Final Report

EM&V STUDY OF THE SBEA ENERGY SAVERS 2002-2003 LOCAL PROGRAM

Submitted to ASW Engineering, RLW Analytics, and the CPUC Energy Division
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Submitted by
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1. Executive Summary

This section briefly identifies "top level" EM&V findings regarding the 2002-2003 Small Business Energy Alliance Energy Savers program implemented by ASW Engineering in southern California (SCE service territory) and RLW Analytics in northern California (PG&E service territory).

Primary Methodologies and Approaches Utilized

- Reviews of program documents (including tracking system databases) and follow-up program staff interviews; external data sources consulted as necessary.

- Full participant phone surveying and associated application paperwork reviews for samples of 69 and 70 data points for ASW and RLW, respectively.

Key Findings – Impact Evaluation

- Based on S&A's impact evaluation analyses ASW exceeded its gross annual kWh energy savings program goal by 1%, as can be seen in the following table.

ASW Impact Evaluation Findings and Comparison to Program Goal

Statistic	Value	Units
Program Goal Total	9,792,750	gross annual kWh energy savings
Population Ex Ante Total -savings	11,122,899	gross annual kWh energy savings, per program tracking system
Population Ex Ante Total –participants	420	customers
Realization Rate (per S&A Impact Evaluation Adjustments for Samples Applications)	.964	ratio
Tracking Savings Total (population * sample Ex Ante Mean)	10,261,963	gross annual kWh energy savings
Population Ex Post Total (Tracking Savings Total * Realization Rate)	9,897,483	gross annual kWh energy savings
Relative Precision of Estimate (at 90% confidence level)	4%	ratio
Population Ex Post Total as % of Program Goal Total	101%	ratio

- Based on S&A's impact evaluation analyses RLW exceeded its gross annual kWh energy savings program goal by 10%, as can be seen in the following table.

RLW Impact Evaluation Findings and Comparison to Program Goal

Statistic	Value	Units
Program Goal Total	6,964,138	gross annual kWh energy savings
Population Ex Ante Total -savings	7,595,763	gross annual kWh energy savings, per program tracking system extract
Population Ex Ante Total –participants	304	customers
Realization Rate (per S&A Impact Evaluation Adjustments for Samples Applications)	.933	ratio
Tracking Savings Total (population * sample Ex Ante Mean)	8,230,709	gross annual kWh energy savings
Population Ex Post Total (Tracking Savings Total * Realization Rate)	7,678,828	gross annual kWh energy savings
Relative Precision of Estimate (at 90% confidence level)	2%	ratio
Population Ex Post Total as % of Program Goal Total	110%	ratio

- Primary reasons for the slight downward adjustments in energy savings by S&A for ASW (-3.6%) and RLW (-6.7%) relative to claimed amounts are 1) changes in participant self-reported lighting measure operating hours and 2) significant reductions in refrigeration tune-up measure energy savings engineering constants

Key Findings – Process Evaluation

- Customers are generally highly satisfied with the SBEA program, and with lighting measures in particular. Customer satisfaction regarding the other program measures (refrigeration system tune-up, AC tune-up, programmable thermostat) is more uneven.

- Customers primarily want to participate in the program to implement energy efficiency (ASW) or to save on their monthly utility bills (RLW).

- Both program implementations have served their intended target markets with respect to geographic regions, measure scope, and completion date time frames. Both program implementations have been geared heavily towards Very Small and Small customers (ASW) or Very Small customers (RLW), as can be seen in the following tables:

ASW Customer Sizes – Goal, Population, and Participant Sample

Customer Size	Implementation Plan[1] (N and %)	Program Population (N and %)	Participant Sample (n and %)
Medium (100-500 kW)	187.5 (25%)	29 (7%)	3 (4%)
Small (20-100 kW)	187.5 (25%)	287 (68%)	42 (61%)
Very Small (0-20 kW)	375 (50%)	104 (25%)	24 (35%)
Total	750 (100%)	420 (100%)	69 (100%)

RLW Customer Sizes – Goal, Population, and Participant Sample

Customer Size	Implementation Plan[2] (N and %)	Program Population (N and %)	Participant Sample (n and %)
Medium (100-500 kW)	48 (19%)	18 (6%)	4 (6%)
Small (20-100 kW)	63 (25%)	65 (21%)	9 (13%)
Very Small (0-20 kW)	139 (56%)	221 (73%)	57 (81%)
No Listing	--	--	0 (0%)
Total	250 (100%)	304 (100%)	70 (100%)

Key Recommendations (with respect to 2004-2005 implementation)

- Update lighting kW data for a relatively small number of fixtures

- Utilize updated engineering constants for the refrigeration tune-up, AC tune-up, and programmable thermostat measures

- Make a series of relatively minor changes to application paperwork content and associated staff/management handling processes, and add several incremental database tracking system fields and structural enhancements

Other

- EUL data for the lighting measure for both ASW and RLW may need slight downward adjustment, in light of the significant role played by CFL lamps

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[1] ASW SBEA Implementation Plan, 5/2002, page 6.
[2] RLW SBEA Implementation Plan, 7/2002, pp. 42-43.

2. Introduction

This document is the formal EM&V report by Sisson and Associates Inc. (S&A) for the 2002-2003 Small Business Energy Alliance (SBEA) Energy Savers program.

Its intended audiences and associated uses are as follows:

- CPUC: independent party findings and assessment regarding the programs; final payment evaluation

- ASW and RLW: obtain information useful in modifying / improving various aspects of the 2004-2005 implementations of the same program (since the program is continuing in both northern and southern California)

This document assumes reader general familiarity with and/or access to the following:

- ASW and RLW implementation plans (and associated relevant updates such as the CPUC's granting of a one quarter program extension for RLW)

- ASW and RLW quarterly reports (note, however, that this EM&V report has been prepared independently of ASW and RLW final reports)

- S&A EM&V Research Plan

With respect to the S&A EM&V Research Plan, please note the following changes in scope and timing relative to the original version approved by the CPUC in February 2003:

- *ASW*. The sample data points now reflect full participants completing the program between 10/1/2002 and 1/31/2004 (*note*: previously these dates had 10/1/2002 and 12/31/2003, respectively), based on recognition of the fact that some participants committing to the program in very late 2003 actually completed program participation in early 2004 Q1. Additionally, S&A added two additional sample data points (for a total of 69) at no cost in recognition of these program "latecomers".

- *RLW*. The sample data points now reflect full participants completing the program between 10/1/2002 and 5/31/2004 (*note*: previously these dates had been 10/1/2002 and 12/31/2003, respectively), based on the program extension granted by the CPUC. Additionally, S&A added three additional sample data points (for a total of 70) at no cost in recognition of the program's time extension.

- *General*. There has been no review of data logger information, since there ended up being no such data to assess; both ASW and RLW opted to not

conduct such data collection efforts in their respective program implementations owing to early 2003 concerns regarding program administrative costs.

- *General*. The energy savings adjustments and associated realization rates have been conducted per the five-step process described in Sections 4.1 and 5.1, rather than using two ratio statistics (one for verification audits, and one for phone surveys). The five-step process is a methodological improvement that 1) reduces the potential for double-counting of certain effects and 2) allows impacts of specific detailed matters to be more clearly discerned. Further, the energy savings adjustment equations have been modified to be based on sample means (and therefore fully consistent with CPUC Evaluation Framework sampling guidelines[3]), rather than on overall program database ex ante savings.

After a discussion of general issues associated with this EM&V effort, the remainder of the report is structured around the two impact evaluation issues and four process evaluation issues identified in the S&A EM&V Research Plan. Discussion for each of the six EM&V topics begins with a description of the approach / methodology utilized, followed by findings and then associated recommendations.

By reference, this final EMV report includes the following:

- Full participant phone survey instrument (Appendix A)

- Full participant survey response coded datasets (in Excel workbook format; Appendices B and C for ASW and RLW, respectively)

- Impact evaluation workbooks (in Excel workbook format; Appendices D and E for ASW and RLW, respectively)

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[3] Per 4/2004 S&A discussions with Roger Wright of RLW Analytics, author of the Sampling chapter in the 2/2004 TecMarket Works "California Evaluation Framework" study for the CPUC.

3. General Comments and Observations

3.1. Methodologies and Approaches Utilized

The bulk of the EM&V research utilized in this particular study involved 1) program documents and associated program staff interviews, and/or 2) full participant phone surveying and associated application paperwork reviews. Each type of research is briefly summarized in turn.

Research involving the former (i.e., program documents and associated program staff interviews) typically featured a relatively intense front-loaded review of program documents and follow-up in-person staff interviews to familiarize S&A with program operational details. Subsequent research in this area happened as-needed periodically over the course of the program (e.g., when quarterly reports were published; when program modifications were approved by the CPUC). The subsequent research was usually characterized by as-needed document reviews which in turn generated iterative question and answer sessions conducted by S&A staff via either email or phone with ASW and/or RLW program staff until adequate resolution was attained.

Research involving the latter (i.e., participant phone surveys and associated application paperwork reviews) involved monthly cycles of research associated with samples of full SBEA program participants. As was noted in Section 2, full participant research involved 69 and 70 sampled applications from the ASW (SCE) and RLW (PG&E) service territories, respectively. The samples covered participants who successfully completed the SBEA program in each operational month that the respective program was formally completing applications (i.e., for ASW, 10/2002 through 1/2004, and for RLW, 1/2003 through 5/2004). The pragmatic intent was to sample a relatively even number of applications completed in each relevant operating month so as to survey all participants approximately 45 to 75 days after completing the SBEA program (hence attempting to hold reasonably constant time-related recollections regarding the program). This approach sought to optimize the tradeoff between having program experience be "fresh" (and vividly recalled) on one hand versus having multiple months of "post" installation utility bills reviewed to be able to form opinions regarding the pragmatic effect of the program on energy consumption and measure persistence.

For each update cycle, the then-current version of each program's tracking database would be obtained and screened for records with program completion dates in the desired time frame. Participant data points were then sampled randomly (e.g., if 5 records were needed for a given month's completion date "bin" and 30 distinct application records were available, the initial record would be randomly chosen, with every 6th record sampled thereafter). If the bottom of the sample universe list was reached before the needed number of completed surveys was reached, counting would continue from the top of the list. If the list became exhausted, the needed data points would be "rolled forward" into the next completion date month's bin. Once successful participant phone surveys were obtained, paperwork application packets were then requested for those participants

to conduct paperwork application verification audits, and to aid more generally in the impact evaluation quantification. As part of the impact evaluation, sampled application paperwork materials were cross checked with corresponding electronic records in the respective tracking database.

The RLW sample had one additional complexity. During 2004 Q1, RLW completed a relatively small number of extremely large projects that required addressing "late in the game" in order to avoid having the random sample be skewed dramatically toward smaller customers. As a result, S&A stratified the sample beginning with projects completed in January 2004 to involve random monthly samples of large projects (i.e., with ex ante savings larger than the pre- January 2004 sample maximum). This approach ultimately resulted in a sample mean ex ante savings value within 8% of the population mean's ex ante savings. Data specifics are described in Section 3.1.

Note that findings associated with the participant phone survey questions are discussed in different EM&V subject matter sections of this report, as indicated in the following table.

Mapping of Surveying Questions to Report Section

Participant Survey Questions	Findings Discussed in Report Section
1 - 5, 7	5.2.1
6, 11 - 26	8.2.1
8 - 10	4.2.4

3.1.1. Full Participant Sample Characteristics

This section provides information regarding the samples of full participants for ASW and RLW that were surveyed and whose application paperwork packets were reviewed.

Sample data points by completion month. The following tables list sample data points by completion month. As was noted in Section 3.1, each operating month has been covered.

ASW Sample Data Points by Program Completion Month

Completion Month	N
10/2002	2
11/2002	1
12/2002	3
1/2003	2
2/2003	5
3/2003	5
4/2003	8
5/2003	5
6/2003	6
7/2003	5
8/2003	5
9/2003	4
10/2003	4
11/2003	5
12/2003	7

1/2004	2
Total	69

RLW Sample Data Points by Program Completion Month

Completion Month	N
1/2003	1
2/2003	6
3/2003	6
4/2003	6
5/2003	6
6/2003	6
7/2003	6
8/2003	6
9/2003	6
10/2003	6
11/2003	6
12/2003	2
1/2004	3
2/2004	1
3/2004	1
4/2004	1
5/2004	1
Total	70

Sample and Population Statistics. Impact evaluation-adjusted savings estimates have been developed for both ASW and RLW at the 90% confidence based on the realization rate statistics for the sampled applications; the resulting data have relative precisions of 4% and 2% for ASW and RLW, respectively. Derivations of these data can be found in the ASW and RLW impact evaluation workbooks (appendices D and E, respectively). Issues related to the development of the realization rate data are provided in Sections 4 and 5.

ASW. Key observations re the statistical data are briefly summarized below, followed by the full data in tabular form.

- The sample of 69 applications covered 16.4% of the program's 420 total participants, resulting in case weights of 6.09 (1/.169).

- The mean ex ante and ex post gross annual kWh savings for the sample were 24,433 and 23,565, respectively; the overall realization rate was .964.

- Maximum and minimum ex ante gross annual kWh savings for the sample were 204,102 and 433, respectively.

- For references purposes: the population ex ante mean gross annual kWh savings was 26,483 (8% less than the sample), and indicates a modest bias in the sample towards smaller customers.

- The sample data indicate that the program attained approximately 9.9 million gross annual kWh savings (101% of program goal), +/- 0.36 million gross annual kWh savings.

ASW Statistics Summary

Sample-based Statistics, assuming Simple Random Sampling and Ratio Estimation of Realization Rate	
Mean (Ex Ante; gross annual kWh savings)	24,433
Max (Ex Ante; gross annual kWh savings)	204,102
Min (Ex Ante; gross annual kWh savings)	433
Mean (Ex Post; gross annual kWh savings)	23,565
Max (Ex Post; gross annual kWh savings)	209,321
Min (Ex Post; gross annual kWh savings)	718
Sample Size (n)	69
Case Weight (w)	6.09
Sum, (w * Step 5 Ex Post values; gross annual kWh savings)	9,897,483
Sum, (w * Step 1 "measure status" TBL Ex Ante values; gross annual kWh savings)	10,261,963
Realization Rate	0.964
Standard Error	0.021
Error Bound @ 90% confidence level	0.035
Upper Error Bound re Realization Rate	1.000
Lower Error Bound re Realization Rate	0.929
Relative Precision	4%
Population Size (per Program Tracking System; N)	420
Tracking Savings (= population * sample Ex Ante mean; gross annual kWh savings)	10,261,963
Total Gross Ex Post Annual kWh Savings (= Tracking Savings * Realization Rate)	9,897,483
Standard Error (gross annual kWh savings)	219,506
Error Bound @ 90% confidence level (gross annual kWh savings)	361,088
Upper Error Bound re Realization Rate (gross annual kWh savings)	10,258,571
Lower Error Bound re Realization Rate (gross annual kWh savings)	9,536,396
Program Goal Gross Annual kWh Savings	9,792,750
S&A estimate of Gross Annual kWh Savings as % of Goal	101.1%
Upper Error Bound - S&A estimate of Gross Annual kWh Savings as % of Goal	104.8%
Lower Error Bound - S&A estimate of Gross Annual kWh Savings as % of Goal	97.4%
Selected Population Statistics	
Program Tracking System Gross Annual kWh Savings (ex ante)	11,122,899
Mean Gross Annual kWh Savings (ex ante) per Program Participant	26,483
Sample Mean as % of Population Mean: Gross Annual kWh Savings (ex ante) per Participant	92%

RLW. Key observations re the statistical data are briefly summarized below, followed by the full data in tabular form.

- The sample of 70 applications covered 23% of the program's 304 estimated total participants, resulting in case weights of 4.34 (1/.230).

- The mean ex ante and ex post gross annual kWh savings for the sample were 27,075 and 25,259, respectively; the overall realization rate was .933.

- Maximum and minimum ex ante gross annual kWh savings for the sample were 592,844 and 1,382, respectively.

- For references purposes: the population ex ante mean gross annual kWh savings was 24,986 (8% less than the sample's ex ante mean of 27,705), and indicates a modest bias in the sample towards larger customers.

- The sample data indicate that the program attained approximately 7.7 million gross annual kWh savings (110% of program goal), +/- 0.13 million gross annual kWh savings (see discussion following tabular statistical data).

RLW Statistics Summary

Sample-based Statistics, assuming Simple Random Sampling and Ratio Estimation of Realization Rate	
Mean (Ex Ante; gross annual kWh savings)	27,075
Max (Ex Ante; gross annual kWh savings)	592,844
Min (Ex Ante; gross annual kWh savings)	1,382
Mean (Ex Post; gross annual kWh savings)	25,259
Max (Ex Post; gross annual kWh savings)	550,498
Min (Ex Post; gross annual kWh savings)	1,433
Sample Size (n)	70
Case Weight (w)	4.34
Sum, (w * Step 5 Ex Post values; gross annual kWh savings)	7,678,828
Sum, (w * Step 1 "measure status" TBL Ex Ante values; gross annual kWh savings)	8,230,709
Realization Rate	0.933
Standard Error	0.010
Error Bound @ 90% confidence level	0.016
Upper Error Bound re Realization Rate	0.949
Lower Error Bound re Realization Rate	0.917
Relative Precision	2%
Population Size (per Program Tracking System; N) (*note: RLW 4/23/04 estimate of projected total*)	304
Tracking Savings (= population * sample Ex Ante mean; gross annual kWh savings)	8,230,709
Total Gross Ex Post Annual kWh Savings (= Tracking Savings * Realization Rate)	7,678,828

Standard Error (gross annual kWh savings)	78,540
Error Bound @ 90% confidence level (gross annual kWh savings)	129,198
Upper Error Bound re Realization Rate (gross annual kWh savings)	7,808,026
Lower Error Bound re Realization Rate (gross annual kWh savings)	7,549,630
Program Goal Gross Annual kWh Savings	6,964,138
S&A estimate of Gross Annual kWh Savings as % of Goal	110.3%
Upper Error Bound - S&A estimate of Gross Annual kWh Savings as % of Goal	112.1%
Lower Error Bound - S&A estimate of Gross Annual kWh Savings as % of Goal	108.4%
Selected Population Statistics	
Program Tracking System Gross Annual kWh Savings (ex ante)	7,595,763
Mean Gross Annual kWh Savings (ex ante) per Program Participant	24,986
Sample Mean as % of Population Mean: Gross Annual kWh Savings (ex ante) per Participant	108%

3.2. Actual Versus Originally Intended Program Implementation

Very few surprises were found in actual program implementation (relative to what was described in either the ASW or RLW 1/2002 proposals, or the respective 5/2002 and 7/2002 Implementation Plans). The most significant modifications in program delivery during the 2002-2003 implementation cycle (in S&A's opinion) consisted of the following:

- *RLW.* The incentive cap pertaining to the lighting measure was modified in 6/2003 such that the incentive ceiling of 50% of the measure cost was changed to 75% of measure cost. Additionally, refrigeration system tune-ups were provided at no cost beginning in 6/2003 to any participant who also participated in the lighting portion of the program.

- *ASW.* CFL's were added explicitly to the program beginning in mid 2003. ASW's Implementation Plan had been ambiguous on this matter; in S&A's opinion, this measure modification was not precluded by the Implementation Plan, but does have probably implications for the Equipment Useful Life (EUL) assumption that should be pragmatically applied to the lighting measure for cost effectiveness calculations (see Section 10 discussion).

3.3. Program Issues Not Explored

Based on S&A reviews of April 2004 versions of the ASW and RLW tracking system databases, it appears that both programs exceeded gross aggregate annual kWh energy savings goals. Given this relatively pleasant state of affairs, relatively little effort was spent by S&A for purposes of EM&V report preparation on issues such as:

- How ASW and RLW identified and prioritized prospective customers

- What methods ASW and RLW used to "close" SBEA program sales, or

- What optimized incentive levels or measure definitions might be (relative to what was implemented)

The broader intent of S&A's EM&V work efforts involved focusing efforts and resources on key "big ticket" areas of uncertainty (e.g., energy savings quantification; customer satisfaction with various aspects of program delivery).

3.4. Scope of EM&V Formal Issues

Consistent with the EM&V Research Plan, the bulk of the remainder of this report focuses on the following impact evaluation and process evaluation topics:

- Impact Evaluation Issue #1: Are Measure Savings Data Characterized Accurately?

- Impact Evaluation Issue #2: Do Verification Processes Provide Adequate QA Screens?

- Process Evaluation Issue #1: Are Measure Savings Data Characterized Accurately?

- Process Evaluation Issue #2: Do Verification Processes Provide Adequate QA Screens?

- Process Evaluation Issue #3: Are Participants Well-Served?

- Process Evaluation Issue #4: Does the Program Serve Its Intended Target Markets?

4. Impact Evaluation Issue #1: Are Measure Savings Data Characterized Accurately?

4.1. Approach / Methodology

This particular issue is addressed through 1) verification audits/reviews of application paperwork, 2) engineering reviews of "pre" and/or "post" measure data, and 3) participant self-reported phone surveys. Relevant portions of the participant phone surveys include survey questions 8 through 10 (regarding measure persistence and hours of operation for the business in general, as well as for lighting systems in particular).

In terms of impact evaluation quantification, Impact Evaluation Issue #1 maps to Steps 1 through 4 in the impact evaluation workbooks for ASW and RLW (regarding "Application Paperwork Formal Verification Audit-based Gross Savings Adjustments"). Note that Step 5 in the impact evaluation workbooks is largely discussed within the context of Impact Evaluation Issue #2.

The first four steps in the overall 5-step impact evaluation process are summarized in the following paragraphs.

Step 1: Reference Information for Sampled Applications. In this step, the annual gross kWh savings values in the program tracking database are used as the starting point for the impact evaluations work. As part of Step 1, any measure-specific disagreements between database and paperwork savings values are identified.

Step 2: Reverse Engineering of Annual kWh Savings Figures Using ASW/RLW Data Inputs. Step 2 pragmatically involves verifying whether listed savings data have been developed according to SBEA program specification. Paperwork materials are used as much as possible by S&A before relying on electronic database values to fill in as-needed gaps (e.g., where certain pieces of data needed for the energy savings calculation may not have been provided in hard copy). Note that at least *some* measure-specific information has to be included in sampled application paperwork, otherwise the measure-specific claimed energy savings are zeroed out.

Step 3: *Reverse Engineering of Annual kWh Savings Figures Using Selected Primary Source Data Inputs Obtained by S&A*. This step involves S&A reviews of various primary data sources to verify that SBEA-assumed energy savings engineering constants are in fact appropriate (updating/correcting them where necessary). Step 3 also involves implementing S&A research findings in the energy savings calculations for each sampled application. Work regarding lighting measures involved verifying/modifying A) SPC program lighting fixture table and/or manufacturer kW values for specific fixtures, as well as B) kW data for certain fixture types not included in either the 1998 or 2003 SPC tables (using inferred values for lamps and/or ballasts). Work regarding non-lighting measures involved verifying/modifying engineering constants used in the energy savings

equations based on S&A reviews of ASW and RLW source documents and/or product/industry research.

Step 4: Participant Self-reported Verification-based Gross Savings Adjustments. This step involves making adjustments to the gross annual energy savings kWh data derived in Step 3 with respect to issues such as participant self reported verification of the customer identity, key contact identity, business type identity, and service location of the measure installation, as well as participant self reported verification of the measure types and quantities involved. Each issue is treated as binary (i.e., Step 3-based gross savings values are multiplied by 1 if acceptable responses are confirmed, and by 0 if not). Additional [proportional] adjustments are made based on participant self reported responses regarding A) measure persistence, B) general business hours of operation, and C) specific lighting system hours of operation.

4.2. Findings

Summary findings regarding the impact evaluation assessments are provided in tabular form below. Data are provided for the sample's aggregated gross annual kWh savings figures and in indexed form (where the Step 1 Database value equals 1.000) for each impact evaluation step for the samples of 69 ASW and 65 RLW applications.

Summary of Findings – ASW Sampled Applications

Step 1 "Measure Status" TBL Value	Step 1 "Details" TBL Value	Step 1 Paperwork	Step 2	Step 3	Step 4	Step 5
1,685,894	1,690,948	1,685,094	1,684,946	1,655,609	1,626,015	1,626,015
1.000	1.003	1.000	0.999	0.982	0.964	0.964

Summary of Findings – RLW Sampled Applications

Step 1 Database	Step 1 Paperwork	Step 2	Step 3	Step 4	Step 5
1,895,229	1,904,254	1,878,866	1,870,452	1,768,151	1,768,151
1.000	1.005	0.991	0.987	0.933	0.933

Application record-specific values are provided in the "Summary" worksheets of the ASW and RLW impact evaluation workbooks.

Impact evaluation step-specific findings and issues are discussed in turn in the following sections.

4.2.1. Step 1

This step pertains to reference information gathered regarding the sampled applications. Observations regarding ASW and RLW are discussed in turn.

ASW. There were 5 records among the 69 sampled applications where disagreements existed between the annual kWh saved values in the "Measure Status" table of the program database and the paperwork. Reasons for the disagreements varied, and included

1) rounding errors in one source or the other, 2) accidental inclusion of air conditioning-related energy savings in the claimed savings figures, and 3) data not being updated in one source or the other. The overall magnitude of these disagreements was exceedingly small (i.e., less than a 0.1 % drop in annual kWh savings for the paperwork values relative to the "Measure Status" table when measured across all sampled applications). Interestingly, approximately *half* of the sampled applications had [generally small] disagreements regarding the annual kWh savings between the "Measure Status" table and the applicable "Details" table; for the most part, these disagreements appeared tied to rounding errors occurring within one or the other table. *Note*: ASW tracks two sets of energy savings within its tracking system database for QA reasons.

RLW. There were 8 records among the 70 sampled applications where disagreements existed between the annual kWh saved values in the program database and the paperwork. Reasons for the disagreements primarily pertained to 1) the database not being updated to be consistent with the paperwork and 2) disagreements regarding measure scope between the database and the paperwork. The overall magnitude of these disagreements was quite small, and utilization of paperwork values resulted in a 0.5% increase in aggregate annual kWh savings across all sampled applications.

4.2.2. Step 2

This step pertains to the reverse engineering of annual kWh savings figures using ASW/RLW data inputs. Observations regarding ASW and RLW sampled applications are discussed in turn.

ASW. There were 12 records among the 69 sampled applications where the S&A reverse engineering of annual kWh savings data resulted in disagreements relative to the Step 1 application paperwork values. Virtually all instances involved extremely small differences most likely related to rounding errors in the paperwork. In the aggregate, the Step 2 reverse engineering process reduced the annual kWh savings by 0.1% relative to the Step 1 application paperwork value. Aggregate Step 2 annual kWh savings values stood at .999 of the corresponding Step 1 "Measure Status" table values.

RLW. There were 40 records among the 70 sampled applications where the S&A reverse engineering of annual kWh savings data resulted in disagreements relative to the Step 1 application paperwork values. Most instances involved small differences related to rounding errors in the paperwork. In the aggregate, the Step 2 reverse engineering process reduced the annual kWh savings slightly relative to the Step 1 application paperwork value. Aggregate Step 2 annual kWh savings values stood at 0.991 of the corresponding Step 1 database values.

4.2.3. Step 3

This step pertains to the reverse engineering of annual kWh savings figures using selected primary source data inputs obtained by S&A. Impact Evaluation Step 3 is discussed in two distinct parts. First, findings regarding the S&A primary source reviews are discussed at a measure-specific level. Second, aggregate findings specific to ASW and RLW are discussed in turn. Note that the primary data source reviews were

significantly more extensive for lighting than for the other three SBEA program measures, since lighting represented more than 90% of annual gross kWh energy savings for both ASW and RLW for both program goals and reported program results.

Lighting measure. ASW and RLW lighting fixture kW values were reviewed based on the 1998 and 2003 SPC program lighting fixture tables. Additionally, certain fixtures were evaluated using manufacturer catalog data (i.e., the Sylvania catalog), since RLW utilized Sylvania exclusively and ASW utilized Sylvania significantly). In general, ASW and RLW database values were found to be almost entirely in agreement with either the SPC table or manufacturer catalog data.

Interestingly, there were 10 lighting fixtures where ASW and/or RLW had kW values for that differed either with the SPC tables, or with each other. Refer to the table on the following page for a listing of these fixtures, as well as discussion of how the difference was treated by S&A. These disagreements resulted from either 1) ASW's using 1998 SPC table values (while RLW derived kW data incrementally from more recent lamp and ballast kW assumptions) or 2) RLW's utilizing manufacturer catalog data (which happen to disagree modestly from SPC table data). To help reconcile these conflicts, S&A consulted with Alternative Energy Systems Consulting (AESC; see http://www.aesc-inc.com/main.htm) of Carlsbad, California, the contractor who updated the SPC tables in 2002/2003 relative to the 1998 version (which had been developed by Schiller Associates). The S&A-AESC discussions indicated that:

- 1998 SPC table kW values for a given fixture should not have changed in the 1998-2003 time frame

- Single lamp ballasts are significantly less efficient than multiple lamp ballasts, and

- A range of several watts for a given fixture type (i.e., lamp and ballast combination) is absolutely to be expected; in isolation, lamp and ballast kW values are nominal values only that are not necessarily additive.

As the table indicates, S&A left certain fixture kW values unchanged, and modified other fixture kW values that resulted in increased SBEA program energy savings (all other things equal); there were no instances where kW modifications resulted in decreased energy savings (all other things equal).

The lighting fixture databases for ASW and [especially for] RLW include many fixture values not in either the SPC tables or in the Sylvania catalog. Such values arose owing to custom fixture configurations encountered/utilized in the programs (e.g., particularly odd/old "pre" fixtures; "post" fixtures with particular combinations of lamps, ballasts, and de-lamping or wiring). S&A reviewed these values – particularly closely for fixtures involved relatively frequently in the SBEA program – and found these values to be reasonable (especially in light of the AESC discussions mentioned above).

Lighting Fixtures with kW Disagreements between ASW, RLW, and/or SPC, and S&A Recommended Values

		ASW Base Value		RLW Base Value		2003 SPC			ASW EM&V Value			RLW EM&V Value			
Fixture	Fixture Type	kW	Basis	kW	Basis	G1 kW	G2 kW	G3 kW	kW	Basis	Impact on Base Energy Savings	kW	Basis	Impact on Base Energy Savings	Notes
F41ILL-R	post	0.027	SPC database (2/13/98)		F42ILL-R per 2002 Sylvania catalog is .051; value halved and rounded up	NA	NA	0.025	0.026	RLW value	increase	0.026	base value	none	
F41SE	pre	0.050	SPC database (2/13/98)	0.049	2003 SPC for F41EE is .043; add 6 watts (40-34) for SE	NA	NA	NA	0.050	ASW value	none	0.049	base value	none	RLW base value within 2 watts of ASW base value, so kept as-is
F42ILL	post	NA	NA	0.059	2002 Sylvania catalog	0.059	0.059	0.054	NA	NA	none		base value	none	catalog value most accurate
F42ILL-H	post	NA	NA	0.077	2002 Sylvania catalog	0.065	0.065	NA	NA	NA	none	0.077	base value	none	not obvious why 2003 SPC is so much different
F42ILL-R	post	0.052	SPC database (2/13/98)	0.051	2002 Sylvania catalog	0.052	0.052	0.048	0.051	RLW value	increase	0.051	base value	none	catalog value most accurate
F42SE	pre	0.086	SPC database (2/13/98)	0.084	2003 SPC for F42EE is .072; add 12 watts (2*(40-34)) for SE	NA	NA	NA	0.086	ASW value	none	0.084	base value	none	RLW base value within 2 watts of ASW base value, so kept as-is
F43ILL-R	post	0.078	SPC database (2/13/98)	0.076	2002 Sylvania catalog	0.078	0.078	0.073	0.076	RLW value	increase	0.076	base value	none	catalog value most accurate
F43SE	pre	0.140	SPC database (2/13/98)	0.128	derived from data for F42SE: ((3 lamps * 40 watts/lamp) + (2 ballasts * 4 watts/ballast)	NA	NA	NA	0.140	ASW value	none	0.140	ASW value	increase	RLW base value not within 2 watts of ASW base value, so ASW value used
F44ILL-R	post	0.102	SPC database (2/13/98)	0.098	2002 Sylvania catalog	0.102	0.102	0.094	0.098	RLW value	increase	0.098	base value	none	catalog value most accurate
F44SE	pre	0.172	SPC database (2/13/98)	0.168	derived from data for F42SE: ((4 lamps * 40 watts/lamp) + (2 ballasts * 4 watts/ballast)	NA	NA	NA	0.172	ASW value	none	0.172	ASW value	increase	RLW base value not within 2 watts of ASW base value, so ASW value used

Finally, S&A notes that ASW utilized a sub-contractor – EIG – who utilized fixture codes with significantly different nomenclature than the SPC tables. S&A's mapping of the EIG fixture codes to SPC table values resulted in kW value modifications for a significant number of records. Only a small number of "pre" fixture kW values were adjusted, and most of these values were increased (resulting in slightly increased energy savings, all other things equal). Among "post" fixture kW values, a majority of records were adjusted, but in relatively even amounts between values increased and values decreased. A listing of S&A's mapping of EIG fixtures and kW values to corresponding SPC values can be found in the "EIG Fixture kW Issues" worksheet of the ASW and RLW impact evaluation workbooks.

Refrigeration tune-up measure. ASW and RLW energy savings equations and associated engineering constants were systematically reviewed and updated, as is summarized in the table on the following page (see also the "Refrig Tuneup Eq Rev" worksheet of the ASW and RLW impact evaluation workbooks, which provides additional supporting primary source research data and notes). The pragmatic upshot of the S&A adjustments is a dramatic reduction in energy savings for both ASW and RLW, primarily because of 1) order-of-magnitude reductions in cooling capacity intensity (kBtuh) per square foot of walk-in cooler/freezer equipment and 2) major reductions in the assumed measure percentage energy savings (since the actual tune-up measure addresses only condenser and evaporator coils; other aspects such as refrigerant charge condition are information-only). Note that energy savings equations for ASW and RLW *can* differ slightly, as RLW does adjust refrigerant charge when necessary as part of the tune-up.

AC tune-up measure. ASW and RLW energy savings equations and associated engineering constants were systematically reviewed and updated, as is summarized in the table on the second following page (see also the "AC Tuneup + Tstat Eq Rev" worksheet of the ASW and RLW impact evaluation workbooks, which provides additional supporting primary source research data and notes). The pragmatic upshot of the S&A adjustments is a slight decrease in energy savings for ASW and a significant increase in energy savings for RLW. Note that the reason for the differences in impact direction between ASW and RLW is because ASW hour/year data required significant downward adjustment while RLW corresponding data did not; both ASW and RLW "benefited" from S&A upward adjustments in the assumed kW/ton values. All other values in the engineering equations – load factors and percentage savings constants – were deemed acceptable, and not in major need of modification.[4]

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[4] Note that use of the S&A step 3 data resulted in general consistency with *ex ante* energy savings claimed by Richard Heath Associates (RHA) in their Small Nonresidential Energy Fitness (SNEF) program proposal for 2004-2005 (approved by the CPUC). Specifically, the RHA SNEF AC tune-up measure (which targets businesses such as offices in the northern Sacramento Valley) assumes a 5 ton unit, and estimates annual energy savings at 360 kWh. S&A-specified values for the AC tune-up measure in such a similar typical small office would work out to be 5 tons * 1.3 kW/ton * .62 load factor * 52 week/year * 50 hour/week * 7.5 months/12 months annual AC system operation factor * 5% savings = 327 kWh. These findings imply that the S&A-adjusted energy savings are slightly more conservative than corresponding RHA assumptions. It should be noted that the RHA measure assumes 7% savings (i.e., higher than the SBEA's 5%), but includes replacement of air filters (while the SBEA program measure simply reports on the condition of the filters).

Refrigeration Tune-up Measure Energy Savings Components

Variable	ASW/ RLW value(s)	ASW/RLW value(s) basis	S&A notes re ASW/RLW value(s) basis	S&A recommendation	S&A recommendation notes
ft (LF for cases; sq ft for walk-in units)	per field audit	determined by audit	appropriate	per field audit	determined by audit
kBtuh/ft	cases range from 1.07 (cold drinks) to 1.53 kBtuh/LF (frozen food); walk-ins range from .5 (meat freezer) to .6 kBtuh/sq ft (coolers)	simulations and work with refrigeration contractor (per C Baginski/ASW email to P Sisson/S&A, 12/8/03)	simulation/contractor materials not provided (though useful ADL DOE 1996 study cited at right was provided); counter-intuitive findings re walk-in freezers being less loads-intensive than walk-in coolers	Cases: 1.5 kBtu/LF for all med. temp cases, 2.08 for low temp cases. Walk-ins: .06 kBtuh/sq ft for coolers, .20 kBtuh/sq ft for freezers.	All data per ADL "Energy Savings Potential for Commercial Refrigeration Equipment" 1996 study for DOE, Table 4.5 (page 14). For walk-in freezers, ADL data adjusted from .08 to .20 kBtuh/sq ft based on S&A 4/04 research re actual Kolpak units (similar research re walk-in coolers found ADL data were highly accurate).
tons/kBtuh	1/12	engineering constant	appropriate	1/12	engineering constant
kW/ton	1.549 for all but frozen food case; frozen food case is 2.548	simulations and work with refrigeration contractor (per C Baginski/ASW email to P Sisson/S&A, 12/8/03)	simulation/contractor materials not provided, so evaluated using selected product spec sheets.	2.0 for all but frozen food case; frozen food case = 2.55	S&A 4/04 spot checks of Delfield equipment (i.e., 500-CRR deli cases, 6100XL reach-in freezers) indicate kW/ton values range between 1.92 and 2.78, so 2.00 used to be relatively conservative; data not found for frozen food cases, so left unchanged
hr/yr	8760	assumes 24/7 operation for food safety purposes	appropriate	assumes 24/7 operation for food safety purposes	appropriate
load factor	80%	less than the 82% inferred from SCE Book of Standards, action 7.4 (8/1/82); 82% = 610 run hr/mo / 720 total hr/mo. 80% is intended to be conservative	very dated source (1982), but value appears generally reasonable (based on past S&A staff audits of grocery stores)	80%	ASW/RLW assumption appears prudently reasonable for default value
% savings for Refrig. Tune-up	6%	more conservative than average finding in SMUD "Small Commercial A/C and Refrigeration Maintenance Program Draft Report", 1/01 (per C Baginski/ASW email to P Sisson/S&A, 12/8/03); less than SCE Book of Standards' 20% savings for coil cleaning; less then Efficiency Maine 2003 materials claim of 25% savings for coil cleaning	SMUD study savings for refrigeration system tune-up are only 0.73% (page 16), but only involved condenser coil cleaning (while ASW and RLW measure also cleans evaporator coils, and RLW also corrects refrigerant charge where warranted); SCE value verified (but is from very dated (1982) source; Efficiency Maine value makes note of monthly cleaning cycle, and almost certainly applies to extremely filthy prior conditions	1.5% for ASW; 1.5% for RLW if no refrigerant charge correction and 3% if refrigerant charge corrected	round up SMUD study value (0.73%) to 1% (to take into account the typical small business/poorly maintained unit targeted by the SBEA program), and take half again (.5%) allowance for evaporator coils also being cleaned. Additional 1.5% savings used for RLW situations where refrigerant charge corrected, based on SMUD study findings (page 16) for AC tune-ups with and without charge correction. All other recommendations are information-only.

AC Tune-up and Programmable Thermostat Measure Energy Savings Components

Variable	ASW/ RLW value(s)	ASW/RLW value(s) basis	S&A notes re ASW/RLW value(s) basis	S&A recom-mendation	S&A recommendation notes
tons	per field audit	determined by audit	appropriate	per field audit	determined by audit
kW/ton	1.0	either 1) SCE "End-Use Metered Data for Commercial Buildings, Annual Report 1995", 12/96, (per C Baginski/ASW email to P Sisson/S&A, 1/22/04) or 2) SMUD "Small Commercial A/C and Refrigeration Maintenance Program Draft Report", 1/01 (per K Moore/RLW email to P Sisson/S&A, 12/5/03)	neither kW/ton nor even basic AC tonnage data found in either of the two documents mentioned. Hence data appear untied to specific "hard" documentation.	1.3 if unit <= 5 tons, 1.1 if unit > 5 tons	S&A research conducted 2/04 for package rooftop units; kW data appear to apply to core cooling system compressor; S&A data are at the conservative (i.e., low) end of the findings. Note further that these data pertain to new models; corresponding data for models 5-20 years old if anything would be significantly higher, owing to lower SEER's / EER's.
load factor	values range between .26 and .70	SCE "End-Use Metered Data for Commercial Buildings, Annual Report 1995", 12/96, (per C Baginski/ASW email to P Sisson/S&A, 1/22/04)	SCE document provides load factors at the building level for 3 different building types within each of 5 season/day types, but not across the overall year, and not with any sort of delineation for Coastal/Inland or economizer/no economizer. See for example page 2-8 of the SCE document for available data re offices. Hence, data appear untied to specific "hard" documentation.	ASW values (.26 - .70)	SCE data appear "about right", if tied to annual AC hours of operation (as opposed to overall annual business hours or overall annual HVAC hours of operation). Note that weather variations between northern & southern Calif. are significant but not "show stoppers" (given that the northern Calif. program operates in a decidedly inland portion of the Bay Area).
hr/yr	ASW: business hours; RLW: AC operating hours	ASW: per C Baginski/ASW email to P Sisson/S&A, 12/8/03; RLW: per reviews of data for sample records in the Customer Information, Tstat Detail, and HVAC Detail tables of the tracking system database	RLW approach probably appears more appropriate, given the climate zones and load factor values involved. Consider for example the inland office load factor for no economizer: .62. Even in the Inland Empire or Desert areas, there are very limited AC loads in the 3 months of Dec-Feb.; a factor of .62 in combination with AC loads during the remaining 75% of the year would imply either near "flat-out" (i.e., 82% (= 62%/75%)) AC unit utilization during Mar-Nov (very unrealistic) or drastic AC unit undersizing (also very unrealistic).	AC operating hours	see prior S&A discussion. Note that an AC unit should be sized to meet design [weather] load (likely in the mid 90s or warmer in almost all of the operational areas of the SBEA). For ASW records, may involve designating 75%, 75%, and 83% of annual business hrs as AC hours for offices, retail stores, and restaurants, respectively (surrogates for approx. 9, 9, and 10 months of cooling loads, respectively).
% savings for AC tuneup	5%	more conservative than average savings reported in SMUD "SML CML A/C and Refrigeration Maintenance Program Draft Rpt", 1/01 (per C Baginski/ASW email to P Sisson/S&A, 12/8/03)	data verified in indicated document, page 16: 4.5% savings for filter change + condenser coil cleaning, and 6.1% if overcharge condition also addressed. Note, however, that refrigerant charge change condition is identified but not conducted as part of the SBE AC tune-up (such work happens optionally/subsequently, and at separate cost incurred by customer).	5%	reflects SMUD study findings for filter change + condenser coil cleaning, then backs out filter change effect (since not part of tune-up), then adds in effect of evaporative coil cleaning (since part of tune-up).
% savings for T-stat	8%	less than the 20-30% claimed by SCE (per C Baginski/ASW email of PDF of SCE web site screen shot sent to P Sisson/S&A, 12/8/03)	SCE web site figure is for residential applications. Hence, cited figure is largely non-applicable.	15%	low end of 15-25% range claimed for small CML customers per Flex Your Power web site, 2/04; see http://www.fypower.com/com/tools/products_results.html?id=100133

Programmable thermostat measure. Discussion regarding this measure is already largely covered by the AC tune-up measure discussion in the previous paragraph, as the energy savings engineering equation is largely identical to the AC tune-up's equation (except for the last term regarding percentage energy savings). As the table on the previous page notes, S&A adjusted this particular constant upwards significantly (from ASW and RLW's 8% value to a recommended 15%), resulting in the aggregate in modestly higher energy savings for ASW and significantly higher energy savings for RLW (with differences in impact magnitude between ASW and RLW owing to the hour/year data adjustment already described for the AC tune-up measure).

The following paragraphs shift to a discussion of Step 3-related observations regarding ASW and RLW sampled applications in turn.

ASW. All but 2 records among the 69 sampled applications had changes in calculated annual kWh savings[5] resulting from the Step 3 work. Not surprisingly, changes in "pre" and/or "post" lighting fixture kW data and refrigeration tune-up measure engineering constants were the primary drivers in terms of the overall magnitude of the changes. In the aggregate, the Step 3 primary data source-based reverse engineering process decreased the annual kWh savings for the sample modestly; in Step 1-indexed terms, aggregate Step 3 annual kWh savings values for the sampled applications dropped to .982 (from the Step 2 corresponding values of .999).

RLW. Thirty-six of the 69 sampled applications had changes in calculated annual kWh savings[6] resulting from the Step 3 work. Not surprisingly, changes in "pre" and/or "post" lighting fixture kW data and refrigeration tune-up measure engineering constants were the primary drivers in terms of the overall magnitude of the changes. In the aggregate, the Step 3 primary data source-based reverse engineering process decreased the annual kWh savings for the sample slightly; in Step 1-indexed terms, aggregate Step 3 annual kWh savings values for the sampled applications dropped slightly to .987 (from the Step 2 corresponding values of 0.991).

4.2.4. Step 4

This step pertains to participant self-reported verification-based gross savings adjustments. Impact Evaluation Step 4 is discussed in two distinct parts. First, findings regarding participant phone surveys questions 8 through 10 (regarding measure persistence and hours of operation for the business in general as well as for lighting systems in particular) are described. Second, aggregate findings specific to ASW and RLW sampled applications are discussed in turn.

Phone surveys. The findings are grouped in the order of the survey instrument questions for questions 8 through 10.

Q8a.) Is the measure(s) and/or tuned-up equipment still fully installed and operational? (*ask about each measure verified by the participant in #7*)

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[5] Relative to corresponding Step 2 data.
[6] Relative to corresponding Step 2 data.

If "no" regarding any of the measures, ask: **b) What % of the measures remain installed and operational? _____**

Q8a. Fully installed/operational (yes/no)?	**Q8b. % Remaining installed/operational?**
_____**Lighting system upgrades**	_____
_____**HVAC system tune-up**	_____
_____**Refrigeration equipment tune-up**	_____
_____**Programmable thermostat installed**	_____

(Treat situations where a piece of equipment promptly failed <u>and</u> was satisfactorily replaced as part of the SBEA program as still installed/operational)

ASW respondents. All but 2 of the sampled applicable measure installations (64 lighting measures, 6 HVAC tune-up measures, 5 refrigeration tune-up measures, and 5 programmable thermostat measures) were verified by program participants as remaining fully installed and operational as of when surveyed. One outlier pertained to lighting (where 5% of the measure installation had been removed), and the other outlier pertained to a refrigeration tune-up (where 50% of the measure was classified as non-operational).

RLW respondents. 100% of all sampled applicable measure installations (70 lighting measures, 1 HVAC tune-up measures, 6 refrigeration tune-up measures, and 1 programmable thermostat measures) were verified by program participants as remaining fully installed and operational as of when surveyed.

Both ASW and RLW. The high levels of persistence – particularly for the lighting measure – imply that the SBEA program is correctly specifying for the lighting applications involved.

Q9.) Our records show that your business hours are _____.
(read from data extract regarding weekdays, Saturdays, and Sundays)
Are your *current* business hours significantly different from what our records indicate? (If yes, record changes in weekdays, Saturdays, and/or Sundays)

ASW respondents. 24 of the 69 respondents who verified program participation (35%) indicated that their business hours were significantly different from the hours indicated in the tracking system database. Interestingly, the overall net impact evaluation effect of these differences was small, as the reported "overages" and "underages" largely offset one another.

RLW respondents. 13 of the 70 respondents who verified program participation (19%) indicated that their business hours were significantly different from the hours indicated in the tracking system database.

Q10.) (*Ask if customer implemented lighting measures in #7*) a) Are the hours of operation for your overall lighting system <u>exactly</u> the same as your business hours?
_____

b) If different, what are lighting system hours? _____
(record differences and/or data for weekdays, Saturdays, and/or Sundays)
c) Do lighting system hours vary for certain fixtures (e.g., security lighting, perimeter versus interior, main areas versus storage areas or bathrooms)? If so, describe. _____

ASW respondents. Approximately 70% (48) of the 69 respondents who verified program participation indicated that their lighting system hours were exactly the same as their business hours.

RLW respondents. Approximately 66% (43) of the 65 respondents who verified program participation indicated that their lighting system hours were exactly the same as their business hours.

The following paragraphs shift to a discussion of aggregate Step 4-related observations regarding ASW and RLW sampled applications in turn.

ASW. All but 16 records among the 69 sampled applications had changes in calculated annual kWh savings[7] resulting from the Step 4 work. Changes in lighting system operating hours were the main drivers in terms of the overall magnitude of the changes, and appear to reflect a mix of 1) updated business conditions and 2) more specific lighting system operating information. In the aggregate, the Step 4 verification-based gross savings adjustments decreased the annual kWh savings for the sample modestly; in Step 1-indexed terms, aggregate Step 4 annual kWh savings values for the sampled applications dropped to .964 (from the Step 3 corresponding values of .982). It should be noted that there was no preponderant pattern to the S&A adjustments to lighting system operating hours; the overall net drop in annual kWh savings is more than anything else the result of downward adjustments for a few of the relatively large sampled applications.

RLW. Forty-one of the 70 sampled applications had changes in calculated annual kWh savings[8] resulting from the Step 4 work. Changes in lighting system operating hours were the main drivers in terms of the overall magnitude of the changes, and appear to reflect a mix of 1) updated business conditions and 2) more specific lighting system operating information. In the aggregate, the Step 4 verification-based gross savings adjustments decreased the annual kWh savings for the sample modestly; in Step 1-indexed terms, aggregate Step 4 annual kWh savings values for the sampled applications dropped to .933 (from the Step 3 corresponding values of .987). It should be noted that there was no preponderant pattern to the S&A adjustments to lighting system operating hours; the overall net drop in annual kWh savings is more than anything else the result of downward adjustments for a few of the relatively large sampled applications.

As was noted previously, Impact Evaluation Step 5 is discussed with the context of Impact Evaluation Issue #2 (see Section 5).

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[7] Relative to corresponding Step 3 data.
[8] Relative to corresponding Step 3 data.

4.3. Recommendations

S&A recommends utilization of:

- The updated fixture kW values for the lighting measure identified in tabular form in Section 4.2.3

- The updated engineering constants for the refrigeration tune-up measure identified in tabular form in Section 4.2.3

- The updated engineering constants for the AC tune-up and programmable thermostat measures identified in tabular form in Section 4.2.3

Pragmatically, use of the updated refrigeration tune-up engineering constants may take the focus of that particular measure away from walk-in coolers and freezers, since those particular loads appear to be much smaller than originally assumed.

Note that generally related program management process recommendations are made within the context of Process Evaluation #1 (see Section 6).

5. Impact Evaluation Issue #2: Do Verification Processes Provide Adequate QA Screens?

5.1. Approach / Methodology

This particular issue is addressed through 1) verification audits of application paperwork and 2) participant self-reported phone surveys. Relevant portions of the participant phone surveys include survey questions 1 through 5 (regarding participant identity and program participation verification) and 7 (regarding participant measure verification). In terms of impact evaluation quantification, this issue maps to Step 5 in the impact evaluation workbooks for ASW and RLW (regarding "Application Paperwork Formal Verification Audit-based Gross Savings Adjustments"). Section 4 described Steps 1 through 4 of the impact evaluation quantification.

The following paragraph describes the last of the five steps in the impact evaluation process.

Step 5: Application Paperwork Formal Verification Audit-based Gross Savings Adjustments. This step involves making adjustments to the gross annual energy savings kWh data derived in Step 4 with respect to SBEA program-consistent values being found in the sampled applications regarding service address location, measure scope, and application completion date. Each issue is treated as binary (i.e., Step 4-based gross savings values are multiplied by 1 if acceptable responses are confirmed, and by 0 if not).

5.2. Findings

This section begins with a summary of responses for ASW and RLW participants for participant phone survey questions 1 through 5 and 7. It then addresses observations associated with the sampled paperwork applications.

5.2.1. Step 5 (per Participant Phone Survey)

Survey instrument questions 1 through 5 and 7 are listed (and grouped together where logically appropriate), followed by associated findings and observations regarding ASW and RLW program participants.

Key summary findings are that that for both ASW and RLW, existing processes appear functionally strong regarding the service address, measure scope, and completion date issues associated with this aspect of the SBEA program impact evaluation.

The remainder of this section covers question-specific participant survey issues.

Q1.) Verify name (and name of business) _____

Q2.) Verify business location (street address / city)_____

Q3.) Verify business type _____

Q4.) Verify position of interviewee _____

ASW respondents. Interviewees were promised their names would remain confidential. 100% of the 69 respondents were verified (with respect to SBEA program tracking system data) regarding their name, business location, business type, and interviewee position.

RLW respondents. Interviewees were promised their names would remain confidential. 100% of the 70 respondents were verified (with respect to SBEA program tracking system data) regarding their name, business location, business type, and interviewee position.

Q5.) Do you recall participating in the Energy Savers program sponsored by the Small Business Energy Alliance? _____ *If cannot recall, add more information such as: have you had more energy efficient lighting installed, etc. Or ask for another person who might have had responsibility for the business' decision to participate in such a program.*

ASW respondents. 100% of the 69 respondents verified participation in the SBEA program.

RLW respondents. 100% of the 70 respondents verified participation in the SBEA program.

Q7.) Our records indicate that you had the following energy efficiency measures implemented (*read from data extract*):
____**Lighting system upgrades (new lamps, fixtures, ballasts, etc.)**
____**HVAC system tune-up**
____**Refrigeration equipment tune-up**
____**Programmable thermostat installed**
Does this scope of work sound correct? _____
(If answer is no, record their version of what happened.)

ASW respondents. 67 of the 69 respondents who verified program participation (97%) confirmed the indicated scope of implemented measures. The other two respondents mentioned additional measures added previously or subsequent to the completion month sampled.

RLW respondents. 100% of the 70 respondents who verified program participation confirmed the indicated scope of implemented measures.

The following paragraphs shift to a discussion of aggregate Step 5-related observations regarding ASW and RLW collectively.

ASW and RLW. None of the 69 and 70 sampled records for ASW and RLW, respectively, had changes in calculated annual kWh savings resulting from the Step 5 work. In Step 1-indexed terms, aggregate Step 5 annual kWh savings values for the sampled applications remained unchanged from corresponding Step 4 values at .964 and .933 for ASW and RLW, respectively.

5.3. Overall Impact Evaluation Findings

The Step 5 indexed findings reported in the previous paragraph imply that the CPUC should adjust (i.e., multiply) overall program claimed gross annual kWh energy savings for ASW and RLW by factors of .964 and .933, respectively.

Overall results of the impact evaluation analyses – and associated key statistics – are presented in the tables below. Section 3.1 contains additional, more detailed information regarding the respective samples.

Based on S&A's impact evaluation analyses ASW exceeded its gross annual kWh energy savings program goal by 1%, as can be seen in the following table.

ASW Impact Evaluation Findings and Comparison to Program Goal

Statistic	Value	Units
Program Goal Total	9,792,750	gross annual kWh energy savings
Population Ex Ante Total -savings	11,122,899	gross annual kWh energy savings, per program tracking system
Population Ex Ante Total –participants	420	customers
Realization Rate (per S&A Impact Evaluation Adjustments for Samples Applications)	.964	ratio
Tracking Savings Total (population * sample Ex Ante Mean)	10,261,963	gross annual kWh energy savings
Population Ex Post Total (Tracking Savings Total * Realization Rate)	9,897,483	gross annual kWh energy savings
Relative Precision of Estimate (at 90% confidence level)	4%	ratio
Population Ex Post Total as % of Program Goal Total	101%	ratio

Based on S&A's impact evaluation analyses RLW exceeded its gross annual kWh energy savings program goal by 10%, as can be seen in the following table.

RLW Impact Evaluation Findings and Comparison to Program Goal

Statistic	Value	Units
Program Goal Total	6,964,138	gross annual kWh energy savings
Population Ex Ante Total -savings	7,595,763	gross annual kWh energy savings, per program tracking system extract
Population Ex Ante Total –participants	304	customers

Realization Rate (per S&A Impact Evaluation Adjustments for Samples Applications)	.933	ratio
Tracking Savings Total (population * sample Ex Ante Mean)	8,230,709	gross annual kWh energy savings
Population Ex Post Total (Tracking Savings Total * Realization Rate)	7,678,828	gross annual kWh energy savings
Relative Precision of Estimate (at 90% confidence level)	2%	ratio
Population Ex Post Total as % of Program Goal Total	110%	ratio

Significantly, both ASW and RLW have attained these results while consuming significantly less than the budgeted program incentive amounts (based on S&A interviews with ASW and RLW program staff). These findings imply both programs have Program Administrator Test cost-effectiveness results significantly in excess of what would have been calculated on an ex ante basis (since goal energy savings were exceeded while overall program implementation costs was significantly less than goal).

5.4. Recommendations

S&A has no specific recommendations with respect to Impact Evaluation Issue #2. Note, however, that related program management process recommendations are made within the context of Process Evaluation #2 (see Section 7).

6. Process Evaluation Issue #1: Are Measure Savings Data Characterized Accurately?

6.1. Approach / Methodology

This particular issue is the management process side of Impact Evaluation Issue #1 (discussed previously in Section 4). This issue is addressed based on verifications audits of application paperwork (and database records) and 2) interviews of program staff. Particular attention has been placed on the specific step-by-step approaches utilized by ASW and RLW staff in the development of application paperwork packets and associated tracking system data entry.

6.2. Findings

General. S&A begins by noting that the vast majority of ASW and RLW SBEA program management processes related to accurate characterization of measure savings data appear functionally appropriate and sound. The specific observation noted here are therefore relatively focused in nature.

Additionally, S&A observes that the ASW and RLW tracking system databases have significant differences in structure (e.g., the RLW database utilizes significantly more tables; the ASW database tracks measure-specific kWh savings data in multiple locations). Except as specifically noted below, however, both databases contain the needed information to conduct the relevant calculations, and for EM&V activities to be conducted in a straightforward manner in support of those calculations.

ASW. S&A has four observations regarding this topic, as noted below.

- The EIG-related applications rely on lighting fixture codes significantly different from the rest of the ASW SBEA program. Consistent fixture codes should be utilized in all ASW program applications to avoid situations where similar fixtures have significantly different engineering assumptions.

- Sampled applications involving lighting measures installed in facilities open year-round sometimes assume 52 weeks/year operation, while other generally similar applications assume 365 days/year op (i.e., 52.14 week/year). A consistent assumption of 365 days/year should be used in all such applications. Obviously, such observations do not apply to most school installations (generally assumed by ASW to be open 44 week/year[9]).

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[9] With respect to the assumed school building operating schedule of 44 weeks/year, S&A notes that California public schools are required to be open 180 days per academic year (36 5-day weeks). Taking into account teacher preparation days, school year ramp-up days, and school year ramp-down time, plus maintenance scheduled during vacations, S&A feels that a figure of 40 or 41 weeks/year is probably more defensible. That said, however, the 44 week/year assumption is not wildly implausible, and hence has not been adjusted in the impact evaluation analyses.

- Lighting fixture records provide operating schedules in terms of overall hour/week. ASW should consider adopting the RLW database structural attribute of operating schedules specified by hours/day for each of the seven days of the week. S&A found record verification significantly more straightforward and closely tied to participant survey responses using the RLW approach.

RLW. S&A has two observations regarding this topic, as noted below.

- Application packets involving lighting measures almost universally include materials identifying overall measure annual kWh savings, but rarely present specific details associated with the kWh savings derivations (i.e., the "Energy and Cost Savings Recommendation Report") showing how the kWh savings data are determined). In contrast, S&A notes ASW usually does provide such materials. Inclusion of these calculations streamlines EM&V paperwork reviews, and provide useful information to customers; see related discussion in Section 8.2.2). S&A recommends inclusion of such materials in all relevant application paperwork packets.

- Among the 70 sampled applications, there were 4 instances where measure record-specific energy savings were not included in the RLW database reporting structure because of additions or modifications made relatively late in the measure specification process[10]. Application processing should include a formal or automated database update step *whenever* measure data are added or modified.

6.3. Recommendations

For ASW program implementation going forward, S&A recommends the following:

- Use of standardized lighting fixture codes (and associated kW values) in *all* applications.

- Standardized use of a 52.14 week/year assumption in energy savings calculations for those facilities that are open year-round.

- Specification of lighting fixture operating schedules (hours/day) on a day-specific basis.

For RLW program implementation going forward, S&A recommends the following:

- Universal inclusion of "Energy and Cost Savings Recommendation Report" paperwork materials showing specific lighting measure annual kWh savings calculations.

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[10] See customer ID's 20056, 20139, 20163, and 70016.

- Inclusion of formal or automated database update steps whenever measure data are added or modified.

7. Process Evaluation Issue #2: Do Verification Processes Provide Adequate QA Screens?

7.1. Approach / Methodology

This particular issue is the management process side of Impact Evaluation Issue #2 (discussed previously in Section 5). As was the case with Impact Evaluation Issue #2, this issue is addressed based on 1) participant self-reported phone surveys and 2) verifications audits of application paperwork. This issue is also addressed through interviews of program staff (with respect to program oddities and ambiguities).

7.2. Findings

7.2.1. Participant Phone Survey

Responses for survey instrument questions 1 through 5 and 7 (already described in Section 5.2.1) indicate that existing processes appear functionally strong for both ASW and RLW regarding service address, measure scope, and completion date QA issues for the SBEA program.

7.2.2. Application Paperwork

The following discussion focuses on S&A reviews of application paperwork. Given the overall positive findings of Section 5.2.1 (and 7.2.1), these reviews and associated recommendations (see Section 7.3) should be considered "peripheral" or "incremental" in nature.

ASW. Paperwork packets associated with the EIG-contracted lighting measure installations usually lack a Final Installation Report; addition of such a form is recommended. Note that lack of such reports within the sampled 2002-2003 applications does not disqualify claimed energy savings (since participants *did* adequately verify program and measure participation on a self-reported basis), but does add an additional component to verification work.

RLW. Paperwork associated with AC or refrigeration tune-up measures frequently lack paperwork for the actual tune-up "pre" and "post" results and associated annual kWh savings [11]; the universal inclusion of such materials in the paperwork is highly recommended.

Both ASW and RLW. Application paperwork forms refer to the customer site address, while the program databases refer to the billing address; fields for the latter should be renamed to reflect their pragmatic use. Additionally, fields should be added to each

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[11] For example, the following sampled customer ID paperwork packets lacked tune-up results: 20001; the following customer ID paperwork packets lacked both tune-up results and annual kWh savings calculation sheet details: 20001 (for AC tune-up), 20244, 30283, and 70016. In all instances, however, sufficient paperwork existed regarding the basic occurrence of the tune-ups' having happened.

respective program tracking system database such that the billing/check address for the customer can be distinguished from the site/service address (where the two values differ). This issue emerged owing to temporary confusion caused in the EM&V process regarding several sampled applications where the two addresses were not the same.

7.3. Recommendations

For ASW program implementation going forward, S&A recommends the following:

- Universal inclusion of Final Installation Report paperwork (i.e., such paperwork provided for all completed measures for all applications)

- Add fields to the program tracking database to distinguish customer situations where the billing/check address differs from the site/service address.

For RLW program implementation going forward, S&A recommends:

- Universal inclusion of tune-up "pre" and "post" results in paperwork for all application involving completed AC tune-ups and/or refrigeration system tune-ups.

- Add fields to the program tracking database to distinguish customer situations where the billing/check address differs from the site/service address.

8. Process Evaluation Issue #3: Are Participants Well-Served?

8.1. Approach / Methodology

This issue is addressed based on 1) participant self-reported phone surveys and 2) S&A reviews of materials typically conveyed to [prospective] participants. To a lesser extent, this issue also is based on reviews of program documents and associated program staff interviews.

Relevant portions of the phone survey included questions regarding:

- How the participant learned about the SBEA program (question 6)

- What key program components made them decide to be full participants (questions 11-12)

- How satisfied they were with various program delivery issues (questions 13-18 and 24-26)

- Refrigeration tune-up measure-specific issues (questions 19-21)

- Facility energy usage familiarity / observations (questions 22-23)

Obviously, survey results pertain to only to program participants who completed the SBEA program (e.g., participants who stopped after receiving the free SBEA facility energy audit could have significantly different perspectives).

Reviews of materials conveyed to prospective participants include SBEA program marketing materials and application-specific paperwork provided to customers.

S&A notes that the EM&V Research Plan also called for leveraging of findings from the CPUC's Best Practices study (initiated by Quantum Consulting in spring 2003). Unfortunately, the Best Practices study ended up 1) lagging significantly the originally-envisioned schedule, 2) largely focused on pre-2002 California IOU programs and 2002-2003 non-California programs, and 3) overly general (at least with respect to initially published portions), and hence was not utilized. As of 4/2004, the Best Practices study is still at a relatively early stage of development, with many program-related chapters and program category comparisons not yet started. While Best Practices study materials developed to date *do* include discussion of nonresidential lighting (the primary focus of the SBEA program), relevant Best Practices materials currently in the public domain are too general to be truly useful or insightful regarding the SBEA program. For example, the nonresidential lighting materials do not include discussion of non-utility programs geared to small customers with respect to topics such as 1) ways to overcome effectively onerous

internal financial hurdle rates (e.g., a 4 month payback being considered overly risky) or 2) particularly effective (or ineffective) selling techniques regarding property managers. S&A is hopeful that such information will become available in the near future (i.e., of use to the 2004-2005 version of the SBEA program). Interestingly, given the SBEA 4/2004 designation by the U.S. E.P.A. as an ENERGY STAR Small Business Special Award program, perhaps the Best Practices study should look to ASW and RLW for best practices regarding reaching small customers.

8.2. Findings

This section begins with a summary of responses for ASW and RLW participants for phone survey questions 6 and 11 through 23, followed by observations associated with the reviews of materials conveyed to prospective participants.

8.2.1. Participant Phone Survey

Survey instrument questions 6 and 11 through 26 are listed and grouped together where logically appropriate, followed by associated findings and observations regarding ASW and RLW sampled program participants.

Key summary findings regarding these sections of the survey are as follows:

- Customers wanted to participate in the program more than anything else to implement energy efficiency (ASW) or to save on their monthly utility bills (RLW).

- In the aggregate, customers were quite highly satisfied with the SBEA program, and with lighting in particular.

- Most participants were not familiar with energy use for their business facility, but those customers that *were* generally observed a drop in energy consumption (adjusted for weather effects) following participation in the SBEA program.

- Most participants either had no prior experience with IOU energy efficiency programs, or found SBEA program services better or much better than corresponding IOU program services.

The remainder of this section covers question-specific participant survey issues.

Q6.) How did you *initially* learn about the program? (pre-coded list; multiple responses allowed) Do you recall receiving information about the program from *other sources as well*? *(probe until exhausted)*
____**Site visit from program representative**
____**Energy audit by program representative**
____**Phone call**
____**Professional association**
____**Website**

____Newspaper/media
____Friend/colleague
____Other _____ (record)

ASW respondents. The leading response (with 33 of the 69 respondents who verified program participation; 48%) was "other". The second place response (31 responses; 45%) was the on-site "feet in the street" visit from the program representative. The third place response (19 responses; 28%) was the energy audit. "Other" responses were scattered, with various types of advertising the most frequently mentioned item. All other responses were far behind.

RLW respondents. The leading response (with 48 of the 70 respondents who verified program participation; 69%) was the on-site "feet in the street" visit from the program representative. In a distant second place (14 responses; 20%) was "other". "Other" responses were widely scattered. All other responses were far behind.

Q11.) What made you decide to participate in the program? *(pre-coded list; multiple responses allowed; probe until exhausted)*
____Good business economics / good investment
____Good way to save on monthly utility bill
____Wanted to support a local small business service company
____Clear/compelling program literature
____Convincing/trustworthy program representative
____Clear/compelling program web site
____Willing to / interested in trying new technology
____Turnkey service program made the upgrades easy
____Not disruptive to my business
____Good word-of-mouth from other program participants
____Good testimonials in ads from respected local individuals and/or organizations
____Other _____ (record)

ASW respondents. Among the 69 respondents who verified program participation, the leading responses were "other" (49 respondents; 71%), "good way to save on monthly utility bill (48 respondents; 70%), and "good business economics" (32 respondents; 46%). All other responses were far behind.

Within the "other" category, the leading response – by far – pertained to wanting to save energy / energy conservation / energy efficiency [a attribute deemed distinct from the related benefit of saving on the monthly utility bill]. Another leading response pertained to the fact that the SBEA program incentives covered more of the cost for new lights than other programs.

RLW respondents. Among the 70 respondents who verified program participation, the leading responses were "good way to save on monthly utility bill (62 respondents; 89%), "other" (41 respondents; 59%), and "good business economics" (15 respondents; 21%).

Within the "other" category, the leading response pertained to energy conservation. Other leading responses pertained to A) needed new lighting systems and B) better quality lights.

Q12.) What was the single most important reason for deciding to participate in the program? *(circle the answer from the prior pre-coded list)*

ASW respondents. Responses generally resembled the responses for question 11. The most frequently cited most important reason was "good way to save on utility bill" (33.5 respondents; 49%). "Good business economics" was a very distant second place (18 respondents; 26%), and "Other" was in third place (12.5 respondents; 18%). *Note*: the reason for "half responses" (e.g., 35.5 respondents) is because one program participant was emphatic about splitting the answer evenly between two reasons.

RLW respondents. The top two responses dominated all others. The most frequently cited most important reason was "good way to save on utility bill" (43 respondents; 61%). "Other" (e.g., energy conservation, needed new lighting systems) was the second place vote-getter (16 respondents; 23%).

I am going to read you a short list of questions that I would like you to respond to using a 5-point scale (where 5 is best possible score and 1 is the worst possible score).
Q13.) ____Overall, how satisfied are you with the Energy Savers program?
Q14.) ____How easy was it to participate in the program, relative to the application paperwork process?
Q15.) ____How satisfied were you with the performance of the contractor(s) who performed the installation (and/or tune up)?
Q16.) ____What was the level of disruption to your business during installation?

ASW respondents. Respondents scored these four elements of SBEA program satisfaction relatively evenly and favorably. "Easy to participate" received an average score of 4.7, followed by "level of disruption" at 4.5, followed by overall program satisfaction at 4.4, and "performance of contractor" at 4.3).

RLW respondents. Respondents scored these four elements of SBEA program satisfaction rather evenly and *very* favorably. "Easy to participate" and "performance of contractor" both received an average scores of 4.6, followed by "overall program satisfaction" and "level of disruption" (both at 4.4).

Q17.) How satisfied are you with the performance of each measure installed and/or tuned up? (*as applicable from measure list per #6 above*)
____Lighting system upgrades
____HVAC system tune-up
____Refrigeration equipment tune-up
____Programmable thermostat installed

ASW respondents. Lighting measures – the overwhelming portion of the program – received a very high average score of 4.7. HVAC tune-ups and refrigeration tune-ups received average scores of 4.3 and 3.2, respectively, followed by programmable thermostats at 3.0.

Responses regarding measure satisfaction should be assessed bearing in mind the number of sampled application data points for each measure: 63 for lighting measures, 6 for HVAC tune-up measures, 5 for programmable thermostat measures, and 5 for refrigeration tune-up measures. Hence lighting measure responses appear much more robust than responses for the other three measures.

RLW respondents. HVAC tune-ups (based on 1 data point) received an extremely high score of 5.0. Lighting measures (based on 70 data points) received a very high average score of 4.3. The refrigeration tune-up measure received an average score of 4.2 from the 6 applicable respondents sampled. Programmable thermostats (based on 1 application data point) received a score of 3.0.

Q18.) _____ (*For those participants with lighting measures*) **How would you describe the quality of light that you have now, as compared with what you had before your participation in the Energy Savers program?** *(5 point scale – 5 = a lot better, 4 = a little better, 3= just as good, 2= almost as good, 1= not as good)*

ASW respondents. Light quality received an average score of 4.1 from those sampled respondents who had lighting measures installed, indicating a perceived overall improvement relative to the baseline lighting equipment/system.

RLW respondents. Light quality received an average score of 3.9 from those sampled respondents who had lighting measures installed, indicating a perceived overall improvement relative to the baseline lighting equipment/system.

Q19.) (*For those participants who had a refrigeration equipment tune-up conducted; otherwise, skip to # 22*) **What is the likelihood (in percent) that you would have had a refrigeration tune-up conducted in the absence of this program, where 0% = no chance and 100% = definitely would have had?** _____
Q20.) (*For respondents answering Q19 as >0%*) **How much sooner (in months) did the tune-up happen because of this program?**
_____
Q21.) (*For those participants who had a refrigeration equipment tune-up conducted*) **Did you have a maintenance contract for your refrigeration equipment prior to participating in the SBEA program?** _____

ASW respondents. Respondents indicated an average likelihood of 46% that they would have gotten a refrigeration system tune-up in the absence of the SBEA program (nominally implying a net-to-gross ratio of .54). They also indicated that the refrigeration tune-up happened approximately seven months earlier than it otherwise would have in the

absence of the program. One of the respondents previously had a maintenance contract for refrigeration equipment.

Responses regarding refrigeration tune-ups should be assessed bearing in mind the fact that the indicated data are based on a total of 5 sampled applications with refrigeration tune-up measures.

RLW respondents. Respondents indicated an average likelihood of 53% that they would have gotten a refrigeration system tune-up in the absence of the SBEA program (nominally implying a net-to-gross ratio of .47). They also indicated that the refrigeration tune-up happened approximately six months earlier than it otherwise would have in the absence of the program. One of the respondents previously had a maintenance contract for refrigeration equipment.

Responses regarding refrigeration tune-ups should be assessed bearing in mind the fact that the indicated data are based on a total of 6 sampled applications with refrigeration tune-up measures.

Q22.) Are you at all familiar with the energy *usage* (as opposed to the energy *costs*) at your site? _____
Q23.) *(if answered "yes" to #22 above)* **Adjusting for seasonal factors such as air conditioning loads, what do you think has happened to your site's overall energy usage since the retrofit?**
(*Choose the one most appropriate response)*
a. Unsure
b. Much less
c. Slightly less
d. About the same
e. Slightly more
f. Much more
g. I look at costs much more than usage

ASW respondents. Thirty-two of the 69 respondents who verified program participation (46%) were at least somewhat familiar with the energy usage for their business facility. Of the 32, 16 respondents were unsure as to what the direction in consumption had been [adjusting for seasonal factors such as air conditioning] since completing the SBEA program. Of the remaining 16 respondents, 9 observed either much less or slightly less energy consumption, 3 observed about the same energy consumption, and 4 observed either slightly more or much more consumption.

RLW respondents. Twenty-three of the 70 respondents who verified program participation (33%) were at least somewhat familiar with the energy usage for their business facility. Of the 23, 7 respondents were unsure as to what the direction in consumption had been [adjusting for seasonal factors such as air conditioning] since completing the SBEA program. Of the remaining 16 respondents, 15 observed either

much less or slightly less energy consumption, and 1 observed slightly more consumption.

Q24.) How would you rate the energy efficiency services provided by the SBEA compared to energy efficiency services you may have received from SCE or PG&E in the past?
a. **Much better**
b. **Better**
c. **About the same**
d. **Worse**
e. **Much worse**
f. **Not applicable (e.g., haven't had prior experience with SCE or PG&E)**

ASW respondents. Among the 69 respondents who verified program participation, the most common answer was "no prior experience with SCE" (26 respondents; 38%). 24 respondents (35%) rated SBEA program service as much better or better than corresponding SCE service, 19 respondents (28%) rated SBEA program service the same as corresponding SCE service, and none rated SBEA program service as worse or much worse as corresponding SCE service.

RLW respondents. Among the 70 respondents who verified program participation, the most common answer was "no prior experience with PG&E" (29 respondents; 41%). 31 respondents (44%) rated SBEA program service as much better or better than corresponding PG&E service, 9 respondents (13%) rated SBEA program service about the same as corresponding PG&E service, and 1 respondent (1%) rated SBEA program service as worse or much worse as corresponding PG&E service.

Q25.) Do you think the California Public Utilities Commission should continue to fund programs such as the SBEA to operate energy efficiency programs?
a. **Definitely**
b. **Probably**
c. **Unsure**
d. **Probably not**
e. **Definitely not**
f. **Don't know / no opinion**

ASW respondents. Among the 69 respondents who verified program participation, the most common answer was "definitely" (49 respondents; 71%), followed by "probably" (10 respondents; 14%).

RLW respondents. Among the 70 respondents who verified program participation, the overwhelming most common answer was "definitely" (63 respondents; 90%).

Q26.) Do you have any other feedback or suggestions regarding the program that we have not covered? _____

ASW respondents. General feedback and suggestions generally fell into one of three categories: 1) generally positive process improvement suggestions related to program promotion, 2) strong praise for the program, and 3) criticism of the program and/or technologies used. Illustrative verbatim quotes for each category are provided below.

Positive process improvement suggestions related to program promotion:

-       "Promote the program better!"

-       "Participating was a very pleasant experience. This program really needs better publicity; it's as if they are keeping the program a secret!"

-       "Use more local contractors; we had scheduling issues."

Strong praise for the program

-       "It's a great program; let more people know about it!"

-       "We got our money back in 3 months. I've recommended this to other people."

-       "I can't understand why everyone doesn't participate!"

-       "This is a good program for small businesses."

-       "Very smooth process, great contractors, easy to participate."

-       "We are already realizing a savings, the lights require less maintenance, and we have a better quality of light. More schools should know about this program."

Program/technology criticism

-       "We have not seen a change at all in our bill, so we are disappointed, and not sure if it was worth it. Are we conserving or not?"

-       "Our original cost estimate was much lower than the price we are being asked to pay now."

-       "We are happy with all the work done except for the thermostats – the installers left a gaping hole."

RLW respondents. General feedback and suggestions generally fell into one of three categories: 1) positive process improvement suggestions related to program promotion, 2) strong praise for the program, and 3) criticism of the program and/or technologies used. Illustrative verbatim quotes for each category are provided below.

Positive process improvement suggestions related to program promotion:

- "Being a small business owner, having a rep coming in off the street is not always welcomed-I think they are selling something. The program should be mentioned in the paper or PG&E should mail something describing the program!"

- "When folks open a new business, information about this program should be provided either when the account is established with PG&E, or have the Chamber send a packet."

- Advertise the program better; there's a grocery store down the street that really needs to join up."

Strong praise for the program

- "Usage is up [because of summer air conditioning], and yet my bills are lower! Many retailers in my area have seen the quality of my lights and now want to participate!"

- "Very happy; after the retrofit we installed a large industrial refrigerator, and our bill is still slightly lower than before the retrofit."

- "We had participated in a [utility] program 4 years ago and we were very unhappy with the bulbs used - they blew up, burned out, etc. within one year of installation. It was terrible. RLW was very sensitive to our needs, helpful, spent a lot of time with us, [and] followed up!"

- "It's paid for my investment in two months."

- "The rep did an excellent job making sure we were satisfied. We don't like the quality of light as well, but we are still happy we survived."

- "I'm so satisfied with program that now when I go into a business that has old lighting, I tell them about this program! We are saving at least $800 a month since the retrofit, and that is at the lower, winter rate."

Program/technology criticism

- "We were told that our costs and usage would decrease with the new lights, and instead both have increased. We are unhappy about this and are trying to get the situation figured out.

- "The lights in one area of the restaurant are flickering so much so that some customers will change their seats after sitting under them. Otherwise the reps were great."

- "Our light bulbs are burning out very quickly - we are having to change 6 to 8 bulbs per week. We have called our rep and they came and changed out some of the fixtures at our cost, but we are very unhappy with the cost and hassle of changing bulbs so often."

8.2.2. Materials Conveyed to Prospective Customers

In S&A's opinion, SBEA program marketing materials and application-related materials conveyed to prospective customers generally appear reasonable. The issues identified below are therefore relatively specific and focused in nature.

ASW. Customer energy saving calculations for lighting usually include a quantification of energy savings related to air conditioning (i.e., associated with reductions in waste heat within air conditioned space).[12] S&A believes that if such air conditioning-related lighting measure energy savings are identified, then ASW should identify a corresponding increase in winter space heating requirements (typically natural gas-related) as well.

RLW. Some reviewed applications include highly detailed lighting measure customer energy savings analyses (i.e., the "Energy and Cost Savings Recommendation Report"), while most reviewed applications do not. S&A recommends that such information be provided to customers on a more consistent basis.

8.2.3. Additional Observations

The following discussion points are observations related to the "are participants well-served?" topic that are based on general program document reviews and associated S&A interviews of program staff interviews.

First, it should be noted that the "yield rates" associated with the ratios of free audits conducted to participants signed up ended up being significantly lower in actuality than was envisioned in the Program Analysis Worksheets of the CPUC PIP reporting workbooks (particularly for ASW). Specifics are provided in tabular form below.

Audit Yield Rates – Goal and Actual

Statistic	ASW Target	ASW Actual	RLW Target	RLW Actual
Audits conducted	1,000	1392	425	638
Customers participating or completed	750	420	250	304
Yield Rate	75%	30%	59%	48%

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[12] Note that it is ASW's general policy that formally claimed annual kWh savings within the SBEA program *exclude* the air conditioning-related component. S&A believes that such an approach is prudently conservative, especially in light of likely overall HVAC system-lighting system interactions.

In S&A's opinion, the lower actual yields reflect less of a problem with customers not being well-served than it does the original program design reflecting a bit of idealistic/wishful thinking (in major part since neither program implementation had significant SBEA branding identities established at the time of program rollout.[13] S&A notes that both ASW and RLW significantly exceeded the originally targeted number of audits (and RLW exceeded the originally targeted number of customers, as Section 9.2 describes).

Second, prospective customers need to be informed as to *current and upcoming* rate conditions for use in payback analysis evaluation. ASW, for example, utilized the same average electric rate - $.18 per kWh – for *all* records in its 2002-2003 SBEA implementation, even though 1) participating customers were on a mix of SCE GS-1 (Very Small) and GS-2 (Small and Medium) tariff schedules, and 2) SCE dropped average rates as of 8/1/2003 by 18% and 13% for GS-1 and GS-2 customers, respectively.[14] RLW – for its 2004-2005 implementation – should have its average PG&E rates (already provided on a tariff-specific basis) reflect the approximately 10% drop in small commercial rates effective in 2004 associated with PG&E's 4/2004 emergence from bankruptcy. Note that *all other things equal*, lowered electric rates imply a need for higher incentives, in order to "restore" customer paybacks to their pre-rate decrease levels. In contrast, ASW and RLW have dropped modestly the lighting measure incentives for the 2004-2005 implementation (from $.15/kWh in 2002-2003 to $.13/kWh in 2004-2005), and left the other measure incentives unchanged.

8.3. Recommendations

For ASW program implementation going forward, S&A recommends the following:

- Improved program delivery quality regarding thermostats (e.g., installation aesthetic considerations, specific programming scheduling)

- Improved program delivery quality regarding the coils-cleaning aspect of refrigeration system tune-ups. Additionally, ASW should consider incorporating refrigerant charge modifications within the tune-up measure, so as to increase directly-claimable energy savings (albeit it at higher measure cost).

- Identified increased winter space heating requirements associated with lighting measures.

- Updated average $/kWh values used in customer payback analyses, and made rate class-specific to better reflect current and possible future market conditions.

For RLW program implementation going forward, S&A recommends:

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[13] ASW's pre-2002 implementation of the SBEA program had relied extensively on SCE branding support.
[14] See EIX 8/1/03 press release at http://www.edison.com/media/indiv_pr.asp?bu=&year=2003&id=4274.

- Improved program delivery quality regarding thermostats (in response to lackluster customer satisfaction ratings)

- Standardized lighting measure customer energy savings analyses (i.e., "Energy and Cost Savings Recommendation Report" included) for all prospective customers.

- Updated average $/kWh values used in customer payback analyses, and time-indexed to better reflect current and possible future market conditions.

9. Process Evaluation Issue #4: Does the Program Serve Its Intended Target Markets?

9.1. Approach / Methodology

S&A views this topic from the perspective of customer size (e.g., the Medium, Small, and Very Small definitions utilized in the CPUC's Energy Efficiency Policy Manual).[15] Accordingly, this particular issue is addressed primarily through comparisons of program documents (i.e., Implementation Plan filings) with sampled program participant characteristics regarding the envisioned versus actual mix of participating customers. Additional S&A work involved conducting "sanity checks" of ASW and RLW customer size classifications relative to the applicable business types and floor space areas.

9.2. Findings

ASW. The following table summarizes the mix of customer sizes in the SBEA program as envisioned in the 2002-2003 Implementation Plan versus the program population and sampled program participants (as classified within the ASW program tracking system).

ASW Customer Sizes – Goal, Population, and Participant Sample

Customer Size	Implementation Plan[16] (N and %)	Program Population (N and %)	Participant Sample (n and %)
Medium (100-500 kW)	187.5 (25%)	29 (7%)	3 (4%)
Small (20-100 kW)	187.5 (25%)	287 (68%)	42 (61%)
Very Small (0-20 kW)	375 (50%)	104 (25%)	24 (35%)
Total	750 (100%)	420 (100%)	69 (100%)

These findings generally imply that while the ASW program may not yield Very Small customer participation in quite the relative quantities originally envisioned, the program as a whole is somewhat more focused on non-medium customers (i.e., Very Small and Small customers collectively) than was originally planned. These data also imply that the sample has a slight bias towards very small customers (note that customer participation in the phone surveys was mostly a function of catching identified contact persons in their offices, as opposed to having significant numbers of persons decline to participate).

Significantly, S&A reviewed the business types and floor space information associated with the customer size classifications for all records in the participant sample, and found that 100% of the records were either highly or generally plausible; none of the participant records failed a "sanity check." Particular S&A attention was placed on the classification of Medium and Very Small customers. Examples of customer characteristics that would

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[15] S&A has taken this perspective for this particular EM&V research topic, since the Impact Evaluation Issue #2 research indicated no problems with customer geographic location, measure scope, or completion date matters.

[16] ASW SBEA Implementation Plan, 5/2002, page 6.

fail such an assessment include a small retail store (e.g., nail salon) listed as "Medium" and a high school listed as "Very Small".

Detailed delineations of these analyses and characteristics is provided in the "Cust Size" worksheet of the ASW impact evaluation workbook.

RLW. The following table summarizes the mix of customer sizes in the SBEA program as envisioned in the 2002-2003 Implementation Plan versus the program population and sampled program participants (as classified within the RLW program tracking system).

RLW Customer Sizes – Goal, Population, and Participant Sample

Customer Size	Implementation Plan[17] (N and %)	Program Population (N and %)	Participant Sample (n and %)
Medium (100-500 kW)	48 (19%)	18 (6%)	4 (6%)
Small (20-100 kW)	63 (25%)	65 (21%)	9 (13%)
Very Small (0-20 kW)	139 (56%)	221 (73%)	57 (81%)
Total	250 (100%)	304 (100%)	70 (100%)

These finding imply a significantly increased focus on Very Small customers in actuality relative to the customer mix originally envisioned. As was the case for the ASW sample, the participant sample – at least in terms of un-weighted numbers – has a slight overall bias towards very small customers. Also: in the aggregate, the total number of customers exceeded the program goal.

As with the ASW sample, S&A reviewed the business types and floor space information associated with the customer size classifications for all records in the RLW participant sample, and found that 100% of the records were either highly or generally plausible; none of the participant records failed a "sanity check."

Detailed delineations of these analyses and characteristics is provided in the "Cust Size" worksheet of the RLW impact evaluation workbook.

Additional Observations. In their classification of program participant sites, both ASW and RLW utilized non-standardized business type definitions in their program tracking databases. For example, among sampled participants, ASW classified small retail stores using terms such as "Retail" "Small Retail", and "Retail Book Store"; similarly, RLW classified convalescent homes as "Health Care", "Nursing Home," and "Convalescent Home". Standardized business type definitions would increase significantly the usability of the data for program planning, implementation, and evaluation purposes. Additionally, S&A reviews of sampled participant data indicate that approximately 5% of the records for ASW and 10% of the records for RLW did not provide record-specific information for the business type, the floor space (sq ft), and/or the customer size; S&A urges that these fields be made mandatory within each respective program database for the 2004-2005 program implementations.

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[17] RLW SBEA Implementation Plan, 7/2002, pp. 42-43.

One final observation: something to bear in mind for the 2004-2005 SBEA program implementations is that the programs occasionally *can* include Very Small nonresidential participants that happen to be on domestic (i.e., residential) utility tariff schedules; this issue emerged for one of the sampled RLW participants. This state of affairs exists since the Energy Efficiency Policy Manual defines nonresidential customers as "facilities used for business, commercial, agricultural, institutional, and industrial purposes" (hence a small business operation that happens to be based out of or adjacent to a residence cannot be dismissed out of hand); the key issue pertains to business use for the measures in question.

9.3. Recommendations

S&A recommends continued sharing of selling techniques between the two firms during the 2004-2005 SBEA program implementation, so that any emerging marketing/selling issues can be addressed quickly and comprehensively.

S&A also recommends use of standardized, mandatory data fields within each respective tracking system for the business type, floor space, and customer size variables.

10. Other EM&V Issues

This section addresses EM&V issues of relevance to cost-effectiveness considerations associated with the SBEA program. Specifically, it addresses Equipment Useful Life (EUL), net to gross (NTG), and incremental measure cost (IMC) matters associated with the cost-effectiveness calculations performed in the CPUC-provided PIP workbooks for 2002-2003 programs.

10.1. Approach / Methodology

These issues are addressed through 1) review and verification of PIP workbook assumptions and 2) leveraging of impact evaluation data already largely calculated by S&A in the impact evaluation workbooks.

10.2. Findings

Findings are presented for EULs, NTGs, and IMC values in turn.

10.2.1. EUL Values

EUL measure-specific findings are summarized in tabular form below. "Listed EUL" values pertain to data utilized in the CPUC-provided PIP workbooks for 2002-2003 programs.

SBEA EUL Values and S&A Assessment

SBEA Program Measure	Listed EUL	Nominal Basis (per 1/2002 proposals)	S&A Comments
Lighting	16	Per 11/29/01 CPUC Energy Efficiency Policy Manual.	Might be somewhat high, given significant role of CFL's in the SBEA program. Note that the 16 year life is consistent with values for the following measures (all frequently utilized in the SBEA program): T8 fixtures, T8 lamps, electronic ballasts, LED exit signs, and "high efficiency lighting." Note, however, that EUL for CFL's in the Policy Manual is given as 8 years.
Refrigeration System Tune-up	3	Per SMUD study on Refrigeration and AC system tune-up	Ultimately OK. Note that SMUD study dated 1/2001 provided to S&A by ASW did not contain any discussion of either EUL's or savings persistence. However, the 3 year assumed EUL is consistent with the "Audits" measure in the Policy Manual, and audit EUL data have been used by IOUs to model the persistence of savings for non-capital intensive energy efficiency measures (such as tune-ups).
AC System Tune-up	3	Per 11/29/01 CPUC Energy Efficiency Policy Manual.	Same as for Refrigeration System Tune-up.

Programmable Thermostat	11	Per 11/29/01 CPUC Energy Efficiency Policy Manual.	Value verified by S&A.

The gist of the findings is that EULs for all measures except lighting appear reasonable (i.e., consistent with CPUC Energy Efficiency Policy Manual guidelines) for both ASW and RLW. The lighting measure's assumed 16 year EUL nominally may be somewhat high, owing to the significant role of CFLs (an 8 year EUL measure, per the Policy Manual) in both the ASW and RLW programs, as can be in the following impact evaluation analysis-based tables.

Derivation of ASW Savings-Weighted Lighting Measure EUL

Lighting Measure Portion	Population kWh Savings	%	EUL	Participant Sample kWh Savings	%	EUL
CFL's	1,907,218	18%	8	335,195	21%	8
All Other Lighting	8,977,837	82%	16	1,260,830	79%	16
Overall	10,885,055	100%	14.6	1,596,026	100%	14.3

Derivation of RLW Savings-Weighted Lighting Measure EUL

Lighting Measure Portion	Population kWh Savings	%	EUL	Participant Sample kWh Savings	%	EUL
CFL's	1,821,609	25%	8	440,196	25%	8
All Other Lighting	5,415,772	75%	16	1,314,663	75%	16
Overall	7,237,381	100%	14.0	1,754,859	100%	14.0

If Policy Manual EUL values were to be literally applied on a weighted annual kWh savings basis, then the lighting measure should utilize EUL values of 14 or 15 years for ASW and 14 or 14 years for RLW (depending on whether the program population of participation sample data are used, respectively). Alternatively, CFL's could be configured as a distinct measure line item for cost-effectiveness calculation purposes.

That said, pragmatic considerations associated with nonresidential lighting make accurate assessments of appropriate EUL values to apply to the CFL portion of the lighting measure extremely difficult (or at very least, subject to considerable uncertainty):

- On the one hand, a weighted-average CFL installed through the SBEA program typically has a long daily operating schedule; given a CFL's typical life of approximately 6,000 hour per lamp, above-average utilization implies an above-average number of unit burnouts and subsequent replacement with successor CFL units over the assumed lifetime of up to 16 years. Replacement of one CFL with another (and another, and another, as appropriate) may be wishful thinking. Furthermore, a truly accurate cost-effectiveness analysis over a period of up to 16 years should include the discounted incremental costs of the subsequent CFL unit purchases.

- On the other hand, such nonresidential customers may find 1) CFL energy savings truly compelling (especially in light of above-average daily utilization) and 2) CFL extended lamp life (and associated labor savings) extremely compelling (since a 6,000 hour life for a CFL lamp most typically competes with a 750 hour life for an incandescent lamp). Furthermore, over time it is likely that CFL unit color quality and ballast reliability will improve further from 2002-2003 market conditions.

10.2.2. NTG Values

NTG measure-specific findings are summarized in tabular form below. "Listed NTG" values pertain to data utilized in the CPUC-provided PIP workbooks for 2002-2003 programs.

SBEA NTG Values and S&A Assessment

SBEA Program Measure	Listed NTG	Nominal Basis (per 1/2002 proposals)	S&A Comments
Lighting	98% (ASW), 96% (RLW)	Express Efficiency filings for 2002.	Express Efficiency 96% value confirmed in both IOU 2002 filings and in Energy Efficiency Policy Manual listing for Express Efficiency program. Express Efficiency value appears appropriate, given similarity of measures offered. ASW 98% value appears to be a typographical mistake from "day 1" that has never been corrected.
Refrigeration System Tune-up	80% (both)	Express Efficiency filings for 2002.	80% value is correct, but is actually associated with the "All Other Non-residential Measures" value in the 11/29/01 Energy Efficiency Policy Manual.
AC System Tune-up	80% (both)	Express Efficiency filings for 2002.	Same as for Refrigeration System Tune-up measure.
Programmable Thermostat	98% (ASW), 96% (RLW)	Express Efficiency filings for 2002.	Same as for Lighting measure.

The gist of the findings is that NTG values for all measures appear reasonable (i.e., consistent with CPUC Energy Efficiency Policy Manual guidelines), except that the ASW lighting and programmable thermostat measure values need to be corrected from 98% to 96%.

10.2.3. IMCs

Ex ante IMC data from ASW's 2003 Q4 PIP workbook and RLW's 2004 Q1 PIP workbook are listed in tabular form below; all measure data are expressed on a per-gross annual kWh saved basis. To the extent that actual measure cost data are less (more) than these values, ex post program TRC Test cost-effectiveness results would be better (worse) than corresponding ex ante assumptions, all other things equal. S&A suggests

that ASW and RLW consider calculating and presenting such data in its 2002-2003 program final report, and that ASW and RLW monitor such data on an ongoing basis during the 2004-2005 program.

ASW and RLW IMC Data

SBEA Program Measure	ASW Ex Ante Gross IMC / Gross kWh/Year Savings (per 2003 Q4 PIP Workbook)	RLW Ex Ante Gross IMC / Gross kWh/Year Savings (per 2004 Q1 PIP Workbook)
Lighting	$.26	$.17
Refrigeration System Tune-up	$.16	$.14
AC System Tune-up	$.18	$.28
Programmable Thermostat	$.15	$.14

10.3. Recommendations

As was noted in Section 10.2:

- EUL assumptions for the lighting measures may need modification to 14 and 14 years for ASW and RLW, respectively, to reflect the role of CFL's in the sample on the overall lighting measure. Alternatively, CFL's could be configured as a distinct measure line item for cost-effectiveness calculation purposes.

- NTG values for ASW for the lighting and programmable thermostat measures should be corrected to 96%.

- Both ASW and RLW should monitor IMC data over the course of the 2004-2005 program.

Appendix A. Full Participant Phone Survey Instrument

<u>Verify respondent and business:</u>

1.) Verify name (and name of business) _____

Open with preamble about who is calling, why, and the fact that we want to talk with them for approximately five minutes. Mention respondent anonymity, and the fact that we are not trying to sell the customer anything. Sample script:

I am sorry to bother you when I know you are busy. My name is _____, and I am not trying to sell you anything. I am calling from Sisson and Associates, an independent market research firm. We are doing some follow-up work required by the California Public Utilities Commission (CPUC) regarding the Small Business Energy Alliance Energy Savers program administered by _____ (ASW Engineering in southern California / RLW Analytics in northern California). Our records indicate your firm participated in this program during late 2002 or 2003. I will only need approximately five minutes of your time – or I can arrange to call back at another time if that is more convenient.

(If get agreement to proceed) I want to assure you that your responses will be anonymous, and will be combined with many other program participants' answers to help verify, measure, and evaluate this program for the CPUC.

2.) Verify business location (street address / city)

   _____

3.) Verify business type _____

4.) Verify position of interviewee _____

<u>Verify program participation (and assess communication about program)</u>

5.) Do you recall participating in the Energy Savers program sponsored by the Small Business Energy Alliance? _____ *If cannot recall, add more information such as: have you had more energy efficient lighting installed, etc. Or ask for another person who might have had responsibility for the business' decision to participate in such a program.*

   If still no recollection, END SURVEY, and thank the respondent for his/her time.

6.) How did you *initially* learn about the program?
   (pre-coded list; multiple responses allowed)

   Do you recall receiving information about the program from *other sources as well*?
   (probe until exhausted)

   _____Site visit from program representative

   _____Energy audit by program representative

   _____Phone call

   _____Professional association

   _____Website

   _____Newspaper/media

   _____Friend/colleague

   _____Other _____ (record)

   If no mention of surveyor or survey, ask: did an Energy Savers (or SBEA) program
   representative conduct a free facility energy audit for you?

   (If yes, add response to above list)

7.) Our records indicate that you had the following energy efficiency measures
   implemented (*read from data extract*):

   _____Lighting system upgrades (new lamps, fixtures, ballasts, etc.)

   _____HVAC system tune-up

   _____Refrigeration equipment tune-up

   _____Programmable thermostat installed

   Does this scope of work sound correct?
   _____
   (If answer is no, record their version of what happened.)

8.) a) Is the measure(s) and/or tuned-up equipment still fully installed and operational? (*ask about each measure verified by the participant in #7*)

If "no" regarding any of the measures, ask: b) What % of the measures remain installed and operational? ____

8a. Fully installed/operational (yes/no)?	8b. % Remaining installed/operational?
____Lighting system upgrades	_____
____HVAC system tune-up	_____
____Refrigeration equipment tune-up	_____
____Programmable thermostat installed	_____

(Treat situations where a piece of equipment promptly failed <u>and</u> was satisfactorily replaced as part of the SBEA program as still installed/operational)

9.) Our records show that your business hours are _____.
(read from data extract regarding weekdays, Saturdays, and Sundays)

Are your *current* business hours significantly different from what our records indicate?
_____
(If yes, record changes in weekdays, Saturdays, and/or Sundays)

10.) (*Ask if customer implemented lighting measures in #7*) a) Are the hours of operation for your overall lighting system <u>exactly</u> the same as your business hours?
_____

b) If different, what are lighting system hours? _____
_____
(record differences and/or data for weekdays, Saturdays, and/or Sundays)

c) Do lighting system hours vary for certain fixtures (e.g., security lighting, perimeter versus interior, main areas versus storage areas or bathrooms)? If so, describe.
_____
_____
_____
_____

11.) What made you decide to participate in the program? *(pre-coded list; multiple responses allowed; probe until exhausted)*

_____Good business economics / good investment

_____Good way to save on monthly utility bill

_____Wanted to support a local small business service company

_____Clear/compelling program literature

_____Convincing/trustworthy program representative

_____Clear/compelling program web site

_____Willing to / interested in trying new technology

_____Turnkey service program made the upgrades easy

_____Not disruptive to my business

_____Good word-of-mouth from other program participants

_____Good testimonials in ads from respected local individuals and/or

organizations

_____Other _____ (record)

12.) What was the single most important reason for deciding to participate in the program?
> *(circle the answer from the prior pre-coded list)*

Program Satisfaction and Effectiveness

I am going to read you a short list of questions that I would like you to respond to using a 5-point scale (where 5 is best possible score and 1 is the worst possible score).

13.) _____Overall, how satisfied are you with the Energy Savers program?

14.) _____How easy was it to participate in the program, relative to the application paperwork process?

15.) _____How satisfied were you with the performance of the contractor(s) who performed the installation (and/or tune up)?

16.) _____What was the level of disruption to your business during installation?

17.) _____ How satisfied are you with the performance of each measure installed and/or tuned up? (*as applicable from measure list per #6 above*)
_____Lighting system upgrades

_____HVAC system tune-up

_____Refrigeration equipment tune-up

_____Programmable thermostat installed

(*Note slightly different 5-point scale for #18 below.*)

18.)   _____ (*For those participants with lighting measures*) How would you describe the quality of light that you have now, as compared with what you had before your participation in the Energy Savers program? *(5 point scale – 5 = a lot better, 4 = a little better, 3= just as good, 2= almost as good, 1= not as good)*

19.) (*For those participants who had a refrigeration equipment tune-up conducted; otherwise, skip to # 22*) What is the likelihood (in percent) that you would have had a refrigeration tune-up conducted in the absence of this program, where 0% = no chance and 100% = definitely would have had? _____

20.) (*For respondents answering Q19 as >0%*) How much sooner (in months) did the tune-up happen because of this program? _____

21.) (*For those participants who had a refrigeration equipment tune-up conducted*) Did you have a maintenance contract for your refrigeration equipment prior to participating in the SBEA program? _____

22.) Are you at all familiar with the energy *usage* (as opposed to the energy *costs*) at your site? _____

23.) *(if answered "yes" to #22 above)* Adjusting for seasonal factors such as air conditioning loads, what do you think has happened to your site's overall energy usage since the retrofit?
(*Choose the one most appropriate response*)
a. Unsure
b. Much less
c. Slightly less
d. About the same
e. Slightly more
f. Much more
g. I look at costs much more than usage

24.) How would you rate the energy efficiency services provided by the SBEA compared to energy efficiency services you may have received from SCE or PG&E in the past?
- g. Much better
- h. Better
- i. About the same
- j. Worse
- k. Much worse
- l. Not applicable (e.g., haven't had prior experience with SCE or PG&E)

25.) Do you think the California Public Utilities Commission should continue to fund programs such as the SBEA to operate energy efficiency programs?
- g. Definitely
- h. Probably
- i. Unsure
- j. Probably not
- k. Definitely not
- l. Don't know / no opinion

26.) Do you have any other feedback or suggestions regarding the program that we have not covered? _____

Thank you.

Appendix B. ASW Full Participant Phone Survey Coded Dataset

The dataset is an Excel workbook, and is provided in electronic format (owing to printing length and viewing format considerations). Explicit customer identifiers have been removed.

Appendix C. R:W Full Participant Phone Survey Coded Dataset

The dataset is an Excel workbook, and is provided in electronic format (owing to printing length and viewing format considerations). Explicit customer identifiers have been removed.

Appendix D. ASW Impact Evaluation Workbook

The dataset is an Excel workbook, and is provided in electronic format (owing to printing length considerations).

Appendix E. RLW Impact Evaluation Workbook

The dataset is an Excel workbook, and is provided in electronic format (owing to printing length considerations).