air flow when operator is not present	SDGE3010	ESB								P								
M01183	3518-1596-101	Custom HVAC	1.8	Upgrade of five constant volume AHUs to VAV and repair of chilled water valves	SDGE3010	ESB									P							
M01185	3518-1520-104	Custom HVAC	1.8	Reduction of minimun airflow in 36 lab fume hoods of building F	SDGE3010	ESB									P							
M01186	3518-1520-106	Custom HVAC	1.8	Re-comissioning of fume hood air flow controls in building F	SDGE3010	ESB									P							
M01191	3518-1595-103	Custom HVAC	1.8	Convert 4 air handlers to from constant volume to variable volume with reduced air flows serving medical research facility.	SDGE3010	ESB									P							
M01193	3518-1907-101	Custom HVAC	3.0	Fume hood flow reduction, lab controls	SDGE3010	ESB								P	S							
M48734	3518-2507-101	Custom HVAC	1.8	Lab Controls	SDGE3010	ESB								P								

E: Measure Level Results by Program (Gross Direct)

This appendix provides a listing of important results for each of the direct sampled measures. A separate table is presented for each program or program component where direct measures were evaluated. The data within each table is sorted by the three custom HIMs. Information is provided in the table relevant to both the gross and net analyses performed for each sampled measure. The parameters summarized in the tables include the following:

Measure Identification – The SBW ID is a unique identifier that was assigned to a sampled measure within the SBW database. The IOU measure ID is the unique identifier assigned by the respective IOU to each measure. For confidentiality reasons, the names of the sites associated with each measure were not included in this appendix.

HIM – The high impact measure category associated with the sampled measure. All direct measures were assigned to either Custom Lighting, Custom HVAC and Custom Other.

Case Weight – The sampling weight calculated for each measure. This weight was used in the calculated of domain-level results.

Measure Description – A brief description of the sampled measure. Original measure descriptions came from the IOU tracking database. In many cases the measure name was modified by the evaluation team for clarification purposes.

Ex Ante Gross Savings – The first year gross savings (kW, kWh and therms) for each measure that was claimed by the IOU in their tracking database.

Ex Post 1st Year Gross Savings – The first year gross savings (kW, kWh and therms) for each measure that was computed by the evaluation team.

Gross Realization Rate – The ratio of first year ex post savings (kW, kWh and therms) to the respective first year ex ante savings.

NTGR – The net-to-gross ratio assigned by the evaluation team to each measure. The NTGR was computed by applying the NTG scoring algorithm to data collected in the NTG surveys.

Ex Post 1st Year Net Savings – The first year net savings for each measure, which was computed by multiplying the NTGR by the first year ex post gross savings.

Table 45: SCE2517-SPC: Gross and Net Savings Results for Sampled Measures

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M24431	2007-456	Custom HVAC	1.4	EMS upgrade to DDC	477.2	4,541,403	0	458.9	6,073,760	29,119	0.96	1.34	N/A	N/A	N/A	N/A	N/A
M25098	2007-703	Custom HVAC	152.0	Replace two 265 ton chillers with new VSD chillers	36.8	261,249	0	22.0	148,129	0	0.60	0.57	N/A	0.50	11	74,065	0
M00437	2006-837	Custom Lighting	336.5	T12 to T8 fixture replacement with controls	17.9	78,469	0	19.9	119,329	0	1.11	1.52	N/A	0.83	17	99,043	0
M00516	2007-91	Custom Lighting	152.0	MH to T5 fixture replacement	32.8	163,276	0	32.4	222,414	0	0.99	1.36	N/A	0.73	24	162,362	0
M00649	2006-113	Custom Lighting	89.5	T12 and HID to T8 fixture replacement and exit signs	87.2	708,630	0	92.2	688,242	0	1.06	0.97	N/A	0.87	80	598,771	0
M00665	2006-561	Custom Lighting	38.0	Replace MH fixtures with 6 lamp, T8 fixtures with electronic ballast.	107.1	935,568	0	109.1	658,048	0	1.02	0.70	N/A	N/A	N/A	N/A	N/A
M24332	2007-156	Custom Lighting	336.5	T8 lamps to more efficient T8 lamps and exterior HID to T5 fixture replacement and exit signs	9.7	36,948	0	3.5	51,120	0	0.36	1.38	N/A	N/A	N/A	N/A	N/A
M24773	2008-523	Custom Lighting	89.5	MH to T8 fixture replacement	163.1	612,290	0	119.2	495,241	0	0.73	0.81	N/A	0.53	63	262,478	0
M25314	2007-124	Custom Lighting	38.0	Lighting - Indoor System Replacement	351.6	3,119,115	0	335.0	1,869,680	0	0.95	0.60	N/A	N/A	N/A	N/A	N/A
M00471	2006-618	Custom Other	152.0	Add VSDs to pumps at new pumping station	13.9	121,535	0	0.0	0	0	0.00	0.00	N/A	0.74	0	0	0
M00715	2006-57	Custom Other	1.4	Replace 900-hp centrifugal comrpessor with 350-hp centrifugal	333.8	3,346,850	0	402.0	3,467,454	0	1.20	1.04	N/A	N/A	N/A	N/A	N/A
M00716	2006-804	Custom Other	1.4	Replacement of pump motors and mag-drives with new motors and VFDs	466.6	3,629,424	0	5.1	19,603	0	0.01	0.01	N/A	0.37	2	7,253	0
M00718	2007-44	Custom Other	1.4	Gas oil pump impeller destaging	537.5	4,138,421	0	538.3	3,595,878	0	1.00	0.87	N/A	0.20	108	719,176	0
M00720	2006-467	Custom Other	1.4	Optimization control system installation	501.4	4,392,088	0	0.0	5,926,413	0	0.00	1.35	N/A	0.97	0	5,748,621	0

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M00722	2006-794	Custom Other	1.4	Replacement of cement plant raw grind mill	5,038.0	30,187,643	0	4,242.0	21,494,363	0	0.84	0.71	N/A	0.75	3,182	16,120,772	0
M25150	2007-643	Custom Other	1.4	Replace multiple 1-stage ball mills with 2-stage ball mill at cement plant	6,721.1	35,045,198	0	5,532.0	32,028,318	0	0.82	0.91	N/A	0.72	3,983	23,060,389	0
M25175	2007-652	Custom Other	1.4	Variable speed drives on mechanical vapor recompression units	592.4	4,976,094	0	0.0	0	0	0.00	0.00	N/A	0.77	0	0	0
M25368	2006-850	Custom Other	1.4	Adjustable speed drive on large kiln exhaust fan	1,130.3	9,179,171	0	1,024.0	8,318,297	0	0.91	0.91	N/A	0.93	952	7,736,016	0

Table 46: SCG3513: Gross and Net savings Results for Sampled Measures

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M00724	3018-5887-1	Custom Other	155.8	Steam boiler retube	0.0	0	13,585	0.0	0	28,115	N/A	N/A	2.1	0.67	0	0	18,837
M00726	3018-5953-1	Custom Other	155.8	Oil still burner replacement	0.0	0	11,372	0.0	0	0	N/A	N/A	0.0	0.37	0	0	0
M00919	3018-8322-1	Custom Other	27.0	Steam kettles replaced with steam-to-water heat exchanger	0.0	0	34,679	0.0	0	27,505	N/A	N/A	0.8	0.25	0	0	6,876
M00953	3018-6335-1	Custom Other	2.5	Boiler rebuild	0.0	0	165,346	0.0	0	137,191	N/A	N/A	0.8	0.53	0	0	72,711
M00959	3018-5565-1	Custom Other	1.1	Burner replacement on rotary dryer	0.0	0	339,670	0.0	0	0	N/A	N/A	0.0	0.37	0	0	0
M00961	3018-6318-1	Custom Other	1.1	Process Steam Boiler replacement	0.0	0	417,872	N/A	N/A	301,120	N/A	N/A	0.7	N/A	N/A	N/A	N/A
M49367	3018-7946-1	Custom Other	155.8	Replace reverberatory aluminum melting furnace with crucible furnace	0.0	0	3,000	0.0	0	31,597	N/A	N/A	10.5	N/A	N/A	N/A	N/A
M49386	3018-8846-1	Custom Other	155.8	Replace two burners on process heat boiler	0.0	0	10,394	0.0	0	0	N/A	N/A	0.0	0.93	0	0	0

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M49388	3018-9177-1	Custom Other	2.5	Replace reverberatory aluminum melting furnace with a stack-melt furnace	0.0	0	125,478	0.0	0	66,809	N/A	N/A	0.5	0.90	0	0	60,128
M49488	3431-50039-1	Custom Other	2.5	Install condensing boiler	0.0	0	154,228	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M49493	3431-50047-1	Custom Other	2.5	Replace heat exchanger	0.0	0	160,868	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M49886	3433-70000-1	Custom Other	1.1	Replace heat exchanger in fossil fuel reforming hydrogen process	0.0	0	623,805	0.0	0	955,185	N/A	N/A	1.5	0.67	0	0	639,974
M49887	3433-70001-1	Custom Other	1.1	Replace 2 Rotary Furnaces	0.0	0	701,352	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M49888	3433-70002-1	Custom Other	1.1	Pipe Insulation / Tank Insulation, new high efficiency condensing boiler	0.0	0	2,177,246	0.0	0	208,678	N/A	N/A	0.1	0.83	0	0	173,203
M49890	3433-70004-1	Custom Other	1.1	Add insulation to kiln exhaust ductwork	0.0	0	1,770,173	0.0	0	0	N/A	N/A	0.0	0.63	0	0	0
M49891	3433-70005-1	Custom Other	1.1	Replacement of afterburner with regenerative thermal oxidizer	0.0	0	502,976	0.0	0	132,278	N/A	N/A	0.3	N/A	N/A	N/A	N/A
M49896	3434-30005-1	Custom Other	27.0	Replace recuperative thermal oxider (RTO) with regenerative RTO	0.0	0	37,884	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M49897	3434-30006-1	Custom Other	2.5	Boiler replacement	0.0	0	132,203	0.0	0	0	N/A	N/A	0.0	0.65	0	0	0
M49914	3434-30026-1	Custom Other	2.5	Replace reverberatory aluminum melting furnace with a stack-melt furnace	0.0	0	125,478	0.0	0	79,276	N/A	N/A	0.6	1.00	0	0	79,276

Table 47: SDGE3025-Electric: Gross and Net Savings Results for Sampled Measures

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M01195	3232-1-1	Custom HVAC	85.3	Upgrade of three constant volume AHUs including converting to VAV, economizer controls and schedule controls.	2.2	27,379	0	19.0	39,267	0	8.67	1.43	N/A	0.57	11	22,382	0

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M01196	3197-1-3	Custom HVAC	85.3	High Efficiency Chiller - 300 ton	10.4	49,505	0	21.0	316,331	0	2.02	6.39	N/A	N/A	N/A	N/A	N/A
M01357	3216-1-1	Custom HVAC	3.0	1- 365 ton Chiller Replacement	115.2	548,371	0	-4.0	-15,144	0	-0.03	-0.03	N/A	0.74	-3	-11,207	0
M49153	3357-1-1	Custom HVAC	3.0	chiller replacement	159.1	740,000	0	38.6	157,394	8,145	0.24	0.21	N/A	0.10	4	15,739	814
M01313	3179-1-1	Custom Lighting	27.0	Photocell controll added to emergency Circuits and building management system controls added to an additional number of circuits.	85.0	472,096	0	116.6	752,971	0	1.37	1.59	N/A	0.83	97	624,966	0
M01314	3031-2-1	Custom Lighting	27.0	Halogen wattage reduction and halogen to metal halide fixture replacement	31.7	176,085	0	39.8	176,491	0	1.26	1.00	N/A	N/A	N/A	N/A	N/A
M49216	3475-1-1	Custom Lighting	27.0	Replace incandescant electronic message board with LED message board	32.6	180,851	0	30.3	189,619	N/A	0.93	1.05	N/A	0.10	3	18,962	N/A
M49261	3562-1-1	Custom Lighting	85.3	T12 to T8 fixture replacement and T8 lamps to more efficient T8 lamps plus thermostat replacements	16.5	90,293	0	9.5	18,617	N/A	0.58	0.21	N/A	0.33	3	6,144	N/A

Table 48: SDGE3025-Gas: Gross and Net Savings Results for Sampled Measures

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M01358	3034-1-1	Custom HVAC	5.5	Replacement of a 4,000 MBH hot water boiler with a 5,400 MBH boiler	0.0	0	11,635	N/A	N/A	1,038	N/A	N/A	0.1	0.32	N/A	N/A	332
M01359	3340-1-1	Custom Other	5.5	Laundry Ozone Washing	0.0	0	5,468	-0.1	-710	2,042	N/A	N/A	0.4	0.85	0	-604	1,736
M01360	3077-1-1	Custom Other	5.5	Aqueous pool cover & solar heating	0.0	0	24,169	0.0	0	0	N/A	N/A	0.0	0.25	0	0	0
M01369	3049-1-1	Custom Other	1.0	Thermal Cover for Pool	0.0	0	65,922	0.0	0	24,177	N/A	N/A	0.4	0.52	0	0	12,572

SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Ex Ante Gross Savings kW	Ex Ante Gross Savings kWh	Ex Ante Gross Savings Therms	Ex Post 1st Year Gross Savings kW	Ex Post 1st Year Gross Savings kWh	Ex Post 1st Year Gross Savings Therms	Gross Realization Rate kW	Gross Realization Rate kWh	Gross Realization Rate Therms	NTGR	Ex Post 1st Year Net Savings kW	Ex Post 1st Year Net Savings kWh	Ex Post 1st Year Net Savings Therms
M49205	3458-1-1	Custom Other	1.0	Install new boiler and heat exchanger	0.0	0	142,336	0.0	0	45,331	N/A	N/A	0.3	0.87	0	0	39,438
M49268	3570-3-1	Custom Other	5.5	Insulation of aggregate-drying drum	0.0	0	8,554	0.0	0	12,784	N/A	N/A	1.5	0.57	0	0	7,287

Table 49: SDGE3010-Electric: Gross and Net Savings Results for Sampled Measures

SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Ex Ante Gross Savings kW	Ex Ante Gross Savings kWh	Ex Ante Gross Savings Therms	Ex Post 1st Year Gross Savings kW	Ex Post 1st Year Gross Savings kWh	Ex Post 1st Year Gross Savings Therms	Gross Realization Rate kW	Gross Realization Rate kWh	Gross Realization Rate Therms	NTGR	Ex Post 1st Year Net Savings kW	Ex Post 1st Year Net Savings kWh	Ex Post 1st Year Net Savings Therms
M01157	3518-1767-1	Custom HVAC	14.0	CO Sensor System for lower level Parking Garage to control the ventilation system, which includes 4-40 hp motors and 2-60 hp motors	128.8	1,840,552	0	62.6	537,730	0	0.49	0.29	N/A	1.00	63	537,730	0
M01158	3518-1595-3	Custom HVAC	14.0	Convert 4 air handlers to from constant volume to variable volume with reduced air flows serving medical research facility.	215.8	652,068	0	182.7	1,312,020	0	0.85	2.01	N/A	0.82	150	1,075,856	0
M01180	3518-2059-1	Custom HVAC	1.0	CO sensors were added to 5 supply fans and 4 exhaust fans located in the parking garage of the One America Building.	378.9	5,412,785	0	172.8	1,464,461	0	0.46	0.27	N/A	1.00	173	1,464,461	0
M01181	3518-1431-1	Custom HVAC	1.0	CO Systems for Parking Garages	170.1	2,429,300	0	105.0	962,147	0	0.62	0.40	N/A	1.00	105	962,147	0
M48711	3518-2411-1	Custom HVAC	14.0	Retrofit with Turbocor chiller	53.0	756,922	0	87.0	739,412	0	1.64	0.98	N/A	0.57	50	421,465	0
M00965	3518-2305-1	Custom Lighting	264.0	MH to 6 lamp T8 fixture replacement	1.4	8,452	0	2.3	575	0	1.60	0.07	N/A	N/A	N/A	N/A	N/A
M01073	3518-1758-1	Custom Lighting	73.5	Replace HPS fixtures with 6-lamp T8 fixtures	49.2	289,430	0	30.9	220,339	0	0.63	0.76	N/A	N/A	N/A	N/A	N/A
M48676	3518-2287-1	Custom Lighting	264.0	Replace T12 with T8 lighting	15.2	89,177	0	13.2	39,702	0	0.87	0.45	N/A	0.87	11	34,541	0

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M49013	3518-2892-1	Custom Lighting	73.5	Exterior MH to T5 lighting retrofit	40.2	236,244	0	0.0	184,533	0	0.00	0.78	N/A	N/A	N/A	N/A	N/A

Table 50: SDGE3010-Gas: Gross and Net Savings Results for Sampled Measures

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M01182	3518-1520-102	Custom HVAC	1.8	Building F Zone Presence Sensor retrofit to reduce fume hood air flow when operator is not present	0.0	0	6,089	0.0	0	2,186	N/A	N/A	0.4	0.87	0	0	1,902
M01183	3518-1596-101	Custom HVAC	1.8	Upgrade of five constant volume AHUs to VAV and repair of chilled water valves	0.0	0	21,232	0.0	0	33,224	N/A	N/A	1.6	0.80	0	0	26,579
M01185	3518-1520-104	Custom HVAC	1.8	Reduction of minimun airflow in 36 lab fume hoods of building F	0.0	0	5,706	0.0	0	3,604	N/A	N/A	0.6	0.86	0	0	3,099
M01186	3518-1520-106	Custom HVAC	1.8	Re-comissioning of fume hood air flow controls in building F	0.0	0	6,928	0.0	0	412	N/A	N/A	0.1	0.87	0	0	358
M01191	3518-1595-103	Custom HVAC	1.8	Convert 4 air handlers to from constant volume to variable volume with reduced air flows serving medical research facility.	0.0	0	69,326	0.0	0	94,189	N/A	N/A	1.4	0.91	0	0	85,712
M01193	3518-1907-101	Custom HVAC	3.0	Fume hood flow reduction, lab controls	0.0	0	100,462	0.0	0	82,945	N/A	N/A	0.8	0.83	0	0	68,844
M48734	3518-2507-101	Custom HVAC	1.8	Lab Controls	0.0	0	35,188	0.0	0	34,071	N/A	N/A	1.0	N/A	N/A	N/A	N/A

F: Measure Level Results by Program (Gross Indirect)

This appendix provides a listing of important results for each of the indirect sampled measures. A separate table is presented for each program or program component where indirect measures were evaluated. The data is relevant to the Audit HIM. Information is provided in the table relevant to both the gross and net analyses performed for each sampled measure. The parameters summarized in the tables include the following:

Measure Identification – The SBW ID is a unique identifier that was assigned to a sampled measure within the SBW database. The IOU measure ID is the unique identifier assigned by the respective IOU to each measure. For confidentiality reasons, the names of the sites associated with each measure were not included in this appendix.

HIM – The high impact measure category associated with the sampled measure. All indirect measures were assigned to the Audit HIM.

Case Weight – The sampling weight calculated for each measure. This weight was used in the calculated of domain-level results.

Measure Description – A brief description of the sampled measure. Original measure descriptions came from the IOU tracking database. In many cases the measure name was modified by the evaluation team for clarification purposes.

Ex Ante Gross Savings – The first year gross savings (kW, kWh and therms) for each measure that was claimed by the IOU in their tracking database.

Ex Post 1st Year Gross Savings – The first year gross savings (kW, kWh and therms) for each measure that was computed by the evaluation team.

Gross Realization Rate – The ratio of first year ex post savings (kW, kWh and therms) to the respective first year ex ante savings.

NTGR – The net-to-gross ratio assigned by the evaluation team to each measure. The NTGR was computed by applying the NTG scoring algorithm to data collected in the NTG surveys.

Ex Post 1st Year Net Savings – The first year net savings for each measure, which was computed by multiplying the NTGR by the first year ex post gross savings.

Table 51: SCE2517 Indirect

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M33188	1130	Audit	5.3	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M33407	28287	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M33901	2250	Audit	5.3	NR Onsite very small , small audits	0.9	2,909	0	0.0	45	0	0.05	0.02	N/A	N/A	N/A	N/A	N/A
M34688	3269	Audit	5.3	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M35374	3955	Audit	5.3	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M35391	4289	Audit	3.4	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M35511	28463	Audit	5.3	NR Onsite medium audits	3.2	18,898	0	4.4	5,074	0	1.38	0.27	N/A	0.19	1	964	0
M35527	28479	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M35536	28488	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M35760	10140	Audit	4.2	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M36089	19063	Audit	3.4	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M36196	19172	Audit	4.2	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M37009	12627	Audit	4.2	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M37038	12659	Audit	4.2	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M37543	28190	Audit	4.2	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M37553	28200	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M37560	28207	Audit	3.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M37722	20006	Audit	4.2	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M37793	28644	Audit	3.4	NR Onsite large audits	3.2	18,898	0	17.8	155,549	0	5.56	8.23	N/A	0.68	12	106,292	0
M37808	28659	Audit	3.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M37844	28695	Audit	3.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M37918	28770	Audit	1.4	NR Onsite large audits	3.2	18,898	0	10.9	68,549	0	3.40	3.63	N/A	N/A	N/A	N/A	N/A
M38629	20953	Audit	5.3	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	0.83	0	0	0
M39149	21595	Audit	5.3	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M39401	21964	Audit	3.4	NR Onsite medium audits	3.2	18,898	0	24.0	75,056	0	7.50	3.97	N/A	N/A	N/A	N/A	N/A
M39488	22051	Audit	3.4	NR Onsite very small , small audits	0.9	2,909	0	0.7	355	0	0.78	0.12	N/A	0.33	0	118	0
M41109	25142	Audit	4.2	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M41338	26072	Audit	5.3	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M41586	28832	Audit	4.2	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M41736	29685	Audit	3.4	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M41738	29687	Audit	3.4	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M42147	42481	Audit	3.4	NR Onsite large audits	3.2	18,898	0	0.3	2,637	0	0.09	0.14	N/A	0.42	0	1,107	0
M42391	32765	Audit	4.2	NR Onsite very small , small audits	0.9	2,909	0	0.0	182	0	0.05	0.06	N/A	0.55	0	100	0
M42418	32792	Audit	4.2	NR Onsite medium audits	3.2	18,898	0	0.0	695	0	0.00	0.04	N/A	N/A	N/A	N/A	N/A
M42436	33813	Audit	3.4	NR Onsite very small , small audits	0.9	2,909	0	0.0	0	0	0.00	0.00	N/A	0.47	0	0	0
M42498	33877	Audit	3.4	NR Onsite medium audits	3.2	18,898	0	0.2	1,825	0	0.06	0.10	N/A	0.90	0	1,642	0
M43353	43087	Audit	1.4	NR Onsite large audits	3.2	18,898	0	30.1	263,077	0	9.41	13.92	N/A	0.76	23	199,939	0
M43599	41513	Audit	3.4	NR Onsite very small , small audits	0.9	2,909	0	0.3	2,868	0	0.36	0.99	N/A	N/A	N/A	N/A	N/A
M43854	42816	Audit	3.4	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M44033	43151	Audit	3.4	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M47046	49951	Audit	3.4	NR Onsite medium audits	3.2	18,898	0	0.1	596	0	0.02	0.03	N/A	N/A	N/A	N/A	N/A
M47201	50316	Audit	4.2	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M47213	50328	Audit	3.4	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M47220	50335	Audit	4.2	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M47384	50508	Audit	5.3	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48002	51585	Audit	4.2	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48020	51604	Audit	3.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48054	51673	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48102	51721	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48103	51722	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48151	51770	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48152	51771	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48153	51772	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48156	51800	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48157	51801	Audit	1.4	NR Onsite large audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48238	51157	Audit	1.4	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M48335	51284	Audit	1.4	NR Onsite medium audits	3.2	18,898	0	0.0	0	0	0.00	0.00	N/A	N/A	N/A	N/A	N/A
M48395	51344	Audit	4.2	NR Onsite medium audits	3.2	18,898	0	1.6	5,530	0	0.51	0.29	N/A	0.65	1	3,594	0

Table 52: SCG3503 Indirect

					Ex Ante Gross Savings			Ex Post 1st Year Gross Savings			Gross Realization Rate			NTGR	Ex Post 1st Year Net Savings		
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	kW	kWh	Therms	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms
M49989	3513-9-1	Audit	1.4	Shut off and lock out space heating system for 8 m	0.0	0	110,074	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M49992	3513-50-1	Audit	1.4	Practice - Boiler Maintenance & Combustion Contro	0.0	0	18,892	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M49994	3513-7-1	Audit	1.0	Replace non operational, leaky damper and institut	0.0	0	1,161,913	0.0	0	117,675	N/A	N/A	0.1	N/A	N/A	N/A	N/A
M49995	3513-21-1	Audit	1.0	Monitor Reheat Furnace performance with PHAST Tool	0.0	0	338,087	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M49998	3513-13-1	Audit	1.4	Site Visit, Workshop with Infrared Gun	0.0	0	40,924	0.0	0	47,619	N/A	N/A	1.2	1.00	0	0	47,619
M50002	3513-33-1	Audit	1.0	Practice - Maintenace (Repair Seals on Dryer Doors	0.0	0	457,939	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M50003	3513-31-1	Audit	1.4	Practice - Reduce Openings door for burner	0.0	0	16,000	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M50005	3513-18-1	Audit	1.0	Evaluate GTG HRSG performance and confirmation of	0.0	0	3,000,000	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M50009	3513-10-1	Audit	1.4	Replaced recuperative thermal oxidizer with a rege	0.0	0	50,000	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M50010	3513-20-1	Audit	1.4	Replaced recuperative thermal oxidizer with a rege	0.0	0	90,000	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M50013	3513-11-1	Audit	1.4	Increase loading to full fire on 2 primary boilers	0.0	0	100,000	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A
M50018	3513-24-1	Audit	1.4	Measure - Back Pressure Steam Turbine	0.0	0	188,600	0.0	0	0	N/A	N/A	0.0	N/A	N/A	N/A	N/A

G: Measure Level Results by Program (Net Direct)

Table 53: SCE2517 SPC NTGR Scoring Components and Final Score for Sampled Measures

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M00419	2007-301	N/A	336.5	Lighting - Indoor System Replacement Fluorescent	8.0	3.5	10.0	0.72	N/A	N/A	N/A	N	N	0.72
M00452	2006-715	N/A	336.5	Lighting - Indoor System Replacement Fluorescent	8.0	6.0	8.3	0.74	N/A	N/A	N/A	N	N	0.74
M00459	2006-290	N/A	336.5	Refrigeration	10.0	5.0	7.7	0.76	N/A	N/A	N/A	N	N	0.76
M00470	2006-405	N/A	152.0	Lighting - Indoor System Modification Fluorescent	9.0	6.0	0.0	0.30	N/A	N/A	N/A	N	N	0.30
M00490	2006-535	N/A	152.0	Turbocor Compressor (HVAC)	8.0	3.5	3.0	0.48	N/A	N/A	N/A	N	N	0.48
M00502	2006-520	N/A	152.0	Chiller VSD	10.0	8.0	4.3	0.74	N/A	N/A	N/A	N	N	0.74
M00527	2007-67	N/A	152.0	Lighting - Indoor System Replacement Fluorescent	8.0	8.0	10.0	0.87	N/A	N/A	N/A	N	N	0.87
M00535	2006-281	N/A	152.0	75-200 Ton Chiller	10.0	3.0	7.7	0.69	N/A	N/A	N/A	N	N	0.69
M00543	2006-76	N/A	152.0	Occupancy Sensors	8.0	4.0	6.6	0.62	N/A	N/A	N/A	N	N	0.62
M00557	2007-463	N/A	152.0	Lighting - Indoor System Replacement Fluorescent	8.0	5.0	7.7	0.69	N/A	N/A	N/A	N	N	0.69
M00629	2006-622	N/A	89.5	Lighting - Indoor System Replacement Fluorescent	10.0	5.0	10.0	0.83	N/A	N/A	N/A	N	N	0.83
M00645	2007-274	N/A	89.5	Lighting - Indoor System Replacement Fluorescent	10.0	5.0	5.0	0.67	N/A	N/A	N/A	N	N	0.67
M00646	2006-742	N/A	89.5	Lighting - Indoor System Replacement Fluorescent	8.0	5.0	3.2	0.54	N/A	N/A	N/A	N	N	0.54
M00661	2006-764	N/A	89.5	Motors Project (Process)	6.0	2.0	0.0	0.10	N/A	N/A	N/A	N	N	0.10
M00690	2007-978	N/A	38.0	Equipment	10.0	3.0	0.0	0.15	N/A	N/A	N/A	N	N	0.15
M00698	2007-127	N/A	38.0	Lighting - Indoor System Modification Fluorescent	7.0	6.0	5.7	0.62	N/A	N/A	N/A	N	N	0.62
M00707	2006-301	N/A	38.0	Variable Speed Drives	8.0	4.0	7.2	0.64	N/A	N/A	N/A	N	N	0.64

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M00719	2006-689	N/A	1.4	Equipment	6.0	7.0	7.7	0.69	6.0	7.0	7.7	Y	N	0.69
M00721	2006-29	N/A	1.4	Injection Molding Machine Replacement	10.0	3.0	10.0	0.77	10.0	9.0	10.0	Y	Y	0.97
M24354	2007-219	N/A	336.5	SA - Equipment New Load	10.0	4.0	0.0	0.20	N/A	N/A	N/A	N	N	0.20
M24434	2007-485	N/A	1.4	Equipment	9.0	7.0	10.0	0.87	9.0	7.0	10.0	Y	N	0.87
M24440	2007-537	N/A	89.5	Injection Molding Machine Replacement	10.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M24442	2007-540	N/A	89.5	Adjustable Speed Drive	9.0	5.0	10.0	0.80	N/A	N/A	N/A	N	N	0.80
M24499	2007-751	N/A	38.0	Pumping Systems	10.0	5.0	8.0	0.77	N/A	N/A	N/A	N	N	0.77
M24554	2007-931	N/A	152.0	Chiller Water Controls	6.0	1.0	1.0	0.27	N/A	N/A	N/A	N	N	0.27
M24566	2007-958	N/A	38.0	Refrigeration	8.0	1.5	0.0	0.08	8.0	1.5	0.0	Y	N	0.08
M24584	2007-1031	N/A	38.0	Injection Molding Machine Replacement	5.0	3.0	0.0	0.15	N/A	N/A	N/A	N	N	0.15
M24775	2008-524	N/A	152.0	EMS (Space Conditioning)	10.0	8.0	10.0	0.93	N/A	N/A	N/A	N	N	0.93
M25005	2007-931	N/A	336.5	Chiller Water Controls	6.0	1.0	1.0	0.27	N/A	N/A	N/A	N	N	0.27
M25047	2007-785	N/A	152.0	Lighting - Indoor System Replacement Fluorescent	10.0	7.0	10.0	0.90	N/A	N/A	N/A	N	N	0.90
M25093	2008-22	N/A	336.5	Lighting - Indoor System Modification Fluorescent	10.0	10.0	0.0	0.50	N/A	N/A	N/A	N	N	0.50
M25108	2007-865	N/A	152.0	Lighting - Indoor System Replacement Fluorescent	9.0	4.0	9.2	0.74	N/A	N/A	N/A	N	N	0.74
M25226	2007-260	N/A	89.5	Lighting - Indoor System Modification Fluorescent	10.0	10.0	4.9	0.83	N/A	N/A	N/A	N	N	0.83
M25509	2006-686	N/A	336.5	Controls	10.0	4.5	0.0	0.23	N/A	N/A	N/A	N	N	0.23
M25098	2007-703	Custom HVAC	152.0	Replace two 265 ton chillers with new VSD chillers	10.0	10.0	0.0	0.50	N/A	N/A	N/A	N	N	0.50
M00437	2006-837	Custom Lighting	336.5	T12 to T8 fixture replacement with controls	10.0	5.0	10.0	0.83	N/A	N/A	N/A	N	N	0.83
M00516	2007-91	Custom Lighting	152.0	MH to T5 fixture replacement	10.0	2.0	10.0	0.73	N/A	N/A	N/A	N	N	0.73

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M00649	2006-113	Custom Lighting	89.5	T12 and HID to T8 fixture replacement and exit signs	10.0	6.0	10.0	0.87	N/A	N/A	N/A	N	N	0.87
M24773	2008-523	Custom Lighting	89.5	MH to T8 fixture replacement	10.0	5.0	1.0	0.53	N/A	N/A	N/A	N	N	0.53
M00471	2006-618	Custom Other	152.0	Add VSDs to pumps at new pumping station	8.0	7.0	7.2	0.74	N/A	N/A	N/A	N	N	0.74
M00716	2006-804	Custom Other	1.4	Replacement of pump motors and mag-drives with new motors and VFDs	10.0	4.0	2.0	0.53	5.0	4.0	2.0	Y	Y	0.37
M00718	2007-44	Custom Other	1.4	Gas oil pump impeller destaging	9.0	4.0	0.0	0.20	N/A	N/A	N/A	N	N	0.20
M00720	2006-467	Custom Other	1.4	Optimization control system installation	10.0	9.0	10.0	0.97	10.0	9.0	10.0	Y	N	0.97
M00722	2006-794	Custom Other	1.4	Replacement of cement plant raw grind mill	7.5	7.0	10.0	0.82	7.5	7.0	8.0	Y	Y	0.75
M25150	2007-643	Custom Other	1.4	Replace multiple 1-stage ball mills with 2-stage ball mill at cement plant	7.5	6.0	10.0	0.78	7.5	6.0	8.0	Y	Y	0.72
M25175	2007-652	Custom Other	1.4	Variable speed drives on mechanical vapor recompression units	7.0	6.0	10.0	0.77	N/A	N/A	N/A	N	N	0.77
M25368	2006-850	Custom Other	1.4	Adjustable speed drive on large kiln exhaust fan	10.0	9.0	8.9	0.93	10.0	9.0	8.9	Y	N	0.93

Table 54: SCG3513 NTGR Scoring Components and Final Score for Sampled Measures

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M00723	3018-8678-1	N/A	155.8	Commercial Double Rack Oven	10.0	10.0	0.0	0.50	N/A	N/A	N/A	N	N	0.50
M00727	3018-8863-1	N/A	155.8	Commercial Double Rack Oven	10.0	1.0	3.0	0.47	N/A	N/A	N/A	N	N	0.47
M00728	3018-5619-1	N/A	155.8	Commercial Convection Oven	5.0	3.0	1.0	0.30	N/A	N/A	N/A	N	N	0.30
M00731	3018-8307-1	N/A	155.8	Commercial Combination Oven	0.0	0.0	0.0	0.00	N/A	N/A	N/A	N	N	0.00
M00735	3018-8040-1	N/A	155.8	Commercial Fryer	0.0	0.0	0.0	0.00	N/A	N/A	N/A	N	N	0.00
M00736	3018-7727-2	N/A	155.8	Equip. Modernization	6.0	6.0	4.0	0.53	N/A	N/A	N/A	N	N	0.53
M00740	3018-5681-2	N/A	155.8	Furnace Replacement	10.0	10.0	7.7	0.92	N/A	N/A	N/A	N	N	0.92
M00743	3018-8967-1	N/A	155.8	Commercial Fryer	10.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M00744	3018-8780-1	N/A	155.8	Commercial Convection Oven	5.0	2.5	0.0	0.13	N/A	N/A	N/A	N	N	0.13
M00748	3018-5838-1	N/A	155.8	Equip. Modernization	8.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M00749	3018-9034-1	N/A	155.8	Commercial Fryer	9.0	3.5	1.0	0.45	N/A	N/A	N/A	N	N	0.45
M00750	3018-8743-2	N/A	155.8	Commercial Pressurless Steamer	10.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M00921	3018-5810-1	N/A	27.0	Heat Recovery	10.0	10.0	6.6	0.89	N/A	N/A	N/A	N	N	0.89
M00923	3018-5558-1	N/A	27.0	Furnace Replacement	10.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M00924	3018-6188-1	N/A	27.0	Misc. Process Equip. Replacement	10.0	5.0	10.0	0.83	N/A	N/A	N/A	N	N	0.83

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M00925	3018-8119-1	N/A	27.0	Heat Recovery	7.0	3.0	10.0	0.67	N/A	N/A	N/A	N	N	0.67
M00954	3018-5716-1	N/A	2.5	Equip. Modernization	4.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M00955	3018-7232-1	N/A	2.5	Heat Recovery	10.0	5.0	10.0	0.83	N/A	N/A	N/A	N	N	0.83
M49466	3431-50016-1	N/A	27.0	N/A	10.0	4.0	1.4	0.51	N/A	N/A	N/A	N	N	0.51
M49509	3432-10015-1	N/A	155.8	N/A	5.0	2.0	0.0	0.10	N/A	N/A	N/A	N	N	0.10
M49903	3434-30014-1	N/A	155.8	Broiler-Conveyor	10.0	8.0	0.0	0.40	N/A	N/A	N/A	N	N	0.40
M00724	3018-5887-1	Custom Other	155.8	Steam boiler retube	8.0	2.0	10.0	0.67	N/A	N/A	N/A	N	N	0.67
M00726	3018-5953-1	Custom Other	155.8	Oil still burner replacement	7.0	3.0	1.0	0.37	N/A	N/A	N/A	N	N	0.37
M00919	3018-8322-1	Custom Other	27.0	Steam kettles replaced with steam-to-water heat exchanger	10.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M00953	3018-6335-1	Custom Other	2.5	Boiler rebuild	10.0	5.0	1.0	0.53	N/A	N/A	N/A	N	N	0.53
M00959	3018-5565-1	Custom Other	1.1	Burner replacement on rotary dryer	7.0	2.0	2.0	0.37	N/A	N/A	N/A	N	N	0.37
M49386	3018-8846-1	Custom Other	155.8	Replace two burners on process heat boiler	10.0	8.0	10.0	0.93	N/A	N/A	N/A	N	N	0.93
M49388	3018-9177-1	Custom Other	2.5	Replace reverberatory aluminum melting furnace with a stack-melt furnace	10.0	8.0	8.9	0.90	N/A	N/A	N/A	N	N	0.90
M49886	3433-70000-1	Custom Other	1.1	Replace heat exchanger in fossil fuel reforming hydrogen process	9.0	5.0	6.0	0.67	N/A	N/A	N/A	N	N	0.67
M49888	3433-70002-1	Custom Other	1.1	Pipe Insulation / Tank Insulation, new high efficiency condensing boiler	10.0	5.0	10.0	0.83	10.0	5.0	10.0	Y	N	0.83

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M49890	3433-70004-1	Custom Other	1.1	Add insulation to kiln exhaust ductwork	8.0	5.0	10.0	0.77	8.0	5.0	6.0	Y	Y	0.63
M49897	3434-30006-1	Custom Other	2.5	Boiler replacement	10.0	5.0	4.6	0.65	N/A	N/A	N/A	N	N	0.65
M49914	3434-30026-1	Custom Other	2.5	Replace reverberatory aluminum melting furnace with a stack-melt furnace	10.0	10.0	10.0	1.00	N/A	N/A	N/A	N	N	1.00

Table 55: SDGE3025-Gas NTGR Scoring Components and Final Score for Sampled Measures

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M01362	3270-1-1	N/A	5.5	Pool Cover	5.0	2.5	2.4	0.33	N/A	N/A	N/A	N	N	0.33
M49100	3073-1-1	N/A	5.5	Replace Space heating boiler	10.0	5.0	6.4	0.71	N/A	N/A	N/A	N	N	0.71
M49258	3558-1-1	N/A	5.5	Dryer upgrade	6.0	4.0	0.0	0.20	N/A	N/A	N/A	N	N	0.20
M49270	3572-1-1	N/A	5.5	Boiler	10.0	6.0	0.0	0.30	N/A	N/A	N/A	N	N	0.30
M01358	3034-1-1	Custom HVAC	5.5	Replacement of a 4,000 MBH hot water boiler with a 5,400 MBH boiler	8.0	0.5	1.0	0.32	N/A	N/A	N/A	N	N	0.32
M01359	3340-1-1	Custom Other	5.5	Laundry Ozone Washing	10.0	8.0	7.4	0.85	N/A	N/A	N/A	N	N	0.85
M01360	3077-1-1	Custom Other	5.5	Aqueous pool cover & solar heating	10.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M01369	3049-1-1	Custom Other	1.0	Thermal Cover for Pool	7.0	3.0	5.7	0.52	N/A	N/A	N/A	N	N	0.52
M49205	3458-1-1	Custom Other	1.0	Install new boiler and heat exchanger	9.0	7.0	10.0	0.87	N/A	N/A	N/A	N	N	0.87

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M49268	3570-3-1	Custom Other	5.5	Insulation of aggregate-drying drum	10.0	4.0	3.0	0.57	N/A	N/A	N/A	N	N	0.57

Table 56: SDGE3025-Electric NTGR ScoringComponents and Final Score for Sampled Measures

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M01197	3207-1-1	N/A	85.3	Lighting Upgrade	9.0	5.0	5.0	0.63	N/A	N/A	N/A	N	N	0.63
M01198	3198-3-1	N/A	85.3	Wireless EMS	8.0	6.0	0.0	0.30	N/A	N/A	N/A	N	N	0.30
M01200	3374-7-1	N/A	85.3	GTO	7.0	4.0	4.0	0.50	N/A	N/A	N/A	N	N	0.50
M01202	3183-1-1	N/A	85.3	Steam Line Replacement	7.0	5.0	4.0	0.53	N/A	N/A	N/A	N	N	0.53
M01205	3374-16-1	N/A	85.3	GTO	7.0	5.0	4.9	0.56	N/A	N/A	N/A	N	N	0.56
M01208	3023-1-1	N/A	85.3	230 ton Chiller replacement	9.0	5.0	5.7	0.66	N/A	N/A	N/A	N	N	0.66
M01213	3295-1-1	N/A	85.3	Water source heat pump replacement	4.0	2.0	0.0	0.10	N/A	N/A	N/A	N	N	0.10
M01315	3197-1-2	N/A	27.0	High Efficiency Packaged A/C or Chiller 600 Tons	6.0	4.0	5.2	0.51	N/A	N/A	N/A	N	N	0.51
M01318	3078-1-1	N/A	27.0	Injection Molder Replacement	8.0	5.0	3.0	0.53	N/A	N/A	N/A	N	N	0.53
M01320	3069-1-1	N/A	27.0	DDC Controls system	10.0	8.0	7.2	0.84	N/A	N/A	N/A	N	N	0.84
M01321	3196-1-2	N/A	27.0	Package AC Fan VSDs	10.0	5.0	7.4	0.75	N/A	N/A	N/A	N	N	0.75
M01322	3055-1-1	N/A	27.0	Replace pumps add VFDs	5.0	1.0	10.0	0.53	N/A	N/A	N/A	N	N	0.53
M01323	3024-1-1	N/A	27.0	Chiller Replacement	10.0	8.0	9.4	0.91	N/A	N/A	N/A	N	N	0.91
M01325	3080-1-1	N/A	27.0	Injection Molder replacement	8.0	5.0	3.0	0.53	N/A	N/A	N/A	N	N	0.53
M01326	3197-1-1	N/A	27.0	High Efficiency Packaged A/C or Chiller 600 Tons	5.0	4.0	5.2	0.47	N/A	N/A	N/A	N	N	0.47

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M49151	3356-1-1	N/A	85.3	Lighting Retrofit	9.0	6.0	4.0	0.63	N/A	N/A	N/A	N	N	0.63
M49173	3381-1-1	N/A	3.0	Economizer	10.0	4.5	0.0	0.23	N/A	N/A	N/A	N	N	0.23
M49188	3411-1-1	N/A	85.3	Booster Pump Replacement	10.0	7.0	7.2	0.81	N/A	N/A	N/A	N	N	0.81
M49202	3453-1-1	N/A	27.0	Lighting Retrofit	10.0	7.0	10.0	0.90	N/A	N/A	N/A	N	N	0.90
M49222	3483-1-1	N/A	3.0	Chiller	6.0	4.0	0.0	0.20	N/A	N/A	N/A	N	N	0.20
M49299	3612-1-1	N/A	85.3	VSD	8.0	3.5	10.0	0.72	N/A	N/A	N/A	N	N	0.72
M01195	3232-1-1	Custom HVAC	85.3	Upgrade of three constant volume AHUs including converting to VAV, economizer controls and schedule controls.	5.0	2.0	10.0	0.57	N/A	N/A	N/A	N	N	0.57
M01357	3216-1-1	Custom HVAC	3.0	1- 365 ton Chiller Replacement	10.0	8.0	4.3	0.74	N/A	N/A	N/A	N	N	0.74
M49153	3357-1-1	Custom HVAC	3.0	chiller replacement	10.0	2.0	0.0	0.10	N/A	N/A	N/A	N	N	0.10
M01313	3179-1-1	Custom Lighting	27.0	Photocell controll added to emergency Circuits and building management system controls added to an additional number of circuits.	10.0	5.0	10.0	0.83	N/A	N/A	N/A	N	N	0.83
M49216	3475-1-1	Custom Lighting	27.0	Replace incandescant electronic message board with LED message board	2.0	2.0	0.0	0.10	N/A	N/A	N/A	N	N	0.10
M49261	3562-1-1	Custom Lighting	85.3	T12 to T8 fixture replacement and T8 lamps to more efficient T8 lamps plus thermostat replacements	7.0	1.0	2.0	0.33	N/A	N/A	N/A	N	N	0.33

Table 57: SDGE3010-Gas NTGR Scoring Components and Final Score for Sampled Measures

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M01194	3518-1018-1	N/A	3.0	Stills Overhead Vapor Cross Feed Heat Exchangers	8.0	8.0	10.0	0.87	8.0	8.0	7.0	Y	Y	0.77
M01182	3518-1520-102	Custom HVAC	1.8	Building F Zone Presence Sensor retrofit to reduce fume hood air flow when operator is not present	9.0	7.0	10.0	0.87	N/A	N/A	N/A	N	N	0.87
M01183	3518-1596-101	Custom HVAC	1.8	Upgrade of five constant volume AHUs to VAV and repair of chilled water valves	8.0	6.0	10.0	0.80	N/A	N/A	N/A	N	N	0.80
M01185	3518-1520-104	Custom HVAC	1.8	Reduction of minimun airflow in 36 lab fume hoods of building F	10.0	7.0	8.9	0.86	N/A	N/A	N/A	N	N	0.86
M01186	3518-1520-106	Custom HVAC	1.8	Re-comissioning of fume hood air flow controls in building F	9.0	7.0	10.0	0.87	N/A	N/A	N/A	N	N	0.87
M01191	3518-1595-103	Custom HVAC	1.8	Convert 4 air handlers to from constant volume to variable volume with reduced air flows serving medical research facility.	10.0	8.0	9.2	0.91	N/A	N/A	N/A	N	N	0.91
M01193	3518-1907-101	Custom HVAC	3.0	Fume hood flow reduction, lab controls	10.0	5.0	10.0	0.83	N/A	N/A	N/A	N	N	0.83
M48955	3518-2787-1	Custom HVAC	3.0	Boiler Replacement	10.0	5.0	3.2	0.61	N/A	N/A	N/A	N	N	0.61

Table 58: SDGE3010-Electric NTGR Scoring Components and Final Score for Sampled Measures

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M00969	3518-2172-1	N/A	264.0	6 Lamp T8 High Output	10.0	4.0	0.0	0.20	N/A	N/A	N/A	N	N	0.20
M00971	3518-1055-15	N/A	264.0	250W HID w/Electronic Dim Ballast	10.0	5.0	8.9	0.80	N/A	N/A	N/A	N	N	0.80
M01075	3518-2071-1	N/A	73.5	6 Lamp T8 High Output	10.0	2.5	4.9	0.58	N/A	N/A	N/A	N	N	0.58
M01076	3518-1796-1	N/A	73.5	Refrigeration Controllers	10.0	10.0	4.0	0.80	N/A	N/A	N/A	N	N	0.80
M01080	3518-1826-1	N/A	73.5	Install Turbocor Compressors	7.0	0.0	0.0	0.00	N/A	N/A	N/A	N	N	0.00
M01159	3518-1794-1	N/A	14.0	Central Plant, air handlers, EMS, Hartman LOOP & T	7.0	5.0	2.0	0.47	7.0	5.0	2.0	Y	N	0.47
M01161	3518-2145-1	N/A	14.0	CO System	10.0	6.0	10.0	0.87	N/A	N/A	N/A	N	N	0.87
M01163	3518-1907-1	N/A	14.0	Lab Controls	10.0	5.0	4.3	0.64	8.0	5.0	5.8	Y	Y	0.63
M01164	3518-1947-1	N/A	14.0	Electric Furnace Replacement	8.0	6.0	6.0	0.67	N/A	N/A	N/A	N	N	0.67
M01166	3518-1806-1	N/A	14.0	Electric Furnace Replacement	7.0	7.0	6.0	0.67	N/A	N/A	N/A	N	N	0.67
M01168	3518-1757-1	N/A	14.0	2L 59W T8 Fixtures	8.0	8.0	10.0	0.87	N/A	N/A	N/A	N	N	0.87
M48485	3518-1031-1	N/A	73.5	Daylight/Daylight Controls	10.0	5.0	4.0	0.63	N/A	N/A	N/A	N	N	0.63
M48536	3518-1828-1	N/A	264.0	Connect Health Services Plant to Psychiatric Hospi	10.0	5.0	10.0	0.83	N/A	N/A	N/A	N	N	0.83
M48614	3518-2007-1	N/A	14.0	CO System	10.0	5.0	2.4	0.58	N/A	N/A	N/A	N	N	0.58
M48673	3518-2285-1	N/A	264.0	4 FT 2L 32 W T8	8.0	5.0	10.0	0.77	N/A	N/A	N/A	N	N	0.77

					Decision Maker Survey(s)				Adjusted or Concensus					
M48682	3518-2288-3	N/A	264.0	4FT 2L 32W T8	8.0	5.0	10.0	0.77	N/A	N/A	N/A	N	N	0.77
M48837	3518-2649-1	N/A	14.0	4 Lamp T5 High Bay Fixture w/ Occupancy Sensors	10.0	10.0	7.2	0.91	N/A	N/A	N/A	N	N	0.91
M48838	3518-2650-1	N/A	14.0	Convert air cooled screw plant to water cooled tur	8.0	6.0	6.6	0.69	8.0	6.0	6.6	Y	N	0.69
M48846	3518-2662-10	N/A	14.0	F32 T8 w/sensor	10.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M48852	3518-2662-6	N/A	264.0	F32 T8 RLRB	10.0	5.0	8.6	0.79	N/A	N/A	N/A	N	N	0.79
M48893	3518-2704-1	N/A	73.5	CO System	9.0	3.5	0.0	0.18	N/A	N/A	N/A	N	N	0.18
M48908	3518-2721-1	N/A	73.5	CO System	10.0	8.0	4.3	0.74	N/A	N/A	N/A	N	N	0.74
M48953	3518-2782-1	N/A	264.0	4 Lamp T5 High Bay Fixture w/ Occupancy Sensor	10.0	7.0	0.0	0.35	N/A	N/A	N/A	N	N	0.35
M48956	3518-2787-2	N/A	14.0	Lighting Retrofit	10.0	5.0	1.4	0.55	N/A	N/A	N/A	N	N	0.55
M49009	3518-2883-1	N/A	14.0	Major Lighting Retrofit (T8 Fluorescent Lamps)	9.0	3.0	3.0	0.50	N/A	N/A	N/A	N	N	0.50
M49017	3518-2922-1	N/A	73.5	4 Lamp T5 High Output	10.0	5.0	5.2	0.67	N/A	N/A	N/A	N	N	0.67
M49024	3518-2971-1	N/A	73.5	400-TON SMARDT CHILLERS WITH (3) COMPRESSORS EACH	9.0	4.0	3.0	0.53	N/A	N/A	N/A	N	N	0.53
M01157	3518-1767-1	Custom HVAC	14.0	CO Sensor System for lower level Parking Garage to control the ventilation system, which includes 4-40 hp motors and 2-60 hp motors	10.0	9.0	10.0	0.97	10.0	9.0	10.0	Y	Y	1.00
M01158	3518-1595-3	Custom HVAC	14.0	Convert 4 air handlers to from constant volume to variable volume with reduced air flows serving medical research facility.	10.0	8.0	6.6	0.82	N/A	N/A	N/A	N	N	0.82
M01180	3518-2059-1	Custom HVAC	1.0	CO sensors were added to 5 supply fans and 4 exhaust fans located in the parking garage of the One America Building.	10.0	9.0	10.0	0.97	10.0	9.0	10.0	Y	Y	1.00
M01181	3518-1431-1	Custom HVAC	1.0	CO Systems for Parking Garages	10.0	9.0	10.0	0.97	10.0	9.0	10.0	Y	Y	1.00

					Decision Maker Survey(s)				Adjusted or Concensus					
M48711	3518-2411-1	Custom HVAC	14.0	Retrofit with Turbocor chiller	10.0	3.0	4.0	0.57	N/A	N/A	N/A	N	N	0.57
M48676	3518-2287-1	Custom Lighting	264.0	Replace T12 with T8 lighting	8.0	8.0	10.0	0.87	N/A	N/A	N/A	N	N	0.87

H: Measure Level Results by Program (Net Indirect)

Table 59: SCE2517-Audit NTGR Scoring Components and Final Score for Sampled Measures

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M35511	28463	Audit	5.3	NR Onsite medium audits	2.7	5.0	1.3	0.19	N/A	N/A	N/A	N	N	0.19
M35550	28502	Audit	1.4	NR Onsite large audits	10.0	6.0	10.0	0.87	N/A	N/A	N/A	N	N	0.87
M36933	19910	Audit	3.4	NR Onsite medium audits	6.0	4.0	10.0	0.67	N/A	N/A	N/A	N	N	0.67
M37373	15067	Audit	4.2	NR Onsite medium audits	5.0	4.7	6.2	0.53	N/A	N/A	N/A	N	N	0.53
M37793	28644	Audit	3.4	NR Onsite large audits	8.3	6.0	6.2	0.68	N/A	N/A	N/A	N	N	0.68
M37838	28689	Audit	4.2	NR Onsite large audits	10.0	7.0	8.3	0.84	N/A	N/A	N/A	N	N	0.84
M37957	11858	Audit	4.2	NR Onsite very small , small audits	6.7	6.7	6.5	0.66	N/A	N/A	N/A	N	N	0.66
M38083	13767	Audit	4.2	NR Onsite medium audits	9.0	8.0	5.0	0.73	N/A	N/A	N/A	N	N	0.73
M38629	20953	Audit	5.3	NR Onsite very small , small audits	10.0	5.0	10.0	0.83	N/A	N/A	N/A	N	N	0.83
M39488	22051	Audit	3.4	NR Onsite very small , small audits	4.7	3.7	2.5	0.33	N/A	N/A	N/A	N	N	0.33
M40122	26	Audit	3.4	NR Onsite very small , small audits	10.0	7.0	8.7	0.86	N/A	N/A	N/A	N	N	0.86
M40167	72	Audit	4.2	NR Onsite medium audits	10.0	N/A	0.0	0.00	N/A	N/A	N/A	N	N	0.00
M40209	114	Audit	5.3	NR Onsite very small , small audits	0.0	5.0	0.0	0.25	N/A	N/A	N/A	N	N	0.25
M40828	734	Audit	5.3	NR Onsite very small , small audits	8.0	5.0	7.9	0.70	N/A	N/A	N/A	N	N	0.70

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M41594	28840	Audit	3.4	NR Onsite medium audits	9.0	7.3	10.0	0.88	N/A	N/A	N/A	N	N	0.88
M41719	29668	Audit	4.2	NR Onsite medium audits	9.0	3.0	2.0	0.47	N/A	N/A	N/A	N	N	0.47
M42147	42481	Audit	3.4	NR Onsite large audits	5.0	3.5	5.7	0.42	N/A	N/A	N/A	N	N	0.42
M42321	32355	Audit	3.4	NR Onsite medium audits	10.0	9.0	9.1	0.94	N/A	N/A	N/A	N	N	0.94
M42391	32765	Audit	4.2	NR Onsite very small , small audits	5.0	5.0	6.6	0.55	N/A	N/A	N/A	N	N	0.55
M42436	33813	Audit	3.4	NR Onsite very small , small audits	2.0	2.0	10.0	0.47	N/A	N/A	N/A	N	N	0.47
M42498	33877	Audit	3.4	NR Onsite medium audits	10.0	7.0	10.0	0.90	N/A	N/A	N/A	N	N	0.90
M43353	43087	Audit	1.4	NR Onsite large audits	9.0	6.0	7.9	0.76	N/A	N/A	N/A	N	N	0.76
M43795	42714	Audit	4.2	NR Onsite medium audits	5.0	7.0	0.0	0.35	N/A	N/A	N/A	N	N	0.35
M45150	46660	Audit	4.2	NR Onsite large audits	8.0	10.0	1.4	0.57	N/A	N/A	N/A	N	N	0.57
M45241	46389	Audit	4.2	NR Onsite very small , small audits	3.0	3.0	0.0	0.15	N/A	N/A	N/A	N	N	0.15
M45503	46705	Audit	5.3	NR Onsite medium audits	4.0	5.0	8.7	0.36	N/A	N/A	N/A	N	N	0.36
M46362	48426	Audit	4.2	NR Onsite medium audits	5.0	7.0	3.0	0.50	N/A	N/A	N/A	N	N	0.50
M46783	49199	Audit	3.4	NR Onsite medium audits	8.0	N/A	3.2	0.56	N/A	N/A	N/A	N	N	0.56
M47239	50354	Audit	4.2	NR Onsite medium audits	4.3	2.7	2.5	0.30	N/A	N/A	N/A	N	N	0.30
M48395	51344	Audit	4.2	NR Onsite medium audits	7.0	6.0	6.6	0.65	N/A	N/A	N/A	N	N	0.65
M48429	51378	Audit	4.2	NR Onsite medium audits	8.0	5.0	5.0	0.60	N/A	N/A	N/A	N	N	0.60

Table 60: SCG3503 NTGR Scoring Components and Final Score or Sampled Measures

					Decision Maker Survey(s)				Adjusted or Concensus					
SBW ID	IOU Measure ID	HIM	Case Weight	Measure Description	Timing and Selection	Program Influence	No-Program	Standard Scoring NTGR	Timing and Selection	Program Influence	No-Program	Was Standard Very Large (Y/N)	Scoring Overridden by other information (Y/N)	Final NTGR
M49998	3513-13-1	Audit	1.4	Site Visit, Workshop with Infrared Gun	10.0	N/A	10.0	1.00	N/A	N/A	N/A	N	N	1.00

I: Summary of Dual Baseline Gross Savings Results (Direct and Indirect)

Table 61: SCE2517 SPC Gross Savings Results for Dual Replacement

				Ex Post Gross Savings Early Replacement			Gross Realization Rate Early Replacement			RUL (Yrs)	Ex Post Gross Savings Normal Replacement			Gross Realization Rate Normal Replacement		
SBW ID	IOU Measure ID	HIM	Measure Description	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms	kW	kWh	Therms
M00437	2006-837	Custom Lighting	T12 to T8 fixture replacement with controls	19.9	119,329	0	1.11	1.52	N/A	5	7.9	51,246	0	0.44	0.65	N/A
M00516	2007-91	Custom Lighting	MH to T5 fixture replacement	32.4	222,414	0	0.99	1.36	N/A	4	140.9	979,747	0	4.30	6.00	N/A
M00649	2006-113	Custom Lighting	T12 and HID to T8 fixture replacement and exit signs	92.2	688,242	0	1.06	0.97	N/A	5	78.0	540,407	0	0.89	0.76	N/A
M00665	2006-561	Custom Lighting	Replace MH fixtures with 6 lamp, T8 fixtures with electronic ballast.	109.1	658,048	0	1.02	0.70	N/A	4	141.8	855,860	0	1.32	0.91	N/A
M24332	2007-156	Custom Lighting	T8 lamps to more efficient T8 lamps and exterior HID to T5 fixture replacement and exit signs	3.5	51,120	0	0.36	1.38	N/A	8	3.5	60,080	0	0.36	1.63	N/A
M24773	2008-523	Custom Lighting	MH to T8 fixture replacement	119.2	495,241	0	0.73	0.81	N/A	9	64.1	265,807	0	0.39	0.43	N/A
M25314	2007-124	Custom Lighting	Lighting - Indoor System Replacement	335.0	1,869,680	0	0.95	0.60	N/A	3	58.7	350,613	0	0.17	0.11	N/A

Table 62: SCE2517 Audit Gross Savings Results for Dual Replacement

				Ex Post Gross Savings Early Replacement			Gross Realization Rate Early Replacement			RUL (Yrs)	Ex Post Gross Savings Normal Replacement			Gross Realization Rate Normal Replacement		
SBW ID	IOU Measure ID	HIM	Measure Description	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms	kW	kWh	Therms
M37918	28770	Audit	NR Onsite large audits	10.9	68,549	0	3.40	3.63	N/A	4	0.0	0	0	0.00	0.00	N/A
M39401	21964	Audit	NR Onsite medium audits	24.0	75,056	0	7.50	3.97	N/A	5	-10.1	-31,454	0	-3.16	-1.66	N/A
M39488	22051	Audit	NR Onsite very small , small audits	0.7	355	0	0.78	0.12	N/A	6	0.5	563	0	0.56	0.19	N/A
M42147	42481	Audit	NR Onsite large audits	0.3	2,637	0	0.09	0.14	N/A	3	-4.7	-41,470	0	-1.48	-2.19	N/A
M42498	33877	Audit	NR Onsite medium audits	0.2	1,825	0	0.06	0.10	N/A	6	0.0	0	0	0.00	0.00	N/A
M43599	41513	Audit	NR Onsite very small , small audits	0.3	2,868	0	0.36	0.99	N/A	6	0.0	0	0	0.00	0.00	N/A
M47046	49951	Audit	NR Onsite medium audits	0.1	596	0	0.02	0.03	N/A	6	0.0	0	0	0.00	0.00	N/A
M48395	51344	Audit	NR Onsite medium audits	1.6	5,530	0	0.51	0.29	N/A	5	0.0	0	0	0.00	0.00	N/A

Table 63: SCG3513 Gross Savings Results for Dual Replacement

				Ex Post Gross Savings Early Replacement			Gross Realization Rate Early Replacement			RUL (Yrs)	Ex Post Gross Savings Normal Replacement			Gross Realization Rate Normal Replacement		
SBW ID	IOU Measure ID	HIM	Measure Description	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms	kW	kWh	Therms
M00724	3018-5887-1	Custom Other	Steam boiler retube	0.0	0	28,115	N/A	N/A	2.1	5	0.0	0	0	N/A	N/A	0.0
M00919	3018-8322-1	Custom Other	Steam kettles replaced with steam-to-water heat exchanger	0.0	0	27,505	N/A	N/A	0.8	2	0.0	0	0	N/A	N/A	0.0
M00953	3018-6335-1	Custom Other	Boiler rebuild	0.0	0	137,191	N/A	N/A	0.8	2	0.0	0	0	N/A	N/A	0.0
M00961	3018-6318-1	Custom Other	Process Steam Boiler replacement	N/A	N/A	301,120	N/A	N/A	0.7	2	N/A	N/A	27,757	N/A	N/A	0.1
M49367	3018-7946-1	Custom Other	Replace reverberatory aluminum melting furnace with crucible furnace	0.0	0	31,597	N/A	N/A	10.5	5	0.0	0	0	N/A	N/A	0.0
M49493	3431-50047-1	Custom Other	Replace heat exchanger	0.0	0	0	N/A	N/A	0.0	5	0.0	0	0	N/A	N/A	0.0
M49891	3433-70005-1	Custom Other	Replacement of afterburner with regenerative thermal oxidizer	0.0	0	132,278	N/A	N/A	0.3	2	0.0	0	8,793	N/A	N/A	0.0

Table 64: SDGE3025-Electric Gross Savings Results for Dual Replacement

				Ex Post Gross Savings Early Replacement			Gross Realization Rate Early Replacement			RUL (Yrs)	Ex Post Gross Savings Normal Replacement			Gross Realization Rate Normal Replacement		
SBW ID	IOU Measure ID	HIM	Measure Description	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms	kW	kWh	Therms
M01314	3031-2-1	Custom Lighting	Halogen wattage reduction and halogen to metal halide fixture replacement	39.8	176,491	0	1.26	1.00	N/A	1	0.0	0	0	0.00	0.00	N/A
M49216	3475-1-1	Custom Lighting	Replace incandescant electronic message board with LED message board	30.3	189,619	N/A	0.93	1.05	N/A	2	0.0	0	0	0.00	0.00	N/A
M49261	3562-1-1	Custom Lighting	T12 to T8 fixture replacement and T8 lamps to more efficient T8 lamps plus thermostat replacements	9.5	18,617	N/A	0.58	0.21	N/A	7	9.5	18,617	N/A	0.58	0.21	N/A

Table 65: SDGE3010-Electric Gross Savings Results for Dual Replacement

				Ex Post Gross Savings Early Replacement			Gross Realization Rate Early Replacement			RUL (Yrs)	Ex Post Gross Savings Normal Replacement			Gross Realization Rate Normal Replacement		
SBW ID	IOU Measure ID	HIM	Measure Description	kW	kWh	Therms	kW	kWh	Therms		kW	kWh	Therms	kW	kWh	Therms
M00965	3518-2305-1	Custom Lighting	MH to 6 lamp T8 fixture replacement	2.3	575	0	1.60	0.07	N/A	5	0.4	99	0	0.28	0.01	N/A
M01073	3518-1758-1	Custom Lighting	Replace HPS fixtures with 6-lamp T8 fixtures	30.9	220,339	0	0.63	0.76	N/A	2	3.9	28,103	0	0.08	0.10	N/A
M48676	3518-2287-1	Custom Lighting	Replace T12 with T8 lighting	13.2	39,702	0	0.87	0.45	N/A	5	0.0	0	0	0.00	0.00	N/A

J: Indirect Measure Evaluation Process

Two programs were evaluated that reported savings for indirect measures (measures installed by the customer without a rebate). They include the SCE2517 NRA program and the SCG3503 program. The SCE2517 NRA program performs audits for commercial and industrial customers. SCE and site personnel tour the customer’s facility and examine opportunities for energy savings. A report is sent to the customer itemizing the opportunities. In some cases the reports are specific in terms of quantities, e.g. number of lights to replace, and savings in kWh and dollars. The reports indicate the programs and incentives that would apply to each measure. For larger customers, the audits are part of a continuum of communication that involves regular discussions of energy savings.

The SCG3503 Education and Training program provides a variety of assistance to SCG commercial and industrial customers. The Industrial End-User component of the program provides assistance to SCG’s larger non-residential customers. The assistance may take the form of training, for example in the use of DOE steam or process heat tools, engineering assistance, and it can also be in the form of an energy audit. SCG’s “Energy Van” makes site visits and tours the facility in the company of site personnel. The Energy Van produces a report detailing opportunities for energy savings.

This impact evaluation identified qualifying indirect measures from both programs and performed an engineering assessment of gross and net energy savings. Section 2.2.2 above describes the methods used to design and select the gross sample for indirect measures from both programs. A two stage sample design was used. The first stage was a telephone interview sample. The interview determined whether the sampled audits resulted in any indirect savings. The interview survey instrument is provided in Appendix K. The telephone responses were scored and each sampled audit placed into one of two categories: no indirect savings and possible indirect savings. All those scored as possible indirect savings became the list from which the second stage sample was drawn.

The second stage selected a sample of audits which then received engineering review by the evaluation team. This included review of the audit documents and as appropriate, telephone follow-up with the customers who received the audits. In many cases, the engineering review determined that no indirect savings occurred as a result of the audit. However, in some cases the engineering review determined that the sampled audits contained measures with indirect savings, which were quantified via on-site data collection and ex post savings analysis. The process that was used to perform the first stage interview and the second stage engineering review is described in more detail below.

J.1. First Stage Interviews

SCE provided the evaluation team with a database listing the recommendations made at each SCE2517 NRA audit. This list was used as the basis for first-stage telephone interview to identify indirect savings. For each measure, audit recipients were asked whether they had implemented the recommendation, and, if so, whether or not they had received a rebate for the measure implementation. Customers were also asked when the measure was implemented, or if it was still in progress or in the planning stage.

SCG provided the evaluation team with a listing of indirect measures in the IOU tracking system. In addition, SCG provided the evaluation team with the site reports developed for each measure listed in the tracking database. These two sources were used by the phone interviewers when they contacted personnel at the sites to determine whether measures had been implemented with or without rebates.

The first stage phone interview identified customers who reported indirect measures. In addition, the first stage identified audit recipients who reported measure implementation, but were uncertain as to whether or not they had received a rebate. All audits with possible indirect measures formed the pool from which the second stage sampled was selected.

J.2. Second Stage Engineering Review

The second stage sample was selected and rank ordered. Audit reports were requested from SCE for sites selected to be part of the second stage of the process. The evaluation team also searched the IOU tracking database for rebates associated with each of these selected sites. This information was used to confirm that indirect measures identified by the customers did, in fact, not receive a rebate. The evaluation team recruited sites in rank order to participate in an engineering assessment of the energy savings from the indirect measures. In the recruitment process, the survey was repeated, with the benefit of additional information from the audit report. Verdicts from the first round of screening were confirmed, changed, or resolved at this stage. In many cases, sites which were originally thought to have indirect measures were found to have only direct measures because it was determined that, while the customer had not received a rebate, a contractor had. All of the CFL installations were determined to be direct measures because of the high likelihood that they received upstream rebates. In many cases repeating the survey to the same respondent revealed different information than the telephone interview. The first-round verdict was overturned only in cases where the site contact was considered to be knowledgeable about the audit recommendations and implementation. In cases of uncertainty, the site was dropped from the sample.

In cases where indirect measures were confirmed, the evaluation team attempted to recruit the site for a site visit and an engineering assessment of gross savings for the implemented indirect measures. In some cases the verdict was changed again on site because it was determined that the measure was not actually installed or that it had been installed prior to the audit.

In the recruitment process the evaluation team observed that the recommendations listed in the database did not always match the recommendations listed in the audit report. SCE reported that sometimes recommendations are made in ongoing communications with the customer, and entered into the database, but that the audit report was not always updated. Audit recipients were asked about all recommendations listed in either source.

J.3. Screening Results

J.3.1. SCE2517 NRA Program

The first stage sample selection completed 392 telephone surveys for the SCE2517 NRA program. Of these completed cases, the telephone interviewers found site contacts familiar enough with the audits and recommendations to complete 364 interviews. Of these complete interviews, 199 audits, or 55%, were identified as potentially having at least one indirect measure.

Audits were divided by SCE into three categories: Small/ very small, Medium, and Large. Phone screening put more emphasis on the larger audits. First-stage phone screening found direct, indirect, and no measures implemented as shown in the following table according to audit size. The audit size associated with the greatest frequency of measure implementation and indirect measures is the Large Audits category.

Table 66: SCE2517 Audit First Stage Phone Survey Results by Audit Size

Audit Size	Percent of Total Audit Population (15,442)	Percent of Phone Survey Sample (366)	Audits with Only Direct Measures	Audits with Indirect Measures	Audits with No Measures Implemented
Large audits	4%	17%	11%	64%	25%
Medium audits	41%	53%	6%	51%	43%
Small and very small audits	54%	31%	11%	55%	34%

The second stage screening contacted sites representing 58 audits. It was determined that 24 of these audits had indirect measures. Site visits were made to all of these cases. While on site, the evaluation team determined that ten of these audits did not actually result in the implementation of any indirect measures. The final disposition for the 58 audits contacted are shown in the table below. Of the audits investigated as possibly including indirect measures, seven were re-classified as direct because the implemented measures were CFLs.

Table 67: SCE2517 Audit: Engineering Review Survey Results from 58 Audits

Telephone Survey Audit Verdict	Engineering Review Verdict	Count
Indirect	Direct Measures Only	22
Indirect	At Least One Indirect Measure	9
Indirect	No Measures Implemented	5
Maybe Rebate	Direct Measures Only	13
Maybe Rebate	At Least One Indirect Measure	5
Maybe Rebate	No Measures Implemented	4

The sample of audits used in the evaluation included all audits reported in the 2006-08 database. Some of the sampled audits were performed as late as November, 2008. This evaluation considered indirect measures that were completed at the time of contact in September – November, 2009. Two sites indicated that non-rebated work was currently underway. A number of other sites indicated that work was in the planning stage. A number of customers reported that audit recommendations were followed up by utility-sponsored installation of lighting through direct install programs. A significant number of customers reported that the economic downturn had prevented them from following through with implementation. Large customers with ongoing energy efficiency programs reported that they were in the practice of working with the IOU to ensure that improvements were done through the incentive programs. The audit program makes every effort to direct customers into the incentive programs. Of the 364 original phone surveys completed, 82 audits (23%) reported implementing 162 direct measures with an incentive.

J.3.2. SCG3503 Program

This program reported savings associated with 34 audits or other interventions at 31 sites in its 2008 filing. First round phone screeners attempted to make contacts for all 34 cases, and were successful in 30 cases. Four of these contacts reported receiving rebates for all implemented recommendations, and five reported not implementing any of the recommendations. The 21 remaining cases which reported indirect measures formed the pool for the stratified random sample. Six of these audits were put in the excluded stratum. The evaluators then attempted to contact the remaining 15 audits and were successful in 12 cases. In three cases the evaluation team was not able to contact a knowledgeable respondent.

Since this program is not strictly an audit program, savings were claimed for utility involvement other than audit recommendations. The evaluation team based its decision as to whether a measure was an indirect measure on the basis that the utility involvement had to be instrumental in the measure implementation. If the measure would have been implemented in exactly the same way without any utility involvement, the measure did not qualify as an indirect measure.

In addition to speaking with personnel at the sites, the evaluation team contacted the Energy Van program manager for further information about utility interactions with the sites. Evaluation investigations led to the conclusion that 10 of the 12 cases did not have indirect measures. In eight cases the reason for this conclusion is that there was insufficient utility involvement in the measure implementation. The savings claim was based on an association with a measure implementation that was not causal on the part of SCG. In addition, two measures were found not to have been implemented. Evaluators made site visits to the remaining two sites and assessed the energy savings that resulted from the utility involvement

K: Telephone Interview Survey Instrument – Indirect Audits

Introduction Screener

	INTRODUCTION AND FINDING CORRECT RESPONDENT	
Q1	Hello, this is <INTERVIEWER NAME> calling from JJ Mitchell Analytics on behalf of the California Public Utilities Commission. This is not a sales call. May I please speak with ...PROGRAM_CONTACT...? [IF NEEDED]: my understanding is that ...PROGRAM_CONTACT... is responsible for making energy-related decisions for your firm at ...SERVICE_ADDRESS... – may I please speak with him/her?	
1	No, this person no longer works here	Q1B
2	No, this person is not available right now	Q1B
4	Yes	Q1C
77	No, Other reason (specify)	Q1B
88	Refused	Q1B
99	Don't know	Q1B

Q1B	[IF ...PROGRAM_CONTACT... WILL NOT EVER BE AVAILABLE] May I please speak with the person most knowledgeable about recent changes of cooling, lighting, or other energy-related equipment for your firm at …SERVICE_ADDRESS....	
	[IF NEEDED] We're calling to do a follow-up survey about your firm's participation in the 2006-2008 SCE Energy Efficiency Audit program. The purpose of the survey is to assess how well the Audit program met the needs of your company and to follow up on the recommendations that were made in the Audit Report.	
	[IF NEEDED] This is a very important fact-finding survey among firms that have recently participated in an energy efficiency program sponsored by SCE. We are NOT interested in selling anything, and responses will not be connected with your firm in any way. The purpose of the survey is to understand how businesses think about and manage their energy consumption.	
	[IF NEEDED] The California Public Utilities Commission is conducting this important study with the coooperation of SCE to better understand how businesses like yours think about and manage their energy consumption. Your input is very important to the Commission and to SCE.	

77	There is no one here with information on that address/wrong address	T&T
1	Address correct/Continue Q1B until you find appropriate contact person	Q1C

Q1C	[IF ...PROGRAM_CONTAC...T IS AVAILABLE] Hello ...PROGRAM_CONTACT..., this is <INTERVIEWER NAME> calling from JJ Mitchell Analytics on behalf of the California Public Utilities Commission. Our records show that you participated in the SCE 2006-2008 Energy Audit program, involving an On-Site Audit conducted by SCE for ...SERVICE_ADDRESS... on or about ...AUDIT_DATE.... Is this correct?	
	[IF NEEDED] We're calling to do a follow-up survey about your firm's participation in the 2006-2008 SCE Energy Audit program.	

	[IF NEEDED] This is a very important fact-finding survey among firms that have recently participated in an energy efficiency program sponsored by SCE. We are NOT interested in selling anything, and responses will not be connected with your firm in any way. The California Public Utilities Commission wants to understand how businesses think about and manage their energy consumption.	

	INTRODUCTION AND FINDING CORRECT RESPONDENT	
	[IF NEEDED] The California Public Utilities Commission is conducting this important study with the coooperation of SCE to better understand how businesses like yours think about and manage their energy consumption. Your input is very important to the Commission and to SCE.	
1	Yes, we participated in the program, and address is correct	S3
2	There is no one here with information on that address/wrong address	T&T
3	Do not recall participating in the program	T&T
	SCREENER	
S23.	Do you recall an SCE representative visiting your facility and completing an energy survey on or about ...AUDIT_DATE? [IF NEEDED: this survey involved a auditor coming to you facility and examining your equipment and asking questions about your energy use and your equipment. The auditor would have left energy saving information at the time of the audit and/or mailed you a written report with energy saving recommendations. Do you remember this on-site survey?]	
1	Yes	S25
2	No	S27
88	Refused	S27
99	Don’t know	S27
S25.	Based on this on-site survey, did you or someone else at your facility receive a written report with energy saving recommendations on or about …AUDIT DATE... from SCE?	
1	Yes	S26
2	No	S27
88	Refused	S27
99	Don’t know	S27
S26	Are you familiar with the recommendations that were made in the SCE AUDIT REPORT?	
1	Yes	NRA3
2	No, not really	S27
88	Refused	S27
99	Don't know	S27
S27.	It sounds like someone else at your location may be more familiar with your firms participation in this energy management program? IF YES: Can you tell me who that person might be?	
1	Yes, it was probably [NEW CONTACT NAME]	NRA3
77	No	T&T
88	Refused	T&T
99	Don’t know	T&T

Action Screener

AUDIT ID	REPEAT THIS LOOP FOR EACH RECOMMENDED MEASURE.	MEASURE 1	MEASURE 2	MEASURE 3
	NOTE RECOMMENDATION NAME			
	NOTE ASSOCIATED REBATE (IF ANY)			
	NOTE REBATE CONTACT NAME (IF DIFFERENT PERSON)			
	NAME OF PERSON SURVEYED			
	NOTE SURVEY COMPLETION DATE			

NRA3	Our records show that your organization received a recommendation for ...MEASURE... as part of the SCE Energy Efficiency Audit Report on about …AUDIT DATE.... Is this correct?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	Yes	NRA5			
2	No	end loop			
88	Refused	end loop			
99	Don't know	end loop			

NRA5	Which of the following best describe the actions your organization has taken as a result of receiving the recommendation for …MEASURE... in the SCE Audit Report … (READ OPTIONS)	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	We have completed energy efficiency improvements to the facility based on this recommendation	NRA7			
2	We are currently making energy efficiency improvements to the facility based on this recommendation.	NRA7a			
3	We have plans to make energy efficiency improvements to the facility based on this recommendation, but this work is still in the planning stage.	NRA7b			
4	We have taken no actions to plan or implement changes to the facility based on this recommendation	RR1			
77	Other, Last Resort! (Don't offer this response) If appropriate, gather rebate and timing data for "other" action.	NRA7			
88	Refused	end loop			
99	Don't know	end loop			

NRA7	What year were these changes completed?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	2006	PN18			
2	2007	PN18			
3	2008	PN18			
4	2009	PN18			
88	Refused	PN18			
99	Don't Know	PN18			

NRA7a	In what year are these changes expected to be complete?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	2009	PN18			
2	2010	PN18			
3	2011	PN18			
4	2012	PN18			
77	Other (SPECIFY)	PN18			
88	Refused	PN18			
99	Don't Know	PN18			

NRA7b	In what year do you expect work to begin on the changes resulting from the Audit recommendation for …MEASURE...?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	2009	NRA7bb			
2	2010	NRA7bb			
3	2011	NRA7bb			
4	2012	NRA7bb			
77	Other (SPECIFY)	NRA7bb			
88	Refused	NRA7bb			
99	Don't Know	NRA7bb			

NRA7bb	In what year do you expect this work to be completed?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	2009	PN16			
2	2010	PN16			
3	2011	PN16			
4	2012	PN16			
77	Other (SPECIFY)	PN16			
88	Refused	PN16			
99	Don't Know	PN16			

PN16	Do you expect these changes to be rebated through an SCE energy efficiency incentive program?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	Yes	RR1			
2	No	RR1			
88	Refused	RR1			
99	Don’t know	RR1			

ASK IF WE HAVE NO RECORD OF A REBATE FOR MEASURE; ELSE GO TO PN19

PN18	Did your organization receive a rebate from an SCE energy efficiency incentive program for these improvements?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	Yes	PN24			
2	No	end loop			
88	Refused	end loop			
99	Don’t know	end loop			

PN19	Our records show your organization received a rebate for this equipment through an SCE energy efficiency incentive program. Is that correct?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	Yes	end loop			
2	No	RR1			
88	Refused	RR1			
99	Don’t know	RR1			

PN24	Which SCE energy efficiency incentive program provided a rebate for this installation?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	SCE Express Efficiency Program	RNR1			
2	SCE Standard Performance Contract Program (SPC)	RNR1			
77	Other SCE Energy Efficiency Program (SPECIFY)	RNR1			
88	Refused	RNR1			
99	Don't know	RNR1			

ASK IF WE HAVE A RECORD OF A REBATE THAT IS NOT MENTIONED IN NRA5 or PN18, or is denied in PN19; ELSE END LOOP

RR1	Our records show your organization installed …REBATED MEASURE…in the facility at …SERVICE ADDRESS...as part of an SCE Energy Efficiency Incentive Program, is this correct?	GO TO	MEASURE 1	MEASURE 2	MEASURE 3
1	Yes	RR3			
2	No	RR7			
88	Refused	NC1			

99	Don't know	NC1			

RR3	Was the installation of ….REBATED_MEASURE…a follow up to the recommendation for ….MEASURE…?	**GO TO**	**MEASURE 1**	**MEASURE 2**	**MEASURE 3**
1	Yes	end loop			
2	No	RR5			
88	Refused	NC1			
99	Don't know	NC1			

RR5	Can you help me understand why the installation of …REBATED MEASURE… is not a follow up to the recommendation for …MEASURE?	**GO TO**	**MEASURE 1**	**MEASURE 2**	**MEASURE 3**
77	RECORD VERBATIM	end loop			
88	Refused	NC1			
99	Don't know	NC1			

RR7	Can you think any reason that SCE might have a mistaken record of a rebate issued for REBATED MEASURE for SERVICE ADDRESS?	**GO TO**	**MEASURE 1**	**MEASURE 2**	**MEASURE 3**
77	RECORD VERBATIM	end loop			
88	Refused	NC1			
99	Don't know	NC1			

NC1	The contact person we have on record for the installation of ...REBATED MEASURE… is …REBATE CONTACT…, would it be okay if I follow up with this person about the …REBATED MEASURE… at another time?	**GO TO**	**MEASURE 1**	**MEASURE 2**	**MEASURE 3**
1	Yes	NC3			
2	No	end loop			
88	Refused	end loop			
99	Don't know	end loop			

NC3	What is the best way to get in touch with …REBATE CONTACT…?	**GO TO**	**MEASURE 1**	**MEASURE 2**	**MEASURE 3**
77	RECORD VERBATIM	end loop			
88	Refused	end loop			

99	Don't know	end loop			

ASK IF THERE IS NO RECORD OF A REBATE FOR THE MEASURE INSTALLED IN 2006-2008, AND PN18 = "YES"

RNR1	We have no record of a rebate issued by an SCE energy efficiency program for this equipment at …SERVICE ADDRESS…, can you think of any reasons that we might not have this record? (IF NECESSARY: "For example, maybe this was installed prior to 2006, or the rebated was issued in 2009, or maybe it was issued another institution, not SCE...?' OR 'Can you please share those thoughts with me?')	**GO TO**	**MEASURE 1**	**MEASURE 2**	**MEASURE 3**
77	RECORD VERBATIM	end loop			
88	Refused	end loop			
99	Don't know	end loop			

L: ED Response to Public Review Comments

ED Response to Public Review Comments from TURN for the Major Commercial Contract Group

TURN Comment	ED Response
1. For the Custom Lighting HIM across three of the main programs (SCE 2517, SDG&E 3025 and 3010) differences in lighting measure operating hours among business types were found to explain a large amount of the very significant variation in realization rates. E.g., lighting in "manufacturing hallways," ex ante 3,770 hrs/yr; ex post 248 hrs/yr (a -93% difference) or "manufacturing non-occupancy sensor," ex ante 8,736 hrs/yr; ex post 5,173 hrs/yr (a -41% difference). Calibration of these parameters is obviously crucial to calculating the savings from commercial lighting. Given that the SPC is not a new program, the frequency with which the ex post operating hours for lighting measures are found to differ from the IOUs' ex ante assumptions, not only in this program but in numerous others, is troubling.	1. Differences between ex ante and ex post operating hours was the primary reason for differences in the savings estimates for lighting measures. Some level of difference is unavoidable because the program, had to forecast the post-retrofit hours while the evaluation had the advantage of measuring them after the fact. In the future, the IOUs may be able to reduce some of these differences by examining the results of this evaluation for common building classifications and usage groups.
2. The Nonresidential Audit (NRA) program was also found to have performed very poorly. Fifty-four of the 70 sites sampled showed no savings from indirect measures at all. According to the Draft Report this was partially explained by the customers pursuing direct measures for which no savings accrued to the NRA program. Notwithstanding the poor program score received, the report's authors saw this spillover as a silver lining.	2. The evaluation determined that the IOUs were very effective at directing customers to available program incentives for audit recommendations that they implemented. This is good news that directly benefits the incentive programs. However, the downside of this is that there was little additional indirect savings to be claimed.
3. TURN welcomes the change in this program cycle toward greater oversight of the EM&V process by ED. The Commission recognizes the need for "a clearer separation between 'those who do' (the program administrators and implementers) and 'those who evaluate' the program performance." As noted earlier, there is a need to continue to improve on the earlier adopted independent EM&V structure. While the present set of reports reflect movement in this direction, EM&V contractors can and must strive toward even greater independence from the IOUs when evaluating programs. We have noted instances in the evaluation of this Major Commercial program where contractors' desire to 'give the IOUs credit' interfered with an impartial assessment of program performance.	3. The evaluation team went to a great deal of effort to provide an impartial assessment of savings. The work was completed independently from the IOUs. Data requests were the only communication with the IOUs throughout the evaluation. The IOUs made no attempt to influence the results. Our scope required that we provide a fair and reasonable accounting of all of the savings associated with the sampled measures. In this accounting of "all" savings, we did not limit ourselves to aspects of the savings that were claimed by the IOUs. In some cases we considered fuels and end uses that were not included in the savings claim. For some measures these additional considerations reduced savings from the claimed value; in others it increased savings. The word "credit" used in the conclusions section on page 53 referred to this increase or decease in savings from these additional considerations. Since the word "credit" is confusing to the reader, we will change it to "allocate".

TURN Comment	ED Response
4. Another lesson learned from the M&V work on the Major Commercial Program is that it would have been beneficial to have a larger sample size. Contractors in the Q&A of the Dec 17 webinar were at a loss to justify their decision to pursue a very small sample when evaluating the SPC program.	4. The evaluation considered the largest sample possible that met the ED rigor requirements and could be completed within the schedule constraints. The sample size evaluated for the SCE SPC program provided relative precision of 90/10 for kW and 90/15 for kWh. These results met the 90/10 precision target for kW and were only slightly greater for kWh. Our discussion of rigor level assignments at the webinar could have been stated more clearly. For all HIMs ED desired a rigor level of "enhanced" for the gross savings estimates. This was the default rigor level assigned to all measures. In many cases we completed the analysis at the enhanced rigor level. However, for some direct measures ED allowed the rigor level to be reduced to basic. This was allowed for reasons such as increasing sample size and data collection constraints imposed by the customer. For the indirect measures ED allowed the savings analysis to be completed without an assigned rigor level. The more simplified analysis methods were allowed in this case to increase sample size and to complete the work within the schedule constraints. The time constraints that were imposed on the project required trade-offs to be made between rigor and sample size. It wasn't possible to have both at the desired levels. Larger sample sizes would have produced better statistical precision, but at a cost to accuracy within each project.
5. The Major Commercial Programs represent a significant share of the energy efficiency portfolio. The overall findings in this evaluation report were that net savings were below those estimated by the IOUs. "For kW savings the NTGR values ranged from a low of 0.56 for the SDGE 3025 program to a high of 0.68 for the SDGE3010 program. For kWh savings the values ranged from a low of 0.54 for the SDGE3025 program to a high of 0.70 for the SDGE 3010 program. For therm savings, the values ranged from a low of 0.43 for the SDGE3025 program to the high of 0.85 for the SDGE3010 program. These quantitative results indicate that the programs are significantly overestimating their net savings claims for direct measures.	5. As stated in the comment, the NTGR values did vary significantly across programs and in all cases were less than one, indicating that IOUs overestimated net savings. However, in many cases they are consistent results from previous evaluations of similar programs.
6. As noted in TURN's recent Protest, Decision 09-09-047 requires the IOUs to use "ex ante values … that are based upon the best available information at the time the 2010-2012 activity is starting." The present series of EM&V reports that have been published in draft form in December, include updated data, at times significantly different from the ex ante data. To execute the proposed set of programs for the next program cycle with the discredited ex ante data when an updated and field-verified set is now available would be a grave mistake.	6. These comments are duly noted.

TURN Comment	ED Response
7. The Strategic Plan calls for reducing overall energy consumption in commercial buildings (zero net energy by 2030 for all new and a substantial proportion of existing buildings). While energy efficiency savings is a key output of the EM&V process, EE savings are, in and of themselves, not equivalent to reductions in total energy consumption. The IOUs' 2006-08 EE portfolio has resulted in EE savings while the state's total energy consumption has continued to rise. Absolute reductions in energy consumption, if they are to be brought about through utility EE, must exceed the sum of the forces that presently encourage increased energy consumption. If EE is to play a role in achieving the goals of the Strategic Plan then the programs that make up the current and future program portfolio must deliver results that exceed IOU forecasts rather than lag behind them. This program, along with most of the others which have now been evaluated, have fallen short of their goals	7. These comments are duly noted

ED Response to Public Review Comments from Sempra for the Major Commercial Contract Group

Sempra Comment

1. The realization rates in the study are provided for each stratum within each program. Disaggregating in this manner results in very small sample sizes at the individual stratum level (sample sizes that range from a low of one to a high of nine) – very similar to problems discovered in almost all of the Impact evaluations being reviewed. As a result, the 90% confidence intervals, because of the small sample sizes, would tend to be very large. These limited sample sizes severely undermines the relevance of the findings. Even at the aggregated level (i.e., averages over all strata), the realization rates tend to be very large and often at the 90% confidence intervals include the value of 0.9 or higher. To illustrate these points consider the realization rates obtained for the SCG3513 program in the table below.

Table 68: SCG 3513 First Year Gross Savings Parameters by Stratum with Domain Statistics

		Measures		Stratum Boundaries Ex Ante Savings (Therms)		Gross Ex Post Unit Energy Savings1			Gross Savings Realization Rate1		
Program ID	Stratum	Population	Sample	Lower	Upper	kW	kWh	Therms	kW	kWh	Therms
SCG3513	1	623	4	646	27,758	0	0	14,928			1.56
SCG3513	2	54	2	29,125	102,794	0	0	13,753			.38
SCG3513	3	20	6	110,839	286,680	0	0	47,213			.33
SCG3513	9	12	7	339,670	2,177,246	0	0	228,180			.24
SCG3513	Excluded	411	0	0	578						
SCG3513	All Sampled	709	19	0	2,177,246	0	0	17,133			.62
Statistics											
Standard Error								7,519			.27
90% Confidence Interval								12,369			.45
Relative Precision								.72			.72

Note that standard errors and 90% confidence intervals are not reported by individual stratum. However, the sample sizes in every case are extremely small, ranging from two to seven. In many of these cases it appears likely that the 90% confidence interval will be large, implying that the interval may well include a population value of 0.9 or higher for the realization rate. Also note that even for the aggregated results (final row labeled All Sampled) the realization rate estimate is 0.62 and 90% confidence interval is 0.45! Thus the 90% confidence interval includes a population value of the realization rate of 1.07 (.45+.62). In this case, the null hypothesis that evaluated savings are the same as claimed savings cannot be rejected and the utility should receive credit for its claimed savings.

ED Response

1. The M&V activities across all contract groups strove to reduce measurement error through rigorous M&V as directed by the evaluation protocols. The evaluation of direct measures considered the largest sample possible that was consistent with ED rigor requirements and achievable within the study schedule constraints.

An analysis of the confidence intervals around the UES estimates (which would apply to the realization rates as well) shows that, over all 11 combinations of program-fuel estimates reported, in 7 of them, the confidence interval included the IOU claim; in 9 of them, the confidence interval included 0. One could just as well argue that in the 9 cases, the conclusion should be 0 savings. In reality, the mean estimate based on measurements at the site under actual conditions is the best one, not the 0s and not the program claims. If possible, a larger sample size would be desirable as it would produce narrower confidence intervals. However, it remains true that the mean estimate is the most defensible one, regardless of the width of the confidence interval.

In the case of the NRA programs, the installation rate is so small that it would take a sample of several thousand to achieve good precision at the stage of engineering analysis. Only a very small proportion of the population of audits installed anything that would qualify as NRA savings. Thus, in these cases, it would be infeasible to achieve the targeted 10% precision. But it is still true that the best estimate is the mean.

Sempra Comment	ED Response
2. Some of the measures with the highest claimed savings have very small samples sizes. These measures were supposed to be sampled with certainty (stratum 9) but evaluators fell short. Examples include SCG3513 with a population of 12 and a sample of seven (see table above), SDGE3010 with a population of three and a sample of only one, SDGE3025 with a population of six and a sample of two. Again, such small sample sizes put into real question the validity of the results of the evaluation and these studies should either be rejected or redone using proper evaluation protocol.	2. A review of the sample size information in this table revealed that the population value of 12 for SCG3513 was incorrect. It should be 8. It was originally 12 but was lowered to 8 after SCG updated their Q408 filing and removed 4 of the measures. We analyzed 7 of the 8 measures in the population for SCG3513. One of the sites refused to participate in the evaluation. For SDGE3010 therms, we analyzed one of the three sample points in strata 9. The other two sites were recruited but ultimately dropped from the evaluation due to lack of cooperation from the customer. An attempt was made to evaluate all three. For SDGE3025 we analyzed 2 of the 6 cases in the population for strata 9. We only completed two because only 8 total sample points were allocated to this program component. It had low ex ante program savings relative to the other programs in this contract group so justified only 8 cases. The 8 cases had to be spread across 3 strata. We assigned 3 to stratum 1, three to stratum 2 and two to stratum 9.

Sempra Comment	ED Response
3. The free ridership estimates for these programs use the self report approach (SRA) for non-residential programs. NTG rates are provided for each stratum in each IOU program. Again, this disaggregation results in extremely small sample sizes in each stratum. Consequently, the relative precision values are relatively large. Also, the SRA is beset with significant survey issues such as self-report bias, recall error, failure to survey the appropriate "decision-maker," etc. Identification of the relevant "decision-maker" may be especially important for large commercial projects. Specifically, it is likely that a "decision process" that involves multiple individuals representing different divisions of a large firm is used to evaluate energy efficiency projects rather than the decision being made by one individual. In this case, the survey team will likely interview the advocate for the project, who, of course, suggests that the project would have been completed in the absence of the program. However, this ignores the various hurdles that had to be overcome (e.g., financing, prioritization, etc.) and it is inconsistent with reality. How does the evaluation team account for these issues in its calculation of NTG??	3. Please refer to the document entitled, "Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers" for answers to the above questions on how the methodology used in the evaluation addressed issues related to bias, recall error, etc. Regarding the issue of small sample sizes and large relative precision values for each stratum, you are correct. The results were provided at this detailed level for information purposes, and can be compared with those in prior evaluations (for example, of the SPC program) to see the direction or trend of the results. But they are not sufficiently robust on their own. However, the results at the sampling domain level (program by fuel) are robust and have relative precision values that meet the requirements of the evaluation. Also please note that in each case, the NTG team made every effort to identify the project decision-maker, or in their absence, a proxy who was present at the time of the decision and is knowledgeable about the factors leading to the decision to undertake the project. In cases where such a person was not available, the sample point was dropped and a replacement sample point was used instead. Therefore, there were no interviews done with persons who were unfamiliar with the project and the basis for the underlying decision. In addition, if the project involved multiple decision-makers, the NTG interview included all such persons, rather than a single person as is assumed in the question.

Sempra Comment	ED Response
4. M01180 ESB project 06-03-002 Controls of Garage fans utilizing CO sensors – AC Energy Comment: As the evaluator notes "there is no precise evidence of baseline operations", and based on discussion with only one person, he assumes that the fans were not operating 100% of the time as was assumed by the project sponsor. The evaluator assumes that the supply and exhaust fans were operating only 40% and 44% respectively. The IOU position is that this pre project fans run time appears to be low. The parking garage is below grade and does not appear to have sufficient natural ventilation. Since the post data indicate that the fans were on 27% of the time it is logical to think that the pre run time is at least double that value (54%) assuming 50% of the sensors were faulty. The measure load by the evaluator is 430 kW compared to 612 kW which was arrived by the vendor. The IOU does not doubt the readings but as was stated, the facility has been working on the fans controls to reduce the fans energy further. One of the findings is that the project cost appears to be excessive for the size of the project and there was no invoice to the customer in the file. The IOU position is that ESB program as whole do comply with the TRC guidelines set by the PUC.	4. The person who provided information regarding fan operating hours was the building engineer, who was in charge of the garage ventilation fan operations prior to the time the sponsor initiated the project at this site. This individual corroborated statements made by other building engineers for buildings included in the evaluation sample that received similar services from the project sponsor; namely that the project sponsor tested existing CO sensor systems, found them to be in disrepair, recommended the building engineers run their ventilation fan systems at 100% full speed 100% of the time, then used these operations as the baseline. An investigation of codes, and conversations with regulatory agencies performed by the evaluator, revealed no codes requiring such operations. The sponsor influenced the baseline assumed for the ex ante estimate of savings. With respect to deriving baseline operating hours from post data, it would be very difficult to establish a relationship between the number of faulty sensors and the likely impact on the relative number of baseline vs as-built hours of operation. The fact that the baseline type is early replacement mandates that previously existing equipment is to be used as the baseline. While the faulty sensors may have allowed CO buildup in some areas of the garage, and a properly operating system would have brought the fans on to remove that buildup, the faulty sensors would have generated no such call for fans. Therefore, CO excursions would not generate additional fan power draw. Our approach of assuming movement of the annual quantity of ventilation air recommended by ASHRAE may in fact exceed the actual quantity of air moved by the fans with the pre-existing (faulty) controls in place.

Sempra Comment	ED Response
	We recognize the facility's efforts to improve the performance of the fans, but we can only perform our evaluation on the operations in effect at the time we obtain our measurements. This is standard procedure for evaluations and was specified at the outset of our work. It takes into account the potential for implemented measures that are not operated exactly as specified. The findings stated in all the reports are specific to the site being evaluated. We cannot, nor do we have any charge to refute the assertion that the ESB program as a whole complies with the PUC's TRC guidelines.
5. M01181 ESB 06-03-002 Controls of Garage fans utilizing CO sensors – AC Energy Comment: The evaluator acknowledge that the fans were operating 100% of the time @ 2/3 rd of maximum speed prior to installation. The speed determination is based on estimate following the interview of the site contact. As noted the VFD failed providing no readout of the motor speed and there were no records of the manual setting of the drives. The assumption by the evaluator yielded a fan power draw during pre construction of 28.3 kW and post construction post construction of 15.8 kW vs. the IOU estimate of 79 kW fan motor power draw for both periods. The operating times of the fans are in agreement. As the power draw measurements show the average power draw according the evaluator at 54 Hz is 64 kW which for 60Hz brings the power draw to 73 kW as assumed by the utility. The IOU does not agree with the 2/3 of maximum fan speed as a baseline.	5. The person who provided information regarding baseline fan operations was the building engineer, who was in charge of the garage ventilation fan operations prior to the time the sponsor initiated the project at this site. This individual was very clear in stating that the fans were adjusted to less than full speed. The building engineer's statements also corroborated statements made by counterparts at other buildings included in the evaluation sample that received similar services from the project sponsor; namely that the project sponsor tested existing CO sensor systems, found them to be in disrepair, recommended the building engineers run their ventilation fan systems at 100% full speed 100% of the time, then used these continuous full-speed operations as the baseline. An investigation of codes, and conversations with regulatory agencies performed by the evaluator, revealed no codes requiring such operations. Based on statements made by the building engineer, the sponsor influenced the baseline assumed for the ex ante estimate of savings.

Sempra Comment	ED Response
6. M01157 ESB 06-03-002 Controls of Garage fans utilizing CO sensors – AC Energy Comment: According to the evaluator the power draws of the fans appears to be 1/3 of name plate values. Such low power draw will result in low motor efficiency and power factor. The IOU assumed a total fans motors power draw of 221 kW vs. the evaluator position that the combined power draw is 70.9 kW. It is postulated by the IOU that the fans speed may have been altered since the installation by changing the pulley ratios between the motors and the fans. It is hard to understand why such large motors were installed on this system when they are way under utilized.	6. We agree the fans appear to be oversized when taken in light of their current usage. Our calculations are based on measured kW for the individual fans. We did not investigate the reason for this apparent overly conservative design. The IOU assumption of 221 kW for all fans combined appears to have been derived from the motor horsepower ratings assuming 100% full load power (and 95% motor efficiency), which probably exaggerates the power draw to the extent the fan motors would have run drawing less than full power.
7. M01073 ESB 06-03-114 Comment: This project is a part of a larger bid project submitted by CCSE. The specific project premise was to deliver 289,430 kWh savings out of 2,946,061 kWh savings for the entire collections of projects. The evaluated savings were found to be 28,103 kWh for normal and 220,339 kWh for early. The M&V for this project has shown savings of 201,860 kWh and 33.2 kW in demand reduction. The reason for the drop between the estimated savings and the as found is the drop in operating hours from 8760 hrs/yr to 6,088 hrs/yr. The operating hours discovered during the M&V are even lower than the 7,147 hours pointed out by the evaluator. As a result from this project and other projects within this ESB projects grouping, the claimed M&V savings dropped to 2,075,033 kWh from the project premise to deliver 2,946,061 kWh.	7. Evaluations are performed on individual measures rather than groupings of measures so the values associated with the project groupings are not relevant to the evaluation. The evaluated savings for early replacement indicates a better realization rate than the M&V savings estimated by the implementer. The evaluated savings calculations assume previously-existing equipment for the early replacement baseline and a code-adherent baseline for normal replacement. The normal baseline is then assumed to be in effect once the remaining useful life of the pre-existing equipment would have ended. The baseline for the M&V calculations cited in the comment is not specified, so we cannot comment on whether this is a reasonable comparison.

Sempra Comment	ED Response
8. M49205 SPC 3548 Comment: This project is new installation of boiler and heat exchanger in a brand new cheese factory. The IOU did calculate the savings by obtaining future operating data from the facility staff. The heat recovery was based on the new boiler efficiency and on the process streams flows, temperatures and annual operating hours. The evaluator is talking about old plant, but there was not an old plant. The plant has not reached maximum production rates following the SPC project. The energy savings did assume that once the plant starts up they will operate at design level, it is assumed that either bottlenecks remained in the plant or the market was not there.	8. Equipment descriptions from the old facility were provided solely as a basis for justifying the use of a new construction baseline for this project. This was necessary because the site contact indicated that the equipment from the old facility could have potentially been moved to the new facility if it had met the company's production needs. Therefore, by indicating the size and operating schedule of the old equipment in relation to the size and operating schedule of the new equipment (provided in the subsequent section of the report), a justification for using a new construction baseline was provided. The language in the report was somewhat misleading and understandably could have been misconstrued to indicate that an early replacement baseline was used. The language has been changed where appropriate and a clarifying sentence has been added to section 2.6. Regarding the appropriate operating load, the load used in the report was verified from two sources within the facility, neither of which indicated that significant production bottlenecks exist. The reason for the reduced load relative to the ex-ante assumption was not explored because it was not pertinent to the as-built condition analysis. The site contacts at no point indicated that they anticipated a change in load in the future.

Sempra Comment	ED Response
9. M49153 SPC 3357-07 Comment: The project is installation of one new 1280 ton chiller replacing 700 ton Trane chiller Model CVCA890. This is one of three centrifugal chillers at the facility. The new chiller is designated Chiller #3 by the site. Please refer to section 6.1.Results Summary- Program claimed 740000 kWh and 171.6 kW. Please readjust 'Program kWh and "Program kW" in this section. Please refer to section 3.1 Utility Algorithms- EQuest, not SPC program was used to calculate energy savings. New chiller efficiency of .533 kW/ton was used in utility energy savings calculations, not .48 kW/ton as stated in 3.1. For the EQuest model energy evaluation, the new chiller was compared to a 1998 Title 24 min (.676 kW/ton) chiller since chiller being replaced was overhauled in 1992, qualifying for early retirement. Section 3.1 lists new chiller NPLV of .355 kW/ton. New chiller NPLV is .338 kW/ton- (per Trane equipment submittal). Section 3.3 Evaluation Algorithms – Energy Savings Correlation only yielded .42 R2 value for outside air temp VS cooling load. Alternate method should be used to characterize cooling load. Section 2.7 Site chillers – Customer has replaced 700 ton Trane Chiller (CVVA890, originally 1000 tons) w/1280 ton chiller (CVHF1280). This new chiller is designated chiller #3. This chiller will be staged with 2 existing 1000 ton electric chillers (Trane CVCA890). The new chiller is not staged with two 1300 ton chillers as currently stated in section 2.7 Section 3.1 states "the calculation does not take into account the lead/lag switching of the chillers that occurs every 7 days" Customer signed post installation inspection confirmed "chiller 3 comes on first and. chiller 1 and chiller 2 come on after when load calls for it". Inspection report signed by site contact, (customer). Please Confirm with customer chiller 3 is lead chiller and operation does not alternate every 7 days.	9. We verified that the data base values are 740,000 kWh and 171.6 kW. We will change the report. The program documentation that we received had only the SPC program software printout with savings of 1,393,798 kWh and 179.4 kW savings with chiller efficiency of 0.48 kW/ton as mentioned in the report. The revised savings of 740,000 kWh and 171.6 kW were also included in the project file, but no basis for these values was included. There was no mention of eQuest or a different baseline efficiency. We have edited the report to reflect this updated information. The site contact indicated that the chillers that were replaced were absorption chillers, not electric chillers, therefore we assumed normal replacement as an alternative to new code baseline chillers. The correlation was the best that we could derive from the data. Even though the 0.42 R-squared is not ideal, it does represent a reasonable approximation of the relationship of cooling load to outside air temperature. It indicated that there is a large scatter in the data, which also may be attributed to the manual on/off control of the chillers. The other two chillers were replaced with chillers identical to the measure chiller and they are rotated at the lead chiller. The trend data confirms this.
10. M01358 SPC 3034-06 Comment: The project is replacement of existing boiler with a more efficient model. Section 6.2 Key Findings includes Table 5. In table 5 the headings - Baseline Input therms per day and Post Input therms per day should contain different values. Post input therms per day will be lower. In Section 4.2 Data Collection Methods - Boiler sub meter gas usage was measured over a 16 day period September 28 through October 15. Sub metering should be carried out seasonally to capture variable seasonal loads.	10. The Baseline Input therms per day values in Table 5 were incorrect. This has been corrected. The savings results are correct. It would have been better to sub meter the boiler gas consumption over a longer time period to capture a wider variation in operating condition, however due to time constraints only the 16 day period was available.

Sempra Comment	ED Response
11. M049261 SPC 3562 Comment: This project upgraded lighting and replaced HVAC programmable thermostats with EMS control. During SPC review by utility, lighting hours that vendor proposed were similar to SPC characteristic schools lighting hours. Please furnish lighting logger information. Section 3.3 Evaluation Algorithms - Evaluation Measure ID: M49261 HVAC thermostat upgrade –M&V has not been completed on this measure yet for the utility. Final utility approved savings for this measure has not yet been reported. Section 3.3 Evaluation Algorithms states "Inputs to the baseline model were identical to those of the installed model with the exception of the HVAC operating schedules and heating/cooling set point schedules" How was the HVAC model compared to baseline utility data to insure that baseline T stat operation (with 7 day programmable t stats) was characterized accurately? Baseline equipment programmable thermostat set points, schedules and reference clock time can all be out of alignment with expected scheduling and set points. Billing analysis with corrections for lighting modifications would more accurately capture baseline HVAC operation.	11. Section 3.3 Evaluation Algorithms – Evaluation Measure ID: M49261 HVAC thermostat upgrade – The final savings values were reported in the application file. These values were also reported in the database. No mention of ongoing M&V activities was made that would have changed these values. Equest modeling should be more accurate than billing analysis for this measure. We calibrated the model to post bills. Other effects could complicate the billing analysis, such as schedule changes not related to the measure.
12. On the EM&V reports reviewed many words and phrases are blanked-out and we have not been able to identify the SPC or BID project name or number. Additional assistance in identifying these projects by SPC or BID name and project number is requested. Following are a list of these report Evaluation ID Numbers. 720 1313 665 1357 1195 42147 42418 42498 47046 48395 965 965 1182 1183 1185 1186 1191 1193 48734	12. This request was officially handled through EEGA. It is noted that several measures in this list are from SCE programs. It is also noted that the requested information is in appendix E and F of the final report.

Sempra Comment	ED Response
13. One overriding question for the auditors is that it appears that the auditors disregarded the calculation methodology used by the utility and chose to go with their own. This leads to questions of their methodology, who reviewed their assumptions, and why were the utility calculations so easily disregarded? In addition, for some of the projects, auditors chose to go with a simple bill regression analysis versus using actual data from metered equipment. It appears that the results were not validated against each other.	13. The evaluation team selected a calculation methodology that was consistent with the assigned rigor level. The methodology was documented in a measure-specific EM&V plan. The plan was carefully reviewed and approved by ED and its advisors. The evaluation results for each measure were documented in a measure-specific EM&V report that was reviewed and approved by ED and its advisors.
14. M49914 & M49388 – Comment: 2 Furnace projects at same location for different production lines. Evaluator continually indicates production lower than "anticipated" as if production did not meet capacity. The evaluators own report indicates "due to a decreased product demand" (M49388). Original calculations were in accordance with production levels before decrease and downturn in economy. There is no reference to indicate previous production levels before decrease. Assumption that economic downturn leading to decrease product demand will remain stagnant for the life of the units is misleading and incorrect.	14. Response: While it is unfortunate that product demand at this facility has decreased, the Program rules for this evaluation restrict us to using the observed production level. There is no assumption that product demand will remain stagnant for the life of these units, though the energy savings reported are mandated to be based on this reduced production level.

Sempra Comment	ED Response
15. M00919 – Comment: The evaluator indicates a realization rate of 79% due to the spillover effect yet in the evaluation the auditor themselves indicate "the primary site specific data collected for this evaluation was insufficient to capture the measure savings because of the myriad factors affecting production efficiency". The auditor agrees with rationale but reduces savings due to reduction of 5 - ?? unsure - in addition to 4 -?? - unsure items. Difficult to comment when the very reason for the reduction is not revealed. Auditor has difficulty measuring savings but can readily measure spillover affect.	15. The language in section 6.2, which previously stated , "the primary site specific data collected for this evaluation was insufficient to capture the measure savings because of the myriad factors affecting the site'sproduction efficiency" was somewhat misleading because it implies that the measure savings could not be properly evaluated at all. However, as discussed in section 6 in the report, a secondary analysis methodology nearly identical in approach to that used by the utility was next undertaken as a fall back approach. The quoted sentence has been clarified accordingly. The secondary methodology allowed calculation of measures savings based on the 4 pieces of baseline equipment indicated in the application file. Spillover savings were then calculated based on the other 5 identical pieces of equipment which were decommissioned as a result of the project. These other 5 pieces of equipment were decommissioned once the functional capacity of the heat exchanger was verified through successful operation. Additional savings from the retirement of these 5 pieces of equipment were not considered in the utility calculation and were therefore considered spillover. Since the remaining 5 pieces of equipment were of the same two types as the four incented pieces of equipment, spillover savings were easily calculated using an identical approach to the incented portion of the project.

Sempra Comment	ED Response
16. M00726 – Comment: Auditor indicates the burner that was replaced must meet SCAQMD standards and the existing burner was out of compliance with those requirements. As such, the burner is normal replacement. All based on questions posed to a manufacturer of burners. Questions arise. What questions were asked and were the requirements mentioned required at the time of replacement or implemented prior to date of requirements - if requirements are currently in effect or will be in the future. Is it the auditors assumption that all burners are equal with no efficiency differences? Also, does a customer have the option to not replace? This last question is not discussed in any of the evaluations.	16. The site's environmental coordinator informed the auditor that the SCAQMD had required a downgrade of the affected burners because the existing burners were out of compliance with air quality standards. He stated that the old burners were not low-NOx burners and that the burner derating left the plant with insufficient heat energy for operations. He stated that the reason the existing burners were replaced was for emission control. The site contact offered this information in response to the auditor's standard questions regarding the condition, age and suitability of existing equipment and the impetus for the plant's energy efficiency project. The site contact stated that the replaced burners were very specialized and that they did not consider other suppliers for these burners. A subsequent conversation with the burner manufacturer revealed that the replacement burner was the only burner available to meet SCAQMD ultra-low NOx requirements. As was explained by the manufacturer, it is not possible to reduce NOx to the very low regulatory levels without using the highest efficiency burner technology. In short, replacement of the burners needed to support plant operations was required to meet air pollution regulations. The replacement burners were the plant's only considered choice available to meet these regulations. Energy savings were incidental to the plant's compliance with SCAQMD.
17. SoCalGas is requesting the EM&V report files for M49994 & M49998. .	17. This request was officially handled through EEGA

ED Response to Public Review Comments from SCE for the Major Commercial Contract Group

SCE Comment	ED Response
1. The analyses of the SPC part of the Business Incentive and Services Program (SCE 2517) is a collection of generally well-done site-specific reviews of the energy savings calculations, in line with previous efforts to evaluate the impacts of incentive programs based on calculated energy savings. Unfortunately, it is always difficult to aggregate the individual project results to make a valid statement about the impacts of the Business Incentive and Services Program. As one of the impact evaluation team members opined during a webinar on this report: "The projects become case studies, but you can't say anything at the program level." We agree. We also expect that the Evaluation Reporting Tool report will be hard-pressed to justify program-level conclusions.	1. The evaluation of direct measures considered the largest sample possible that was consistent with ED rigor requirements and achievable within the study schedule constraints. The relative precision of the resulting savings estimates varied by fuel within program. The SCE 2517 SPC program had the best relative precision of the direct programs, achieving 90/10 for kW and 90/15 for kWh. These results met the target value for kW and was only slightly higher for kWh. These results have sufficiently good precision that they are of more value that being case studies.
2. Recommendation 6 (p. 55) states, in part: "The SCE tracking system provides total savings for the individual audits but does not provide savings for the individual measures that were recommended in the audit. Examination of the SCE audit reports shows that measure level savings estimates are often not documented. This lack of measure-level documentation hampers the ability of evaluators to select a representative sample of indirect measures to evaluate. It also creates increased uncertainty around the program level savings estimate. It is recommended that all IOUs provide measure level savings estimates in their audit tracking system." The text of this recommendation should also include a note that the program tracking system was designed and built in the absence of any CPUC evaluation strategy and plans for the Nonresidential Audit part of the Business Incentive and Services Program (SCE 2517). The SCE tracking system recorded the units (i.e., the audits) on which the deemed "unit energy savings" are based, as specified in the Program Implementation Plan submitted in 2005. Years after the implementation of the program, the impact evaluation contractor requested the tracking system data, then complained that there are insufficiently detailed descriptions of the measures recommended in each audit, and that the measure-level energy savings were often not documented. Some statement about the unreasonableness of that expectation should be added to the text of the report.	2. This recommendation was not intended as a complaint about the 2006-08 SCE tracking system but rather a suggestion for improvements in future program cycles. Evaluation data needs should be taken into consideration in formulating the content of its tracking system. If including measure level savings data in the tracking database is not reasonable, then SCE and ED should consult on the measure level data that is reasonable to include in future cycles. Including measure level savings data will increase the likelihood that a representative sample will be analyzed in the evaluation. We will edit this recommendation to be clear that the recommendation is relevant to future program cycles and add a sentence to recommend the consultation mentioned above as a way of determining the reasonableness of the request.

SCE Comment	ED Response
3. Besides that additional text about unreasonable expectations for NRA data, the report should contain an acknowledgement that, in actuality, the research analysis design was flawed — it assumed certain data would be available, and regardless of whatever information was found in the tracking systems, the data were forced to the design rather than altering or abandoning the design. For this program, "ex ante values were not used to define the sampling strata. Instead, the program estimate of total kWh savings for each audit was chosen...It was determined to be the best available predictor of ex post indirect savings and thus the best data to use in defining sampling strata" (p.19). Translation: the researchers decided that this data field (that was never subjected to appropriate quality-control reviews) was a reliable proxy for site-specific energy savings. These numbers were then treated as if they were truly interval data, crunched through a Dalenius-Hodges stratification procedure, and ultimately compared to an on-site, measure-specific engineering estimate to generate a realization rate calculated to three significant digits — with a relative precision of 1.26! In short, this is false precision. The research team should be applauded for their creative solutions in the face of unrealistic deadlines. Nevertheless, for the Nonresidential Audit part of the Business Incentive and Services Program (SCE 2517), their quantitative analysis should be discarded because the starting point is unreliable and leads to "increased uncertainty around the program level savings estimate" (p 55). The application of some way-too-fuzzy numbers to any quantification of the realization rates is simply poor analytic technique.	3. Selecting a representative sample for the SCE2517 NRA evaluation was challenging because the ex ante savings were averaged deemed values rather than the results of a measure-specific analysis of implemented measures. To select a representative sample, an alternative method for sample selection had to be developed that was not based on the deemed values. Formulation of the alternative method did not assume that any information was available. Rather it was based upon whatever information was available from existing databases. Since the existing databases did not have measure-specific savings values, the method was based on the best alternative to this which was audit level savings values. The evaluators were never informed that audit level values were not subjected to appropriate quality control review.
4. Language currently reads: "Claimed indirect savings for audit measures – It is recommended that the CPUC and all IOUs establish a series of rules for inclusion of indirect measures in the savings claim for future program cycles where indirect savings are claimed. It is also recommended that the utilities reconsider whether savings claims should be made at all for indirect measures. The results from this evaluation indicate that the utilities do such a good job of directing audited customers to the financial incentives offered by the direct programs that there is very little indirect savings to be claimed." Wonder if this should be changed given the higher direct savings for NRA. Thanks!	4. We editted the referenced recommendation to limit it to only the SCG3503 program.