NAVIGANT CONSULTING

SUMMIT BLUE CONSULTING, LLC

FY 2008/2009 ENERGY EFFICIENCY PROGRAM EVALUATION

for

The City of Palo Alto Utilities Department

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SUMMIT BLUE CONSULTING

A part of Navigant Consulting

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EXECUTIVE SUMMARY

The City of Palo Alto Utilities (CPAU) is the only city-owned utility in California that operates its own utilities including electric, fiber optic, natural gas, water, and wastewater services. CPAU has been providing quality services to the citizens and businesses of Palo Alto since 1896. CPAU serves almost 29,000 meters with the largest portion of its electrical sales to its commercial and industrial customers (80%), while about 20% of sales are to residential customers. Although residential electric sales are only 20% of sales, these customer accounts represent 90% of CPAU's customer base.

CPAU has a number of energy efficiency and renewable energy programs in both the residential and non-residential sectors. About 70% of the savings achieved through its energy efficiency programs comes from the non-residential sector. Therefore, the impact evaluation efforts for CPAU's FY 08-09 are centered on CPAU's non-residential projects.

In addition to impact evaluation, the Navigant Consulting team (formerly Summit Blue) also performed a process evaluation that focused on the Smart Energy (residential) and Right Lights (small business) Programs. Energy Market Innovations, Inc. (EMI), under sub-contract with Navigant Consulting, conducted this research.

This impact evaluation represents the second year of impact evaluations for the CPAU DSM programs. Last year, measures within the Residential Smart Energy Program were evaluated as well as the Commercial Advantage and RightLights Programs. This year, the Commercial Advantage and RightLights Programs were evaluated.

Background

Two legislative bills (SB1037 and AB2021) were signed into law a year apart. SB1037 requires that the Publicly Owned Utilities (POUs), similar to the Investor Owned Utilities (IOUs), place cost effective, reliable, and feasible energy efficiency and demand reduction resources at the top of the loading order. They must now procure "negawatts" first. Additionally, SB1037 (signed September 29, 2005) requires an annual report that describes the programs, expenditures, expected energy savings, and actual energy savings.

Assembly Bill 2021, signed by the Governor a year later (September 29, 2006), reiterated the loading order and annual report stated in SB1037 as well as expanding on the annual report requirements. The expanded report must include investment funding, cost-effectiveness methodologies, and an independent evaluation that measures and verifies the energy efficiency savings and reductions in energy demand achieved by the energy efficiency and demand reduction programs. AB2021 additionally requires that publically-owned utilities submit a report to the California Energy Commission every three years that highlights potentially cost-effective electricity savings from energy efficiency and establishes annual targets for energy efficiency and demand reduction over ten years. The legislative reports require both an on-going assessment of what is occurring within the programs along with a comparison of how much possible savings are left within the CPAU service territory.

Objectives

The goals of the EM&V effort at CPAU are to provide unbiased, objective and independent program evaluations by giving:

- Useful recommendations and feedback to improve CPAU programs.
- Assessment of conservation program effectiveness.
- Assessment of the quality of the program data for impact evaluation purposes.
- Increased level of confidence in conservation program results through transparent protocols.

Process Evaluation

Energy Market Innovations, Inc. (EMI), under sub-contract with Navigant Consulting, performed a process evaluation that focused on the Residential Smart Energy Program and Commercial RightLights Program. The evaluation efforts consisted of interviews with CPAU program staff and the third party implementers.

Smart Energy Program Recommendations

From the perspective of those interviewed for this study, the Smart Energy Program appears to be running smoothly overall, and CPAU is continuing to evolve to meet increasing program goals without sacrificing customer or workforce satisfaction (i.e., developing online application processing). Recommendations for improvement and future research are offered below as suggestions to help ensure future program goals can be met. It should be noted that these suggestions are based on a very limited number of stakeholder interviews and in many cases should be seen as individual comments and are not representative of universal perceptions of the program.

Reduce the Frequency and Conversion of Returned/Pending Applications. CPAU could work to clarify information that leads to returned or pending applications, such as the 50% requirement for insulation and the lack of a receipt or signature. CPAU should ensure that the online application system includes validation of these parameters or includes popup prompts to remind customers of the required information needed to successfully process the application. Pending applications should also be tracked and a process should be developed for increasing the follow up with these customers. In some cases, these customers may simply require an additional reminder or push to provide the necessary information for application approval. These customers have already shown interest in participating in the program and following up with them could provide the opportunity to identify additional opportunities.

In addition, CPAU should provide email notification to customers about the status of their applications. This is especially important for the final approval of the application and for the crediting of the rebate amount to the bills of the customers. The final notification should make clear that the rebate is applied as a credit to the bill and will not be issued as a check. This could cut down customer confusion about how the rebate is applied and significantly cut down on follow up phone calls from customers.

The CPAU program manager indicated that a number of these features for the online system are already being implemented or considered. However, the evaluation team has still included these recommendations in the report to simply emphasize the potential usefulness and effects of these potential features.

Understand the Effectiveness of the Online Auditing Tool. CPAU could conduct a study to understand the usefulness of the online auditing tool and to understand how effective it is at referring customers to CPAU rebates. A "City of Palo Alto online home energy audit" answer should be included as an option to the question of where the customer heard about the Smart Energy program. This would help track the effectiveness of this tool in producing referrals to the Smart Energy program. Increasing the

understanding of the effectiveness of this tool could result in simple ways to improve the tool and its effectiveness at promoting the Smart Energy Rebates.

Increased Collaboration with the Green@Home Program. CPAU should ensure that the Green@Home program managers are receiving adequate training on the Smart Energy rebate programs. Through the contract program manager, Green@Home volunteers should be encouraged to promote the programs and CPAU should suggest that the promotion of these programs is included on the Green@Home checklist as a standard task for volunteers. CPAU should also ensure that Green@Home continues to have adequate marketing material on the Smart Energy and other residential efficiency programs and that this is distributed with the standard handout materials to Green@Home participants. A tracking system could also be developed to understand how the program helps customers identify rebates they can apply for from CPAU. A "Green@Home" answer should be included as an option to the question of where the customer heard about the Smart Energy program. CPAU could also use the names and addresses of previous Green@Home audit recipients to target direct mailing marketing materials on Smart Energy rebates.

Dedicate Full-Time Staff to the Implementation of the Program. If resources and/or budget allow it, CPAU should consider having a dedicated staff member work on implementing the Smart Energy program and processing the rebates. Having a full-time, dedicated staff member of this program would allow consistency in having the same person answer the phone and talk to customers (rather than a part-time employee not in the office everyday). In addition, a full-time employee could help lower the processing time to less than 30 days and a full-time employee might spend more time tracking program referrals and working on training and outreach that could lead to increased participation in the program.

RightLights Plus Program Recommendations

According to most stakeholders interviewed for this process research, the RightLights Plus program seems to be a success. The program uses a program model in use by PG&E since 2003 and successfully reduces barriers to small and medium businesses that are traditionally very difficult to reach. In addition, the program garners energy savings from these hard to reach customers in a cost effective manner. Recommendations for improvement and future research are offered below as suggestions to help ensure that future program goals continue to be met. It should be noted that these suggestions are based on a very limited number of stakeholder interviews and in many cases should be seen as individual comments and are not representative of universal perceptions of the program.

Continue to Expand Qualified Measures. Some stakeholders interviewed for this evaluation indicated that there were additional measures they would like to see supported by this program. These include electrically commutated (EC) motors as a stand-alone measure, evaporative fans, programmable two speed motors, refrigerator doorframe heater controllers, and lighting motion sensors. The RightLights Plus program could use other programs in the area as a model for the addition of further measures to the program. Since contractors in the area that work with CPAU might already be installing some of these measures for other utilities or programs, these measures might be easily adopted into the RightLights Plus program.

Develop Online Project Tracking System. One contractor indicated that an externally facing online tracking system for contractors to track the status of their projects could be very helpful. The current system involves a lot of work on the contractor side to track the various projects. If there was a simpler method for tracking these projects, it could free up the contractors to take on more projects at a lower cost. This contractor said that they experienced a lot of success with similar programs that had online tracking systems and it simplified the process of participating with the program.

Conduct Additional Interviews with Qualified Contractors and Non-Program Contractors. Given the heavy reliance on quality contractors to successfully run this program, it is suggested that CPAU conducts follow-up research that focused specifically on the contracting market in the CPAU service territory. This research would help CPAU understand contractors' experiences with the program and would help identify potential areas of improvement for the program. While this process research included an interview with one contractor, the evaluation team felt that this interview was very useful in understanding the program and how it operates as the contractor sits between the customer and the utility/program implementer. In addition, the contractors often perform similar work for the PG&E RightLights programs within the vicinity. For this reason, the contractors have specific knowledge of how the CPAU RightLights Plus program compares to other, similar programs. This knowledge would be useful in understanding how the program can be further improved.

Impact Evaluation

The impact evaluation was performed for CPAU's non-residential Commercial Advantage and RightLights Programs. Navigant Consulting conducted separate stratified random samples from the both programs using ratio stratification and selected five Commercial Advantage and 16 RightLights projects for on-site evaluation.

Summary of the Custom Advantage Program Realization Rates

Table EX-1 provides the savings reported in the final installation review documents submitted for the Commercial Advantage Program and the verified gross savings. Overall, the Commercial Advantage Program realization rate is estimated to be 89.2%. It should be noted that this realization rate is based largely on deemed savings for lighting projects. There are two primary reasons for the lower than 100% realization rate. The first is missing lighting fixtures and lamps and the second a lower amount of motor HP associated with the VFD installation.

As noted earlier, CPAU should also be aware that the actual base lighting technology for some of the installations (site 1) has much lower wattage than the base wattage used in the deemed savings calculations and at site 3; one of the two building floors that received a retrofit is unoccupied.

Table EX-1: Commercial Advantage Program Claimed Savings and Verified Gross Savings

Customer	Claimed		Verified	
	kW	kWh	kW	kWh
Site 1	107	589,125	96.383	481,915
Site 2	30	205,970	29.928	237,991
Site 3	7	36,229	6.529	33,357
Site 4	0	18,825	0	20,330
Site 5	2	56,839	2.11	35,415
Total	**146**	**906,988**	**134.95**	**809,008**
Percent Realization			**92.4%**	**89.2%**

Summary of the RightLights Program Realization Rates

Table EX-2 provides the savings reported in the final installation review documents submitted for the RightLights Program and the verified gross savings. Reported kW is coincident peak demand savings and kWh savings include interactive effects. Overall, the RightLights program energy realization rate was estimated to be 84.3% and a demand realization rate of 86.9%. The primary reason for the less than 100% realization rate is due to how energy savings are calculated by Ecology Action. To a lesser extent, the reason was due to removed fixtures at one customer location.

Table EX-2: RightLights Program Claimed Savings and Verified Gross Savings

Customer	Claimed		Verified	
	kW	kWh	kW	kWh
Site 1	6.600	57,450	6.274	55,595
Site 2	0.000	6,448	0.000	19,344
Site 3	11.482	138,802	7.166	150,640
Site 4	0.645	5,653	0.888	4,893
Site 5	1.233	7,659	0.837	6,406
Site 6	13.413	118,959	14.124	103,951
Site 7	33.459	299,606	30.944	279,029
Site 8	7.305	47,201	7.305	54,595
Site 9	2.255	9,912	3.122	8,129
Site 10	14.690	92,004	14.169	81,265
Site 11	1.409	4,277	0.718	4,080
Site 12	11.952	59,299	7.540	43,572
Site 13	28.892	321,015	23.909	171,266
Site 14	3.277	24,205	3.188	24,009
Site 15	3.938	13,546	1.893	10,191
Site 16	24.792	331,537	24.044	171,929
Total	140.550	1,206,035	122.076	1,016,965
Percent Realization			**86.9%**	**84.3%**

Process Recommendations Based on Impact Evaluation

Several issues arose while conducting both the RightLights and Commercial Advantage Programs that should be addressed in order to improve future EM&V efforts. Some of the delays encountered in the evaluation were due to the Navigant Consulting team not recognizing that an issue existed until several weeks into the evaluation process. A more timely recognition of issues on our part in the future is also needed. The primary issues include the following:

- There appears to be a need for greater oversight and post installation auditing in the Commercial Advantage Program. In some sites, we found that measures had never been installed. In another site, we found that more measures were being claimed for savings than there were fixtures to put them in.
- On a site by site basis, we had difficulty understanding the linkages between the reporting by Ecology Action and how that information was used by CPAU. It is our understanding that the Ecology Action information was directly summed and used, but we would like to see these linkages more clearly defined and documented.
- A methodological issue exists in the evaluation of savings from T8 luminaries replacing T12s. Standard practice among the investor owned utilities (IOUs) in California requires that program evaluations use Title 24 standards as the minimum efficiency baseline from which savings are calculated. An exception to this rule is granted to programs specifically designed to encourage the early replacement of existing equipment. However, there is question as to how energy savings for early retirement should be estimated.

  NCI believes that the RightLights current impact estimates overstate the actual impacts of the

RightLights program in those cases where the existing equipment is less efficient than Title 24 standards. Although we concur that the savings realized from an early retirement are greater than those realized through natural replacement (ROB), the current method does not account for the abbreviated remaining life of the pre-existing technology. Therefore, it is NCI's position that unless savings estimates for RightLights are shifted down to reflect the two-stage effect of an early retirement program, the savings estimate should use Title 24 as the baseline to prevent overestimating the program impacts.

1 INTRODUCTION

The City of Palo Alto Utilities (CPAU) is the only city-owned utility in California that operates its own utilities including electric, fiber optic, natural gas, water and wastewater services. CPAU has been providing quality services to the citizens and businesses of Palo Alto since 1896. CPAU serves almost 29,000 meters with the largest portion of its electrical sales to its commercial and industrial customers (80%), while about 20% of sales are to residential customers. Although residential electric sales are only 20% of sales, these customers account for 90% of CPAU's customer base.

CPAU has a number of energy efficiency and renewable energy programs in both the residential and non-residential sectors. However, about 70% of the savings achieved through its energy efficiency programs comes from the non-residential sector.

This evaluation plan represents the second year (FY 08-09) EM&V effort designed to respond to California legislative requirements. Two legislative bills (SB1037 and AB2021) were signed into law a year apart. SB1037 requires that the Publicly Owned Utilities (POUs), similar to the Investor Owned Utilities (IOUs), place cost effective, reliable, and feasible energy efficiency and demand reduction resources at the top of the loading order. They must now procure "negawatts" first. Additionally, SB1037 (signed September 29, 2005) requires an annual report that describes the programs, expenditures, expected energy savings, and actual energy savings.

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The legislative reports require both an on-going assessment of what is occurring within the programs along with a comparison of how much possible savings are left within the CPAU service territory. The goal of this FY 08-09 Energy Efficiency Program Plan is to assist CPAU to meet these requirements.

The focus of the FY 07-08 EM&V efforts covered both residential and commercial sector programs.

- Residential Smart Energy
- Commercial Right Lights
- Commercial Advantage

The largest amount of claimed energy savings (about 70%), along with the greatest uncertainty with results, are from CPAU's commercial sector programs. Because of these two points, the focus of the FY 08-09 impact evaluation is on the non-residential program: specifically, the Commercial Advantage and the RightLights Programs. In addition to impact evaluation, the Navigant Consulting team also performed a process evaluation for FY 08-09 that focused on the residential Smart Energy Program and the Commercial RightLights Program. Energy Market Innovations, Inc. (EMI), under sub-contract with Navigant Consulting, conducted this research to provide insights on current program operations and recommendations for improving the program delivery and accounting systems.

2 PROCESS EVALUATION

This section presents the findings from process evaluation research of select programs administered by the City of Palo Alto Utility (CPAU). The programs examined by this research were determined jointly with the CPAU after consideration of programs that were covered by past process evaluation work. In particular, this research focused solely on the residential Smart Energy and the commercial sector RightLights Plus incentive programs. The objective of this research was to assess the operational efficiency of program delivery and to identify any aspects of program delivery in need of improvement. Because of budgetary constraints, this is not to be considered a comprehensive or traditional process evaluation (which can be costly and not a cost-effective use of evaluation resources given the size of the CPAU portfolio). Rather, this research was based almost entirely on in-depth interviews with CPAU and third-party program staff. Secondary information sources were also referenced to gain background information on the programs for appropriate context prior to the interviews and for clarification. Customer and contractor-based research, while very valuable sources to understand how a program interacts with utility customers, was not in the scope of this project.

Interviews for this process research focused on CPAU staff responsible for managing the Smart Energy and Right Lights Plus programs as well as third party implementers, contractors, and other program partners. A complete list of stakeholders interviewed for this research is found in Table 2-1.

Table 2-2: Completed Interview Sample

Organization	Interview Type
CPAU Staff	Utility Marketing Services Manager
	Smart Energy Program Manager
	Part-Time Smart Energy Staff
	Former Part-Time Smart Energy Staff / Utility Marketing Services Admin
Acterra	Associate Director
Ecology Action	Vice President of Energy Group
	RightLights Plus Program Manager
	Energy Analyst
Wave One	President and Founder
	Chief Operating Officer
Contractor	RightLights Plus Contractor
Total Stakeholders Interviewed = 11	

In addition to in-depth interviews, the evaluation research team also consulted a number of secondary sources of information to better understand the program processes. These sources included:

- CPAU Residential Programs Brochure
- Smart Energy Rebate Application
- Sample Input into the CPAU Tracking Data Base for the Smart Energy Rebates
- Acterra Green@Home House Call Checklist
- RightLights Plus Flyer
- Energy Efficiency Proposal Sample
- RightLights Site Access Agreement

- Contract between CPAU and Ecology Action

The remainder of this process research summarizes the findings with respect to the Smart Energy Program and the RightLights Plus program. Each section provides an overview of the program and summarizes the general delivery strategy and processes through which program services are provided to participants. Each section also includes the observations from the evaluation team on program delivery, and offers recommendations for the consideration of the CPAU.

2.1 Residential Smart Energy Program

The CPAU Smart Energy program is an energy efficiency program that provides prescriptive incentives for the purchase of energy efficient products by residential customers. The program covers the following products:

- **Appliances:** dishwashers, refrigerators, clothes washers
- **Heating and Air Conditioning:** gas furnaces, central AC, boilers
- **Insulation:** attic/roof insulation, wall insulation
- **Pool Pumps:** two speed/variable pool filtration pumps and motors
- **Water Heaters:** residential water heaters

The program also includes a refrigerator/freezer recycling program through JACO Environmental that was not included in the scope of this evaluation.

To participate in this program, customers must fill out a residential rebate application that is available on the CPAU website as well as from a number of other outlets, including: the CPAU directly, some local retailers, community centers, and the City Hall. Applications are mailed to the CPAU and must include appropriate documentation (e.g., receipts, product specifications, invoices, contractor details, etc.) to be processed. Rebates are given in the form of credits on the customers' future utility bills unless special situations apply such as rebates to landlords for multifamily (e.g., apartments, duplexes, etc.) dwellings, or for rebates greater than $350. The program is also applicable to both new construction and retrofit projects. Rebates are processed within three monthly billing cycles from the receipt of all required documentation.

In addition to rebates for energy efficient measures, CPAU also offers rebates for water efficient measures under a separate program. The water efficiency program is not within the scope of this evaluation; however, in the case of clothes washers, customers can apply for both an energy incentive as well as a water incentive, so there is some overlap of the two programs.

The CPAU staff working on the Smart Energy program indicated that rebates for "white goods" (clothes washers, dishwashers, and refrigerators) were the most popular rebates for customers. The less popular measures are those for insulation, furnaces, pool pumps, air conditioning, boilers, and water heaters.

2.1.1 Program Processes

The role of CPAU staff in implementing the Smart Energy program primarily involves processing the applications received from the customers. A designated staff member will open received applications, enter information from the application into the database, assign an application number, and verify that all the required information is included in the applications. When necessary information is missing from the account, such as the customer signature or proper receipts, staff will follow up with the applicant by phone or email to attempt to acquire the missing information, sometimes using an email template for the

most common reasons where follow up is required. Once a month, CPAU staff compile a report of approved applications and send it to the program manager or the utility marketing services manager for review. Once the rebates have been approved, staff enters the rebate information into a SAP system to credit the customers' accounts. If the amount is greater than $350 or if the landlord of a multi-tenant building is supposed to receive the rebate, then staff will pass off the rebate information to the accounts payable department who will issue checks. The accounts payable department will print and sends checks every Tuesday, or the account credit will show up on the customers' next bills.

While currently all applications are physically mailed to CPAU, the Smart Energy program manager indicated that CPAU is working on an online application system for the program. The online application system is expected to streamline this process by eliminating the need for staff to physically enter the information from the application into the database and by making the information easier to track. This change could also streamline the application process from the customer's perspective, though the customer will still be required to physically mail in supporting materials (e.g., receipts, product specifications, invoices, contractor details, etc.).

Program staff also spends time answering calls and speaking on the phone with customers who are planning to apply or are applying for rebates through the program. Staff will answer questions on what rebates are applicable and answer other questions about the rebates or about the applications customers have submitted.

2.1.2 Key Staff

The CPAU staff working directly on the Smart Energy program include the program manager, who clarifies borderline applications, works on program modifications, approves rebates, and engages in marketing efforts, and one part-time employee responsible for opening and processing the applications, and following up on incomplete applications. In addition, a few CPAU employees were identified that offer infrequent support to the Smart Energy program staff, including an engineer who helps calculate energy savings and incentive levels for new and modified rebates, and a marketing specialist who helps coordinate program promotion.

2.1.3 Program Observations

Application Processing

One important role CPAU staff undertakes is answering telephone inquiries about the program, as many customers call prior to applying for a rebate. Program implementation staff indicated that for roughly two out of ten applications, the CPAU receives a call from the customer before the application is received. These customers often call to get clarification on some of the rebate offerings or to ask if there are rebates applicable to certain products. Staff felt that it was helpful to have the same people responsible for processing the applications answer the main line and be able to talk to the customers directly about their programs, answer applicable questions, and suggest other improvements. One CPAU staff member indicated, "I think people just want to talk to someone." The program manager also indicated they would sometimes do an informal "phone audit" with the customer and suggest possible areas where the customer could do efficiency upgrades and apply for rebates. CPAU would then often send these customers a rebate form so they could apply for an incentive after making any suggested upgrades.

Program staff interviews revealed an estimated volume of applications processed by the CPAU. Interviewees indicated that the program receives five to ten applications per day (roughly 20-30 per week) and that the program rebates about $10,000 - $15,000 per month in rebates. Of the applications received,

program staff indicated that three to four of every 20 did not contain all the necessary information to process the application. Staff indicated that the most popular reasons for returning applications were missing receipts or applications that have not been properly signed. One specific measure, the insulation rebate, typically results in a large number of returned applications because the customers or contractors forget to fill out a section indicating the percentage of the wall or roof covered by the new insulation. This information is necessary because the insulation must cover at least 50% of the area to be eligible for the rebate.

Another product that creates confusion is the clothes washer rebate. This product is a two-part rebate that includes an electricity portion and a water portion. The application process includes two separate forms for the different portions of the rebate. The electrical portion of the rebate uses the standard Smart Energy Residential Rebate Application, while the water savings portion of the rebate is administered by Pacific Gas and Electric (PG&E) as a part of the regional "Water Energy Savings" program. The application for the water portion is available on a PG&E maintained website (www.waterenergysavings .com). Since this is a regional effort, the water application is also branded with the PG&E logo and includes fields for PG&E account numbers and Water Service Account Numbers. CPAU staff indicated that although they do not administer the water portion of the rebate, they get a lot of questions from customers about how to fill out the water portion of the rebate application. Staff felt that it would eliminate confusion to have a version of the application specific to CPAU where information on how to complete the application would be more self-explanatory.

Audits

Due to cost and staffing issues, CPAU does not conduct any in-person audits for the Smart Energy program.[1] To help perform the auditing function, CPAU has set up an online auditing tool on the City's website. According to the program manager, the audit tool received 6,500 hits and 1,900 new users in 2009. However, program implementation staff all indicated that they were unsure of whether the tool ever leads to customers applying for incentives and that they have not heard any feedback that the tool is useful.

In addition to online audits, CPAU sponsors Acterra, a local non-profit organization that provides free energy audits through a program called "Green@Home." Acterra became involved when CPAU released an RFP for third party programs, and Acterra responded with a proposal for funding the Green@Home program within Palo Alto (it has since expanded to other utility districts). The Green@Home program trains and deploys volunteers who do energy audits of local homes. They typically provide a number of small efficiency upgrades such as: installing CFLs (typically three per customer); a home power cost monitor (only for residences that use over $500 of electricity per month); sink aerators; low flow shower heads; and insulation plugs for electrical outlets and light switches. They also measure and adjust refrigerator/freezer temperatures and hot water temperatures for energy savings. In total, they have a checklist of 80 items they check for each home, although this checklist does not include any mention of CPAU Smart Energy rebates.

The Green@Home program is funded in Palo Alto by CPAU, which provides the organization with funds to run the program, CFLs for distribution, and home energy monitors to install. CPAU claims savings from this program based solely on the number of CFLs distributed per house. The program also

[1] The City does offer in home audits to low-income customers through the Residential Energy Assistance Program (REAP); however, this is a separate program run independently from the Smart Energy program and is not included in this evaluation.

distributes information provided from CPAU on their programs. The associate director of Acterra indicated that the package of information provided to program participants includes information on CPAU residential rebates, but could not find the information in the current packets that were going to customers receiving the audits. The packet did contain information on water conservation programs, a practical plumbing handbook, and a smart energy wheel to calculator electrical costs to run appliances.

While the program managers at Acterra give training to the volunteers on CPAU Smart Energy rebates, the managers themselves do not receive training from CPAU staff on the rebates on an ongoing basis. There also is not a method in place to track the results of the Green@Home program, and so CPAU staff were unsure of whether the Smart Energy program had received any referrals from the Green@Home program. The Green@Home program only provides an excel spreadsheet with the names and addresses of audit recipients, the number of CFLs they installed (for CPAU to claim savings) and whether they received a home energy cost monitor. CPAU could crosscheck this list with the Smart Energy database, but because the database is in Access format and the Green@Home information is in Excel format, this could be a time consuming process and has not been pursued.

Staffing

The Smart Energy program currently has one part-time employee working two to three days a week who does the majority of the work implementing the program. These tasks mostly involve receiving and processing applications, and answering the phone and talking to customers. On top of this, there are a number of people offering basic support to the program as part of their job descriptions at CPAU. The staff indicated that this level of staffing is sufficient to keep operating at the current level. However, at the time of the interviews (mid-January) there was a backlog of applications from the holiday season, when many new appliances are purchased and therefore many applications are received by CPAU.

The program manager also indicated that there could be improvement in the processing time of applications, and expressed a desire to get the processing time down to less than one billing cycle (30 days). The program manager believed that to accomplish this, CPAU would need a full-time staff member dedicated to the residential program. The program manager indicated that they were looking to fill a full-time spot for the residential program, or possibly to rearrange some of the staff responsibilities to enable someone to work on residential full-time.

Marketing

The Smart Energy program is mainly marketed through billing inserts included in utility bills and on payment envelopes. CPAU also performs outreach events such as a local concert series and workshops at community centers and senior centers. These outreach events are often done in collaboration with the CPAU water conservation programs. CPAU staff also leave program information such as applications at community centers, the town hall, and local retailers. In addition, the program will mail application materials to local contractors such as pool contractors and insulation contractors. Program marketing also includes limited newspaper advertisements.

The current version of the application includes a question about where the customer heard about the program, including the options: utility bill insert, newspaper, CPAU website, retailer, and other. While this information is collected and added to the database, staff indicated that this data was not tracked and only used in a limited capacity to assess the success of marketing efforts.

In addition, CPAU has not conducted training for some of the key people that might be able to help market the program. The program manager indicated that they had offered training to some local retailers, but that so far no one had requested the training. The program manager indicated that this is not

something CPAU has aggressively pursued. It was also indicated that they had not given training to the staff at Acterra implementing the Green@Home program.

Rebate and Customer Tracking

One topic EMI focused on in interviews with CPAU staff was procedures for tracking customers and rebate applications. CPAU indicated that information from applications are entered into the database as soon as an application is received and reviewed. The information entered includes how the customer heard about the program and has a field for the status of the application (hold, approved, or declined. Although CPAU has been entering this information into the database, staff indicated that the information was not tracked regularly. For example, for incomplete applications (or applications on hold), staff would make initial attempts to contact the customer through a phone call or email, and then file the application in a binder. If the applicant did not reply or resubmit the required information, there is typically no attempt to further follow up with the applicant. Although it would be possible to use the database to generate lists of outstanding applications for follow up, CPAU staff is not currently doing this. The program manger indicated that once the online application system is operational, it should be easier to run these reports and that it is desired to set up a system to identify pending applications and make additional efforts for follow up.

Staff also indicated that a large number of phone calls are placed by customers whose applications have already been processed (as much as nine of ten calls received by one staff member's estimate). Staff indicated that there is no system in place for informing customers of the status of their rebate applications. As a result, some customers call to inquire about their application status when the application has already been processed. Although the rebate application includes a question about how the customer would like to be notified of "application approval," this information is not recorded in the tracking database and there does not seem to be any notification released to these customers. This may create confusion by making customers think they will receive a notification. These follow up calls may also be a result of customers simply not realizing the rebate was applied as a credit to their utility bill (if they were mistakenly expecting a check) or if they simply had not yet received the latest bill with the applied credit.

In addition, while information on how the applicant heard about the program is entered into the database, it is also not reliably tracked. This field could also include additional sources such as the Green@Home program or the online audit tool. This would help CPAU determine how useful these resources are in referring customers to the Smart Energy Rebates.

2.1.4 Recommendations

From the perspective of those interviewed for this study, the Smart Energy Program appears to be running smoothly overall, and the CPAU is continuing to evolve to meet increasing program goals without sacrificing customer or workforce satisfaction (i.e., developing online application processing). Recommendations for improvement and future research are offered below as suggestions to help ensure future program goals can be met. It should be noted that these suggestions are based on a very limited number of stakeholder interviews and in many cases should be seen as individual comments and are not representative of universal perceptions of the program.

Reduce the Frequency and Conversion of Returned/Pending Applications. CPAU could work to clarify information that leads to returned or pending applications such as the 50% requirement for insulation and the lack of a receipt or signature. CPAU should ensure that the online application system includes validation of these parameters or includes popup prompts to remind customers of the required information needed to successfully process the application. Pending applications should also be tracked

and a process should be developed for increasing the follow up with these customers. In some cases, these customers may simply require an additional reminder or push to provide the necessary information for application approval. These customers have already shown interest in participating in the program and following up with them could provide the opportunity to identify additional opportunities.

In addition, CPAU should provide email notification to customers about the status of their application. This is especially important for the final approval of the application and for the crediting of the rebate amount to the bills of the customers. The final notification should make clear that the rebate is applied as a credit to the bill and will not be issued as a check. This could cut down customer confusion about how the rebate is applied and significantly cut down on follow up phone calls from customers.

The CPAU program manager indicated that a number of these features for the online system are already being implemented or considered. However, the evaluation team has still included these recommendations in the report to simply emphasize the potential usefulness and effects of these potential features.

Understand the Effectiveness of the Online Auditing Tool. CPAU could conduct a study to understand the usefulness of the online auditing tool and to understand how effective it is at referring customers to CPAU rebates. A "City of Palo Alto online home energy audit" answer should be included as an option to the question of where the customer heard about the Smart Energy program. This would help track the effectiveness of this tool in producing referrals to the Smart Energy program. Increasing the understanding of the effectiveness of this tool could result in simple ways to improve the tool and its effectiveness at promoting the Smart Energy Rebates

Increased Collaboration with the Green@Home Program. CPAU should ensure that the Green@Home program managers are receiving adequate training on the Smart Energy rebate programs. Green@Home volunteers should be encouraged to promote the program, and CPAU should suggest that the promotion of these programs is included on the Green@Home checklist as a standard task for Green@Home volunteers. CPAU should also ensure that Green@Home continues to have adequate marketing material on the Smart Energy program and that this is distributed with the standard handout materials to Green@Home participants. A tracking system could also be developed to understand the effectiveness of the program in referring customers to the Smart Energy Program. A "Green@Home" answer should be included as an option to the question of where the customer heard about the Smart Energy program. CPAU could also use the names and addresses of previous Green@Home audit recipients to target direct mailing marketing materials on Smart Energy rebates.

Dedicate Full-Time Staff to the Implementation of the Program. If resources and/or budget allow it, CPAU should consider having a dedicated staff member work on implementing the Smart Energy program and processing the rebates. Having a full-time, dedicated staff member of this program would allow consistency in having the same person answer the phone and talk to customers (rather than a part-time employee not there everyday). In addition, a full-time employee could help lower the processing time to less than 30 days and a full-time employee might spend more time tracking program referrals and working on training and outreach that could lead to increased participation in the program.

2.2 Commercial RightLights Plus Program

The RightLights Plus program helps small and medium commercial businesses in the CPAU service territory implement energy efficiency retrofits and upgrades. The RightLights Plus program model is primarily based upon providing turnkey services through a single point of contact for the customer. The program integrates free energy surveys and applicable efficiency rebates into a single process that eliminates most of the barriers these businesses face when investing in energy efficiency retrofits.

When the program first started, some customers had initial skepticism about receiving an energy audit or about the new efficient technology. To overcome initial skepticism, the RightLights Plus program would often install a free "quick saver package" (QSP), a direct-install package that includes compact fluorescent lamps (CFLs) and/or LED exit sign retrofit kit, and other direct-install measures and is valued at approximately $250. The QSP provides instant energy savings and is a valuable outreach tool that helps the program develop a rapport and trust with the customer. After having the QSP installed, some customers would then proceed to receive an audit. More recently, after the RightLights Plus program established a positive reputation and developed improved selling processes, the QSP is rarely needed to get a foot in the door for an audit. However, for companies who do not want full retrofits, or for businesses too small to justify a full audit, the QSP can still be a helpful tool for achieving energy savings for the program

As a result of the energy audit, the assigned program auditor produces a complete job proposal to the customer. This proposal is designed to simplify the purchase and installation process for the customer and limit any risk and uncertainty by making transparent what rebates the customer will receive, providing prescreened and vetted contractors, and solidifying all other costs to the customer up front.

The proposal includes: specifications of recommended energy efficient measures, estimated energy savings from the recommended measures, rebates available for each recommended measure, and any costs associated with the measures above and beyond those covered by the available rebates. Any additional costs associated with the proposal are locked-in equipment and installation labor costs based on pre-negotiated rates established by the RightLights Plus program and the approved contractors. At the end of the project, the rebate will go directly to the contractor performing the work, and then the customer will pay the contractor the balance. In some cases, the rebates can cover up to 80% of the measure costs.

Even though the program began solely as a lighting program, it has expanded over the years to include many non-lighting measures. In addition to lighting, the CPAU program offers incentives for refrigeration measures (gaskets, strip curtains, refrigeration door motors, and controls), vending controls, and HVAC equipment and controls. The Ecology Action program manager indicated that approximately 50% of the estimated program savings are associated with lighting measures.

After the customer accepts the proposal, the program implementation contractor, Ecology Action, essentially serves as an equipment procurement and installation contract manager. That is, Ecology Action dispatches the contractor, maintains oversight over the installation, conducts verification inspections, and coordinates all contractor rebate payments.

It is important to note that this program is based on the Right Lights program administered by Pacific Gas & Electric Company (PG&E) since the 2002 – 2003 program cycle, also implemented by Ecology Action. The CPAU program is similar in nearly all respects to the PG&E program, though some measures covered by PG&E are not covered by CPUA. These include retro-commissioning and non-residential retrofit measures, which are offered by PG&E through the Right Lights program. These are not offered by CPAU, because at the time that Ecology Action proposed the RightLights Plus program in Palo Alto, CPAU already offered these services through other programs.

This program aims to provide value to the customers by making the process as easy as possible for the customers, while providing professional services such as lighting design to customers at no or reduced costs. The program also reduces the risk for the participant because any costs to the customer are fixed before the work takes place.

2.2.1 Program Processes

As a third party program, all primary responsibilities for this program are handled by Ecology Action. These include, but are not limited to:

- Recruit, train, and maintain qualified installation contractors.
- Conduct marketing and outreach, and identify program participants.
- Conduct on-site energy surveys to identify energy efficiency improvement opportunities.
- Develop recommendations for energy efficiency improvements and review with customers.
- Coordinate measure installation with qualified contractors.
- Conduct post-inspection of energy efficiency measures to validate measure installation and customer satisfaction.
- Review and process all rebate applications (customer acceptance of audit recommendations).
- Pay rebates to contractors rebate amounts.
- Maintain accurate tracking of program participants, measure installations, estimated measure savings, rebate payments, and program administration costs.

Marketing

The RightLights Plus program is targeted at small and medium commercial businesses, which can be challenging to reach due to their small size, wide dispersion, and the fact that the majority lease instead of owns the property. To identify these businesses, the program utilizes a number of different sources. In addition to direct outreach and marketing by Ecology Action, there are a number of other program partners and marketing channels that bring customers to the program, including, but not limited to:

- CPAU account representatives
- The Palo Alto Chamber of Commerce
- Contractors and engineers that work with CPAU or Ecology Action
- Sustainability programs (e.g., Wave One, Santa Clara County Green Business Program)
- Local property management firms

For example, the collaboration between the RightLights Plus program and Wave One allows the program to reach a number of hard to reach customers. Wave One is a non-profit organization founded by a local property management firm that was interested in addressing sustainability within Palo Alto businesses. The organization began by bringing sustainability services to the properties managed by the firm. As part of the service offerings, Wave One helps organize and coordinate participation in the RightLights Plus program. This is seen as a positive for the companies leasing business space, as the programs save them money. Since the Wave One organization is rooted in property management, the organization is an on the ground in the local commercial property market that can reach small and medium businesses.

Energy Surveys

Once potential program participants are identified, an Ecology Action auditor will contact the customer to obtain a site access agreement, which allows Ecology Action staff on-site to conduct the cost free, no obligation energy surveys. After the agreement is signed and they are authorized to perform the survey, Ecology Action staff go on-site and survey the property for potential energy efficiency improvements. These energy efficiency improvements are itemized and fully specified in the energy efficiency recommendations document and presented to the customer with full estimations of the annual savings of the combined measures, measure costs, the available rebate, and the final cost to the customer. This final

cost to the customer is a fixed cost based on the pre-negotiated rates for the contractors performing the installations.

Measure Installation

Once the customer signs an agreement to receive the installations, Ecology Action assigns contractors to perform the work. Any contractor approved to perform these installations has signed an agreement with the program to perform the installations at negotiated rates, including time for installations and fixed markups on materials for particular measures. They have also had to meet a number of other criteria to guarantee they are a contractor in good standing. The program has a large number of contractors interested in performing the work for the RightLights Plus program, so the program has two contractor types: "program contractors" and "non-program contractors." The program contractors are assigned to perform installations for projects identified through the RightLights Plus program itself, while the non-program contractors perform installations for customers that they refer to the RightLights Plus program themselves. However, all program and non-program contractors must agree to all the same requirements in order to perform work on jobs within the program. A complete list of contractor requirements includes:

- Appropriate State, County, and City contractor's licenses, workers comp, and requisite insurance
- Specific warranty requirements
- An agreement to install exactly the specified equipment
- Fixed unit prices of equipment, mark up, and labor rates
- Minimum standards of work
- Agreement to workflow processes and timeliness of job completion

The program currently has five main qualified program contractors: two for lighting measures, one for gaskets and strip curtains, one for vending controls, and one for refrigeration. Ecology Action is also adding three more program contractors to perform the HVAC measures that are new to the program. In addition to the program contractors, the program also has six non-program contractors. While some contractors can perform different measure types, the program manager indicated that typically the different contractors are performing only the measures within their specialty. For measures where there are multiple contractors for one specialty (e.g., lighting) the program rotates projects evenly among the approved contractors. The program manger indicated that these contractors have been very stable over the life of the program, so there is not a lot of contractor turnover. The program manager indicated that while many contractors show initial interest in participating in the program, many of the contractors could not agree to the requirements stated above. Furthermore, the current contractors have all demonstrated the ability to meet these requirements and perform their duties with the quality expected from the program.

Ecology Action then assigns contractors to the different jobs and the contractors set up an appointment to conduct the installation. However, using a RightLights Plus contractor is not required and, if desired, the customers may use their own contractors to install the measures.

Post-Installation Processes

After the installation is complete, Ecology Action staff will conduct a post-installation inspection of the measures to ensure that all measures are in conformance with the project specifications and were installed correctly. If any problems are identified, Ecology Action will work with the contractor on any change orders that are required to bring the installations up to the appropriate specifications. CPAU staff conducts inspections on a percentage of the jobs in coordination with Ecology Action.

Once the project has passed the post-installation inspection, Ecology Action will get the invoices from the contractors and pay out the rebates directly to the contractors. The contractors then bill the customer directly for the "copay," or the balance of the project cost, which is usually paid by the customer after the post-installation inspection. At the end of each month, Ecology Action submits the invoices to CPAU and is reimbursed for the rebates paid to the contractors.

Program Tracking

CPAU and Ecology Action track a number of performance metrics to assess the success of the RightLights Plus program. These metrics primarily include:

- Cumulative kWh savings
- Rebate payments and total program costs relative to kWh saved ($/kWh)
- Average rebate per kWh

Information on each project is added to the data tracking tool after the on-site energy survey is complete. Ecology Action uses the data to track the above performance metrics weekly and provides these metrics to CPAU as part of the monthly invoicing and reporting process. Additionally, Ecology Action produces quarterly and year-end summaries of these key metrics. In addition to these key performance indicators, Ecology Action tracks the mix of different measures, the types of customers participating in the program, typical change orders, and reoccurring issues with post-inspections. Tracking these additional parameters enables them to identify ways to further improve the program.

2.2.2 Key Staff

Since the RightLights Plus program is a third-party program, there are relatively few CPAU staff that work directly on program delivery. CPAU maintains oversight over the implementation contract, performs some program outreach and marketing (website) and all required regulatory reporting.

However, the implementation contractor, Ecology Action, has many staff members working directly on the RightLights Plus program. The main Ecology Action staff member is the program manager who coordinates the projects and is dedicated to the CPAU RightLights Plus program. In addition, there is an energy efficiency specialist who has the expertise to conduct the energy surveys and post-installation inspections. Ecology Action also has a number of staff who help with the implementation by working with the contracts, applications, rebates, and payments.

In general, the program is very dependent on contractors to perform the energy efficiency retrofits for the program. Ecology Action indicated that current staff are able to meet the demand of the program, and that most fluctuations get absorbed by the contractor base.

2.2.3 Program Observations

Program Successes

A number of stakeholders interviewed for this research indicated a high satisfaction level with the program and its processes. Comments included:

- The program has exceeded its energy (kWh) goals each year and has done this under the rebate budget.
- The program has historically had a high "close ratio" – the percent of customers that move on to implement a project after undergoing an energy survey.
- The program successfully identifies hard-to-reach customers and therefore addresses a market need. The program has expanded to nearly all commercial business types and includes a wide range of customers.
- Communication between contractors and the program implementer / CPAU is effective, so contractors get the information they need in a timely manner.
- Post inspections and rebate payments are done in a timely manner (usually done within two weeks).

In addition, the RightLights Plus program seems to effectively leverage the efforts of other stakeholders and organizations, such as WaveOne and the Santa Clara County Green Business program, to increase program participation by hard to reach customers.

Meeting Increasing Goals

One of the challenges of the program has been to meet increasing savings goals. Program staff indicated that the program is always pushed to achieve increased cost effectiveness standards. Program staff indicated that this is difficult given that the DEER 2008 deemed values significantly reduced measure savings by 40% from the earlier DEER version. Meeting increasing goals is also difficult, as the program endeavors to not leave any stranded savings, or savings that were not achieved because available energy efficiency measures were not implemented. This approach leads the program to look at a portfolio of savings for each site and to combine measures of high cost effectiveness with measures of lower cost effectiveness to get an acceptable site-wide cost effectiveness. This approach achieves higher savings by addressing more of the savings potential at each site, but achieves a lower overall cost effectiveness than pursuing only the highest cost effective measures. One way the RightLights Plus program has increased savings is by increasing the number of measures applicable to the program, which has been the biggest change to the program since its inception. As a result, nearly 50 percent of the savings are now coming from non-lighting measures.

2.2.4 Recommendations

According to most stakeholders interviewed for this process research, the RightLights Plus program seems to be a success. The program uses a program model in use by PG&E since 2003 and successfully reduces barriers to small and medium businesses that are traditionally very difficult to reach. In addition, the program garners energy savings from these hard to reach customers in a cost effective manner. Recommendations for improvement and future research are offered below as suggestions to help ensure that future program goals continue to be met. It should be noted that these suggestions are based on a very limited number of stakeholder interviews and in many cases should be seen as individual comments and are not representative of universal perceptions of the program.

Continue to Expand Qualified Measures. Some stakeholders interviewed for this evaluation indicated that there were additional measures they would like to see supported by this program. These include electrically commutated (EC) motors as a stand-alone measure, evaporative fans, programmable two speed motors, refrigerator doorframe heater controllers, and lighting motion sensors. The RightLights Plus program could use other programs in the area as a model for the addition of further measures to the program. Since contractors in the area that work with CPAU might already be installing some of these measures for other utilities or programs, these measures might be easily adopted into the RightLights Plus program.

Develop Online Project Tracking System. One contractor indicated that an externally facing online tracking system for contractors to track the status of their projects could be very helpful. The current system involves a lot of work on the contractor side to track the various projects. If there was a simpler method for tracking these projects, it could free up the contractors to take on more projects at a lower cost. This contractor said that they experienced a lot of success with similar programs that had online tracking systems and it simplified the process of participating with the program.

Conduct Additional Interviews with Qualified Contractors and Non-Program Contractors. Given the heavy reliance on quality contractors to successfully run this program, it is suggested that CPAU conducts follow-up research that focused specifically on the contracting market in the CPAU service

territory. This research would help CPAU understand contractors' experiences with the program and would help identify potential areas of improvement for the program. While this process research included an interview with one contractor, the evaluation team felt that this interview was very useful in understanding the program and how it operates as the contractor sits between the customer and the utility/program implementer. In addition, the contractors often perform similar work for the PG&E RightLights programs within the vicinity. For this reason, the contractors have specific knowledge of how the CPAU RightLights Plus program compares to other, similar programs. This knowledge would be useful in understanding how the program can be further improved.

3 IMPACT EVALUATION

For this report, impact evaluations were performed for CPAU's Commercial Advantage Program and RightLights Program.

3.1 Commercial Advantage Program

CPAU, through the Commercial Advantage Program, offers several incentives for its commercial customers to replace old equipment with new, more efficient equipment. Rebates are available for the following types of measures:

- Lighting
- Boilers and water heating equipment
- HVAC equipment
- Chillers and heat rejection equipment
- Food service equipment
- Refrigeration equipment
- Custom rebates
- Appliances and general equipment

The custom rebate is capped at $100,000 per customer per fiscal year, and it applies only to replacement equipment. Applications must be approved before the replacement equipment is purchased, and the equipment must be installed within six months of the application approval. Energy savings for the custom rebate must be estimated by a professional engineer.

The objectives of the verification activities were to complete site visits and collect key energy program performance metrics including:

1. Establishing the presence of energy efficient measures by comparing the number of installations observed with the number of installations recorded in the rebate application.
2. Providing input on the quality of installations observed – including whether or not they were operating correctly.
3. Where observed equipment did not match program reported installations, determine if retrofits/installations were ever present, and/or the reason that the installation plan changed.
4. Recording key facility performance data, such as daily schedules, seasonal variations in schedules, and control strategies.
5. Where energy usage is not well documented, log energy use at the installation site.

3.1.1 Commercial Advantage Program Sample

The evaluation of the Commercial Advantage Program was conducted based on a sample of five participant sites. The sample sites were chosen using stratified ratio estimation with a 90% confidence interval based on a list of 21 participant sites provided by CPAU.

The evaluation included three lighting retrofit and two sites where variable frequency drives had been installed, including one site with additional rebated food service appliances. The lighting retrofits included combinations of upgrades covering T12 to T8, HPS to T8, and CFLs.

Table 3-1 details the sample verification results of the energy efficient installations and savings that occurred under the Commercial Advantage Program for the City of Palo Alto Utilities. For privacy, the customer names are not given, but rather a site number has been assigned.

Table 3-1: Verified Program Installations and Savings, Sampled Sites

Customer	Retrofit Measures	kW	kWh
Site 1	CFL retrofit *(from halogen spotlights)*	96.383	481,915
Site 2	T8 retrofit *(from HPS)*	29.928	237,991
Site 3	T8 and CFL retrofit *(nearly all T12 to T8)*	6.529	33,357
Site 4	Ventilation fan VFD	0	20,330
Site 5	Food service appliances, high efficiency water heaters and ventilation fan VFD	2.11	35,415
Sample Total		**134.95**	**809,008**
Realization Rate		**92.4%**	**89.2%**

The lighting retrofits involved comprehensive retrofits of commercial office and retail type spaces and parking areas. Overall, the lighting savings were lower than those claimed by the program, primarily due to claimed savings for unused lamps.

In evaluating these projects, particular attention was paid to reviewing the program documents and supplementing it with field verifications. The evaluation of the lighting retrofits involved the IPMVP Option A approach by reviewing engineering calculations and performing site interviews.

In some cases, deemed values were compared to calculated savings values. Only some of the implemented measures had standard deemed values available. Deemed savings values are an acceptable alternative to calculated values for CEC verification. Incandescent to compact fluorescent, T12 to T8 retrofits, and food service appliances all have associated deemed savings values. These results were compared to the calculated values and the larger of the two values was used for verified savings. No deemed values were available for the ceramic metal halide retrofits; therefore, only calculated savings were used for verification. The resulting verified savings for the program are a mix of deemed values and calculated values.

Site Activities

Field activities typically involved two components:

1. Evaluators coordinated with the implementation contractor and primary customer contacts to establish field activity dates and identify site level contacts.
2. While on-site, the evaluation team conducted an area-by-area, measure-by-measure audit, noting retrofit count, type, and operating conditions. Interviews were also conducted at the site representative's convenience.

Field evaluation activities were conducted on November 5-6, 2009. At the time, it was anticipated that all expected installations were completed and finalized.

Impact Assessments

Assessment of each of the five sites follows below. After the individual site assessments, a program summary assessment is provided.

Site 1

Part of a national retail chain, Site 1 is one of the large department stores associated with a shopping mall. As such, it has very predictable operational hours and a corporate structure that includes a Department of Energy Services & Sustainability. Site 1 performed a CFL retrofit, replacing 1,967 halogen spot lights with 23W and 25W CFLs.

Savings associated with Site 1 are given in Table 3-2. The savings for this site were lower than expected, because the rebate was issued for more lamps than the store has appropriate fixtures to accommodate. This is due to the fact that claimed savings were calculated based on purchased lamps rather than installed lamps. The site's claimed savings were based on 2,300 23W lamps and 125 25W lamps. A review of the site's reflected ceiling plan found only 1,967 luminaries specified for this lamp type. The remainder of the purchased 23W CFLs are being stored as spares. At the time of the site visit by Navigant Consulting staff, the 125 25W lamps remained on a pallet in the store's maintenance area. Site personnel indicated that these lamps may be used in the future in the case that the store's merchandising department requests product specific spot lighting. Store personnel also indicated a possibility that these lamps may be shipped to other locations outside the CPAU service area.

Table 3-2: Site 1 Installation and Savings

	kW Savings	Annual kWh Savings
Claimed Savings	107.0	589,125
Deemed (Verified) Savings	96.4	481,915

The realization rate or 81.8% of claimed energy savings is due to the corrected quantity of retrofitted lamps. Although the deemed savings per installed lamp is used to determine verified savings, CPAU should be aware that the deemed savings assume a 65W lamp as the base technology. According to the store facilities staff, all lamps installed in these fixtures since 2001 have been 44 W halogens. Therefore, 44 watts is the actual base. If this actual 44 W base was used to estimate the verified savings, the energy realization rate would fall to 33.8%.

Site 2

Site 2 was the below-ground portion of a multi-level parking structure connected to a medical facility. Prior to the lighting upgrade, the area was illuminated with 150 watt high pressure sodium lamps. The high pressure sodium lamps were replaced with 235 2-lamp T8 fixtures. A third of the 235 total luminaries are on a circuit that turns off from 11:00PM to 5:30AM daily. The remainder of the lights are on 24 hours per day.

As shown in Table 3-3, calculated verified energy savings have a realization rate of 115%. Deemed values for this installation are not available, because the E3 calculator does not include a T8 option with the base case of 150W HPS lamps.

Table 3-3: Site 2 Installation and Savings

	kW Savings	Annual kWh Savings
Claimed Savings	30.0	205,970
Verified Calculated Savings	29.9	237,991

The realization rate for annual kWh is greater than 100% because more lights are on 24 hours per day, seven days per week than estimated for the rebate application. The original estimate was that 115 luminaries were switched off for 6.5 hours per night. As part of the review process, it was determine by facility staff that the actual number of fixtures off at this time is 79.

Site 3

Site 3 is a two-story office building with daylighting available to nearly all offices via exterior windows and an interior courtyard. Lighting upgrades performed on both floors were submitted as part of the Commercial Advantage Program. These included T8 lamps in various sizes, as well as 14W CFLs.

During the site visit, the total claimed lighting count of 668 4-foot T8 lamps, 42 2-foot T8 lamps and 27 14W CFL could not be verified. The quantities of the reported lights were found to be 480 4-foot T8 lamps 72 2-foot U-tube and 17 CFLs. These counts, along with the deemed savings per unit, were used to estimate the verified savings. Site 3's savings summary is shown in Table 3-4. The energy realization rate is 92.1% because of the reduced number of lamps and fixtures found. CPAU should be aware that the first floor lighting equipment was replaced just before the tenant for that floor moved to a new office. At the time of the site visit, the property had not yet been leased to a new tenant; therefore, the operational hours for the first floor are zero with the exception of security lights and a brief, but intermittent, occupancy by the building's cleaning staff. If this change of occupancy were included in the realization rate calculation, it would fall to 14.5%.

Table 3-4: Site 3 Installation and Savings

	kW Savings	Annual kWh Savings
Claimed Savings	7	36,229
Deemed (Verified)Savings	6.5	33,357

Site 4

Site 4 is a medium sized office building occupied by a law firm and a few other tenants. The site installed a variable frequency drive (VFD) on their 25 HP ventilation fan. Prior to the retrofit, this fan was part of variable air volume system that relied on air dampers to mitigate air flow to the occupied space.

The subsequent rebate was based on a prescriptive basis per motor horse power. Actual savings were calculated using the following equation:

$$\Delta kWh = units * \frac{hp}{unit} * \frac{RLF}{\eta_{motor}} * 0.746 * FLH_{base} * ESF$$

"Units" represents the number of motors included in the calculation; for this site 1-25hp motor was evaluated.

RLF is the "Rated Load Factor" and is defined as the ratio of the motor load at the design flow rate to the nameplate rating. This was approximated as 0.724 by using trend data collected over a four week period spanning most of November and part of December 2009.

Based on the manufacturer's product data sheet, the efficiency (η) of the motor at this site is rated as 0.941. The conversion factor 0.746 is used to convert between hp and kW.

Because air flow in the original system was controlled using dampers (not motor controls), equivalent full load hours (FLH) was established using 12 hours per work day, five days per week, 50 weeks per year. Fan use of 12 hours per day was supported by trend data.

Energy Savings Factor (ESF) for the VFD controls was estimated using the following equation:

$$ESF = 1 - \frac{FLH_{VFD}}{FLH_{base}}$$

Equivalent full-load hours for the system with VFD installed were established using a temperature sensitive polynomial that was calculated using trend data and local weather data for the period of data collection. This polynomial was then applied to a weather profile based on the Typical Meteorological Year file for the San Jose airport. The resulting FLH_{VFD} estimate was 1,583 hrs/yr.

The primary uncertainty for the evaluation of this VFD installation was in establishing the full-load amps drawn by the motor prior to the retrofit. This was estimated using the peak power draw recorded during the period of trend data collection by Navigant Consulting.

Final calculated savings from this VFD installation are 20,330 kWh/yr. This energy savings is 108% of the claimed energy savings as summarized in Table 3-5. There is no demand savings associated with the VFD.

Table 3-5: Site 4 Installation and Savings

	kW Savings	Annual kWh Savings
Claimed Savings	0	18,825
Verified Calculated Savings	0	20,330

Site 5

Site 5 is a medium sized office building. The facility was completely remodeled at the time of participation in the Commercial Advantage Program. The site retrofitted one commercial kitchen as well as three break rooms with efficient appliances. Site 5 also installed two high efficiency natural gas water heaters. Additionally, the building's HVAC system was retrofitted with a VFD on one of the air conditioning evaporator fan.

At the site visit, all the appliances were found to be installed; these included seven dishwashers, 12 refrigerators and freezers of various sizes and configurations, and one convection oven. Savings associated with the appliances were calculated based on deemed values and totaled 12,309 kWh/year and

a demand savings of 2.11 kW. There is no electricity savings associated with the two natural gas water heaters.

It was found that while the site's program application claimed VFD on motors totaling 53 HP, only three of the four VFDs were found. One was installed on a 25 HP evaporator fan motor on one air conditioning unit and two on 1.5 HP pumps used for the heating system. Site personnel indicated that they do have plans to retrofit a second AC unit, which will have a second 25 HP motor. However, that has been delayed since the building is not fully occupied and its needs are being met with only one AC unit.

Actual savings were calculated using the following equation:

$$\Delta kWh = units * \frac{hp}{unit} * \frac{RLF}{\eta_{motor}} * 0.746 * FLH_{base} * ESF$$

RLF is the "Rated Load Factor" and is defined as the ratio of the motor load at the design flow rate to the nameplate rating. This was approximated as 0.822 by using trend data collected over a four week period spanning most of November and part of December 2009.

Based on the manufacturer's product data sheet, the efficiency (η) of the motor at this site is rated as 0.94. The conversion factor 0.746 is used to convert between hp and kW.

Because air flow in the original system was controlled using dampers (not motor controls), equivalent full load hours (FLH) was established using 12 hours per work day, five days per week, 50 weeks per year. Fan use of 12 hours per day was supported by trend data.

Energy Savings Factor (ESF) for the VFD controls was estimated using the following equation:

$$ESF = 1 - \frac{FLH_{VFD}}{FLH_{base}}$$

Equivalent full-load hours for the system with VFD installed were established using a temperature sensitive polynomial that was calculated using trend data and local weather data for the period of data collection. This polynomial was then applied to a weather profile based on the Typical Meteorological Year file for the San Jose airport. The resulting FLH_{VFD} estimate was 1,583 hrs/yr.

Final calculated savings from this VFD installation are 23,106 kWh/yr. Deemed savings of this single 25HP fan motor is 18,825kWh/year. Table 3-6 shows the total claimed and verified savings for site 5. The site's low realization rate of 62.2% is due to there being only a VFD on 28HP of motors as opposed to 53 total HP of motors claimed.

Table 3-6: Site 5 Installation and Savings

	kW Savings	Annual kWh Savings
Claimed Savings	2.0	56,893
Verified Calculated Savings	2.1	35,415

3.1.2 Commercial Advantage Impact Results

Table 3-12 provides the savings reported in the final installation review documents submitted for the Commercial Advantage Program and the verified gross savings. Overall, the Commercial Advantage Program realization rate is estimated to be 89.2%. It should be noted that this realization rate is based largely on deemed savings for lighting projects. There are two primary reasons for the lower than 100% realization rate. The first is missing lighting fixtures and lamps and the second a lower amount of motor HP associated with the VFD installation.

As noted earlier, CPAU should also be aware that the actual base lighting technology for some of the installations (site 1) has much lower wattage than the base wattage used in the deemed savings calculations and at site 3, one of the two building floors that received a retrofit is unoccupied.

Table 3-7: Commercial Advantage Program Claimed Savings and Verified Gross Savings

Customer	Claimed		Verified	
	kW	kWh	kW	kWh
Site 1	107	589,125	96.383	481,915
Site 2	30	205,970	29.928	237,991
Site 3	7	36,229	6.529	33,357
Site 4	0	18,825	0	20,330
Site 5	2	56,839	2.11	35,415
Total	**146**	**906,988**	**134.95**	**809,008**
Percent Realization			**92.4%**	**89.2%**

3.2 RightLights Program

The RightLights Program is a third party program designed for small commercial customers and primarily provides efficient lighting upgrades with minimum cost to the customer. In addition to lighting measures, some refrigeration and vending control measures are also implemented.

The approaches employed to measure and verify energy savings attributed to the RightLights Program included the following activities:

1. Verified measure installation.
    a. Developed a sample for field verification activities.
    b. Conducted field verification activities and observations.
2. Reviewed applications and supporting documentation provided to the City of Palo Alto Utilities.
3. Developed adjusted measure savings values based on field activities and data reviews.
4. Provided conclusions and recommendations for City of Palo Alto RightLights Programs

These activities are discussed in detail in the following sections. Additional detailed information may be found in the appendices.

3.2.1 Measure Installation Verification and Impact Assessment

The objectives of the verification activities were to complete site visits and collect key energy program performance metrics, including:

1. Establishing the presence of energy efficient measures by comparing the number of installations observed with the number of installations recorded in the rebate application.
2. Providing input on the quality of installations observed – including whether or not they were operating correctly.
3. When observed that equipment did not match program reported installations, determine if retrofits/installations were ever present, and/or the reason that the installation plan changed.
4. Recording key facility performance data, such as daily schedules, seasonal variations in schedules, and control strategies.

RightLights Program Sample

The 16 projects sampled for the FY 2009 RightLights program included lighting retrofits, refrigeration gaskets and controls, and vending machine controls. The evaluation focused on lighting retrofits primarily involving new T8 fluorescent fixtures and T8 retrofits and compact fluorescents.

Table 3-8 identifies the energy efficient installations and the verified savings from the sampled sites for the FY 2009 RightLights Program. Reported kW are coincident peak demand savings and kWh savings include interactive effects. For privacy, the customer names are not given, but rather a site number assigned. The 16 sites included two eating establishments, four grocery stores, two dry cleaners, three hotels, one retirement community, and four office spaces.

Table 3-8: Sampled Program Installations and Verified Savings

Customer	Retrofit Measures	kW	kWh
Site 1	Refrigeration Gaskets	6.274	55,595
Site 2	Vending Machine Controls	0.000	19,344
Site 3	Refrigeration Gaskets, Vending Machine Controls, T8 and CFL Lighting	12.839	156,847
Site 4	T8 Lighting	0.888	4,893
Site 5	T8 and CFL Lighting	0.837	6,406
Site 6	Refrigeration Gaskets, T8 and CFL Lighting	14.690	104,193
Site 7	Refrigeration Gaskets, Refrigeration Controls, T8 and CFL Lighting	30.944	279,029
Site 8	Refrigeration Gaskets, T8 and CFL Lighting	7.305	54,595
Site 9	T8 and CFL Lighting	3.122	8,129
Site 10	T8 and CFL Lighting	14.169	81,265
Site 11	T8 and CFL Lighting	0.718	4,080
Site 12	CFL Lighting	7.540	43,572
Site 13	Vending Machine Controls, T8 and CFL Lighting	23.909	171,266
Site 14	Refrigeration Gaskets, T8 and CFL Lighting	3.188	24,009
Site 15	T8 and CFL Lighting	1.893	10,191
Site 16	Refrigeration Gaskets, Refrigeration Controls, T8 and CFL Lighting	24.044	171,929
Program Total		**122.076**	**1,016,965**
Program Realization		**86.9%**	**84.3%**

The majority of the lighting retrofits involved replacing standard incandescent lights with screw-in compact fluorescents and retrofitting T12 fixtures to T8 systems. There were also some exit signs retrofitted to LED units and halogens used to replace incandescent display spot lights.

In evaluating these projects, particular attention was paid to reviewing the program documents and supplementing it with field verifications. The evaluation of the lighting retrofits involved the IPMVP Option A approach by reviewing engineering calculations and performing site interviews.

The RightLights program estimates savings on a prescriptive basis; however, some of the measures included in the program do not have standard deemed savings values in the E3 calculator. Since deemed values are considered an acceptable alternative to calculated values for CEC verification, in cases where

they were available, they were compared to savings calculated using operational hours and fixture wattages. Realization rates are based on the higher savings estimate, be it deemed or calculated.

Incandescent to compact fluorescent, T12 to T8 retrofits, and incandescent exit sign replacement with LED units have standard deemed savings values. However, no deemed values are available for the incandescent to halogen retrofits or some of the less standard T12 retrofits, such as replacing one eight-foot lamp with two four-foot units, so calculated values were utilized. The final estimates of verified savings represent a combination of available deemed savings and calculated savings.

Site Activities

Field activities typically involved two components:

1. Evaluators coordinated with the primary customer contacts where possible to establish field activity dates and identify site level contacts.
2. While on-site, the evaluation team conducted an area-by-area, measure-by-measure audit, noting retrofit count, type, and operating conditions. Interviews were also conducted at the site representative's convenience.

Field evaluation activities were conducted on November 5-6, 2009. At the time, all expected installations were completed and finalized.

Impact Assessments

Verification work, discussions with participants subsequent to field verification activities, and an analysis of the verified installations indicated that the installations attributed to the RightLights Program were installed, but some fixtures had been removed either because of change of ownership of the location or because the site occupants were not satisfied with their performance.

Refrigeration Measures

Seven sites included refrigeration measures, these included grocery stores, eating establishments, and hotels. Refrigeration measures are: refrigerator and freezer door gaskets, strip curtains on walk-in cooler doors, and refrigeration controls.

Seven sites installed gaskets on freezer, refrigerator, and under-cabinet cooler doors. These included restaurant sites and grocery stores. During the site visit, the gaskets were checked for sealing using a sheet of paper. No loose gaskets were found. At one site, a refrigerator that had been fitted with gaskets had been removed. The program's standard savings estimates had been accepted for gaskets. Personnel at three sites indicated that there was complication and difficulty dealing with the gasket vendor. They indicated that installation had been done incorrectly and needed to be fixed, or that the vendor required more time to do the retrofit than expected.

Strip curtains were installed on walk-in coolers and freezers at multiple sites. These were found to be present at all expected locations and the site personnel expressed satisfaction and even praise for them. Deemed savings based on the E3 calculator has been used to calculate strip curtain savings.

The controls on the display coolers at both sites that installed them were still operating as originally installed. There was no straightforward way to measure the savings on-site. However, discussions with the store manager and site engineer confirmed that no changes had been made to the installed settings. Based on this, Navigant Consulting recommends accepting the deemed savings estimate provided by the program for these facilities.

Auto-closers on freezer and refrigerator doors were installed at the grocery stores. These were all found to be present as expected.

Refrigeration Impact Results

Table 3-9 shows the claimed and verified refrigeration savings for the seven sites sampled. The savings are only slightly reduced due to the removal of one refrigerator. This results in a 93% realization rate for energy savings and 93% for demand savings. Reported kW are coincident peak demand savings and kWh savings include interactive effects.

Table 3-9: Sampled Refrigeration Savings

	kW Savings	Annual kWh Savings
Claimed Savings	47.7	442,987
Deemed (Verified) Savings	44.4	411,981

T8 Lights

T12 to T8 retrofits were among the most common type associated with the RightLights program. These are a standard replacement, as modern T8 lamps and electronic ballasts use around two thirds of the power of T12 lamps with magnetic ballasts. Furthermore, they provide higher light output with lower energy use.

A methodological issue exists in the evaluation of savings from T8 luminaries replacing T12s. Standard practice among the investor owned utilities (IOUs) in California requires that program evaluations use Title 24 standards as the minimum efficiency baseline from which savings are calculated.[2] An exception to this rule is granted to programs specifically designed to encourage the early replacement of existing equipment. The justification for this exception is founded on the fact that the low efficiency, old equipment could have remained in service for years to come. Because of this disconnect regarding which efficiency level to use, the specification of a baseline for such programs is still under discussion at the CPUC.

It is anticipated that the CPUC's consensus will be to break the energy savings into two stages, each representing a portion of the new equipment's effective useful life (EUL). The first stage will reflect the actual savings resulting from the upgrade and will therefore use the specifications of the equipment being replaced as the baseline. This savings estimate will be applied to a period of time that covers the remaining useful life (RUL) of the old, replaced equipment. The second stage of the savings estimate will reflect that, should the original equipment have been allowed to remain in place until failure, it would have then been replaced on burnout (ROB) by a product that, by default, would have at least met the Title 24 minimum standard. Therefore, the second stage of the savings estimate will use Title 24 minimum requirements as the baseline for the savings calculation. This second stage will apply to the remaining useful life of the new equipment, beyond the portion for which first stage was used. This blending of

[2] This is rationalized by stating that Title 24 is the minimum efficiency standard that any newly installed equipment must meet and that any replacement of existing equipment must meet this standard, minimum requirement regardless of incentive or efficiency programs.

approach should have the effect of providing higher levels of energy savings for early retirement situations relative to natural replacement, but not as high as taking full credit for the savings based solely on the shift from the previously existing equipment to the new equipment for the entirety of the new equipment's EUL.

NCI found that the energy and demand impacts calculated by Ecology Action for RightLights were done within the guidelines identified by PG&E; whereby calculations use the actual specifics of the lighting equipment that existed prior to the upgrade, regardless of Title 24 standards. The justification being that the RightLights program targets early replacement and that the new equipment is usually replacing fully functional, though less efficient, fixtures.

In reviewing the E3 calculator inputs for the T12 to T8 measures, NCI found that the RightLights impacts are not based on deemed values but rather, alternative values to deemed input by CPAU (from values provided by Ecology Action). The Commercial Advantage Program used deemed values and these are based on a Title 24 baseline. Both RightLights and Commercial Advantage used the same measure life of 11 years.

NCI believes that the RightLights impact estimates overstate the actual impacts of the RightLights program in those cases where the existing equipment is less efficient than Title 24 standards. Although we concur that the savings realized from an early retirement are greater than those realized through natural replacement (ROB), the current method does not account for the abbreviated remaining life of the pre-existing technology. Therefore, it is NCI's position that unless savings estimates for RightLights are shifted down to reflect the two-stage effect of an early retirement program, the savings estimate should use Title 24 as the baseline to prevent overestimating the program impacts.

Another issue that CPAU should be aware of is hours of operation. It is acceptable to utilize the deemed hours of operation and in verifying savings, the Navigant Consulting team did use these hours. However, we found that the customers of the RightLights Program generally have shorter actual hours of operation.

Compact Fluorescents

Another common retrofit was changing incandescent lamps to screw-in compact fluorescents. Although compact fluorescents use only around a quarter of the power of standard incandescent lamps, they are not suitable for use in all locations. Compact fluorescents can fail in damp locations and are typically dimmer than their rated light outputs in cold locations. Additionally, some newer types such as dimmable and small chandeliers units can be prone to failure.

During on-site verification, one location was observed to have removed screw-in compact fluorescents and reinstalled incandescent lamps, because of reoccurring failure of 11W chandelier-style CFL lamps. Significantly higher customer satisfaction might be obtained by replacing fixtures rather than bulbs in the case of specialty bulb sizes.

Other Fixtures

In addition to the prevalent T8 and CFL retrofits, some efficient parabolic incandescents and pulse start metal halides were included in the retrofits. There were no reported problems with these units.

Lighting Impact Results

Table 3-10 summarizes both the claimed and the verified energy savings for lighting in the RightLights program at the 14 lighting retrofit sites visited. Reported kW are coincident peak demand savings and

kWh savings include interactive effects. This shows a total realization rate for lighting projects of 81% for energy and 96.5% for demand savings. Although some measures had been removed, such as the chandelier type CFLs, the primary reason for the less than 100% realization rate is due to how energy savings are calculated by Ecology Action. They use wattages as found as their base whereas we used Title 24 as the base.

Table 3-10: Sample Lighting Savings

	kW Savings	Annual kWh Savings
Claimed Savings	117.6	1,061,183
Calculated (Verified) Savings	113.5	861,350

Vending Machine Control Measures

Vending machine controls were installed at three of the samples sites. These controls consist of occupancy sensors that switch the machine's lights, electronics and refrigeration on and off based on the presence of potential customers. Deemed values based on the Palo Alto E3 calculator were used to verify claimed savings. There is no demand savings associated with vending machine controls. One site was reported to have controls on a mix of cooled and uncooled vending machines. It was found that all the controlled machines at that site were cooled.

Vending Machine Control Impact Results

Table 3-11 summarizes both the claimed and adjusted energy savings for vending machines in the RightLights program at the three vending machine control installation sites visited. This shows a total energy realization rate for vending machine controls of 206%. The high realization is due to one site being found to have more cooled vending machines than had been reported.

Table 3-11: Sample Vending Machine Control Savings

	kW Savings	Annual kWh Savings
Claimed Savings	0	33,401
Verified Savings	0	68,865

3.2.2 RightLights Impact Results

Table 3-8 provides the savings reported in the final installation review documents submitted for the RightLights Program and the verified gross savings. Reported kW are coincident peak demand savings and kWh savings include interactive effects. Overall, the RightLights program energy realization rate was estimated to be 84.3% and a demand realization rate of 86.9%. The primary reason for the less than 100% realization rate is due to how energy savings are calculated by Ecology Action. To a lesser extent, the reason was due to removed fixtures.

Table 3-12: RightLights Program Claimed Savings and Verified Gross Savings

Customer	Claimed		Verified	
	kW	kWh	kW	kWh
Site 1	6.600	57,450	6.274	55,595
Site 2	0.000	6,448	0.000	19,344
Site 3	11.482	138,802	7.166	150,640
Site 4	0.645	5,653	0.888	4,893
Site 5	1.233	7,659	0.837	6,406
Site 6	13.413	118,959	14.124	103,951
Site 7	33.459	299,606	30.944	279,029
Site 8	7.305	47,201	7.305	54,595
Site 9	2.255	9,912	3.122	8,129
Site 10	14.690	92,004	14.169	81,265
Site 11	1.409	4,277	0.718	4,080
Site 12	11.952	59,299	7.540	43,572
Site 13	28.892	321,015	23.909	171,266
Site 14	3.277	24,205	3.188	24,009
Site 15	3.938	13,546	1.893	10,191
Site 16	24.792	331,537	24.044	171,929
Total	140.550	1,206,035	122.076	1,016,965
Percent Realization			**86.9%**	**84.3%**

3.3 Process Recommendations Based on Impact Evaluation

Several issues arose while conducting both the RightLights and Commercial Advantage Programs that should be addressed in order to improve future EM&V efforts. Some of the delays encountered in the evaluation were due to the Navigant Consulting team not recognizing that an issue existed until several weeks into the evaluation process. A more timely recognition of issues on our part in the future is also needed. The primary issues include the following:

- There appears to be a need for greater oversight and post installation auditing in the Commercial Advantage Program. In some sites, we found that measures had not been installed. In another site, we found that more measures were being claimed for savings than there were fixtures to put them in.
- On a site by site basis, we had difficulty understanding the linkages between the reporting by Ecology Action and how that information was used by CPAU. It is our understanding that the Ecology Action information was directly summed and used, but we would like to see these linkages more clearly defined and documented.
- Ecology Action provided very good detail on a site by site basis. However, the issue of what wattages to use for base case calculations needs to be clarified and documented.

APPENDIX A: NON-RESIDENTIAL CUSTOM SITE DETAILS

Table A-1: Deemed Savings for Selected Measures

E3 Measure Title	Deemed Annual kWh Savings	Peak kW Savings per unit	Demand Savings (kW) per unit
Screw-In (1-13W)	121	0.021	0.027
Screw-In (1-13W) w/ Interact Effects	135	0.024	0.027
Screw-In (14-26W)	245	0.044	0.049
Screw-In (14-26W) w/ Interact Effects	245	0.044	0.049
Screw-In (>=27W)	314	0.054	0.07
Screw-In (>=27W) w/ Interact Effects	350	0.063	0.07
T-12 to T-8: 2 foot lamp	47	0.008	0.011
T-12 to T-8: 2 foot lamp w/ Interact Effects	53	0.009	0.011
T-12 to T-8: 3 foot lamp	58	0.01	0.013
T-12 to T-8: 3 foot lamp w/ Interact Effects	65	0.012	0.013
T-12 to T-8: 4 foot lamp	37	0.006	0.008
T-12 to T-8: 4 foot lamp w/ Interact Effects	41	0.007	0.008
Delamp: 4 foot lamp	235	0.04	0.052
Delamp: 4 foot lamp w/ Interact Effects	262	0.047	0.052
LED or Electroluminescent Exit signs replaces Incandescent	366	0.044	0.036
Occupancy Sensor: Wall Box	238	0.176	0.217
Auto Closers for Glass Reach-in - Cooler	454	0.052	1.206
Auto Closers for Glass Reach-in - Freezer	729	0.102	0.102
Door Gaskets	100	0.011	0.016
Strip-Curtains for Walk-in Enclosures	465	0.0531	0.425
Vending Machine Controller - Cooled	4836	0	0
Vending Machine Controller - Uncooled	387	0	0

Source: 2009 CPAU E3 Calculator

Table A-2: Standard Occupancy Sensor Reductions by Area Type

Space Type	% Savings	Space Type	% Savings	Space Type	% Savings
Assembly	45	Industrial	45	Restroom	45
Break room	25	Kitchen	30	Retail	15
Classroom	30	Library	15	Stair	25
Computer Room	35	Lobby	25	Storage	45
Conference	35	Lodging (Guest Rooms)	45	Technical Area	35
Dinning	35	Open Office	15	Warehouses	45
Gymnasium	35	Private Office	30	Other	15
Hallway	25	Process	45	Parking Garage	15
Hospital Room	45	Public Assembly	35		

Source: 2008 NRR-DR Program Procedures Manual, Table 2-1