2010 & 2011
Energy Efficiency Program
Evaluation Report

prepared for

Alameda Municipal Power

energy & resource
solutions

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Executive Summary

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This report documents the evaluation activities undertaken by ERS for Alameda Municipal Power (AMP). The evaluation focuses on the energy savings impacts of ten commercial retrofit projects and one energy efficiency program. The evaluated projects and program were completed during the 2009–2010 and 2010–2011 fiscal years.

The objective of the evaluation is to provide independent verification of AMP's reported energy savings, consistent with State Assembly Bill 2021 requirements.

The evaluation effort consisted of four primary sets of activities: conducting research, developing evaluation plans, collecting data, and estimating energy savings. ERS visited twenty-seven sites and collected data to verify the energy saving attributes of each retrofit project.

ERS combined the research and data collection results to analyze and develop energy savings estimates using standard engineering principles and evaluation methodologies. This report provides the results of our analysis and comports with the evaluation guidelines recommended by the California Energy Commission.

1.1 RESULTS

Table 1-1 provides the energy savings reported by AMP and compares it to the energy savings verified by ERS. The total energy savings reported by AMP for the projects evaluated is 1,358,076 kWh and the energy savings verified by ERS is 1,218,394 kWh. The realization rate – the ratio of verified energy savings to the reported energy savings – is 89.7%.

Table 1-1
Energy Savings Results Summary

Project		Energy Savings (kWh)
2009–2010 projects (Six projects)	Reported	284,886
	Evaluated	190,778
	Realization rate	67.0%
2010–2011 projects (Four projects)	Reported	401,744
	Evaluated	389,692
	Realization rate	97.0%
Keep Your Cool program	Reported	671,446
	Evaluated	637,924
	Realization rate	95%
Combined results	Reported	1,358,076
	Evaluated	1,218,394
	Realization rate	89.7%

Introduction

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This report documents the evaluation activities undertaken by ERS for Alameda Municipal Power (AMP). The evaluation focuses on the energy savings impacts of commercial energy efficiency projects completed during the 2009–2010 and 2010–2011 fiscal years.

2.1 FOCUS OF EVALUATION

This evaluation is focused on ten commercial rebate projects and one third-party energy efficiency program.

AMP selected six projects for evaluation from its 2009–2010 program year and four projects from its 2010–2011 program year. All six projects from the 2009–2010 program year are commercial lighting retrofits. The four projects selected from the 2010–2011 program year consist of two lighting retrofits, a lighting/HVAC retrofit, and a variable frequency drive (VFD) retrofit.

AMP also selected to evaluate its Keep Your Cool program. The program was implemented by a third-party consultant and targeted refrigeration measures for retail food service establishments. A total of fifty-five projects (fifty-four sites – two projects were completed at one site) were completed under the program.

2.2 EVALUATION OBJECTIVES

The primary objective of the evaluation is to provide independent verification of AMP's reported energy savings for ten commercial retrofit projects and one efficiency program.

2.3 OVERVIEW OF EVALUATION ACTIVITIES

The evaluation consisted of four primary sets of activities: conducting research, developing evaluation plans, collecting data, and estimating energy savings.

Conduct Research – ERS conducted initial research and review of the following:

- Similar evaluation efforts
- AMP energy efficiency programs
- Publicly owned utility compliance reporting requirements and methodologies
- Review of project documentation, including pre- and post-inspection reports, manufacturer cut sheets, program tracking spreadsheets, and energy savings estimates

Develop Evaluation Plan – For the Keep Your Cool program, ERS developed a sampling plan to randomly select projects for evaluation, and then created an on-site measurement and verification

(M&V) plan[1]. For the retrofit projects, we developed a site M&V plan for each project. After the M&V plans were complete, an initial site visit schedule was created in order to effectively coordinate all site visit activities.

Collect Data – ERS visited twenty-seven project sites and collected data regarding each energy-efficient measure installed at the site. For selected sites, ERS took spot power measurements and installed data loggers to trend the operating characteristics of retrofitted equipment.

Estimate Energy Savings – ERS combined the research and data collection results to analyze and develop energy savings estimates per the methodologies described in Sections 3 and 4 of this report.

2.4 REPORT STRUCTURE

The remainder of this report consists of three sections:

1. Section 3 describes the evaluation methodologies employed for sampling, data collection, and estimating energy savings. It also provides a discussion on the reliability of the results of the evaluation and provides recommendations for reporting program influence in terms of net-to-gross energy savings.
2. Section 4 provides the results and key findings from each site evaluated.
3. Section 5 presents the combined results for all projects and provides recommendations based on the findings of the evaluation effort.

[1] The on-site M&V plan is provided in Appendix A of this report.

Methodology

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This section describes the methodologies used by ERS for sampling, data collection, and savings verification. It also provides a discussion on the reliability of energy savings estimates and our recommendations for reporting program influence in terms of net-to-gross energy savings.

3.1 SAMPLING

For the Keep Your Cool program, ERS developed a sample design to randomly select projects for site evaluation. Using simple random sampling, a total of sixteen projects were selected. The sample size was designed to achieve a relative precision of 30% at the 90% confidence level (precision of 90/30), which is consistent with the recommendations (precision of 90/30) found in the CPUC evaluation protocols[2] for verification level of rigor.

Of the initial sixteen randomly-sampled sites, thirteen were evaluated. Three of the original sites were replaced with back-up sites. At one site, the business was closed and the site was vacant. At two other sites ERS made several attempts to gain access to the site but were not able to contact the appropriate person to make these arrangements.

In addition to the initial sixteen randomly-selected sites, one additional site was selected for evaluation by AMP. In total, seventeen sites were evaluated for the Keep Your Cool program.

The sample realization rate was calculated for the sixteen sites and then expanded to fifty-three sites (program population less the site not randomly selected). The resulting realization rate is 97.4%, the standard error is 2.0%, the error bound is 0.027, and the relative precision is 2.8% at the 90% confidence level.

3.1.1 PROJECT-LEVEL EVALUATION

ERS conducted verification at the site level for the ten selected projects. Since verification of energy savings was performed at the site level, the results of the site verifications do not statistically represent program-level results. The general site sampling methodology is census (count all measures). For certain sites, ERS verified a representative number of measures in lieu of counting all measures.

3.2 DATA COLLECTION

ERS visited each project site selected for evaluation. ERS collected information on-site regarding the retrofit project to determine if efficiency measures were installed and operational. Information

[2]2006 California Energy Efficiency Evaluation Protocols, California Public Utilities Commission

was also gathered to assist with verifying energy savings estimates. The initial site visit was on November 10, 2011, and the last site visit was on January 4, 2012.

3.3 VERIFICATION OF ENERGY SAVINGS

Note: All energy saving calculations performed by ERS will be provided to AMP in a spreadsheet file.

3.3.1 ENERGY SAVINGS REPORTED BY AMP

AMP uses custom calculations and deemed measure savings values to report energy savings. Deemed savings values come from the publicly owned utility's version of the E3 reporting tool (E3 tool). The E3 tool allows utilities to report both deemed and custom measures. The source of the deemed savings values in the E3 tool is the 2009 KEMA Study[3], which is largely based on the 2008 Database for Energy Efficient Resources maintained by the CPUC. Energy savings resulting from custom measures are provided by the utility and are either calculated by the utility or provided by the customer as follows:

- For lighting projects, AMP used custom measure calculations for reported energy savings. The savings were either calculated by the customer or by a consultant hired by AMP to conduct project inspections.
- For the VFD retrofit, AMP used custom calculations provided by the customer.
- Deemed savings were used for packaged terminal heat pump (PTHP) replacements.
- For the Keep Your Cool program, both deemed and custom measure calculations were used.

3.3.2 ENERGY SAVINGS VERIFIED BY ERS

For most sites with lighting measures, ERS used the same methodology described in the 2009 KEMA study. ERS calculated energy savings as the difference between pre-retrofit (baseline) conditions and post-retrofit conditions. Baseline conditions were determined from the rebate documentation, utility inspections, and information provided by the customer. We used either actual lamp/ballast performance data or typical wattage values for calculating energy use. To estimate lighting run time, we gathered information from the site regarding hours of operation, occupancy hours, and type/use of lighting controls. Where trend data was available, we used the data to establish operating hours.

For all other sites, ERS used standard engineering-based methodologies specific to the measures installed at the site. Our approach to analyzing each site is described in Section 4.

3.4 RELIABILITY

Energy savings cannot be measured directly. Energy savings estimates are a predictor of the absence of energy use – they account for the difference between how energy-consuming systems and equipment operated beforehand (baseline conditions) and how they operate after being upgraded (post-retrofit conditions). Therefore, estimating energy savings is challenging under any

[3] *2009 Measure Quantification Methodology Statewide Savings and Cost,* prepared for NCPA and SCPPA Members, KEMA, Inc.

circumstances. To assess the reliability of the verified energy savings presented in this report, ERS reviewed all potential sources of error associated with our evaluation efforts. Overall, we find the verified savings presented in this report to be a reasonably accurate and precise estimate of the energy savings achieved by program participants.

The following is a list of the potential sources of error:

Baseline conditions – ERS was not able to verify most baseline conditions. All site visits were conducted after the projects were complete. Baseline conditions were determined through rebate documentation, site visits, and staff interviews.

Lighting operating hours – Lighting run time is often the largest variable associated with the estimated energy savings from a lighting retrofit. Monitoring equipment was used at several sites to assess lighting run time. Where measured data was not available, ERS estimated run time by gathering information from site personnel regarding business hours of operation, occupancy hours, lighting controls, space end use, and seasonal schedule variations. We also factored into our estimate observations made while on-site.

Measurement error – Data loggers were used to determine the run time for some of the evaluated measures. The monitoring equipment's level of accuracy introduces the element of measurement error, but this error is relatively minor.

Deemed savings – ERS did not assess the validity of any measure-deemed savings values used to report energy savings. Deemed savings are applicable for measures with a proven track record for producing energy savings, and they represent typical, or average, per-unit savings expected from a relatively large population of measure installations. Our evaluation of the Keep Your Cool program indicates that one site's energy savings varied significantly from what was expected or predicted by the deemed savings values.

Sampling self-selection bias – Three of the seventeen evaluated for the Keep Your Cool program were alternates to the primary list of sites. This introduces the element of self-selection bias. However, there is no indication that the use of alternates led to any material bias in the sampling results. In addition, one site evaluated from the Keep Your Cool program was not randomly selected. To prevent the potential for self-selection bias, the results from this site were not included in the sample site results.

In addition, it should be noted that to ensure the reliability of reported energy savings, AMP pre- and post-inspects 100% of all retrofit projects funded through its commercial energy efficiency programs. For the Keep Your Cool Program, AMP used a third party energy service provider to pre- and post- inspect each project rebated under the program.

3.5 PROGRAM INFLUENCE (NET-TO-GROSS ENERGY SAVINGS)

It is important to understand and properly reflect the influence of utility energy efficiency programs. Program influence is typically reported as net energy savings. Net energy savings is the fraction of the total energy savings that are considered attributable to the program. To determine net energy savings, a net-to-gross (NTG) factor is used to adjust gross energy savings for free ridership and spillover. Free ridership describes program participants who would have implemented energy

efficiency in the absence of the program, and spillover describes the program's ability to indirectly influence behavior (customer or market behavior) leading to increased energy efficiency.

Program influence is difficult to assess, and the results of efforts to quantify this influence have a high degree of uncertainty. Given this uncertainty and the relatively high cost to conduct primary research on program influence, ERS recommends that AMP use stipulated NTG factors for assessing program net savings.

To assist publicly owned utilities (POUs), the E3 tool includes stipulated NTG factors from large investor-owned utilities (IOU) programs. Although the scale and program delivery for these larger IOU programs can greatly differ from POU programs, there are few other readily available resources. Therefore, ERS recommends using the NTG factors included in the E3 reporting tool.

To analyze program cost-effectiveness, ERS recommends AMP use the stipulated NTG factors from the E3 tool listed in Table 3-1.

Table 3-1
NTG Factors

Measure	NTG Factor
Lighting	78%
PTAC unit replacement	64%
HVAC VFD retrofit	64%
Lighting controls	84%

Site Verification Results

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ERS evaluated ten commercial retrofit projects and one efficiency program. This section provides the results of each evaluation.

4.1 SITE 1 – EXTERIOR LED LIGHTING RETROFIT (FY 2010)

Table 4-1 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-1
Site 1 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
Exterior 400 W HPS to 128 W LED	13,650	10,876	N/A	N/A	79.7%	N/A

4.1.1 SITE VISIT

Dates of site visit: November 18 & December 9, 2011

Site 1 is a community center parking lot. The retrofit project consists of replacing seven 400 W metal halide parking lot fixtures with seven new 128 W LED parking lot fixtures. Photo sensor and bi-level controls were installed for the new fixtures.

To verify LED hours of operation and power usage time, ERS installed a HOBO U12 013 current logger to collect current data. Two current transformers (CT-D0-50A) were installed at the circuit disconnect. Data was collected on 10-minute time intervals over a 20-day period.

ERS made a physical count of the LED parking lot fixtures, verified the lamp wattage, and interviewed site staff to determine lighting baseline and operating characteristics.

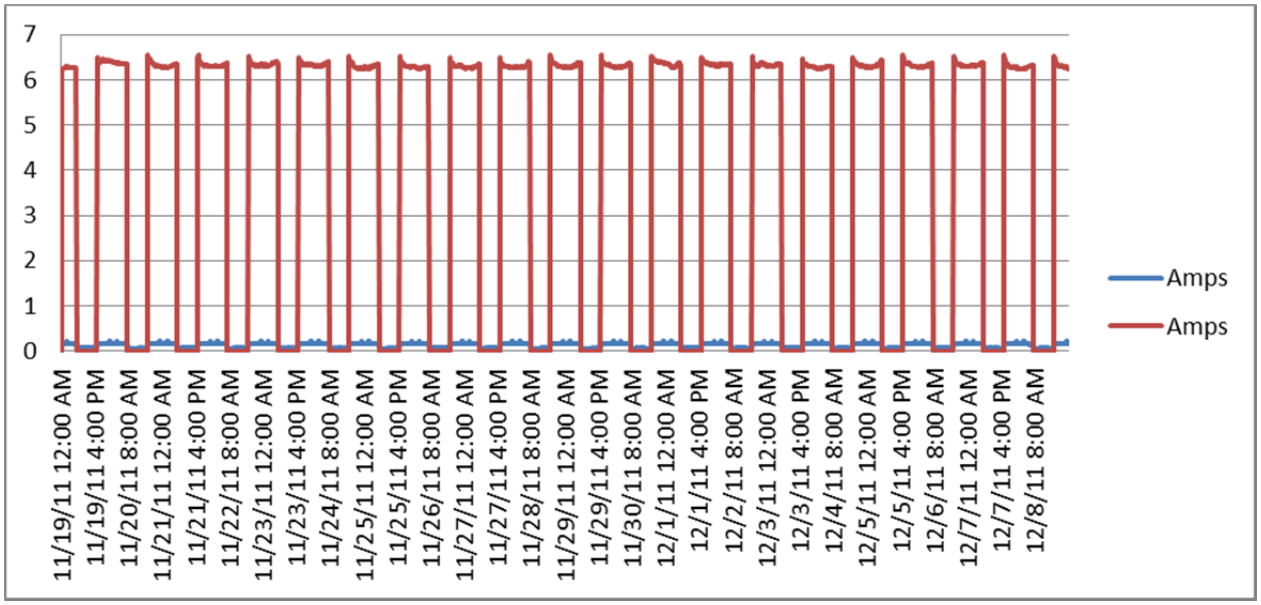
4.1.2 KEY FINDINGS

The bi-level control feature that was installed as part of the retrofit has been disabled. Staff indicated that the control was disabled due to the fixtures turning off at night.

The monitoring data shows the lighting turns on and off in a consistent pattern. Lights turn on around 5 p.m. and then shut off around 7 a.m. every day. The 14 hours per day of operation closely

matches the sunrise and sunset times for the city of Alameda. The data also confirms that bi-level control is not in use.

Figure 4-1
Lighting Run Time Monitoring Data



4.1.3 SAVINGS ANALYSIS

ERS used the methodology described in Section 3 to estimate energy savings. Baseline conditions were determined from the rebate documentation and utility inspections. Fixture wattage values were obtained from the PG&E fixture wattage database. Actual fixture wattage was obtained from the new fixture cut sheet.

Reported hours of operation from the inspection report were 5,310 hours. The KEMA 2009 study suggests 4,100 hours be used for photocell-controlled lighting hours of operation. ERS used the metered data to determine actual hours of operation. Meter data was compared to the Astronomical Applications Department of the U.S. Naval Observatory data on sunrise and sunset times for Alameda. The data showed extended hours of operation that were slightly (8%) longer than actual night hours. This factor was multiplied by the annual hours of night time to determine lighting hours of operation, which was estimated to be 4,610 hours.

4.1.4 EXPLANATION OF DEVIATION FROM REPORTED SAVINGS

The primary difference between reported and verified savings is due to the difference in hours of operation (5,310 hours versus 4,610 hours).

4.2 SITE 2 – RETAIL STORE LIGHTING DELAMP (FY 2010)

Table 4-2 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-2
Site 2 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
T8 delamp & lighting controls	134,678	98,067	24.8	17.1	72.8%	68.8%

4.2.1 SITE VISIT

Date of site visit: December 9, January 4, 2011

Site 2 is a large retail store. The retrofit project consists of delamping and replacing existing T8 lamps and ballasts with new high performance T8 lamps and ballasts. Occupancy sensors were also installed in backroom and stockroom areas.

ERS made a physical count of all T8 lamps, verified the lamp wattage and interviewed site staff to determine lighting baseline and operating characteristics. We also took spot measurements of lighting levels in various locations in the store.

Lighting for this store is controlled by an offsite energy management firm. ERS attempted, but was unable to contact the firm to confirm the lighting control strategies employed at this store.

4.2.2 KEY FINDINGS

ERS could not confirm that the automated lighting dimming controls were functioning at this site. The installation contractor, who installed similar retrofits at other sites for this retail organization, confirmed that dimming capabilities were not installed at every site.

It appeared the lighting inventory and savings calculations provided to ERS were not for this particular store. Fixture counts did not match and spaces listed in the inventory did not exist. Although exterior metal halide (MH) fixtures are included in the retrofit calculations, none were found.

Lighting levels in the stockroom areas were as low as 12 footcandles due to delamping. In the receiving area, lamps were plugged in to make up for low light levels.

Light levels in the main sales area were between 59 and 76 footcandles. The interior sales area was generally lower than the light levels in the exterior sales area, but was still at an acceptable level.

The store's lighting power intensity after delamping is 1.03 W per square foot, with approximately 1.08 W per square foot in the sales area. This is significantly lower than current Title 24 Standards for retail stores (1.6 W per square foot).

4.2.3 SAVINGS ANALYSIS

ERS used the methodology described in Section 3 to estimate energy savings. Baseline conditions were determined from staff interviews. Fixture wattage values were obtained from visual inspection of installed lamps and equipment specifications in the rebate documentation.

4.2.4 Explanation of Deviation from Reported Savings

The installed fixture counts are different from what is found in the reported savings calculations. In addition, the verified savings do not include dimming control or reduced lighting run time savings, as was included in the reported savings.

4.3 Site 3 – High Bay Lighting Retrofit (FY 2010)

Table 4-3 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-3
Site 3 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
400 W MH to four-lamp T5	50,955	44,722	36.2	12.4	87.8%	34.2%

4.3.1 Site Visit

Date of site visit: November 17, 2011

Site 3 is a biotechnology office and laboratory facility. The retrofit project consists of replacing seventy-nine 400 W MH fixtures in a high bay processing/warehouse area with four-lamp high bay T5 fixtures.

ERS counted the number of the high bay lighting fixtures installed, verified the lamp wattage, and interviewed site staff to determine lighting operating hours. ERS verified that sixty-one T5 fixtures are installed and operating.

4.3.2 Key Findings

Eighteen of the T5 fixtures installed were later removed during a renovation that converted a section of processing/warehouse space to office space.

4.3.3 Savings Analysis

ERS used the methodology described in Section 3 to estimate energy savings. Baseline conditions were determined from the rebate documentation and utility inspections. Fixture wattage values were obtained from the PG&E fixture wattage database.

4.3.4 Explanation of Deviation from Reported Savings

This difference between the reported and verified savings is primarily due to the reduction in the number of fixtures related to the renovation which converted processing/warehouse space to office space.

4.4 SITE 4 – T12 TO T8 AND CFL LIGHTING RETROFIT (FY 2010)

Table 4-4 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-4
Site 4 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
T8 retrofit	29,901	3,872	5.1	3.4	12.9%	98.0%
CFL-Exterior	11,375	11,375	2.6	0	100.0%	0.0%
Total	41,275	15,263	7.7	3.4	36.9%	44.7

4.4.1 SITE VISIT

Dates of site visits: November 10 and December 5, 15, & 20, 2011

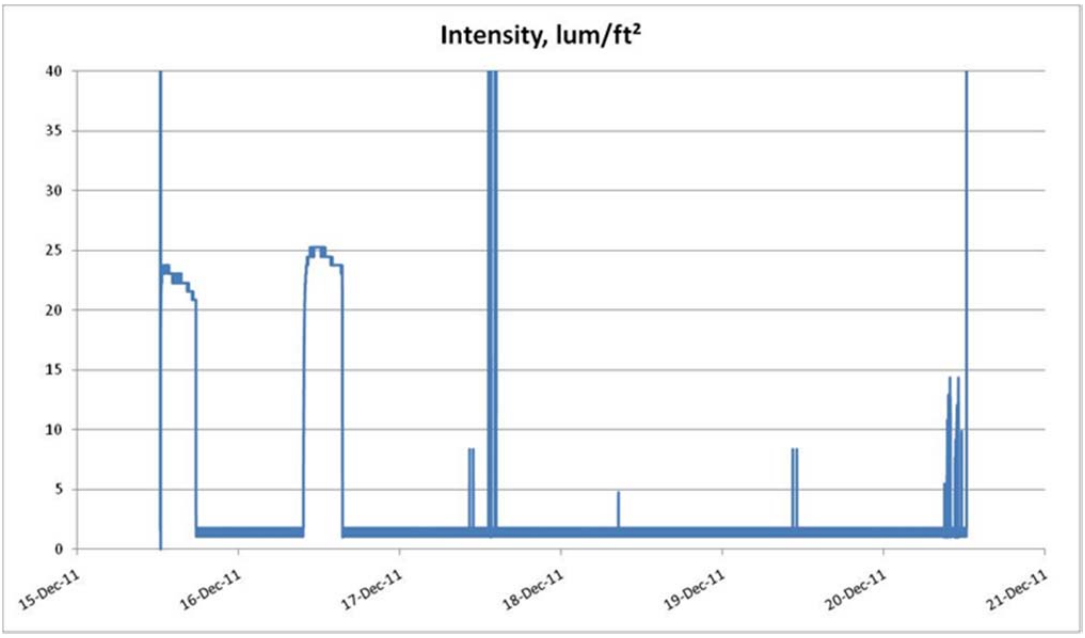
Site 4 is a self-storage facility. The retrofit project consists of replacing T12 lighting and older T8 lighting with high performance and reduced wattage T8 lighting and replacing MH wall pack lamps and ballasts with compact fluorescent lamps. Wall switch timers with a 30-minute maximum were replaced with occupancy sensors.

ERS made a physical count of all lighting equipment, verified manufacturer and model of ballasts and lamps installed for each type of fixture, and interviewed site staff. We installed Watt Stopper occupancy and light loggers but did not obtain usable data. We then installed HOBO U12-012 light intensity loggers in two buildings, and collected light intensity data for 10 days.

4.4.2 KEY FINDINGS

ERS determined from staff interviews that baseline conditions included wall switch timers in each building. The energy savings analysis submitted for the project did not include the effects of wall switch timers or occupancy sensors to determine the pre- or post-retrofit operating hours. We also found some of the occupancy sensors were set to test mode.

Figure 4-2
Monitoring Results for Building 4



Monitored data from Building 4 shows that the lights in the storage area are on 9.8% of the time, or 858 hours per year for the site's interior spaces. Occupancy sensors in all other buildings except Building 6 were observed to be functioning. Therefore, Building 4 is assumed to be representative of the other buildings for the purposes of estimating operating hours.

The lights in Building 6 were observed to be on each time ERS visited the site. Light intensity in this building was also monitored. The data from this building was inconclusive and therefore was not used to estimate energy savings. However, we suspect that the occupancy sensors in Building 6 are not turning off the lights when the space is not occupied.

4.4.3 SAVINGS ANALYSIS

The data loggers recorded light intensity every 30 seconds over a period of 5 days. Whenever the light intensity is equal to or greater than 3 lumens/ft^2, the loggers record the lights as on. The periods with lights on were summed to determine the total run time during the 5-day monitoring period. The percentage of time with lights on multiplied by the hours in a year provides the estimated annual operating hours.

Baseline energy use is estimated using trended operating hours and the baseline lighting power provided in the rebate documentation. For lighting in the storage areas, we assume that the operating hours resulting from the use of wall switch timers are similar to those resulting from occupancy sensor control. Although we cannot verify how the wall switch timers were used, we believe this to be a reasonable assumption because the length of time that the lights remained on with wall switch timers varied between 0 and 30 minutes. The average time is likely similar to the typical occupancy sensor delay. Lighting operating hours for the front office and wall packs are assumed to operate for longer periods (3,069 hours and 4,380 hours, respectively). Lighting

operating hours for the front office is based on the information provided by the site staff, and the wall packs are assumed to operate for 4,380 hours per year, as shown on the rebate documentation.

4.4.4 Explanation of Deviation from Reported Savings

The difference between reported and verified energy savings is due to the significant difference in interior lighting operating hours between those in the rebate documentation (5,840 hours) and those verified by the monitoring data (858 hours). The analysis in the rebate documentation uses the business hours of the site and not the lighting operating hours.

4.5 Site 5 – Financial Institution Lighting Retrofit (FY 2010)

Table 4-5 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-5
Site 5 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
T12 to T8	14,166	8,152	3.1	2.9	57.5%	93.2%
T8 to HPT8	2,433	1,411	0.7	0.5	58.0%	69.9%
CFLs	900	518	N/A	0.2	57.5%	N/A
Total	17,499	10,081	3.9	3.6	57.6%	93.6%

4.5.1 Site Visit

Date of site visit: November 15, 2011 and December 20, 2011

Site 5 is a retail bank. The retrofit project consists of replacing T12 fluorescent lighting and older T8 fluorescent lighting with high performance T8 lighting. The majority of the new lighting uses low output ballasts.

ERS made a physical count of the lighting fixtures, verified the lamp and ballast wattages, and interviewed site staff to determine lighting operating characteristics.

4.5.2 Key Findings

Based on information gathered through staff interviews, ERS estimates the actual lighting operating hours are less than those shown on the incentive documentation.

4.5.3 Savings Analysis

ERS used the methodology described in Section 3 to estimate energy savings. Baseline conditions were determined from the rebate documentation and utility inspections. Fixture wattage values were obtained from the rebate documentation and were verified with ballast manufacturer data.

4.5.4 Explanation of Deviation from Reported Savings

The difference between reported and verified savings is primarily due to the difference in lighting operating hours. ERS estimates 2,052 hours of operation (1,000 hours for restroom lighting) while the reported savings are based on 4,500 hours of operation.

4.6 Site 6 – House of Worship Lighting Retrofit (FY 2010)

Table 4-6 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-6
Site 6 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
T12 to HPT8, 25W	26,828	11,785	N/A	N/A	43.9%	N/A

4.6.1 Site Visit

Date of site visit: December 20, 2011

Site 6 is the school, gym, office, and assembly portion of a community church. The retrofit project consists of replacing T12 fluorescent lighting and older T8 fluorescent lighting with reduced wattage 25 W T8 lighting.

ERS made a physical count of the lighting fixtures and interviewed site staff to determine lighting operating characteristics. Because the two lighting inventories provided to ERS did not match, we had difficulty identifying which fixture/rooms were included in the retrofit project. ERS verified counts in rooms that could be identified and also counted fixtures that site staff indicated had been retrofitted to reconcile fixture counts.

4.6.2 Key Findings

ERS found more rooms had been retrofitted than were included in the inspection report. However, the rooms with retrofitted lighting fixtures have relatively low use.

4.6.3 SAVINGS ANALYSIS

ERS used the methodology described in Section 3 to estimate energy savings. Baseline conditions were determined from the rebate documentation and utility inspections. Fixture wattage values were obtained from 2010 PG&E lighting fixture tables.

The hours of operation for the multi-use spaces are difficult to accurately assess. Beyond Sunday, usage is low and it varies throughout the year. Based on our understanding of facility usage (as determined through staff interviews and the facilities' schedule of activities), we estimate the average run time for all retrofitted lighting to be at least 50% less than reported by the installation contractor.

4.6.4 EXPLANATION OF DEVIATION FROM REPORTED SAVINGS

The primary difference between reported and verified savings is due to the verified lighting operating hours being lower than those used for reported savings. ERS estimated 1,600 hours of annual operation while the installation contractor estimated 3,900 hours of operation. No justification was provided for the contractor's estimate.

4.7 SITE 7 – HOTEL HVAC AND LIGHTING RETROFIT (FY 2011)

Table 4-7 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-7
Site 7 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
HVAC units	51,738	31,952	26.0	31.6	61.8%	121.3%
CFL	67,001	88,968	61.6	63.9	132.8%	103.7%
Total	118,739	120,920	87.6	95.5	101.8%	109.0%

4.7.1 SITE VISIT

Date of site visit: January 4, 2011

Site 7 is a motel. The retrofit project consists of replacing existing incandescent screw-in lights with compact florescent lamps. Existing PTHPs were also replaced with new, energy efficient PTHP units.

ERS did a sample count of five different rooms to verify lamp wattages and counts. ERS also verified the make and model of the various sizes of PTHPs.

4.7.2 KEY FINDINGS

ERS found the retrofit work to be as described in the rebate documentation.

4.7.3 SAVINGS ANALYSIS

ERS used the methodology described in Section 3 to estimate energy savings. Baseline conditions were determined from the rebate application. Fixture wattage values were obtained from visual inspection of the installed compact fluorescents.

To verify heat pump savings, ERS used deemed savings values from E3 without adjustment for early replacement. The energy savings values are the same as provided in Table 152 of the KEMA study. The energy savings is the product of the energy savings value (239 kWh per ton) multiplied by the total cooling capacity (tons) of the heat pumps.

4.7.4 EXPLANATION OF DEVIATION FROM REPORTED SAVINGS

Reported savings for the heat pumps are based on unadjusted early retirement savings taken from Table 154 in the KEMA study. This savings number is meant to be used by the E3 reporting tool, which creates a sliding scale of energy savings based on the age of the equipment replaced. In order for the energy savings for a heat pump to approach the full, early retirement savings value in Table 154 (397 kWh per ton), the unit that was replaced would need to be less than 5 years old. Since there was no proof of the age of the units that were replaced, ERS used the default energy savings value (239 kWh per ton) to calculate verified savings.

For lighting, ERS used the actual wattage for screw-in CFLs and the reported savings were based on wattages for pin-based CFL lamps (which include ballast power in addition to the lamp wattage). This resulted in the verified savings being greater than the reported savings.

4.8 SITE 8 – BAKERY LIGHTING RETROFIT (FY 2011)

Table 4-8 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-8
Site 8 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
Lighting design	209,409	196,395	N/A	N/A	93.8%	N/A

4.8.1 SITE VISIT

Date of site visit: December 5, 2011

Site 8 is a new commercial bakery facility with offices and bakery operations. When the space was built out, an Orion lighting control system with dimming capability and some skylights were installed in the bakery space.

ERS reviewed the lighting plans and energy compliance documentation. We verified the installation and operation of the high bay lighting equipment, skylights, and lighting control system, and interviewed site staff. We reviewed the monthly energy use data provided by the lighting control system and the 1-minute interval data collected by the AMP meter shop during a 5-day monitoring period.

In order to assess energy savings, ERS attempted to obtain additional energy use data from the lighting control system. This was not possible through the user interface at the site. The system manufacturer informed us that this feature was not included in this site's control system and that the manufacturer could collect additional data as an add-on service for a fee. They informed us that the 7 months of energy use data that was collected in 2010 was provided as an add-on service.

4.8.2 KEY FINDINGS

The Orion lighting control system appears to be functioning properly and optimizing energy savings by dimming lights during daylight hours.

4.8.3 SAVINGS ANALYSIS

ERS originally planned to use new energy use data from the lighting control system to verify energy savings. Since we could not obtain additional energy use data, ERS calculated energy savings as the difference between the lighting power allowance (baseline power) multiplied by the operating hours and the post-retrofit energy use collected by the lighting control system. ERS obtained the lighting power allowance for the bakery area (33.7 kW) from the energy compliance documentation. That power allowance multiplied by the operating hours of the facility (8760 hours) yields the baseline annual energy use of 295,378 kWh.

The 7 months of monthly energy use data from the lighting control system was extrapolated to a full year. The difference between this annual energy use and the baseline energy use is the estimated annual energy savings.

For verification purposes, ERS evaluated the 1-minute interval data collect by the AMP meter shop. ERS extrapolated the energy use from 3 days to a full year and compared the results against our estimate based on control system data.

4.8.4 EXPLANATION OF DEVIATION FROM REPORTED SAVINGS

There is no significant deviation between reported and verified savings.

4.9 SITE 9 – HVAC VFD RETROFIT (FY 2011)

Table 4-9 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-9
Site 9 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
VFD on supply fan	42,000	29,518	N/A	N/A	70.3%	N/A

4.9.1 SITE VISIT

Date of site visit: November 10, 2011 and December 5, 2011

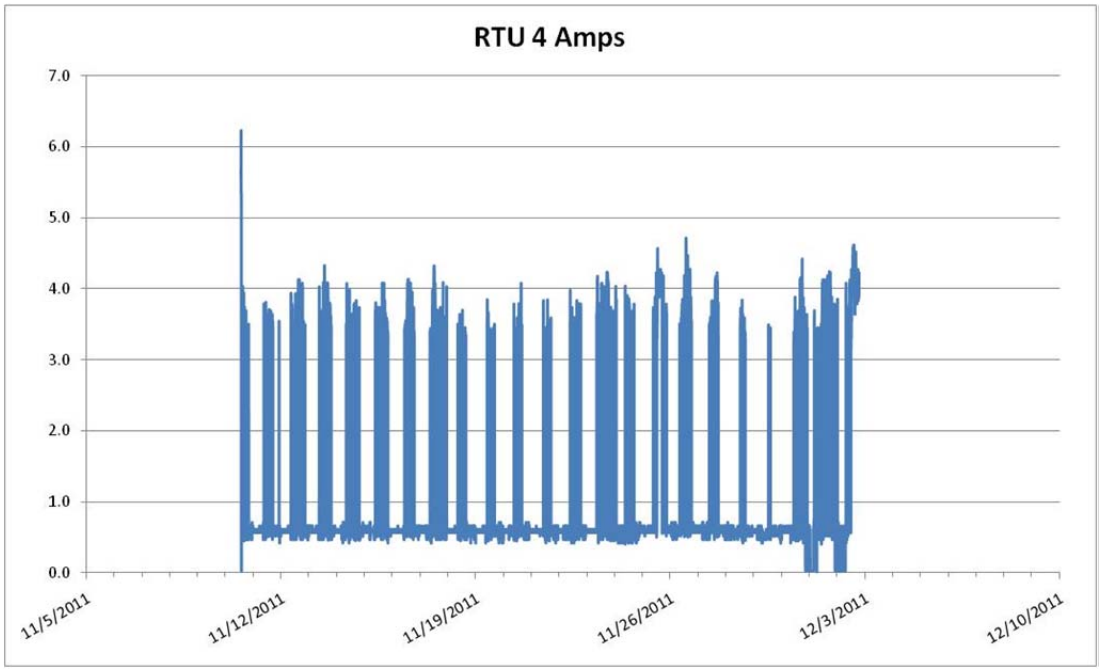
Site 9 is a retail department store. The retrofit project consists of installing VFDs on 7.5 hp supply fan motors in seven packaged HVAC units. ERS opened and observed that the VFDs are installed on two of the packaged units and witnessed the supply fan speed change on all but rooftop unit (RTU) #6. To verify fan speed modulation over time, ERS installed a HOBO U12 013 current logger to collect current data. A current transformer (CT-D0-200A) was installed on one leg of the power input to the VFD on RTU#4. Data was collected on 1-minute time intervals over a 25-day period.

4.9.2 KEY FINDINGS

During the site visit, ERS found the supply fan for RTU #6 operating at full speed. The VFD had a blank display and appeared not to be functioning. ERS observed the other units to be operating at either full or half speed (VFD display panel indicated 60 Hz for full speed and 30 Hz at reduced speed).

The HVAC units are running continuously, even when the building is unoccupied. The monitoring data for RTU #4 confirms the supply fan speed is alternating between full and half speed. It also confirms the fan is operating 24 hours per day.

Figure 4-3
Monitoring results for RTU #4:



ERS could not confirm the control strategy for the VFD; it was not clear what type of input signal is used to modulate fan speed.

4.9.3 SAVINGS ANALYSIS

The energy savings is determined by calculating the difference between the baseline energy use and the post-retrofit energy use. Baseline power (kW) was determined from the monitoring data at full-speed operating conditions. The baseline operating hours of 5,450 hours per year was obtained from the savings calculation included with the rebate documentation. The baseline energy use is the baseline power multiplied by the baseline annual hours of operation. Post-retrofit energy use is based on the monitoring data from November 10, 2011 through December 5, 2011. The post-retrofit power (kW) is the average power at all operating conditions. The post-retrofit hours of operation are shown by the monitoring data to be 24 hours per day. The post-retrofit energy use is the average power multiplied by the annual hours of operation.

The monitored unit (RTU #4) is assumed to be representative of the six units that were observed to modulate. RTU #6 is assumed to operate at full speed 24 hours per day.

This analysis is focused solely on the energy use of the supply fans. ERS was not provided with documentation describing the sequence of operations. Our analysis does not consider how slowing down the supply fans affects the overall efficiency of the packaged HVAC units.

4.9.4 EXPLANATION OF DEVIATION FROM REPORTED SAVINGS

The difference between the reported and verified energy savings is due to RTU #6, which appears to operate at full speed 24 hours per day. In addition, the units are operating at reduced speed at

night, whereas, based on the rebate documentation, it appears that they were being turned off at night before the retrofit.

4.10 SITE 10 – HIGH BAY LIGHTING RETROFIT (FY 2011)

Table 4-10 summarizes the energy savings for each measure evaluated at the site. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-10
Site 10 Results

Measure	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
HID to T8	31,596	42,859	6.0	6.8	135.6%	113.0%

4.10.1 SITE VISIT

Date of site visit: November 15 & December 9, 2011

Site 10 is a grocery store. The retrofit project consists of replacing twenty-six 400 W MH fixtures with twenty-six new 162 W six-lamp T8 fixtures.

ERS made a physical count of the high bay fixtures, verified the lamp wattage, and interviewed site staff to determine lighting baseline and operating characteristics.

To verify hours of operation, ERS installed two Watt Stopper InteliTimer Pro lighting loggers in separate lighting zones. The first logger was installed on the top of an aisle separator in the middle of the grocery area. The second logger was installed above the customer service counter. Data was collected over a 24-day period. Unfortunately, data from the light loggers was inconclusive due to light intrusion from other lighting zones in the store. In lieu of monitored data, ERS interviewed the store manager to determine lighting hours of operation.

ERS was able to confirm the type and wattage of the baseline fixture as two MH fixtures were still in use (staff indicated the fixtures will be retrofitted in a future project).

4.10.2 KEY FINDINGS

Hours of operation vary for different areas of the store: four fixtures are on 24 hours per day, thirteen fixtures are on a timer from 8 a.m. to 8 p.m., and nine fixtures are controlled manually and operated from 8 a.m. to 9 p.m.

4.10.3 SAVINGS ANALYSIS

ERS used the methodology described in Section 3 to estimate energy savings. Baseline conditions were determined from the rebate documentation and utility inspections. Fixture wattage values were obtained from the PG&E fixture wattage database for both the baseline and retrofit fixtures.

Reported hours of operation from Alameda's post-inspection report were 5,238 hours for each fixture. Verified hours of operation are based on hours of operation obtained from store manager for each of the three lighting zones: 8,760 hours, 4,380 hours, and 4,732 hours.

4.10.4 Explanation of Deviation from Reported Savings

The primary difference between reported and verified savings is due to the difference in the estimated hours of operation.

4.11 Keep Your Cool Program (FY 2011)

Table 4-11 provides the energy savings results for the Keep Your Cool program. Energy savings reported by AMP are compared to the energy savings verified by ERS.

Table 4-11
Keep Your Cool Program Results

Description		Energy Savings (kWh)
Program results	Reported	671,446
	Evaluated	637,924
	Realization rate	95.0%

4.11.1 Site Visits

Date of site visits: From November 10 through December 15, 2011

ERS visited seventeen of the program participant sites (sixteen sample sites and one site chosen by AMP for analysis). Several measures were implemented as part of the Keep Your Cool program. The sites consisted of a supermarket, small grocery/convenient stores, a restaurant, a school, a cafeteria, and a commercial bakery.

One or more of the following measures were installed at each site: door gaskets, strip curtains, electronically commutated (EC) motors, anti-sweat heater controls, automatic door closers, evaporator fan controls, and LED case lights. ERS measured the linear feet of installed gaskets and inspected them for leaks and damage. The strip curtains were measured by height and width to calculate the square footage, and ERS evaluated whether or not they were being used properly. ERS verified if the new door closers had been installed and were functioning properly. EC motors were inspected and counted. ERS verified that evaporator fan controllers had been installed and observed them reducing fan speed during the course of the site evaluation. The number of cooler doors with anti-sweat heater controls were counted and verified to be operational. Where possible, ERS identified the location of control equipment, such as humidity sensors. ERS counted the number of LED case light fixtures and verified that they matched the description provided in the rebate documentation.

To help assess the energy savings for the site chosen by AMP (Site KYC 14), ERS inventoried energy-consuming equipment and interviewed staff to determine the site's history and operating characteristics. Staff was questioned about any recent changes that may have affected energy use, such as if any new equipment had been installed, if the site had been closed for an extended period of time, or if operating hours have varied over the past 2 years.

4.11.2 KEY FINDINGS

The following list summarizes ERS's key findings from the site visits:

- No new gaskets could be verified by ERS at Site KYC 2. None of the gaskets at the site appeared new, as the existing gaskets looked too worn. We observed a section of missing gasket as well as a build-up of debris within the pleats of the gasket. ERS interviewed staff about the possible location of other cooler or freezers and was told there were no other units on-site.
- No new gaskets could be verified at Site KYC 11. The staff escorted us to every piece of refrigeration equipment, and the wear and tear on the gaskets suggested they were much more than a year old.
- Approximately half of the reported gaskets at Site KYC 7 could not be verified. The staff confirmed that only one small cooler with 8 feet of gasket had been retrofitted.
- ERS could not find the automatic door closer at Site KYC 13. Both a cooler and a freezer were inspected. Staff confirmed that no other refrigeration units were retrofitted and since removed from the site.
- Site KYC 14 is realizing significantly less energy savings than reported (see site analysis below).

4.11.3 SAVINGS ANALYSIS

ERS estimated site energy savings the product of the measure per unit savings values provided by the installation contractor multiplied by the quantities verified at the site. ERS also verified the per-unit deemed savings used by the contractor matched the per-unit savings found in the E3 reporting tool. Two measures savings provided by the contractor are identified as custom calculated: LED case lighting and EC motors.

ERS compared the reported LED case lighting savings to savings calculated for PG&E and the Efficiency Maine programs. The comparison shows the reported savings are consistent with savings calculated for LED lights replacing T12 HO fixtures.

For the EC motors, the contractor-reported savings is greater than the savings found in the E3 reporting tool. However, it was recently discovered that the values in E3 are incorrect. ERS compared the reported savings to an analysis recently conducted by ERS on SVP's third-party refrigeration program and found the reported energy savings higher, but consistent with the savings estimated for SVP's program. The contractor's savings calculations were not provided so we are unable to assess any differences, although we note the contractor's analysis is for a specific manufacturer's product.

Table 4-12 below presents the results for each of the sample sites visited, with the exception of KYC 14, which is shown in Table 4-13:

Table 4-12
Sample Site Results

Site	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
KYC 1	21,150	21,150	1.0	1.0	100.0%	100.0%
KYC 2	8,601	4,722	1.1	0.2	54.9%	16.4%
KYC 3	10,984	10,984	5.9	5.9	100.0%	100.0%
KYC 4	10,506	10,506	10.1	10.1	100.0%	100.0%
KYC 5	5,198	5,198	6.9	6.9	100.0%	100.0%
KYC 6	46,354	46,354	0.4	0.4	100.0%	100.0%
KYC 7	2,371	1,997	5.8	5.2	84.2%	89.8%
KYC 8	30,456	30,456	33.4	33.4	100.0%	100.0%
KYC 9	8,460	8,460	0.2	0.2	100.0%	100.0%
KYC 10	13,813	13,813	1.4	1.4	100.0%	100.0%
KYC 11	1,492	1,140	0.4	0.3	76.4%	78.8%
KYC 12	14,273	14,273	6.5	6.5	100.0%	100.0%
KYC 13	4,417	3,438	0.2	0.0	77.8%	14.3%
KYC 15	12,986	12,986	0.6	0.6	100.0%	100.0%
KYC 16	1,932	1,932	4.8	4.8	100.0%	100.0%
KYC 17	24,415	24,415	2.2	2.2	100.0%	100.0%

For Site KYC 14, ERS used utility bill analysis to verify energy savings. First, we used information gathered from the site to develop an energy balance and confirmed that the utility bill energy use is consistent with the equipment found on-site. Then, ERS used the pre- and post-retrofit billing data to estimate the site's total energy use reduction. Twelve months of pre-retrofit billing data was used as the energy use baseline (43,538 kWh/yr). To determine post-retrofit annual energy use, ERS extrapolated the 8 months of available post-project billing data over a 12-month period. The difference between the baseline and post-retrofit energy use indicates the total energy savings that may be attributable to the retrofit (7,489 kWh/yr).

The reported savings, based on measure-deemed savings values, is 24,393 kWh. Given that the site's pre-retrofit annual energy use was 43,538 kWh, the reported savings indicates a 56% reduction in annual energy use will be achieved. However, based on the utility bill analysis, the reduction in

energy use for the site is 7,489 kWh (17% of annual energy use). Therefore, ERS estimates the energy savings attributable to the retrofit to be no greater than the site's actual energy use reduction.

Table 4-13
Site KYC 14 Analysis Results

Site	Energy Savings (kWh)		Demand Reduction (kW)		Realization Rate	
	Reported	Evaluated	Reported	Evaluated	Energy	Demand
KYC 14	24,393	7,489	NA	NA	30.7%	NA

To estimate the program results, ERS expanded the realization rate of the sixteen sample sites to the rest of the program projects (53 sites) and then added the results for KYC 14. The total represents the program savings achieved by the Keep Your Cool program.

Table 4-14
Program Results

Description		Energy Savings (kWh)
Sample sites (16)	Reported	217,406
	Evaluated	211,823
	Realization rate	97.4%
Relative precision (at the 90% confidence level)		2.80%
Site KYC 14	Reported	24,393
	Evaluated	7,489
	Realization rate	30.7%
Program results	Reported	671,446
	Evaluated	637,924
	Realization rate	95.0%

4.11.4 EXPLANATION OF DEVIATION FROM REPORTED SAVINGS

For sample sites, the difference between reported and evaluated savings is due to fewer installed measures than what was indicated in the contractor's summary table.

For Site KYC 14, it appears the deemed per unit energy savings for the installed measures do not accurately reflect the energy savings achieved. Since baseline conditions cannot be verified, ERS can only speculate as to why the expected savings are not being realized. Potentially, the existing anti-sweat heaters were not functioning properly, the existing reach-in door lighting was not working, or the refrigeration systems at the site are using less energy than is expected or is typical. It also could be that the deemed savings values overstate the potential energy savings for measures installed at very small facilities with low energy-use characteristics (such as low product sales or active energy conservation strategies). Or, the deemed measure saving values do not take into consideration the interactive effects of the installed measures (which reduces the achievable savings).

Summary

5

This report provides independent verification of AMP's reported energy savings for ten commercial energy efficiency projects and one energy efficiency program.

5.1 COMBINED RESULTS

The combined results of the evaluation are provided in Table 5-1.

Table 5-1
Combined Results

Project		Energy Savings (kWh)
2009–2010 projects (Six projects)	Reported	284,886
	Evaluated	190,778
	Realization rate	67.0%
2010–2011 projects (Four projects)	Reported	401,744
	Evaluated	389,692
	Realization rate	97.0%
Keep Your Cool program	Reported	671,446
	Evaluated	637,924
	Realization rate	95%
Combined results	Reported	1,358,076
	Evaluated	1,218,394
	Realization Rate	89.7%

5.2 CONCLUSION AND RECOMMENDATIONS

Based on the findings of this evaluation effort, ERS offers the following conclusions and recommendations:

Conclusions

- AMP enabled its business customers to achieve 1,218,394 kWh of annual energy savings by providing rebates and assistance for the implementation of energy efficient measures.
- The overall realization rate (89.7%) achieved by the selected projects and program are consistent with the realization rates achieved by other California publicly owned utilities and generally higher than the realization rates for most investor-owned utility programs.
- AMP's Keep Your Cool program enabled AMP's food service customers to achieve 637,924 kWh of annual energy savings.
- The accuracy of reported lighting operating hours was inconsistent, which resulted in lower realization rates for several projects.

Recommendations

- For custom lighting projects, AMP should develop a lighting run time and control worksheet for customers and third-party contractors to complete before a project is approved or installed. The worksheet should direct customers and installation contractors to provide information regarding business hours of operation, occupied hours outside of business hours, lighting control types, and control strategies employed. A table of default values by facility end-use type could be provided, with the values based on those found in the KEMA study.
- AMP should consider requiring lighting installers to capture baseline lighting fixture lamp and ballast information by taking digital pictures and submitting the pictures with the rebate application.
- Where lighting controls will be installed, AMP should consider requiring the controls to be commissioned and for a commissioning report to be submitted at the completion of the project. If lighting controls account for more the 33% of estimated savings, AMP should consider requiring pre- and post- monitoring be conducted by the installation contractor.
- Where HVAC control strategies are expected to achieve a significant amount of a project's proposed savings, AMP should consider requiring a controls commissioning report be submitted at the completion of the project.
- AMP should require third-party program providers of small business programs to conduct a billing analysis of potential retrofit sites before any project is installed. The billing analysis will help verify that projected energy savings are realistic, and it will also help contractors identify projects that are the most cost-effective to implement.
- AMP should continue to target T12 lamps for replacement until the federal deadline arrives. Federal legislation on general-service fluorescent lamps becomes effective on July 14, 2012, which essentially eliminates the availability of most T12 and first-generation T8 lamps as replacements. At that time, utilities may no longer be able to claim savings for a standard T12-to-T8 lighting retrofit.

Appendix A

A

On-site Measurement and Verification Plan

1. OBJECTIVES AND METHODOLOGY

1.1 M&V Objectives

- ❑ Determine if the energy saving measures are installed and operating properly.
- ❑ Verify energy savings, using best available information.
- ❑ Determine realization rate for ten projects and one program.

1.2 Sampling Methodology

- ❑ Keep Your Cool Program – simple random sampling will be used to select 16 customers for site M&V visits. A total of 17 sites will be visited (high level of uncertainty for one project requires it be included in the evaluation).
- ❑ Lighting retrofit projects: census – count all measures installed.

2. LIGHTING RETROFIT PROJECTS – ALL PROJECTS

- ❑ To determine the number of lamps installed, count and verify the quantity of lighting fixtures retrofitted.
- ❑ Verify lamp and ballast type installed by inspecting at least one lamp and ballast of each retrofit type at each site.
- ❑ Interview staff to determine:
  - If fixtures were de-lamped (what was original lamp count?)
  - Type of lamp replaced (T12?)
  - Type of lighting control (time clock, manual switch, etc)
  - Operating hours (occupancy hours, lighting control schedule, etc)
  - End use type served by lighting (office, retail, etc)

- ❑ Determine lighting energy savings:
  - Use KEMA Quantification study energy savings formula: kwh = delta watts x operating hours x interactive effects
  - Based on baseline and retrofit data obtained from site visit
  - Lamp wattage: use either standardized lamp/ballast wattages for both baseline and retrofit measures, or actual lamp/ballast wattages for both baseline and retrofit measures (Source: IOU statewide customized offering program, ERS database, actual lamp ratings)
  - Operating hours: use KEMA Quantification study/E3 Reporting Tool end use operating hours, adjusted as necessary based on operating schedule data obtained on site

3. BI-LEVEL LED PARKING LOT LIGHTS

- ❑ Review manufacturer data
- ❑ Review pre and post monthly meter data to profile daily energy consumption
- ❑ Determine how bi-level operation is controlled and/or operated
- ❑ Measure kW and monitor current for a period of two weeks.

4. RETAIL STORE - DELAMPING AND OCCUPANCY SENSOR RETROFIT

- ❑ Measure building area (to determine light power use intensity watts/sf of lighting system)
- ❑ Verify Novar control settings and if it implements any energy conservation strategies
- ❑ Monitor light levels (using light logger) or circuit current for two weeks to profile lighting at front register area

5. LAB - HI-BAY LIGHTING RETROFIT

- ❑ Review manufacturer data for new high bay lighting fixtures to verify wattage.

6. STORAGE FACILITY – LIGHTING RETROFIT

- ❑ Monitor light run time for two weeks using light logger

7. BANK – LIGHTING RETROFIT

As specified for all lighting projects.

8. House of Worship – Lighting Retrofit

As specified for all lighting projects.

9. Refrigeration Retrofit Program

For each measure present at the site:

- ❑ Verify lineal feet of door gasket installed, inspect gasket for leaks and damage
- ❑ Verify size of doors retrofitted with strip curtains, verify curtains are being properly used
- ❑ Verify door closers installed and working properly
- ❑ Verify quantity of ECM motors installed, location (cooler box, freezer, etc), make and model, nominal HP
- ❑ Verify quantity of fan controllers stalled, verify make/model, inspect for proper operation
- ❑ Verify quantity of anti-sweat heater controls, inspect for proper operation
- ❑ Verify quantity of LED case lighting installed, number of lamps, lamp type, length, and make/model
- ❑ Site 14: utility bill analysis to determine validity of claimed savings

10. Hotel – Lighting and HVAC Retrofit

- ❑ Verify lighting type and count in unoccupied hotel rooms
- ❑ Interview third party inspector to verify total lighting count in post inspection report
- ❑ Count the total number of PTHP's installed. Verify units are heat pumps, verify cooling capacity, make and model.
- ❑ Interview staff to assess the age of the ac units that were replaced

11. Bakery – New Construction, Energy Efficient Lighting Controls

- ❑ Review metered and control system energy use data
- ❑ Review T24 documentation
- ❑ Verify lighting type installed
- ❑ Obtain 2011 energy use data from control system (if available)
- ❑ Interview staff regarding control operation

12. Retail Store – Supply Fan VFD Retrofit

- ❑ Verify quantity, make, and model of VFD's installed.
- ❑ Verify HVAC unit fan HP

- ❑ Verify control strategy for VFD operation
- ❑ Observe VFD % speed
- ❑ Monitor one fan's current for two weeks

13. FOOD STORE – LIGHTING RETROFIT

- ❑ Install light logger to verify hours of operation