CONSULTANT REPORT

EVALUATION OF THE MUNICIPAL AND COMMERCIAL BUILDING TARGETED MEASURE RETROFIT PROGRAM

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ABSTRACT

This report presents the results of the evaluation of the California Energy Commission's Municipal and Commercial Building Targeted Measure Retrofit Program that was funded by the American Recovery and Reinvestment Act of 2009 (ARRA). The Energy Commission awarded contracts to three subrecipients to perform many retrofits and yield high energy savings by using emerging, but proven, technologies. These included EnergySmart Jobs by PECI, Energy Technology Assistance Program by Energy Solutions, and Oakland Shines by QuEST. The evaluation team assessed the effectiveness of each subrecipient program by verifying the energy savings realized and studying the participant and market effects.

EnergySmart Jobs, the largest of the three programs, successfully delivered retrofits to more than 7,100 grocery stores and restaurants that yielded 57.7 gigawatt-hours (GWh) of net annual electricity savings. California Conservation Corps members received training to conduct on-site surveys and install simple retrofits, whereas contractors were trained to perform complex retrofits.

The Energy Technology Assistance Program delivered retrofits at 114 buildings of cities, counties, universities, and nonprofit organizations. These retrofits yielded 23.1 GWh of net annual electricity savings and 985,975 therms of net annual natural gas savings. Workforce development efforts included training electricians, building ventilation installers, interns, and facility managers. By producing case studies, the program paved the way for broader adoption of the program's emerging technologies.

Oakland Shines delivered retrofits to 195 businesses and college campuses in Oakland. Retrofits yielded 3.5 GWh of net annual electricity savings and 13,192 therms of net annual natural gas savings. The marketing campaign included citywide signage and door-to-door visits. The program provided training for contractors and facility managers to learn about wireless technologies, along with a student intern program.

In less than two years of implementation, 335,815 metric tons of greenhouse gas emissions were avoided over the life cycle of the retrofits.

Keywords: California, municipal, commercial, retrofit, American Recovery and Reinvestment Act, ARRA, PECI, QuEST, Energy Solutions, light-emitting diode refrigerator case lighting, wireless lighting controls, wireless HVAC controls, bilevel lighting, parking facilities, beverage cooler controls, compact fluorescent lamps, grocery stores, convenience stores, Oakland

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EXECUTIVE SUMMARY

Introduction

Following the passage of the American Recovery and Reinvestment Act of 2009, the California Energy Commission created new State Energy Programs. One of these, the Municipal and Commercial Building Targeted Retrofit Program, was designed to install targeted, high-impact energy efficiency measures in many nonresidential buildings across California. A primary goal of the programs was to move the markets for these technologies toward becoming self-sustaining. It built upon the Public Interest Energy Research Technology Demonstration Program in which the successful deployment of several lighting and heating, ventilation, and air-conditioning (HVAC) measures had saved at least half of the energy used by the technologies they replaced.

The program objectives were defined as follows:

- Achieve significant energy savings from targeted retrofit measures where opportunities exist in large numbers across the state's municipal and commercial building sectors.
- Capitalize on low-risk, high-return efficiency opportunities that are readily available throughout the state.
- Establish high-volume purchasing agreements with technology manufacturers to reduce equipment costs and minimize payback periods.
- Train entry-level workers and professional tradespeople to conduct on-site assessments and retrofit installations via partnerships with community colleges, the California Conservation Corps, and other regional organizations.
- Develop public and private partnerships to deploy targeted measures quickly and effectively by leveraging other existing retrofit program funds, other related program-area funds, or revolving funds.

Through a competitive solicitation process, the Energy Commission awarded a total of $29.6 million to three subrecipient programs as described below.

EnergySmart Jobs, designed and implemented by PECI, delivered relatively new technologies to grocery stores, convenience stores, and restaurants. These technologies included light-emitting diode refrigerator case lighting, motion sensors, and multistage refrigeration controls, along with off-the-shelf products such compact fluorescent lamps and beverage cooler controllers. The program trained (1) California Conservation Corps members to conduct equipment surveys and deliver direct-install products and (2) contractor firms to install program products requiring greater sophistication. To catalyze and transform the markets for the newer technologies promoted by the program, PECI pursued strategies that included pricing reductions, product research and development, market penetration assessment, and energy efficiency education for grocery/convenience store and restaurant owners.

Energy Technology Assistance Program, designed and implemented by Energy Solutions, targeted city, county, university, and nonprofit buildings. The program delivered bilevel luminaires with occupancy sensors at and around garages and parking lots, wireless controls for constant volume HVAC systems, and wireless lighting controls. Energy Solutions developed information sheets and case studies to educate the targeted markets about the advanced technologies offered by the program. In addition, the program provided workforce development training for electricians, building ventilation installers, interns, and building staff members such as facility managers.

Oakland Shines, designed and implemented by QuEST, targeted commercial building owners, their tenants, and college campuses within Oakland. The program delivered bilevel luminaires with occupancy sensors at garages and parking lots, light-emitting diode refrigerator case lighting and occupancy sensors at grocery/convenience stores, wireless controls for constant volume HVAC systems, and custom lighting projects. Oakland Shines developed a strong marketing campaign in Oakland that included door-to-door visits and signage at bus stops and Bay Area Rapid Transit stations. Workforce development efforts included training contractors about the advanced wireless technologies offered and an intern program for students looking to develop a career in energy efficiency or other "green" fields.

The Energy Commission selected an evaluation team led by DNV KEMA Energy & Sustainability (DNV KEMA). Global Energy Partners, SBW Consulting, kW Engineering, and Discovery Research Group were the four subcontractors selected to support the evaluation effort. This report presents the results of the evaluation of the Municipal and Commercial Building Targeted Retrofit Program.

Purpose

The Energy Commission and the evaluation team designed the evaluation of each subrecipient program to produce:

- Estimates of savings of electricity, demand, natural gas, and avoided greenhouse gas (GHG) emissions.
- Assessments of market transformation efforts and jobs created.
- Recommendations for future program design and implementation.

These evaluation goals were met by gathering information using a variety of methods as summarized in Table 1.

Table 1: Steps Taken to Achieve Evaluation Goals

Evaluation Tasks for Each Subrecipient Program	Subrecipient Program Evaluation Goals		
	Estimate Energy Savings and GHG Reductions	Assess Market Transformation and Jobs Created	Provide Recommendations for Future Programs
Reviews of Implementers' Publications and Tracking Data	▲	▲	▲
Sample Designs	▲	▲	
On-Site Visits and Engineering Analyses	▲		▲
Statistical Analyses to Determine Overall Energy Savings	▲		
In-Depth Interviews of Implementers and Market Actors		▲	▲
Telephone Surveys of Participants	▲	▲	▲

Source: DNV KEMA Energy & Sustainability Analysis

Conclusions and Recommendations

The evaluation team determined that the Municipal and Commercial Building Targeted Measure Retrofit Program installed energy efficiency measures at 7,417 project sites and achieved significant energy savings across California's municipal and commercial building sectors. Using the results of 129 on-site visits and engineering analyses along with 86 participant surveys from a sample of the project sites, the evaluation team determined the annual and life-cycle savings for electricity, demand, and natural gas, as well as the avoided GHG emissions. These results are presented in Table 2 through Table 5, respectively. Each table, from left to right, shows savings as follows:

- Annual savings reported by subrecipient (ex ante savings)
- Annual savings achieved and verified by evaluation team (gross ex post savings)
- Realization rates (gross ex post savings divided by ex ante savings)
- Annual net-adjusted savings (Evaluators used telephone survey results of participants to ascertain the savings-weighted proportion of free riders and then subtracted this proportion from the gross ex post savings.)
- Life-cycle savings (Evaluators tallied the annual net-adjusted savings over the duration of the effective useful life of the retrofitted equipment.)

For each type of savings, two rows of results are provided such that (1) the upper (shaded) value indicates the energy savings using the pre-existing equipment as the baseline and (2) the

lower (unshaded) value indicates the energy savings using either industry standard or code-required equipment as the baseline. These two savings values differ only for the small fraction of project sites where the industry standard or code-required equipment differed from the pre-existing equipment. A summary of results for electricity is provided in Table 2; the programwide net annual savings are 84.2 gigawatt-hours (GWh).

Table 2: Municipal and Commercial Building Targeted Measure Retrofit Electricity Savings

Subrecipient Program	Annual Electricity Savings (GWh)				Life-Cycle Electricity Savings (GWh)
	Ex Ante Savings	Gross Ex Post Savings	Realization Rate	Net-Adjusted Ex Post Savings	Net-Adjusted Ex Post Savings
EnergySmart Jobs	63.6	58.9	93%	57.7	488
		49.7	78%	48.6	434
Energy Technology Assistance Program	23.0	23.1	100%	23.0	345
		23.1	100%	23.0	345
Oakland Shines	4.3	3.8	87%	3.5	44
		3.5	81%	3.3	42
Total	90.9	85.8	94%	84.2	877
		76.3	84%	74.9	821

Shaded results use pre-existing equipment energy consumption as baseline.
Results without shading use standard-practice or code-required equipment energy consumption as baseline.
Source: DNV KEMA Energy & Sustainability Analysis

The programwide net demand savings totaled 8.4 megawatts (MW), as shown in Table 3. Throughout this report, demand savings are defined as hourly electricity usage reductions; these differ from peak demand saving as defined by the California Public Utility Commission.

Table 3: Municipal and Commercial Building Targeted Measure Retrofit Demand Savings

Subrecipient Program Savings	Demand Savings (MW)				Life-Cycle Demand Savings (MW-years)
	Ex Ante Savings	Gross Ex Post Savings	Realization Rate	Net-Adjusted Ex Post Savings	Net-Adjusted Ex Post Savings
EnergySmart Jobs	6.9	6.3	91%	6.2	43.9
		5.3	77%	5.2	38.3
Energy Technology Assistance Program	1.3	1.3	100%	1.3	20.2
		1.3	100%	1.3	20.2
Oakland Shines	0.7	1.0	151%	0.9	12.6
		1.0	146%	0.9	12.4
Total	8.9	8.6	97%	8.4	76.7
		7.6	85%	7.4	70.9

Shaded results use pre-existing equipment energy consumption as baseline.
Results without shading use standard-practice or code-required equipment energy consumption as baseline.
Source: DNV KEMA Energy & Sustainability Analysis

The programwide net annual natural gas savings were 943,645 therms, as shown in Table 4.

Table 4: Municipal and Commercial Building Targeted Measure Retrofit Natural Gas Savings

Subrecipient Program Savings	Annual Natural Gas Savings (therms)				Life-Cycle Natural Gas Savings (therms)
	Ex Ante Savings	Gross Ex Post Savings	Realization Rate	Net-Adjusted Ex Post Savings	Net-Adjusted Ex Post Savings
EnergySmart Jobs	(94,923)	(56,771)	60%	(55,522)	(112,901)
		(56,771)	60%	(55,522)	(112,901)
Energy Technology Assistance Program	948,018	990,827	105%	985,975	14,789,624
		990,827	105%	985,975	14,789,624
Oakland Shines	65,418	14,033	21%	13,192	197,891
		14,033	21%	13,192	197,891
Total	918,513	948,089	103%	943,645	14,874,614
		948,089	103%	943,645	14,874,614

Source: DNV KEMA Energy & Sustainability Analysis

Using the net annual and life-cycle savings for electricity and natural gas, the evaluation team determined that the net annual avoided GHG emissions are 31,351 metric tons programwide, as shown in Table 5.

Table 5: Municipal and Commercial Building Targeted Measure Retrofit Avoided Greenhouse Gas Emissions

Subrecipient Program Emissions Reductions	Annual Net-Adjusted Ex Post Avoided GHG Emissions (metric tons)	Life-Cycle Net-Adjusted Ex Post Avoided GHG Emissions (metric tons)
EnergySmart Jobs	17,749	152,156
	14,925	135,208
Energy Technology Assistance Program	12,427	186,402
	12,427	186,402
Oakland Shines	1,175	14,908
	1,095	14,205
Total	31,351	353,466
	28,447	335,815

Shaded results use pre-existing equipment energy consumption as baseline.
Results without shading use standard-practice or code-required equipment energy consumption as baseline.
Source: DNV KEMA Analysis

While each subrecipient program targeted different markets and segments, each approached its respective markets in similar ways. The programs collaborated with established entities to gain market acceptance, offered technologies typically not promoted in investor-owned and municipal utility programs, and trained surveyors, installers, and building owners to install and maintain these technologies properly and effectively. A more detailed discussion of each program follows.

EnergySmart Jobs

This program, implemented by PECI, proved enormously successful at delivering energy efficiency measures to grocery/convenience stores and restaurants across California. EnergySmart Jobs installed energy efficiency measures at 7,108 stores and restaurants, realizing 57.7 GWh of net annual electricity savings and 6.2 MW of net demand savings. Since PECI accounted for the interactive effects of installing more efficient lighting equipment in conditioned spaces – typically causing heating loads to increase slightly – the program yielded negative net annual natural gas savings of -55,522 therms. In general, the savings at most project sites were equal using either of the accepted baselines since most of the technologies offered by the program did not have minimum code requirements or standard practices that differed from the pre-existing equipment. Only in those instances where refrigeration case lighting retrofits replaced older generations of fluorescent tube luminaires did the two baselines differ.

EnergySmart Jobs was very well received by the target market and resulted in a much higher than anticipated uptake of the contractor-installed technologies early in the program. Due to this early success, the implementer and the Energy Commission decided to scale back the targeted 25,000 in-store surveys; as of the conclusion of the program, 6,025 surveys were completed. Furthermore, all rebate funds had been committed nearly nine months before the end of the program. However, the accelerated uptake left some of the partner contractors and manufacturers with some less-than-favorable perceptions of the program because the product demand did not persist throughout the duration of the program.

Workforce development was an integral goal of the EnergySmart Jobs program. When PECI chose the technologies to offer, it not only considered demonstrated energy savings potential, but considered whether an unskilled workforce could be trained to conduct the on-site surveys and install the simpler energy efficiency measures. PECI provided training to 132 California Conservation Corps members to perform these duties. These were multiday trainings held around the state to teach about the technologies, best practices for installation and maintenance, and energy savings, as well as other benefits, and to develop the necessary skills to perform the on-site surveys.

Later, more than one-third of the program-trained surveyors were selected to participate in the advanced surveyor training that was developed in partnership with product manufacturers. The purpose of the advanced training was to learn how to identify opportunities for and install the more complex, contractor-installed technologies offered by the program. To ensure effective installations of these technologies, only contractors with prior experience with the more complex technologies were selected to perform the retrofits.

The program met its workforce development goals by establishing 118 equivalent full-time positions during the program. While participating contractors hired some surveyors, there is no evidence that the majority of the jobs created during the program will be sustained beyond the end of the program. However, some contractors indicated they may have hired some of the program-trained surveyors had they been more aware of them.

EnergySmart Jobs had the following three major market transformation goals:

- Product pricing reductions through higher volume production triggered by the increased project demand generated by the program
- Penetration of the historically difficult-to-reach grocery and convenience store markets
- Significant increase in the knowledge regarding the benefits of energy efficiency among grocery/convenience store owners, surveyors, and contractors

The program met the following goals with varying success:

- The prices of the program products proved more difficult to influence than hoped, given the relatively brief duration of the program. However, a few contractors reported that they experienced a growing number of inquiries from nonparticipants regarding the

program technologies. These inquiries have led them to expect slow but gradual market growth.

- Reaching the grocery and convenience store markets was far more successful than planned and yielded a dramatically higher percentage of stores that went on to implement the contractor-installed measures than anticipated. In particular, the program successfully reached small grocery and convenience stores that conventional rebate programs have struggled to reach.
- The market uptake of the relatively new energy-efficient technologies offered grew dramatically through the program. Participant understanding regarding the benefits of program participation and energy efficiency grew, but maintenance practices proved harder to influence.

Telephone surveys of EnergySmart Jobs participants revealed the following:

- Most participants reported a high degree of satisfaction with many program delivery facets, including surveyor services, contractor installations, rebate application processes, and reporting requirements.
- Most participants surveyed achieved both energy savings and operating cost reductions consistent with their expectations. They were satisfied with the energy efficiency information and technical assistance provided to them by the program.
- Most participants indicated that they would be very likely to participate in a similar incentive program (74 percent). However, without the same incentives, only 7 percent indicated the same likelihood and 63 percent of participants surveyed indicated that they would still require financial assistance to proceed with similar projects in the future.
- Very few participants were free riders (2 percent, weighted by savings) – hence, the net savings attributable to the program are 98 percent of gross savings.

In conclusion, this program used a very effective design to achieve a large energy impact at a relatively low cost. The evaluation team prepared the following relatively short list of recommendations for future programs similar to EnergySmart Jobs:

- Provide timely communication of changes to program strategy so partner contractors and manufacturers can shift their expectations and make purchasing and hiring decisions to match program needs.
- Only 7 percent of program participants surveyed indicated that they would participate in a similar program without financial incentives. The implication is that rebates will continue to be essential to reach this market. When comparable financial incentives are included in a similar program, however, the proportion of interested participants increased to 75 percent.

Energy Technology Assistance Program

This program, implemented by Energy Solutions, was very successful at delivering energy efficiency measures to municipal and higher education facilities in California. The program installed energy efficiency measures at 114 project sites and realized 23.0 GWh of net annual electricity savings, 1.3 MW of net demand savings, and 985,975 therms of net natural gas savings.

In addition to saving energy, the Energy Technology Assistance Program provided technical assistance and financial incentives to accelerate the uptake of three advanced energy efficiency technologies in the local government market and create a sustainable market. Furthermore, the program increased contractor and facility manager knowledge of new energy efficiency technologies through outreach efforts that included showcasing completed retrofits. The program set out to increase the number of trained workers knowledgeable about the program technologies through its workforce development activities. The program successfully trained 40 electricians, 20 HVAC installers, and 4 interns. The program conducted six seminars as planned but nearly quadrupled its attendance target of 10 per seminar for a total of 229 attendees.

Market actor interviews revealed that contractor and facility manager knowledge of, and interest in, the program energy efficiency technologies increased through the outreach and educational activities. Contractors also promoted the technologies outside the program as a way for customers to save money by realizing both smaller energy bills and decreased cost of equipment maintenance. The program overcame barriers to adoption of the technologies by demonstrating to facility managers that they were affordable and would generate energy bill savings, reduce maintenance costs, and improve occupancy comfort. Training participants agreed that the program improved their awareness of the broad array of energy-efficient technologies available and increased their knowledge of the features, benefits, and maintenance requirements of the technologies. They reported plans to disseminate this knowledge throughout the relevant groups within their organizations. During telephone surveys of program participants:

- Most reported a high degree of satisfaction with many facets of program delivery, including presentation of energy efficiency information, technical assistance, contractor installations, rebate application processes, and reporting requirements.
- Most participants surveyed achieved both the energy savings and cost reductions that they had expected. Slightly more than half reported that their participation also affected the way they maintained or used equipment, suggesting that some behavioral effects may persist.
- Most participants (81 percent) are very likely to participate in a similar program if that program offers comparable financial incentives. Without similar financial incentives, only 11 percent would be very likely to participate again.
- Very few participants were free riders (1 percent, weighted by savings) – hence, the net savings attributable to the program are 99 percent of gross savings.

The evaluation concluded that a dramatic decrease in participation would likely result if financial incentives were no longer offered. This difference is very likely due to external factors affecting the market targeted by the program. Municipal customers operate under severe budget constraints. Even though the program made significant strides to overcome information barriers, the activities promoted under the program will not become significant without incentives until facility managers have larger capital budgets. Recommendations to improve the program going forward include:

- Understand and budget for the time necessary to develop partnerships with associations, organizations, and vendors that will help accelerate program uptake.
- Design marketing tactics specific to the targeted markets. For example, producing educational materials and training specifically geared for staff in municipal and higher educational markets.
- Provide technical assistance to state-funded entities that includes education on technology applications and benefits along with interactive guidance regarding participation requirements, applications, and reporting forms.
- To help sustain the rate of uptake generated through the program, continue to offer financial support to overcome first-cost barriers associated with the advanced technologies promoted by the program.

Oakland Shines Program

This program, implemented by QuEST, succeeded in delivering energy efficiency measures to commercial and municipal buildings in Oakland. Each Oakland business located on the ground level was contacted at least twice to inform owners of the program and, when permitted, conduct a survey. With the help of interpreters, Oakland Shines experienced the greatest level of participation in a very difficult-to-reach neighborhood: Oakland's Chinatown.

At the beginning of the program, the need for efficient office and classroom lighting in the downtown corridor was thought to have been greater than was actually found during the surveys. Conversely, the need for efficient lighting in the refrigeration cases in stores and restaurants was greater than anticipated, particularly when looking at Oakland neighborhoods outside the downtown corridor. These findings led to a shift to promote the LED luminaires more heavily to all Oakland businesses. Since LED luminaires are a very cost-effective measure, the Energy Commission increased the program funding by $250,000 to support this shift and meet the needs of more Oakland businesses.

At the conclusion of the program, energy efficiency retrofits at 195 project sites realized 3.5 GWh of net annual electricity savings, 0.9 MW of net demand savings, and 13,192 therms of net annual natural gas savings. Even though the program-level savings differ depending upon the baseline used, most of the technologies offered through the program did not have minimum code requirements or standard practices that differed from the pre-existing equipment. It was only in those instances where lighting retrofits replaced older types of luminaires that the two baselines differed.

In addition to energy savings, the Oakland Shines program goals included:

- Reduction of energy costs to businesses operating in Oakland through the installation of targeted energy-efficient technologies.
- Workforce development through program-specific trainings.
- Creation of jobs through collaboration with the city government and investor-owned utilities to generate more contracts for energy efficiency contractors and consultants.

Oakland Shines achieved the above goals to varying degrees, as described below:

- Since the retrofits offered through Oakland Shines yielded 44 GWh of net electricity savings over the life of the equipment, the energy cost savings to Oakland businesses were substantial. Most participants reported achieving both energy savings and cost reductions comparable to their expectations.
- The training element of the program successfully delivered technical trainings through partnerships and internships. Contractors and facility managers reported their knowledge of the benefits of energy-efficient equipment improved as a direct result of the program.
- Job creation efforts, however, were not as successful. The program generated new retrofit projects, but there is no evidence to show that new jobs resulted at participating facilities or contractors.

Through telephone surveys of participants, evaluators learned that:

- Overall, program participants expressed a high degree of satisfaction with many facets of the program, including audit services, installations, and the application process.
- While participants did report an increased knowledge of energy-efficient equipment, more than two-thirds reported no expectation that this new knowledge would affect their equipment maintenance practices.
- Likely due in part to their positive experience with the program, the majority of participants expressed a high likelihood of implementing additional projects when a rebate became available (82 percent). However, this percentage dropped dramatically if no incentives were available (19 percent).
- More than half of surveyed participants would consider installing other energy efficiency measures without incentives in the next two years.
- Few participants were free riders (6 percent, weighted by savings) – hence, the net savings attributable to the program are 94 percent of gross savings.

Through interviews with market actors, evaluators learned that:

- One of the original marketing tactics of using electronic social media to reach Oakland businesses was scaled back. Instead, face-to-face communication proved essential to building trust and interest in the retrofits.
- Developing and sharing case studies and printed materials proved effective at building trust among the smaller business owners.
- In the "Chinatown" neighborhood of Oakland, including Cantonese and Mandarin speakers in the door-to-door canvassing efforts built trust by showing sensitivity to longstanding language diversity.

Recommendations to improve the program going forward include:

- Consider training contractors on general business practices and customer service in addition to energy-efficient technologies.
- Continue to build relationships with community groups and regional agencies to foster trust and increase awareness of energy efficiency technologies. Avoid emphasizing electronic social media at the expense of approaches such as door-to-door marketing and community events that generate direct contact between implementers and customers.
- Develop a more rigorous tracking database at the beginning of the program by requiring a unique record for each measure type installed at given site.
- Establish a clear and consistent method for determining the demand savings. The methods used for claimed demand savings varied and led to evaluation challenges.

CHAPTER 1: Introduction

The Municipal and Commercial Building Targeted Measure Retrofit (MCR) Program set out to achieve significant energy savings across the state's municipal- and commercial-building sectors. By targeting the installation of a handful of high-impact measures in many nonresidential buildings across California, the expectation was that markets for these technologies would become self-sustaining. The California Energy Commission awarded $29.6 million to three subrecipients through a competitive solicitation; the winning bidders were EnergySmart Jobs (ESJ), Energy Technology Assistance Program (ETAP), and Oakland Shines (OS).

Following acceptance of the final evaluation plan for the MCR subrecipient programs in June 2011, evaluators evaluated the subrecipient programs from October 2011 through December 2012.

In the chapters that follow, authors provide subrecipient program descriptions and goals, describe evaluation objectives and approaches, and present evaluation results for each of the three MCR subrecipient programs as indicated below:

- **Chapter 2: MCR Subrecipient Program Overviews and Comparisons**. This chapter provides a description of the MCR subrecipient programs, their objectives, and expected results. At the end, it also compares and contrasts the three subrecipient program designs.
- **Chapter 3: MCR Subrecipient Program Evaluation Methodology**. This chapter describes the general approach to evaluating the MCR subrecipient programs. Program-specific details and modifications are provided in the chapters that follow.
- **Chapter 4: EnergySmart Jobs**. This chapter provides specifics regarding the evaluation methods, results and conclusions, and recommendations for ESJ.
- **Chapter 5: Energy Technology Assistance Program**. This chapter provides specifics regarding the evaluation methods, results and conclusions, and recommendations for ETAP.
- **Chapter 6: Oakland Shines**. This chapter provides specifics regarding the evaluation methods, results and conclusions, and recommendations for OS.
- **Chapter 7: Glossary**. This chapter provides a list and defines the meaning of acronyms used in this report.

Appendices to this report include:

- Appendix A: Detailed Evaluation Methodology
- Appendix B: Data Collection Field Measurement Procedures

- Appendix C: Ex Ante and Ex Post Savings for Sampled Sites
- Appendix D: Participant Computer-Assisted Telephone Interview (CATI)
- Appendix E: Confidence Intervals for Participant CATI Results
- Appendix F: Market Actor Interview Guides

CHAPTER 2:
MCR Subrecipient Program Overviews and Comparisons

The Energy Commission established the MCR Program through a competitive bid process. Implementation was awarded to three distinct subrecipient programs and funded through the American Recovery and Reinvestment Act of 2009 (ARRA). These three programs were chosen for their broad-based approaches that included newer technologies for multiple building segments, aggressive outreach to "hard-to-reach" markets, and workforce development to build capacity for these technologies beyond the program period. Table 6 summarizes the selected programs. The sections that follow provide more detailed overviews and comparisons.

Table 6: MCR Summary of Subrecipient Programs and Partners

Categories	EnergySmart Jobs (ESJ)	Energy Technology Assistance Program (ETAP)	Oakland Shines (OS)
MCR Subrecipient:	PECI	Energy Solutions	QuEST
Program Partners (includes subcontractors, vendors, and community partners)	• The California Conservation Corps (CCC) • Gilbert Associates • Aztec Energy Partners • Motus Recruiting & Staffing • Twelve utilities, including three IOUs • Forty-three contractor firms • Thirteen colleges • Four lighting manufacturers • AT&T	• California Advanced Lighting Controls Training Program (CALCTP) • California Lighting Technology Center (CLTC) • Creative Slice • Integrity Electric • Lighting Wizards • Linda Brandon Design • Phoenix1 • Vigilent • William Porter Photography • Adura Technologies • Lutron • Cypress Envirosystems • Workforce Institute • Laney College	• Community Energy Services Corp. • City of Oakland • Phoenix 1 • Circle Point • PG&E's AirCare Plus and On-Bill Financing Programs • East Bay Energy Watch (IOU-funded LGP) • City of Oakland Community and Economic Development Agency (CEDA) • Oakland's Business Improvement Districts • BOMA Oakland/East Bay • Oakland Green Jobs Corps • Oakland Chamber of Commerce
Final Program Budget	$18,167,643	$6,699,738	$5,102,179
Program Expenditure	$18,167,657	$6,674,097	$5,101,862
Rebates	$10,128,988	$3,394,089	$2,848,997

Categories	EnergySmart Jobs (ESJ)	Energy Technology Assistance Program (ETAP)	Oakland Shines (OS)
Measures Targeted	• LED Luminaires for Refrigeration Cases • Occupancy Sensors for LED Luminaires • Refrigeration Controls • Beverage Cooler Controllers • CFLs for Refrigerated Spaces • CFLs for Nonrefrigerated Spaces	• Bilevel Lighting • Wireless HVAC Controls • Wireless Lighting Controls	• Bilevel Lighting • Wireless HVAC Controls • LED Luminaires for Refrigeration Cases • Other Lighting Upgrades
Markets Targeted	• Grocery/Convenience Stores & Restaurants	• Municipalities • Universities • Nonprofits	• Commercial Buildings • Classroom Buildings • Small Grocery and Convenience Stores
Workforce Development	• New Surveyor Training, Advanced Surveyor Training and Contractor Training	• Workshops, Training, Internships	• Internships w/Training

Source: DNV KEMA Analysis

EnergySmart Jobs

ESJ Design Summary

PECI implemented the ESJ program. Its three principal goals included "job creation and economic stimulus, energy savings through adoption of efficiency technologies, and market transformation."[1] ESJ provided job skills training and installed targeted energy-efficient measures by leveraging existing partners and developing new relationships and partnerships with other jobs programs, community colleges, private-sector technology firms, utilities, manufacturers, and technical trainers.

From its inception, PECI developed an innovative plan to work with the California Conservation Corps (CCC) to locate 125 Corps members who were available and willing to complete the ESJ training necessary to become a program surveyor. The trainings sessions:

- Taught students about energy efficiency technologies and their benefits.
- Provided tips for effective communication with store and restaurant owners.
- Demonstrated how and where to install the basic energy efficiency measures (EEMs) offered through the program, such as CFLs for refrigerated and nonrefrigerated spaces and beverage merchandise cooler controllers.

1 PECI, *Final Report for EnergySmart Jobs,* California Energy Commission, 2012, p. 3.

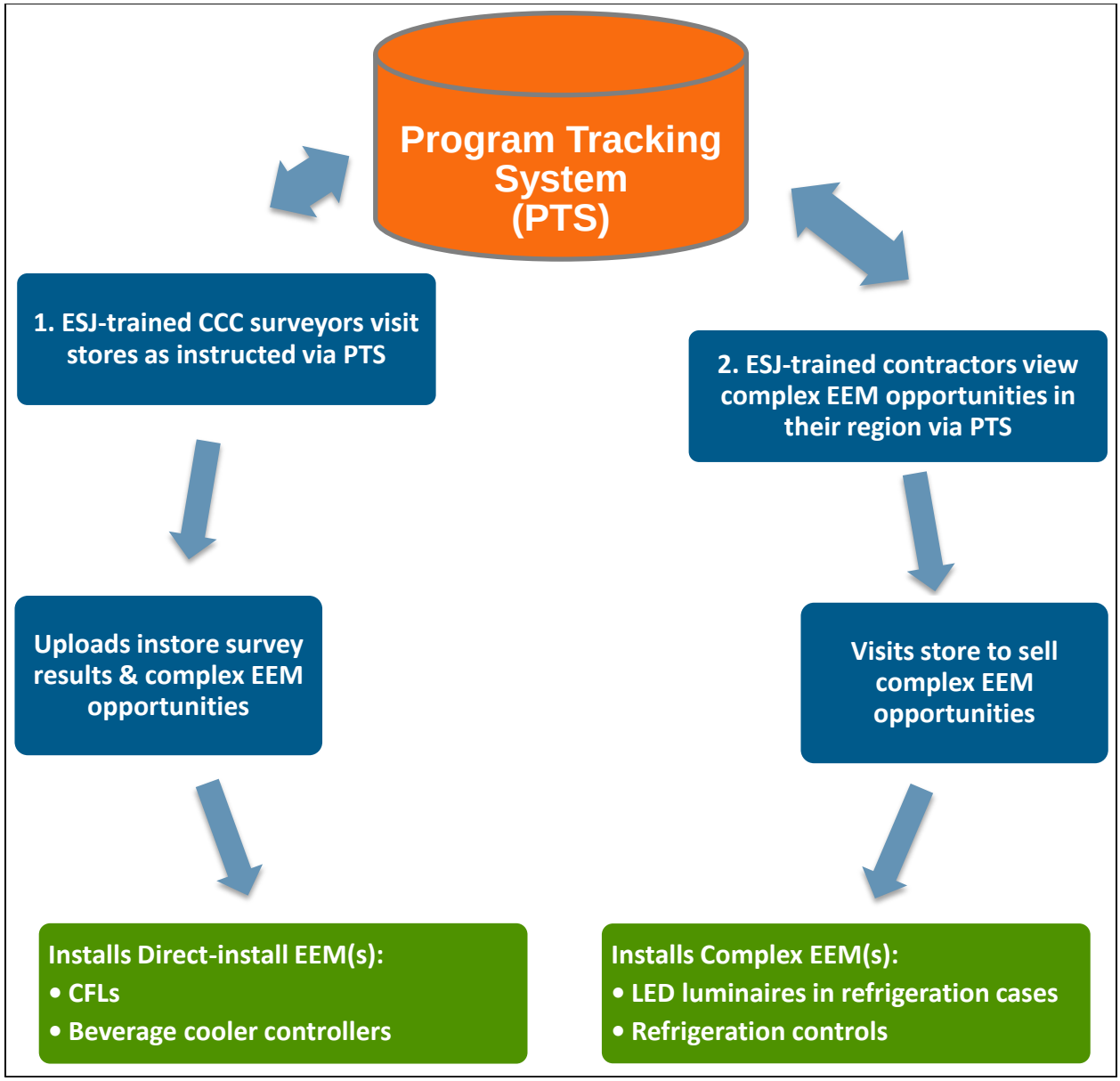
- Demonstrated how to identify opportunities for installation of the advanced EEMs offered through the program, including light-emitting diode (LED) luminaires and motion sensors for reach-in refrigeration cases, as well as multistaged refrigeration control systems.
- Instructed surveyors how to properly complete the on-site surveys and upload the results to the Program Tracking System (PTS).

In addition to CCC surveyor trainings, the workforce training effort included training 50 licensed contracting firms in California. These firms were selected based on having prior experience with the advanced EEMs offered by ESJ and a demonstrated capacity to complete the retrofits in a timely and effective manner. PECI staff and manufacturer partners collaborated to develop the training sessions. These sessions:

- Taught contractors about energy efficiency technologies and their benefits.
- Provided tips for effective communication with store and restaurant owners.
- Demonstrated how to install the advanced EEMs offered through the program including light-emitting diode (LED) luminaires and motion sensors for reach-in refrigeration cases as well as multistaged refrigeration control systems.
- Instructed contractors how to make use of the PTS contractor portal to learn about the advanced EEM opportunities in their area that had been identified by surveyors.

At the start of ESJ, PECI developed a sophisticated PTS that included a surveyor portal to allow on-site surveyors to upload the survey results, including details about the store visited, a record of the simple, direct-install EEM measures that were installed during their visit, and opportunities for complex EEMs offered by ESJ. The PTS contractor portal functioned as a sales lead generator by providing access to on-site surveys that had been uploaded by the program surveyors using iPhones®. The ESJ team members worked together, coordinated efforts, and tracked results using the PTS, as shown in Figure 1.

Figure 1: EnergySmart Jobs Implementation Flow



Source: DNV KEMA Analysis

Upon visiting a customer, simple EEMs were usually provided and installed, immediate energy savings were realized, customer trust was established, and explanations were provided regarding the more complex contractor-installed, energy-saving opportunities available to them. Then, the PTS contractor portal filtered the opportunities available to contractors based on geographic proximity and relevant expertise. For instance, only those contractors possessing prior experience with multistage refrigeration controls were able to view multistage refrigeration opportunities. PECI used this approach because it was convinced that correct installation of equipment was essential for proper operation and reliable energy savings. To ensure the use of effective products, PECI also worked closely with the partner manufacturers to establish quality standards for all the products delivered through the program.

PECI's final implementation plan,[2] along with its program theory and logic model,[3] describes the program approach and expected outputs from the program activities. The program logic model identified eight short-term (less than a year) outcomes and two intermediate-term (one to two years) outcomes that shaped the scope of this evaluation:

- Short-Term Outcomes
  - Increased skills and knowledge
  - Job creation
  - Reduced equipment cost
  - Increased awareness of energy efficiency programs and technology
  - Increased participation in programs
  - Increased awareness of site opportunities
  - EEMs installed to yield verifiable energy savings
  - Positive participant experience
- Intermediate-Term Outcomes
  - Increased demand for EEMs
  - Increased business for contractors

ESJ Goals and Accomplishments

ESJ distributed slightly more than $10 million[4] in project incentives at 7,108 stores and spent another $8 million on job training, energy efficiency surveys, rebate processing, marketing, and general administration. Since the final administrative expenditures were less than initial estimates, the program was able to shift more than $640,000 into direct incentives. Total contract

2 PECI, *EnergySmart Jobs Implementation Plan (Version 1.2)*, California Energy Commission, 2010.

3 PECI, *Logic Model for EnergySmart Jobs (Version 2)*, California Energy Commission, 2010.

4 PECI, *Final Report for EnergySmart Jobs,* California Energy Commission, 2012.

expenditures came to $18,167,657, whereas the final approved budget was $18,167,653. Hence, PECI spent its entire approved budget, as shown in Table 7. For every ESJ rebate dollar given for contractor-installed EEMs, utilities contributed another 58 cents through rebates, and the participating customer expenditures contributed another 77 cents.[4]

Table 7: ESJ Budget

Activity	Budget	Actual	Variance
Administration	$1,281,530	$135,549	($1,145,981)
Program Implementation	$3,797,231	$5,370,329	$1,573,098
Financing	$0	$0	$0
Marketing/Ed/Outreach	$385,936	$385,936	$0
Rebates/Incentives	$10,168,645	$10,128,988	($39,657)
Workforce Development	$626,880	$626,880	$0
QA/QC	$810,796	$151,728	($659,068)
Evaluation, Measurement, and Verification (EM&V)	$1,096,635	$1,368,247	$271,612
Total	$18,167,653	$18,167,657	$4

Source: DNV KEMA Analysis

To achieve its workforce training goals, the program trained 132 California Conservation Corps (CCC) personnel and 160 contractors from 83 California-based contracting firms. Trained CCC personnel conducted 6,025 energy surveys and more than 1,700 postretrofit inspections to verify completed projects. Table 8 summarizes the efforts to achieve these goals.

Table 8: ESJ Workforce Development Achievements

Audience	Workforce Development	Goal	Achieved
New CCC Surveyors	9 training sessions at various colleges	125	132
Advanced CCC Surveyors (from New CCC Surveyors)	4 training sessions regarding adv. refrigeration controls	n/a	54
Installation Contractors	8 EnergySmart Jobs program training sessions	50 firms	83 firms (160 individuals)
	7 LED case lighting training sessions		
	7 refrigeration controls training sessions		

Source: DNV KEMA Analysis

To develop its marketing goals, PECI developed a logic model and supporting table of explanations. The program used the logic model to guide marketing endeavors and program implementation shifts. ESJ aspired to spur both an increase in market adoption of the newer technologies offered by the program, including LED luminaires for refrigeration cases and refrigeration controls, and decreased prices. Furthermore, ESJ set out to reduce operating costs for grocery/convenience store and restaurant owners by increasing their understanding of energy-saving products and practices.

Throughout the ESJ program, CCC surveyors visited 7,108 stores. Of those, the program conducted surveys at 6,025 stores, and slightly more than 6,200 stores accepted direct-install energy efficiency products. Not all contacted stores allowed the survey to be completed, and not all stores accepted (or needed) the direct-install products offered. From these surveyor visits, more than 5,600 stores went on to have contractor-installed energy efficiency products implemented. Combined, the program installed EEMs at 7,108 stores and restaurants. Table 9 provides a summary of the energy efficient measures installed through ESJ.

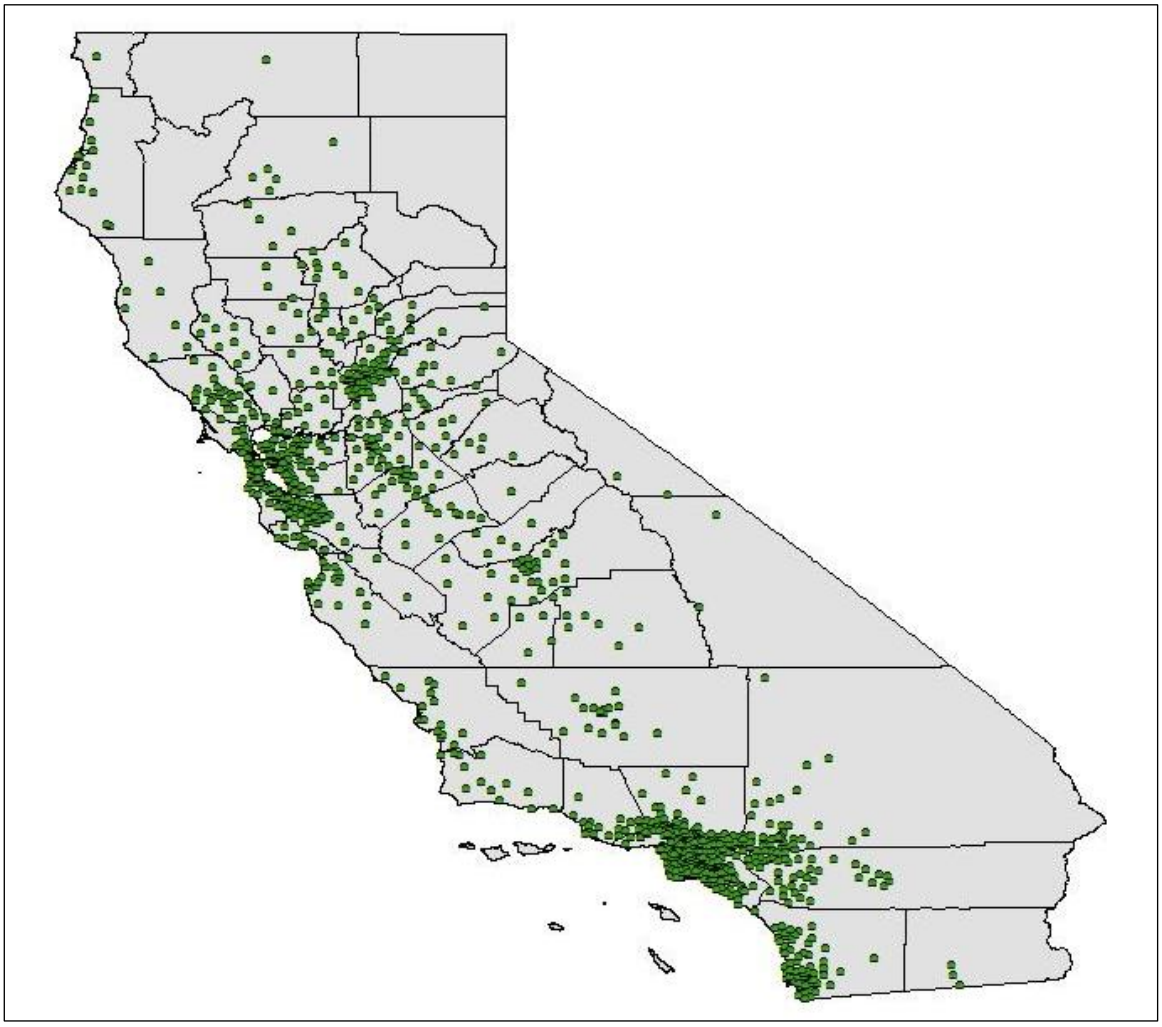
Table 9: ESJ Retrofits Summary

Delivery Channel	Measure Category	Installed	Ex Ante Energy Savings		
			Annual Ex Ante Electricity Savings (kWh)	Ex Ante Demand Savings, kW	Annual Ex Ante Natural Gas Savings (therms)
Contractor Installed (Complex EEMs)	LED Luminaires, Reach-in Refrigeration Cases	384,825 linear feet	39,514,012	5,040	0
	Motion Sensors for LED Luminaires, Reach-in Refrigeration Cases	181,067 linear feet	3,536,086	0	0
	Controls for Refrigeration Equipment	30,959 eqmt. hp	12,186,215	726	2,312
	Subtotal		55,236,313	5,766	2,312
Direct-Install (Simple EEMs)	Beverage Merchandise Cooler Controller	2,275 units	2,634,450	0	0
	CFLs in Refrigerated Spaces	8,253 lamps	2,467,321	702	(41)
	CFLs in Nonrefrigerated Spaces	13,763 lamps	3,292,840	468	(97,194)
	Subtotal		8,394,610	1,170	(97,235)
ESJ Total			63,630,924	6,936	(94,923)

Source: DNV KEMA Analysis

A map of the locations of the ESJ retrofits is shown in Figure 2.

Figure 2: ESJ Map of Energy Efficiency Measure Installations



Source: DNV KEMA Analysis

Since the proportion of stores that went on to have one or more of the contractor-installed measures implemented following a surveyor visit was much higher than initially anticipated (79 percent versus 25 percent), ESJ shifted its priorities away from completing the targeted 25,000 in-store surveys.

In addition to implementing the previously indicated energy efficiency measures, PECI used the results of the surveys to estimate the remaining potential for the LED luminaires and other lighting and refrigeration EEMs typically associated with grocery/convenience stores and restaurants. In particular, it estimated that, for LED luminaires and/or motion sensors at reach-in refrigeration cases, the potential exists to install one and a half times more units than installed through ESJ.

Energy Technology Assistance Program

ETAP Design Summary

Energy Solutions implemented ETAP in partnership with numerous regional government organizations and local associations to invest in energy-efficient measures at public facilities for cities, counties, transit districts, higher education campuses, and nonprofits. At these facilities, auditors and surveyors identified and recommended opportunities for cost-effective, energy efficiency projects to install advanced technology measures. While these measures were not necessarily new, they were ideally suited for and underrepresented in the market targeted by ETAP. To overcome payback hurdles, ETAP provided rebates to facility owners, effectively reducing equipment capital costs by about 23 percent.[5] The program offered the following technologies:

- Wireless lighting controls
- Wireless HVAC controls
- Light-emitting diode (LED) luminaires with bilevel controls for garages and parking lots

Program tactics included the following:

- Workforce development and training was provided for lighting and HVAC installation contractors on these technologies.
- Green internships and employment opportunities for Workforce Institute,[6] community college, and green-certification program graduates were offered.
- Technical seminars were held for public agency staff members to improve their understanding of technologies offered, direct ongoing benefits, and benefits of energy efficiency, in general.

Table 10 shows the organizations that were program partners, including subcontractors and vendors. Originally, these entities fell into three distinct categories: technical services, marketing, and workforce development. Those distinctions blurred during the program as each organization assisted with implementation in multiple ways.

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5 Energy Solutions, *Final Report for Energy Technology Assistance Program*, California Energy Commission, 2012, p. 4.

6 The Workforce Institute is a division of the San Jose/Evergreen Community College District.

Through concurrent and related efforts, program implementers designed ETAP to achieve two main outcomes:[7]

- Accelerate the uptake of the three types of advanced energy efficiency technologies by local governments and colleges/universities.
- Contribute to the supply of trained workers who are knowledgeable about these technologies.

Table 10: ETAP Subcontractors, Vendors, and Community Partners

Focus Area	ETAP Team Members
Technical Services	• California Lighting Technology Center (CLTC) • Federspiel Controls • Adura Technologies • Cypress Environsystems • Integrity Electric
Marketing	• Association of Bay Area Governments • Southern California Association of Governments • Local Government Commission
Workforce Development	• California Lighting Technology Center • Federspiel Controls • Adura Technologies • California Labor Management Cooperative • International Brotherhood of Electrical Workers/National Electrical Contractors' Association • The Workforce Institute • Los Rios Community College • Laney Community College

Source: DNV KEMA Analysis

The program theory behind ETAP is that, if market actors are provided with the proper knowledge, skills, and experience, they will install similar projects without ETAP assistance. To this end, ETAP made a concentrated marketing effort to local government agencies, provided technical assistance to building managers, and delivered financial incentives along with related training. Energy Solutions outlined key elements of its implementation strategy:[8]

- Products had to meet rigorous standards set by ETAP to qualify for incentives. This was to catalyze product improvements among manufacturers of nonqualifying products.

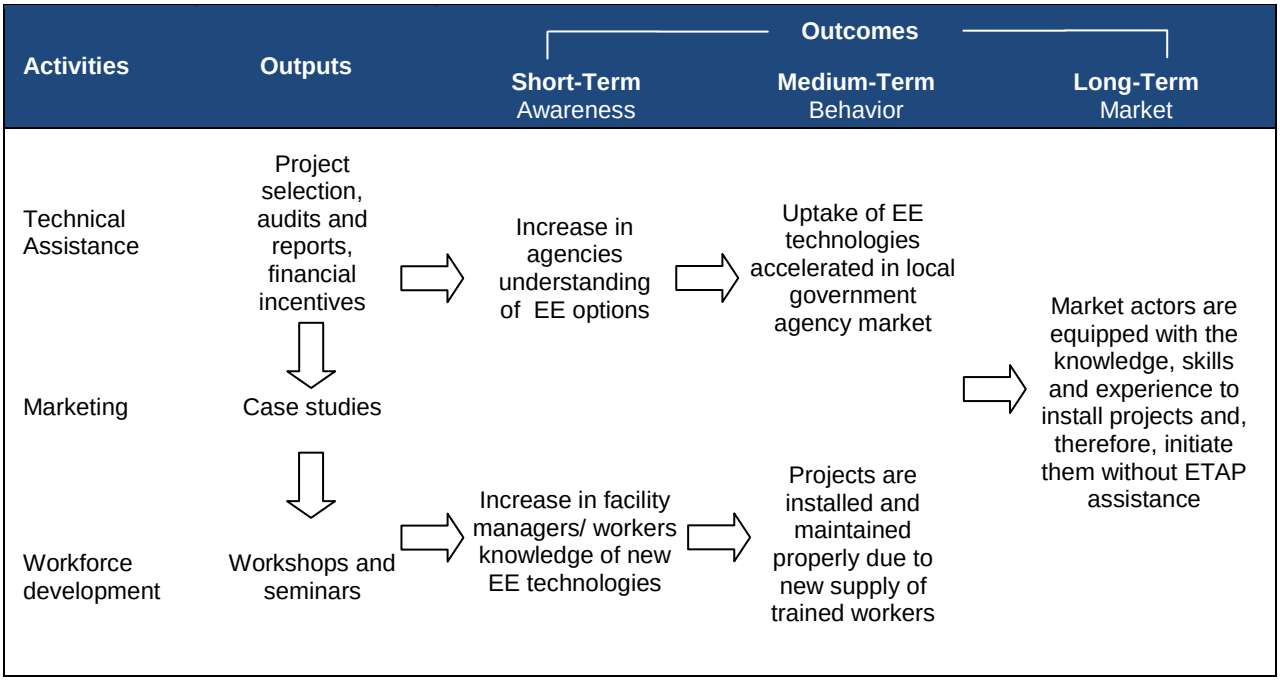
7 Energy Solutions, *ETAP Program Implementation Plan*, California Energy Commission, 2010, p. 13.

8 Energy Solutions, *ETAP Program Implementation Plan*, California Energy Commission, 2010, p. 13.

- Projects had to undergo design review and financial analysis to determine their feasibility and cost-effectiveness before approval. The program provided technical assistance to participants to support this review.
- Case studies were prepared to increase awareness among nonparticipating agencies to provide content for marketing materials and to document lessons learned.
- Workers were trained in quality installation and commissioning procedures.
- Installer and facility manager workshops and seminars provided training to facilitate the effective installations of ETAP equipment and instill proper maintenance practices.

The logic model shown in Figure 3 outlines how Energy Solutions sought to accomplish the objectives described above.

Figure 3: ETAP Logic Model



Source: DNV KEMA Analysis

The ETAP program included the following measures:

- **Bilevel Lighting**: The fixture used an occupancy sensor and a bi–level ballast to dim lights during periods of no activity. Compatible fixtures included linear fluorescent (both T5 and T8), LED, and/or induction. These were installed in a variety of areas, including stairwells, parking lots, and parking garages. Surveyors calculated savings on a site-by-site basis using preretrofit and postretrofit fixture wattages and hours of operation. This measure did not use a deemed savings approach.

- **Wireless Lighting Controls**: Devices installed included occupancy sensors, daylighting sensors, remote switches, wall switches, and integrated wireless receivers that turn lights on when the space is occupied and turn lights off when it is vacant. Most devices have the capacity to be configured to receive commands from both a central computerized control system and local controllers. Surveyors calculated savings on a site-by-site basis using fixture wattages and preretrofit and postretrofit hours of operation. This measure did not use a deemed savings approach.
- **Wireless HVAC Controls**: These controls were used to convert constant air volume (CAV) systems to variable air volume (VAV) systems using advanced wireless sensors and controls. CAV systems deliver a fixed amount of air throughout the building by using an on/off switch on a very simple schedule; VAV systems allow facilities to customize air delivery to various zones of the building and customize schedules to occupant needs. The ability to vary the amount of air delivered allows energy savings at times when buildings are less than fully occupied. Traditional CAV to VAV retrofits typically require installing new ductwork and terminal boxes throughout the building. By using wireless controls, the need for extensive building renovation and disruption is eliminated. Also, pre-existing thermostats were replaced with wireless programmable thermostats to provide zonal control and enforce temperature settings at thermostats. The savings calculation tool employed customized spreadsheets using local outside-air temperatures to calculate cooling, heating, and fan power settings for each hour of a typical year for preretrofit and postretrofit cases.

The ETAP program chose measures for proven energy-saving potential. These measures are emerging technologies, represent "best practices," and are significantly more energy-efficient than code minimums. With program incentives, all measures had a payback period of less than five years. ETAP incentivized products with demonstrated market readiness and proven compatibility with the building types typical to the program. All supported products met industry safety standards and included manufacturer's warranties.

ETAP Goals and Accomplishments

ETAP very successfully promoted advanced controls products to municipal, nonprofit, and higher education facilities. The success of ETAP led the Energy Commission to increase the initial budget of $5,949,739 by $850,000 to respond to high demand from agencies interested in participating. The $3.4 million in ETAP rebates leveraged an additional $17.9 million in project funding from various sources, including utility incentives, participants' internal capital funds, revenue bonds, dedicated energy project funds, and federal block grants.

Energy Solutions surveyors conducted audits and/or feasibility studies for more than 300 facilities at 99 public and nonprofit organizations. Based upon the findings of the feasibility studies and financial analyses, the program selected and implemented energy-efficient

upgrades at 114 project sites at 60 agencies. Table 11 displays the distribution of ETAP products installed and ex ante energy savings from ETAP.[9] As shown, the 114 project sites implemented through ETAP claimed annual ex ante savings of 23,035,547 kWh and 948,018 therms, as well as 1,347 kW of demand savings. The final ex ante savings far surpassed initial program goals of 13,200,000 kWh, 46,275 therms, and 1,275 kW, respectively.

The median payback of ETAP projects, including energy and maintenance cost savings, was 5.15 years. This payback indicates that the program successfully targeted cost-effective projects.[10] Wireless HVAC projects typically had the shortest payback periods due, in part, to the large savings yielded by these measures. In addition to implementing cost-effective projects, Energy Solutions amassed considerable knowledge regarding the technologies presently available in the market and ranked them in terms of ease of promotion.

To achieve its marketing goals, Energy Solutions produced a brochure, three fact sheets, and eight case studies to promote the program. It also developed a comprehensive website to draw attention to the program. Energy Solutions frequently updated the website pages to include the new case studies and other program accomplishments.

Table 11: ETAP Retrofits Summary

Measure Category	Project Sites	Ex Ante Energy Savings		
		Annual Electricity Savings (kWh)	Demand Savings (kW)	Annual Natural Gas Savings (therms)
Bilevel Luminaires for Garages and Parking Lots	71	11,847,265	970	0
Wireless Controls for HVAC	27	8,950,180	160	948,018
Wireless Controls for Lighting	16	2,238,102	217	0
Totals Reported at Program Conclusion	114	23,035,547	1,347	948,018
Program Goals at Program Launch	-	13,200,000	1,275	46,275

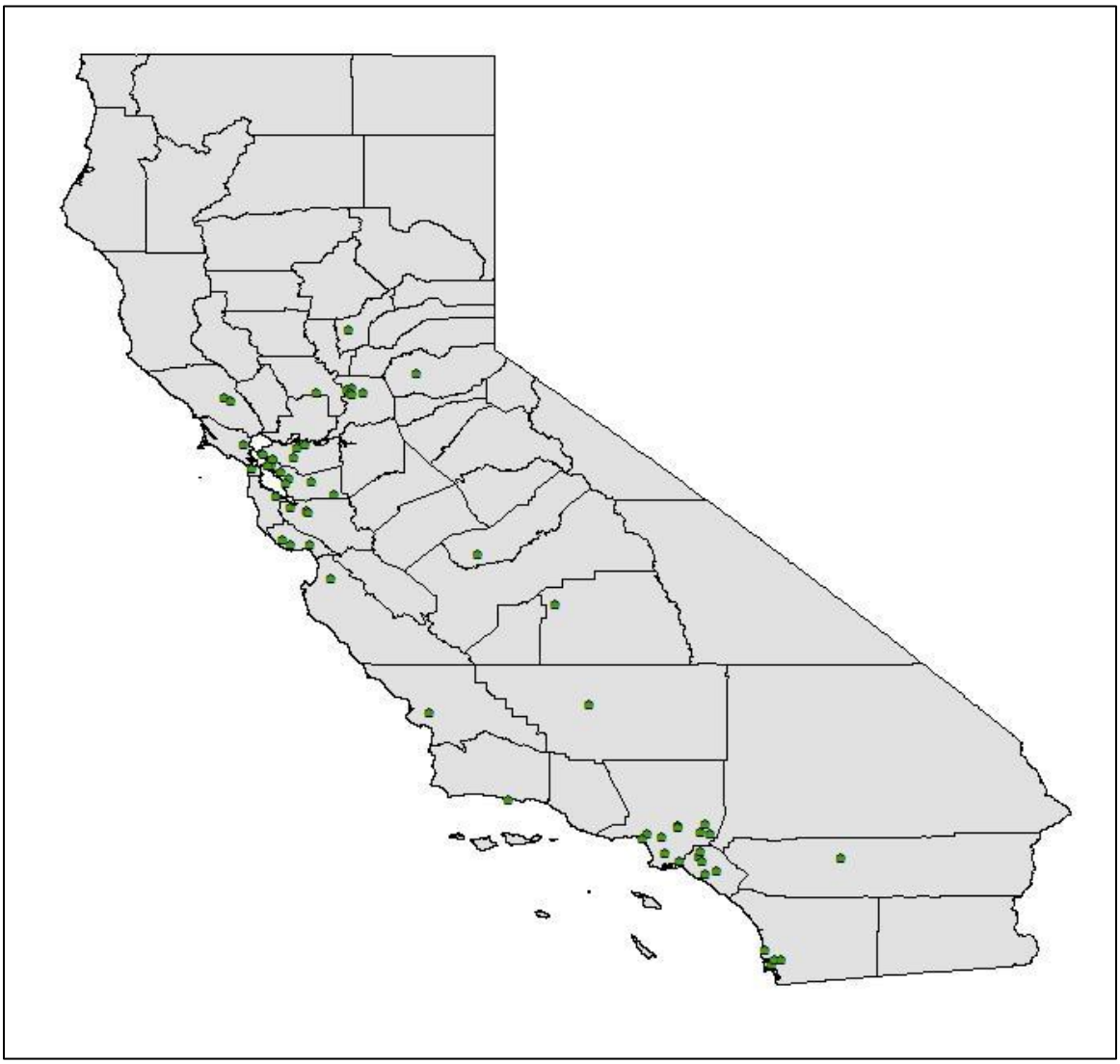
Source: DNV KEMA Analysis

9 From final tracking spreadsheet provided by the Energy Commission, October 2012.

10 Energy Solutions, *Final Report for Energy Technology Assistance Program*, California Energy Commission, 2012, p. 4.

Figure 4 shows the locations of sites where ETAP installed energy efficiency measures.

Figure 4: ETAP Map of Energy Efficiency Measure Installations



Source: DNV KEMA Analysis

To achieve its workforce development goals, Energy Solutions conducted technology seminars for participants to learn about the EEMs offered by the program and training workshops for electricians, HVAC installers, and interns, as shown in Table 12.

Table 12: ETAP Workforce Development Achievements

Audience	Workforce Development	Goal	Achieved
Participants	Technology Seminars Held	6	6
	Seminar Attendee Count	60	229
Electricians	Lighting Trainings Held	n/a	7
	Training Attendee Count	40	40
HVAC Installers	Workshops Held	n/a	2
	Workshop Attendee Count	20	20
Interns	Internships Granted	4	4

Source: DNV KEMA Analysis

Table 13 summarizes the ETAP budget[11] and expenditures.

Table 13: ETAP Budget

Activity	Budget	Actual	Variance
Administration	$917,869	$74,131	($843,738)
Program Implementation	$1,877,290	$2,759,526	$882,236
Financing	$0	$0	$0
Marketing/Ed/Outreach	$249,625	$235,280	($14,345)
Rebates/Incentives	$3,417,116	$3,394,089	($23,027)
Workforce Development	$230,987	$209,867	($21,120)
QA/QC	$6,851	$1,204	($5,647)
EM&V	$0	$0	$0
Total	$6,699,738	$6,674,097	($25,641)

Source: DNV KEMA Analysis

At a later date, the Energy Commission will release a comprehensive report to provide a cost-benefit analysis for the full suite of programs funded through the ARRA.

11 Energy Solutions, *Final Report for Energy Technology Assistance Program*. California Energy Commission, 2012, p. 67.

Oakland Shines

OS Design Summary

QuEST collaborated with a wide range of municipal agencies and Pacific Gas and Electric Company (PG&E), an investor-owned utility (IOU), to increase the saturation of advanced lighting and HVAC technologies among Class B and C[12] properties in the downtown corridor of Oakland. The workforce-training program for Oakland Shines focused on growing contractors understanding of the program technologies and encouraging them to incorporate them into their ongoing offerings. Contractors also helped promote the program by providing opportunities to showcase project sites that demonstrated technology performance claims.

The evaluation team developed a logic model based on the stated program theory and targeted outcomes. The OS program manager validated this model. The key drivers of the program included:

- Reducing energy consumption of businesses operating in Oakland through the installation of targeted energy-efficient technologies.
- Reducing the associated energy costs to these businesses.
- Creating jobs through collaboration with city government and PG&E to generate more contracts for energy-efficiency contractors and consultants.

Originally, Oakland Shines planned to focus marketing and outreach on one area in downtown Oakland. By focusing in one geographic area, the economically disadvantaged corridor along Broadway, the program postulated that business owner awareness regarding the availability and applicability of the targeted energy-saving technologies would increase. After surveying many of the buildings in the target area, QuEST determined that many of the offices had upgraded their lighting more recently than had been anticipated. At the same time, it was becoming increasingly clear that the opportunities for LED luminaires in refrigeration cases were abundant throughout the city. These findings, along with the shortened program implementation time due to contract execution delays, led QuEST to broaden the program to include all Oakland neighborhoods and to expand its promotion of the LED luminaires for refrigeration cases. To accomplish these goals, OS program implementation included:

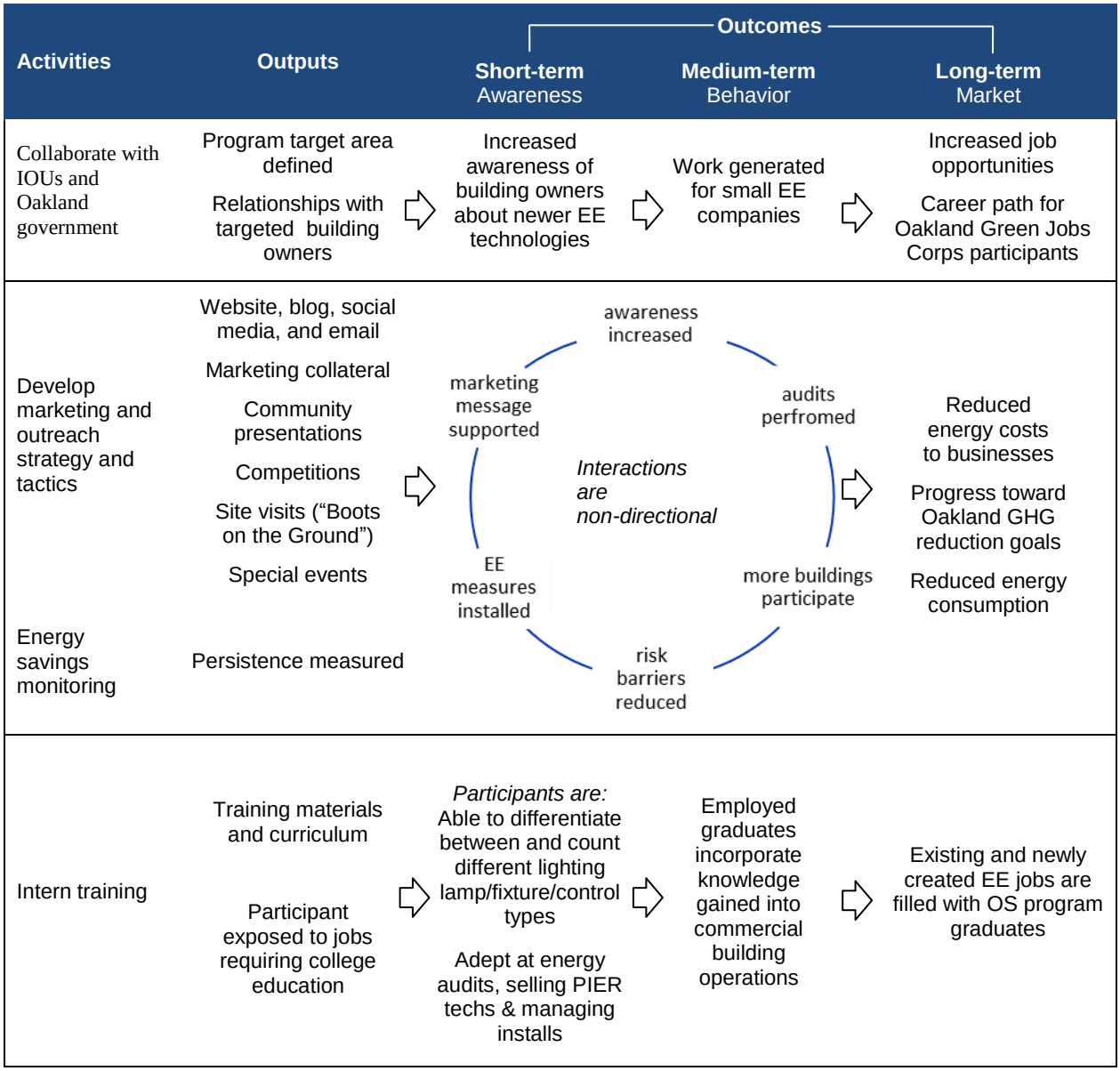
- Focused marketing and outreach efforts in Oakland
- Paying ARRA incentives to fund energy efficiency upgrade projects
- Energy savings monitoring
- Developing the local workforce through contractor training

12 When describing commercial real estate, Class B represents buildings that are not new, but are not more than 20 years old. Class C represents buildings that are typically more than 20 years old and in need of extensive renovation.

- Growing the knowledge of facility managers through promotions and trainings
- Developing case studies to strengthen interest in the measures
- Catalyzing product improvements

The logic model shown in Figure 5 summarizes how QuEST sought to accomplish the described objectives.

Figure 5: OS Program Logic Model



Source: DNV KEMA Analysis

The Oakland Shines measures fall into two main categories: lighting measures and HVAC measures. The measures included in the program were:

- **Wireless Lighting Controls:** Devices installed included occupancy sensors, remote switches, wall switches, and integrated wireless receivers that turned the lights on when the space is occupied and off when it is vacant. Devices could be configured to receive commands from both a central computerized control system and local controllers. Surveyors calculated savings on a site-by-site basis using fixture wattages and preretrofit and postretrofit hours of operation. This measure did not use a deemed savings approach.
- **Daylighting Controls:** Designed to turn the lights off during periods when ambient light was adequate enough to light the space. The device turns the lights back on when there is not enough ambient light. Surveyors calculated savings on a site-by-site basis using fixture wattages and preretrofit and postretrofit hours of operation. This measure did not use a deemed savings approach.
- **Advanced CFL Down Lights:** Used a master/remote wiring approach. Master fixture included the ballast and one lamp; remote fixture was just a lamp. A modular snap connector connected the two fixtures. Surveyors calculated savings on a site-by-site basis using preretrofit and postretrofit fixture wattages and hours of operation. This measure did not use a deemed savings approach.
- **SMART Wall Pack Fixtures:** Induction fixture that used an occupancy sensor and a bilevel ballast to dim lights during periods of no activity. Surveyors calculated savings on a site-by-site basis using preretrofit and postretrofit fixture wattages and hours of operation. This measure did not use a deemed savings approach.
- **SMART Parking Lot Bilevel Fixtures:** Fixture used an occupancy sensor and a bilevel ballast to dim lights during periods of no activity. Lamp types could be either induction or LED. Surveyors calculated savings on a site-by-site basis using preretrofit and postretrofit fixture wattages and hours of operation. This measure did not use a deemed savings approach.
- **Integrated Office Lighting Systems:** A 9W LED fixture used for task lighting; this brighter task lighting allowed for dimmer central lighting. Surveyors calculated savings on a site-by-site basis using preretrofit and postretrofit fixture wattages and hours of operation. This measure did not use a deemed savings approach.
- **Integrated Classroom Lighting Systems:** Used occupancy sensors and time clocks to reduce the lighting time of use. Surveyors calculated savings on a site-by-site basis using fixture wattages and preretrofit and postretrofit hours of operation. This measure did not use a deemed savings approach.
- **Refrigerator Case LED Lighting and Occupancy Sensor:** LED strip lighting replaced linear fluorescent lighting in reach-in refrigeration cases. Occupancy sensors dimmed

the LED case lighting in the absence of nearby occupants. Deemed savings varied depending upon the type of fluorescent tube that replaced as per the referenced work paper.[13]

- **Wireless HVAC Controls** These controls were used to convert constant air volume (CAV) systems to variable air volume (VAV) systems using advanced wireless sensors and controls. CAV systems deliver a fixed amount of air throughout the building by using an on/off switch on a very simple schedule; VAV systems allow facilities to customize air delivery to various zones of the building and customize schedules to occupant needs. The ability to vary the amount of air delivered allows energy savings at times when buildings are less than fully occupied. Traditional CAV to VAV retrofits typically require installing new ductwork and terminal boxes throughout the building. By using wireless controls, the need for extensive building renovation and disruption is eliminated. Also, pre-existing thermostats were replaced with wireless programmable thermostats to provide zonal control and enforce temperature settings at thermostats. The savings calculation tool employed customized spreadsheets using local outside-air temperatures to calculate cooling, heating, and fan power settings for each hour of a typical year for preretrofit and postretrofit cases.
- **HVAC Fault Detection:** Although the OS program claimed no savings, QuEST directed OS participants to participate in the PG&E AirCare Plus program as well. This IOU program offers services to optimize thermostat controls, economizers, refrigerant charge, and airflow at no cost to customers.

The measures offered by OS were selected for their significant energy savings potential and because they were broadly applicable. The measures enhanced many technologies already installed in commercial spaces as well as promoted new technology to update old designs. Projects included a wide range of commercial buildings, including office buildings, hotels, colleges, small grocery, and parking garages.

OS Goals and Accomplishments

Table 14 shows the targeted measures installed by the OS program. The rebates provided across the 195 project sites totaled $2,848,997, according to the final tracking data provided by the Energy Commission in October 2012. OS contacted nearly 1,500 businesses in Oakland, and Community Energy Services Corporation (CESC) provided 612 energy assessments to many of those businesses.

As shown in Table 14, the program retrofitted four major measure categories and claimed ex ante energy savings for each.[14] OS set out to save 8,364,706 kWh, annually, of electricity and

13 Pacific Gas and Electric, *LED Refrigeration Case Lighting (Revision 1)*, 2009.

14 From final tracking spreadsheet provided by the Energy Commission, October 2012.

138,525 therms, annually, of natural gas as well as reduce demand by 654 kW. The final ex ante savings did not achieve the program goals but reported ex ante savings of 4,316,560 kWh, 65,418 therms, and 657 kW, respectively.

Table 14: OS Retrofits Summary

Measure Category	Rebates	Ex Ante Energy Savings		
		Annual Electricity (kWh)	Demand (kW)	Natural Gas (therms)
Bilevel Lighting at Garages and Parking Lots	$1,973,774	2,338,501	151	0
LED Luminaires for Refrigeration Cases	$ 410,822	801,125	118	0
Lighting & Wireless Controls	$ 196,383	135,016	367	(3,188)
Wireless HVAC Controls	$ 429,542	1,041,918	21	68,606
Total Reported at Program Completion	$ 3,010,521	4,316,560	657	65,418
Program Goals[15]	$ 2,300,000	8,364,706	654	138,525

Source: DNV KEMA Analysis

15 QuEST, *Municipal and Commercial Building Targeted Measure Retrofit Program (Volume 2, Technical Program Proposal and Cost Information)*, California Energy Commission, 2010, RFP #400-09-402.

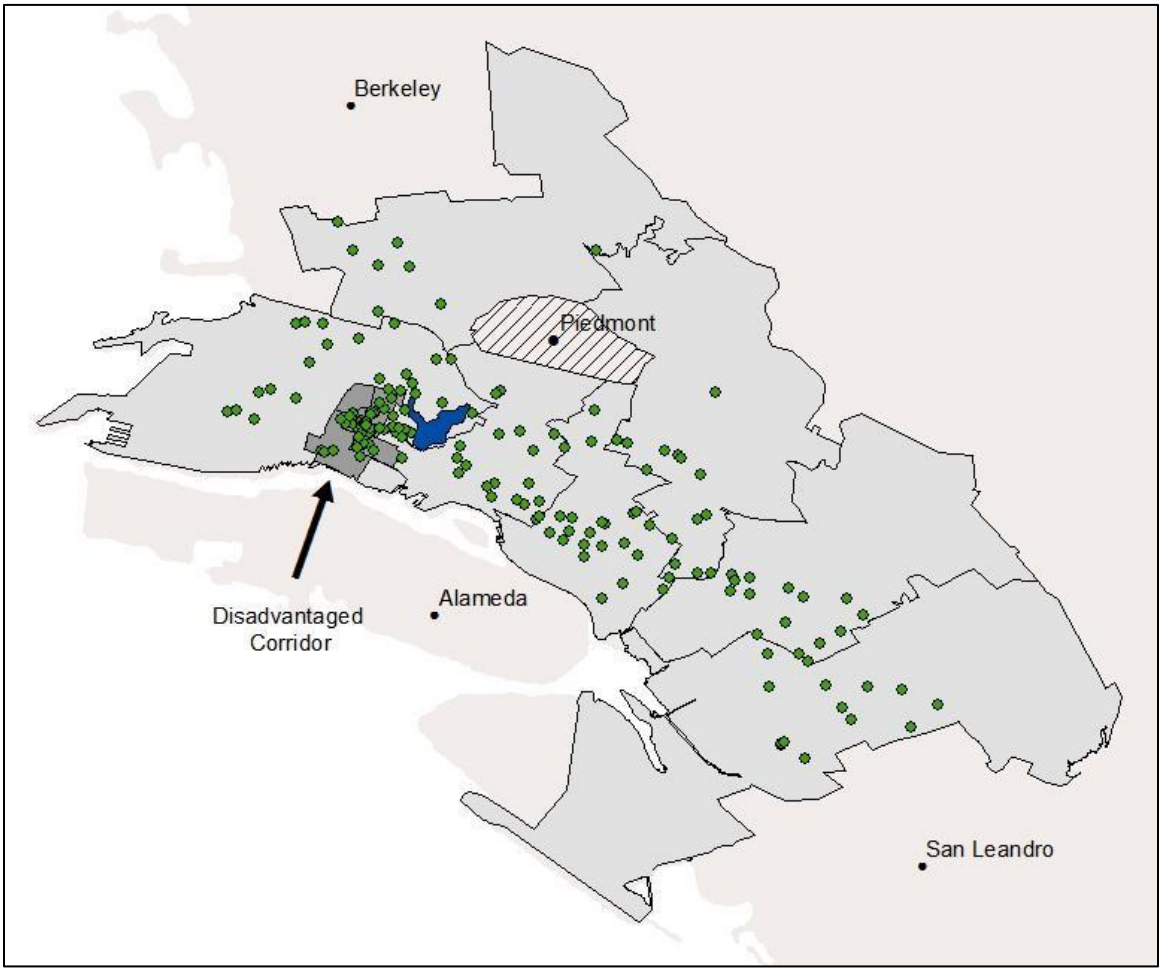
To achieve its marketing goals, QuEST produced brochures and posted signs at bus stops and Bay Area Rapid Transit (BART) stations. It also developed a comprehensive website to draw attention to the program. QuEST frequently updated the website to include the case studies as they were completed and to publicize other program accomplishments. To reach a broader audience, however, QuEST shifted away from relying as heavily on electronic social media toward increased door-to-door outreach.

The expanded marketing and outreach efforts did lead to more audits that, in turn, identified more opportunities for targeted EEMs. This led to more energy-efficient measures installed. As a result, participating businesses throughout Oakland are consuming less energy now than before the program, and their energy costs have decreased as well.

The increased installation activity that resulted from the program led to contract opportunities for small business energy-efficient companies and job opportunities for trained auditors and installers. To help fill these jobs, Oakland Shines implemented an intern program to train students already enrolled in community colleges as energy-efficiency building auditors and equipment installers. There is no indication, however, that OS collaborated directly with other ARRA-funded programs such as Clean Energy Workforce Training Program (CEWTP) as a source for staffing.

Figure 6 provides a map of the project sites in Oakland. The shaded area containing many of the completed project sites in the downtown corridor represents an economically challenged area of Oakland, according to Community and Economic Development Agency (CEDA).[16] Initially, the shaded area was to be the only region targeted, but the audits revealed that the lighting systems in these buildings were more efficient than had been previously thought. Moreover, the opportunities for retrofitting refrigeration case lighting were found to be significant outside the targeted region. Hence, the program was expanded to include all of Oakland.

Figure 6: OS Map of Energy Efficiency Measure Installations



Source: DNV KEMA Analysis

16 http://data.openoakland.org/en/group/geographic-boundaries

By design, the workforce development goals of the program were modest. It met its goal by establishing and staffing eight internships, as shown in Table 15.

Table 15: OS Workforce Development Achievements

Audience	Workforce Development	Goal	Achieved
Interns	QuEST Internship	2	2
	CESC's "Program Assistant Internship Program"	8	6
	Total	10	8
	Advanced to Greater Roles in Clean Energy Sector	-	6

Source: DNV KEMA Analysis

Table 16 summarizes the OS program budget[17] and expenditures.

Table 16: OS Budget

Activity	Budget	Actual	Variance
Administration	$157,732	$159,961	$2,229
Program Implementation	$255,936	$708,800	$452,864
Financing	$0	$0	$0
Rebates/Incentives	$3,304,394	$2,848,997	($455,397)
Marketing, Education, and Outreach	$636,203	$636,163	($40)
Workforce Development	$343,490	$343,477	($13)
QA/QC	$0	$0	$0
EM&V	$404,424	$404,464	$40
Total	$5,102,179	$5,101,862	($317)

Source: DNV KEMA Analysis

In 2014, the Energy Commission will release a comprehensive report to provide a cost-benefit analysis for the full suite of programs funded through the ARRA.

17 QuEST, *Final Report for Oakland Shines Program,* California Energy Commission, April 16, 2012, p. 22.

Program Comparisons

The MCR program chose implementers as subrecipients because each program filled gaps left in the market by California's IOUs. For example, the MCR subrecipients:

- Targeted markets that are considered "hard-to-reach" by traditional utility programs.
- Offered higher first-cost measures that yield higher savings.
- Provided a broad-based approach covering rebates, outreach, training, and workforce development.

Target Markets and Leveraged Funding

The market segments targeted by all three MCR subrecipients were diverse but have one common characteristic – lack of access to capital. Grocery stores are considered risky ventures due to thin profit margins, and restaurants are plagued with high mortality rates. State and local municipalities, while not necessarily considered risky in the long run, are subject to shifts in budget allocations that are beyond their control. Similarly, most nonprofits are subject to government budget allocations and the current interests, priorities, and capital of donors.

Since the first costs for some of the newer technologies promoted by MCR were high when compared to more established, but lower efficiency technologies, the MCR programs mitigated the high costs of these technologies using several mechanisms:

- The rebates paid by the programs represented a high percentage of total project cost. For example, OS paid up to 80 percent of project costs.
- MCR also leveraged existing rebate programs. ESJ and ETAP leveraged the programs run by all three IOUs and up to nine publicly owned utilities (POUs). OS leveraged PG&E's programs only because that program was geographically confined to Oakland. The leveraged IOU and POU rebate programs ranged from standard lighting programs to customized retrofit programs. OS also leveraged federal block grants administered at the local level. Table 17 lists leveraged funding.
- The programs also leveraged existing financing options. On-bill financing though PG&E was the most common, but low-interest loans through the Energy Commission were also available.

Table 17: MCR Summary of Target Markets and Leveraged Funding

Program Goal	Description	Program / Subrecipient		
		ESJ / PECI	ETAP / Energy Solutions	OS / QuEST
Targeted Market Segments	Focus on specific market segments	• Grocery/ Convenience Stores • Restaurants	• Municipalities • Universities • Nonprofits	• Commercial Buildings • Classroom Buildings • Small Grocery/Liquor Stores
	Focus on economically disadvantaged areas (for example, higher unemployment rates, high foreclosure rates and low-income levels)	• Not reached by traditional IOU rebate programs such as "Mom and Pop" stores (includes direct install element)	• Economically disadvantaged due to cyclical cash flow reductions	• Originally targeted older buildings in a 12 square block area of downtown Oakland (expanded to all of Oakland). Includes non-English speaking areas (Chinatown)
Leverage Existing Programs	Collaboration with existing ratepayer-funded energy efficiency programs. *=used ARRA funds	• PG&E • SCE • SDG&E • SMUD • Silicon Valley Power • Truckee-Donner • City of Palo Alto • Burbank Water and Power • Alameda Municipal Power • Roseville Electric* • Lodi Electric • Turlock Irrigation District	• PG&E • SCE • SCG • SDG&E • SMUD	• PG&E

Source: DNV KEMA Analysis

Technologies

In addition to targeting markets with similar "hard-to-reach" characteristics, the programs emphasized relatively advanced yet not overly complex technologies. For example, in addition to traditional CFL options, the programs overlapped by providing LED lighting technology at reach-in refrigerator cases, refrigeration controls, wireless controls for lighting and HVAC, and bilevel lighting at garages and parking lots. Table 18 summarizes the technologies targeted by the programs.

Table 18: MCR Target Measures by Subrecipient Program

Program Goal	Description	Program / Subrecipient		
		ESJ / PECI	ETAP / Energy Solutions	OS / QuEST
Targeted Measures	Focus on specific technologies with "low-risk, high-return" characteristics – readily available, best practice, broadly applicable technologies	• LED Luminaires for Refrigeration Cases • Occupancy Sensors for LED Luminaires • Refrigeration Controls • Beverage Cooler Controllers • CFLs for Refrigerated spaces • CFLs for Nonrefrigerated spaces	• Bilevel Lighting at Parking Facilities • Wireless HVAC Controls • Wireless Lighting Controls	• Bilevel Lighting at Parking Facilities • Wireless HVAC Controls • LED Luminaires for Refrigeration Cases • Other Lighting and Wireless Controls
Measure Savings Approach	Use deemed savings when possible	• Deemed savings for all measures	• Custom savings for all measures	• Deemed savings for LED Luminaires for Refrigeration Cases • Custom savings for all other measures

Source: DNV KEMA Analysis

Partnerships for Delivery and Workforce Development

Even though these programs targeted different market segments with multiple barriers, they were able to connect with these diverse market segments using similar tactics. All three partnered with established entities to build credibility quickly and to leverage these entities for project site leads. They provided program-specific training to build a qualified workforce and educated contractors on the technology benefits, along with proper installation and maintenance practices. Using a grass roots approach for marketing and outreach addressed and overcame this participation barrier. Table 19 summarizes these partners and their roles.

In the case of OS, and to a certain extent ESJ, their target markets included communities that do not use English as their first language. Language differences were a common barrier to participation for several market segments, but using a grass roots approach, including translators, for marketing and outreach addressed and overcame this participation barrier.

Table 19: MCR Subrecipient Marketing and Outreach Approaches

Program Goal	Description	Program / Subrecipient		
		ESJ / PECI	ETAP / Energy Solutions	OS / QuEST
Public & Private Partnerships	Benefits of public and/or private partnerships to meet goals of program including workforce development	• Forty-three contractor firms • Thirteen colleges • Four lighting manufacturers • AT&T	• Adura Technologies • Lutron • Cypress Envirosystems • Workforce Institute • Laney College	• East Bay Energy Watch (IOU-funded LGP) • City of Oakland Community and Economic Development Agency (CEDA) • Oakland's Business Improvement Districts • BOMA Oakland/East Bay • Oakland Green Jobs Corps • Oakland Chamber of Commerce • Pacific Gas & Electric
	Roles of partners to increase community/ industry involvement	• conduit to target market • identification of candidates for training • training curriculum	• conduit to target market	• conduit to target market • door-to-door campaigning • job training as building surveyor • contractor training
	In-kind services from program partners	• marketing and outreach	• marketing • feasibility reviews	• marketing and outreach
Workforce Development and Job Creation	Training activities for auditors, retrofit technicians, other professionals (individuals)	• New CCC Surveyor Training (132) • Advanced CCC Surveyor Training (54) • Contractor Training (160)	• Technology seminars (229) • Lighting trainings (40) • HVAC trainings (20) • Internships (4)	• Interns w/training (8)

Source: DNV KEMA Analysis

Market Transformation

The programs laid the foundation for ongoing change in these markets. Since these markets are typically capital-constrained, adoption of EEMs will drop dramatically with the end of financial assistance. The partnerships created and the awareness raised, however, will have a lasting effect in these segments and will potentially allow future programs targeting these segments to start up and ramp up more quickly. In addition, programs in other markets can apply similar strategies that use the tactical lessons learned. Table 20 lists a summary of these lessons.

Table 20: MCR Subrecipient Program Sustainability and Lessons Learned

Program Goal	Description	Program / Subrecipient		
		ESJ / PECI	ETAP / Energy Solutions	OS / QuEST
Sustainability & Lasting Change in Market	Create lasting change in market, with benefits that persist over time	• increased knowledge of EE • no immediate changes made to maintenance or use behavior	• increased knowledge of EE • made changes in maintenance behavior	• increased knowledge of EE • no immediate changes made in maintenance or use behavior
	Demonstrate tactics to incorporate into future comprehensive building retrofit programs	• continuous communication with contractors and manufacturers on program strategies	• develop and maintain partnerships • use marketing and educational materials for municipal and educational markets • provide technical assistance to state funded entities • continue to offer financial support to overcome first-cost barriers	• train contractors on customer service in addition to energy efficient technologies • continue to maintain or build relationships with community groups • do not emphasize electronic social media at the expense of approaches that generate direct contact between implementers and customers

Source: DNV KEMA Analysis

Conclusion

The three programs targeted diverse markets and segments but approached these markets in similar ways. Common tactics that proved effective to all three programs in achieving their goals included collaborating with established entities to gain credibility in their respective markets, offering technologies typically not highlighted in IOU programs, and training surveyors, installers, and potential leads on the proper installation and maintenance of these technologies.

Leveraging utility rebate programs proved especially useful in lowering first cost to customers or, in the case of larger institutions, reducing simple payback periods to below the level required by management to commit to project investment.

Logistically, the programs are scalable. ESJ and ETAP proved this by operating at the statewide level from the launch of the programs. OS was limited to an urban core by design, but other urban centers in California can replicate this approach.

For future efforts to be successful, on any scale, programs should maintain a proactive communications campaign with partners, manufacturers, and participating contractors. Marketing materials should emphasize case studies in language(s) common to the targeted market segments. Finally, outreach activities should focus on communication channels specific

to the target market. For most hard-to-reach populations, this means direct contact at the neighborhood level with less emphasis placed on websites or electronic social media, as was done by Oakland Shines when its representatives met with the local organization of building owners and campaigned door-to-door to all of the ground-level businesses in Oakland.

Overall, the approaches used by the MCR implementers were effective in recruiting participants and generating energy savings. Though these programs did not achieve their goal of creating self-sustaining markets, they did expand the awareness and knowledge of the technologies they promoted in their target markets. By reducing these knowledge and awareness barriers, future programs will be able to spend more program time and money installing EEMs than for generating interest in the program. As a result, MCR-type programs can continue to generate savings in hard-to-reach markets, provided they have the funding (rebates or financing) to reduce simple paybacks to levels acceptable to participants. In most cases, this means participants will recover their portion of the project cost in two years or less. For government agencies, on the other hand, acceptable payback periods can extend up to 10 years, depending on the agency.

CHAPTER 3:
MCR Subrecipient Program Evaluation Methodology

This chapter provides a general discussion of the evaluation elements that were used across the three subrecipient programs. Sample designs and research questions specific to each subrecipient program are provided at the beginnings of Chapters 4 through 6.

Energy Savings Determination

Gross Energy Savings Calculations

To verify the gross savings achieved by the each subrecipient program, the evaluation team used a stratified random sample design to yield a precision equal to or better than ± 10 percent at the 90 percent confidence interval around the gross energy savings of the program. The selected strata for each subrecipient program were based upon the distribution of the ex ante annual energy savings found in the tracking data provided by the subrecipients in October 2011. This approach allowed for sampling a larger percentage of the sites that fell within the uppermost strata—the one containing the project sites with the most savings—to produce a better representation of the energy savings of the overall program. From the population of project sites occurring within each stratum, DNV KEMA randomly selected the sample of project sites at which to conduct on-site visits.

Data collection fell into roughly five steps: data requests and review, site scheduling, site planning, site-specific measurement and verification (M&V) activities, and site-level report and calculation preparation.

- **Data requests and review:** The evaluation team requested project site contacts and relevant information for calculating energy savings, including detailed measure descriptions; savings calculation spreadsheets and related documentation; feasibility studies; and contractor, vendor, and equipment manufacturer information. The evaluation team reviewed this information to begin planning for the site-specific M&V data collection and analysis activities.
- **Site scheduling:** For each sampled project site, a scheduler contacted the site to initiate the site planning process, confirm project details, and schedule the site visit.
- **Site planning:** Following data review and assessment, the evaluation engineers developed data collection and analysis plans, including brief descriptions of the data requirements and analysis approaches to be used to determine both the preretrofit and postretrofit assumptions and conditions.
- **Site-specific M&V:** The evaluation team collected data to catalog preretrofit and postretrofit operations and conditions, including equipment nameplates, feasibility study reviews, postretrofit monitoring, and self-reported operational data.

- **Site-specific report:** The evaluation team prepared a report and accompanying spreadsheet documenting the findings and savings resulting from each visit to project sites in the sample during the M&V effort.

Site-Specific Analyses to Determine Energy Savings

For each measure installed at each project site within each subrecipient program sample, evaluators determined the effective useful life (EUL) of the preretrofit and postretrofit equipment, remaining useful life (RUL) of the preretrofit equipment, the annual electricity and natural gas savings, and the demand savings. Using these results, the evaluation team also calculated the gross life-cycle savings over the lifetime of the EEMs by summing the annual savings for each year of EUL.

Verified energy savings for each EEM retrofit in the sample were calculated relative to two established baselines, referred to as Baseline 1 and Baseline 2.

- Baseline 1 corresponds to the existing conditions found prior to the energy efficiency measure's implementation and considers the operating efficiency of the equipment along with the control strategies found at that time. Life-cycle savings for Baseline 1 assumes that the pre-existing equipment would have operated for the full EUL of the new equipment regardless if the existing equipment was at the end of its useful life. The Energy Commission requested the evaluation team to report these results to help ARRA subrecipients calculate payback periods from observed preretrofit and postretrofit energy use.
- Baseline 2 uses the pre-existing equipment as the measure baseline only until the end of the existing equipment's RUL. After that, an expected replacement baseline (for example, standard practice or code minimum) is used until the EUL is reached.

Net Energy Savings Calculations

Using the same sample that was selected for the on-site surveys, a survey of subrecipient program participants was conducted, in part, to estimate the extent to which the program was responsible for the realized savings. Specifically, the team asked participants what actions, if any, would have happened without the influence of the subrecipient program. Evaluators subtracted, from 100 percent, the claimed savings-weighted percentage of those participants that indicated that they would have performed the same or an equally efficient retrofit at the same time in the absence of the program. These participants are referred to as *free-riders*. Evaluators used this result as the net-to-gross (NTG) ratio and applied to the gross energy savings to determine the program's overall net savings.

Life-Cycle Savings Calculations

The evaluation team calculated the net-adjusted life-cycle savings by multiplying the net annual savings for each retrofitted measure by its EUL. For each subrecipient program, the EULs for each EEM are provided in Chapters 4 through 6.

Avoided Greenhouse Gas Emission Calculations

The evaluation team calculated the total greenhouse gas (GHG) emissions reduction that resulted from the program. The team used a calculation method that follows guidelines and emissions conversion factors provided by the Energy Commission. Because of California's efforts to reduce greenhouse gas emissions from the power generation industry and avoidance of coal generation, these factors are lower than nationwide factors. Thus, California must save more energy to achieve a similar level of GHG emissions reductions to those of other states. The method applied emissions conversion factors to annual net energy savings, based on energy source, to calculate the carbon dioxide (CO_2) emissions reduction mass in pounds, which were then converted to metric tons. The team used the following factors:

- Electricity conversion factor: 690 pounds CO_2/MWh
- Natural gas conversion factor: 11.69 pounds CO_2/therm
- Weight conversion: 2,204.6 pounds/metric ton

Participant Survey Approach

Evaluators designed the participant survey instrument, provided in Appendix D, to learn:

- Influences that led to participation.
- Participant satisfaction.
- Spillover investments in EEMs that resulted from subrecipient program participation.
- Behavioral changes that resulted from subrecipient program participation.
- Likelihood of future energy efficiency outcomes (such as participation in other programs or installation of EEMs external to the program) resulting from subrecipient program participation.

Many questions asked participants to rate program effects using a scale of one to five. To facilitate the questioning in a time-efficient manner, the interviewer provided a description of what one and five represented and asked respondents to provide their answers within this range. The computer-assisted telephone survey (CATI) was administered by a subcontractor, Discovery Research Group.

Many of the figures that show the CATI results display a bar chart to represent the proportions of answers given to each given CATI question. The 90 percent confidence interval for each response to each CATI question depends upon the following factors:

- The total number of responses gathered for the question at hand
- The types of response options offered to respondents
- The proportion of respondents, in percent, that provided a given answer as shown next to the bar in many of the figures throughout this report

- The number of respondents of which the question was asked, n, as shown at the bottom of each figure
- The total population of subrecipient program participants

Appendix E contains a table for each of the subrecipient programs to show the confidence intervals relative to the number of participants who provided a given response to a survey question.

The scope of this evaluation did not include a survey of nonparticipants. Hence, it is not possible to demonstrate the influence of the program by looking for significant differences in responses between participant and nonparticipant populations.

Market Actor Interview Approach

Each subrecipient program used different strategies for reaching participants and delivering EEMs. The evaluation team created an interview guide, and in-depth interviews were conducted with a sample of each market actor category for each subrecipient program. The research questions addressed by these interviews are provided in Chapters 4 through 6.

CHAPTER 4:
EnergySmart Jobs

In addition to using the general MCR evaluation design described in Chapter 3, on-site visit sample design, participant telephone survey sample design, and market actor interview research questions and sample design differed for each subrecipient program.

ESJ-Specific Evaluation Design Elements

ESJ On-Site Visit Sample Design

Using the approach described in Chapter 3, DNV KEMA stratified the population of ESJ participants listed in the interim tracking database provided by PECI as of October 31, 2011, by total annual electricity energy savings estimated per site. Table 21 illustrates the five strata chosen and the resulting distribution of annual electricity savings resulting from program participation.

Table 21: ESJ On-Site Sample Design Stratification for Interim Tracking Data

Stratum	Annual Ex Ante Electricity Savings Range in Stratum	Interim Tracking Data (10/31/2011)			Project Sites in Target Sample
		Project Sites in Population	Annual Ex Ante Electricity Savings (kWh)	Proportion	
1	Less than 5,000 kWh	2,259	4,212,223	15%	15
2	≥ 5,000 kWh and < 8,500 kWh	729	5,276,024	18%	15
3	≥ 8,500 kWh and < 12,000 kWh	540	5,676,393	20%	15
4	≥ 12,000 kWh and < 18,000 kWh	422	6,056,705	21%	15
5	≥ 18,000 kWh	185	7,705,837	27%	15
Total		4,135	28,927,182	101%	75

Source: DNV KEMA Analysis

Table 22 shows the distribution of savings for each measure category across the ESJ Program, both for the participant population and for the project sites contained in the primary sample. The evaluation team verified that visits to the 75 project sites in the primary sample would yield the gross verified savings for all the measure categories offered by the program. The evaluation team scheduled and conducted the on-site visits from the primary, to the extent possible, and, when necessary, the backup sample.

Table 22: ESJ On-Site Sample Design by Measure Category

Delivery Channel	Measure Category	Interim Population (10/31/2011)		Target Sample	
		Annual Ex Ante Electricity Savings (kWh)	Savings Proportion	Annual Ex Ante Electricity Savings (kWh)	Savings Proportion
Contractor Installed	LED Luminaires, Reach-in Refrigeration Cases	19,996,075	69%	803,241	68%
	Motion Sensors for LED Luminaires in Refrigeration Cases	2,188,597	7%	122,772	10%
	Controls for Refrigeration Equipment	2,242,034	8%	157,485	13%
Direct Install	Beverage Merchandise Cooler Controllers	1,624,674	6%	38,214	3%
	CFLs in Refrigerated Spaces	1,552,300	5%	27,209	2%
	CFLs in Nonrefrigerated Spaces	1,323,502	5%	27,365	2%
Totals		28,927,182	101%	1,176,286	98%

Source: DNV KEMA Analysis

ESJ Site-Specific Analyses to Determine Energy Savings

Calculating ex post energy savings involves determining the estimated baseline energy used by the preretrofit equipment and that used by the postretrofit equipment. For all measures except the refrigeration controls, savings reported in IOU workpapers were used for both the ex ante and ex post savings. For the refrigeration control retrofits, 2005 Database for Energy Efficient Resources (DEER) values were used, depending upon the grocery store building vintage and climate zone.

ESJ Participant Survey Sample Design

As had been done for the on-site sample design, evaluators stratified the population by claimed annual electricity savings per project site, as shown in Table 23. The team used the same target of 15 surveys per stratum, for a total of 75 surveys.

Table 23: ESJ Participant CATI Sample Design

Stratum	Annual Electricity Energy Ex Ante Savings Range (kWh)	Interim Tracking Data (10/31/2011)	
		Project Sites in Population	Target Sample
1	Less than 5,000 kWh	2,259	15
2	≥ 5,000 kWh and < 8,500 kWh	729	15
3	≥ 8,500 kWh and < 12,000 kWh	540	15
4	≥ 12,000 kWh and < 18,000 kWh	422	15
5	≥ 18,000 kWh	185	15
Totals		4,135	75

Source: DNV KEMA Analysis

ESJ Market Actor Interview Approach and Sample Design

The purpose of this task is to assess the effect of the ESJ program on the grocery/convenience store and restaurant markets. To fully understand the goals and intent of the ESJ program, the market assessment team reviewed PECI's final implementation plan,[18] program theory, and logic model documents[19] and interviewed the ESJ program manager. Then, to assess how the program may have affected or transformed the market, the team formulated research questions for in-depth interviews with partner manufacturers and contractors. The evaluation team synthesized results of the gathered data to produce results presented in this report.

The team used the logic model to frame the approach to assessing the program impact on the market and guide development of the research questions. The program logic dictates several expected outputs resulting from program activities, including workforce training, partner relations, marketing, outreach, lead development, opportunity assessment, and measure installation. These outputs are driven by program goals, the overall program theory, and the logic in conducting activities to achieve specific program goals.

The logic model identified eight short-term – less than a year – outcomes and two intermediate-term – one to two year – outcomes as follows:

- Short-Term Outcomes
  - Increased skills and knowledge
  - Job creation
  - Reduced equipment cost
  - Increased awareness of EE programs and technology

18 PECI, *EnergySmart Jobs Implementation Plan (Version 1.2)*, California Energy Commission, 2010.

19 PECI, *Logic Model for Energy Smart Jobs 2010-2012 (Version 2)*, California Energy Commission, 2010.

    - Increased participation in programs
    - Increased awareness of site opportunities
    - EEMs installed to yield verifiable energy savings
    - Positive participant experience
- Intermediate-Term Outcomes:
    - Increased demand for EEMs
    - Increased business for contractors

To ascertain the effects of ESJ on the California grocery/convenience store and restaurant markets and LED lighting markets, Global Energy Partners (GEP), a subcontractor to DNV KEMA, designed an plan to interview a representative subset of market actors associated with ESJ, including four manufacturers; a cross-section of contractors to represent high-volume, mid-volume, and low-volume rebates; and a random sample of CCC surveyors. Evaluators used results from the interviews to draw conclusions about the program's effectiveness at achieving short- and intermediate-term market transformation goals and overcoming barriers to adoption. Table 24 shows the sample plan for the market actor interviews.

Table 24: ESJ Market Actor Interview Sample Plan

Market Actor	Number in Population	Number in Sample	Interview Target	Comments
Manufacturers	4 participating lighting manufacturers 8 manufacturers and distributors who provide equipment to contractors	12	4	2 participating lighting manufacturers. 2 for manufacturer/distributor contacts who provided equipment only.
Contractors	32 with processed rebates	16	8	3—5 interviews with top 7 in terms of rebate volume (91% of rebates); 1—2 mid volume, 2—3 low volume. The 8 interviews will include at least 2 for each type of measure installed (LED case lighting, motion sensors, refrigeration controls).
CCC Surveyors	132	20	8—12	Random sample
Total	176	48	20—24	

Source: DNV KEMA Analysis

ESJ Evaluation Results

This section presents overall evaluation results for the Energy Smart Jobs program, including presentation and discussions of the final sample's disposition; verified savings; realization rates; precision estimates; and the program's overall gross energy savings results, including

measure-type summaries. Next, the authors report participant survey results gathered using CATI technology. Finally, authors provide market actor interview findings to discuss the program's effects.

ESJ Final Dispositions

ESJ On-Site Visit Final Sample

As indicated in the previous section, the evaluation team set out to verify the gross savings achieved by ESJ targeted retrofits by using a stratified random sample design to yield a precision equal to or better than ± 10 percent at the 90 percent confidence interval. The team developed a design based upon the results of the program population provided in the tracking data provided by PECI for project sites completed as of October 31, 2011. DNV KEMA stratified the population by total annual electricity energy savings claimed per project site. Table 25 illustrates the five strata chosen during the sample design and the resulting distribution of annual electricity savings resulting from program participation for the final ESJ population in PECI's tracking database.

Table 25: ESJ Final On-Site Disposition by Savings Stratum

Stratum	Ranges of Strata by Annual Ex Ante Electricity Savings (kWh)	Final ESJ Tracking Data			
		Project Sites in Population	Annual Ex Ante Electricity Savings (kWh)	Proportion of Savings	Project Sites in Sample
1	Less than 5,000 kWh	3,936	6,876,535	11%	15
2	≥ 5,000 kWh and < 8,500 kWh	1,132	8,169,234	13%	15
3	≥ 8,500 kWh and < 12,000 kWh	822	8,463,509	13%	15
4	≥ 12,000 kWh and < 18,000 kWh	698	9,882,759	16%	15
5	≥ 18,000 kWh	520	30,238,887	48%	15
Total		7,108	63,630,924	101%	75

Source: DNV KEMA Analysis

Table 26 shows the distribution of savings by measure categories across the ESJ program, both for the population and for the sites contained in the primary sample. On-site visits to the 75 project sites in the primary and backup sample yielded gross verified savings results for 234 installations of the program EEMs. Global Energy Partners (GEP), a subcontractor to DNV KEMA, scheduled and conducted the on-site visits from the primary and backup sample.

Table 26: ESJ Final On-Site Disposition by Measure Category

Delivery Channel	Measure Category	Final Population		Final Sample	
		Annual Ex Ante Electricity Savings (kWh)	Proportion of Savings	Annual Ex Ante Electricity Savings (kWh)	Proportion of Savings
Contractor Installed	LED Luminaires, Reach-in Refrigeration Cases	39,514,012	62%	804,198	69%
	Motion Sensors for LED Luminaires in Refrigeration Cases	3,536,086	6%	123,708	11%
	Controls for Refrigeration Equipment	12,186,215	19%	157,485	13%
Direct Installed	Beverage Merchandise Cooler Controllers	2,634,450	4%	31,266	3%
	CFLs in Refrigerated Spaces	2,467,321	4%	28,405	2%
	CFLs in Nonrefrigerated Spaces	3,292,840	5%	26,652	2%
Total		63,630,924	100%	1,171,714	100%

Source: DNV KEMA Analysis

ESJ Participant Survey Final Sample

The same sample design was used for the participant Computer Assisted Telephone Interview (CATI) survey as had been used for the impact study design – a randomized sample within each of five strata for a target of 75. Despite a protracted effort on the part of the CATI subcontractor, the final number of completed participant interviews was 43. The team conducted CATIs between late February and mid-June 2012. The CATI subcontractor struggled to reach participants, and it became necessary to increase the original number of attempts per participant from 10 to 20. The targeted number of surveys, however, still proved to be out of reach, and only 43 surveys could be completed. The reasons provided by the CATI subcontractor for not being able to complete more surveys include refusals to participate, hang-ups midway through survey, telephone numbers no longer in service, and language barriers. Furthermore, due to challenges reaching the site contacts at the same projects that were in the final on-site sample, a fraction of the participant survey respondents differed from those 75 project sites that received an on-site visit. Table 27 shows the final disposition of the telephone surveys of ESJ participants.

Table 27: ESJ Final Participant CATI Disposition

Reported CATI Disposition	Response, n
Target	75
Completed Interviews	43
Number of Dialings	2,787
Number of Contacts	1,765
Average Length (minutes)	17.35

Source: DNV KEMA Analysis

To quantify the uncertainty around each CATI response, Appendix E provides a table of confidence intervals for ESJ where the total number of respondents to a question equals 43. The widest confidence intervals occur when exactly 50 percent of respondents provide a given answer. For those instances where either 49 percent or 51 percent of the ESJ participants (n=21 or 22, respectively) provided a given response, the confidence interval around the proportion is ± 12 percent. As the proportion of participants that provided a given response shifts away from 50 percent, in either direction, the confidence interval around that proportion gradually approaches 0 percent. For those instances where either 2 percent or 98 percent of the ESJ participants (n=1 or 42, respectively) provided a given response, the confidence interval around the proportion is ± 4 percent.

ESJ Market Actor Interview Final Sample

To ascertain the effects of ESJ on the California grocery/convenience store and restaurant market and LED lighting markets, evaluators spoke with a representative subset of market actor groups including:

- Three manufacturers involved in the program.
- A cross-section of contractors that represent high-volume, mid-volume, and low-volume rebates, as well as the three main measures installed through the program (for example, LED case lighting, motion sensors, and controllers).
- A random sample of CCC surveyors.

The team used results from the interviews to draw conclusions about the program's effectiveness at achieving short- and intermediate-term market transformation goals and overcoming barriers to adoption. Table 28 shows the final disposition of the market actor interviews.

Table 28: ESJ Final Market Actor Interview Disposition

Market Actor	Interview Target	Interviews Completed
Lighting Manufacturers	2 Partnering 2 Product Only	3 Partnering 0 Product Only
Contractors (with processed rebates)	8	8
CCC surveyors	4—6 On CCC Roster 4—6 No longer on Roster	6 On roster 3 No longer on Roster
Total	20—24	20

Source: DNV KEMA Analysis

ESJ Gross Energy Savings

To determine the program savings, as a whole, the verified ex post savings were determined for a sample of project sites by performing on-site visits and engineering analyses.

ESJ Verified Energy Savings

As a result of the on-site visits made to the 75 participants in the sample, GEP and DNV KEMA determined the gross annual electricity savings in the sample to be as shown in Table 29, for each stratum, and as shown in Table 30, for each measure category.

Table 29: ESJ Verified Annual Electricity Savings in On-Site Sample by Savings Stratum

Stratum	Range of Stratum	Project Sites in Sample	Annual Ex Ante Electricity Savings (kWh)	Baseline 1		Baseline 2	
				Annual Ex Post Electricity Savings (kWh)	Realization Rate	Annual Ex Post Electricity Savings (kWh)	Realization Rate
1	Less than 5,000 kWh	15	27,784	26,721	96%	26,721	96%
2	≥ 5,000 kWh and < 8,500 kWh	15	108,008	93,816	87%	68,141	63%
3	≥ 8,500 kWh and < 12,000 kWh	15	148,796	147,245	99%	111,912	75%
4	≥ 12,000 kWh and < 18,000 kWh	15	213,436	194,111	91%	138,476	65%
5	≥ 18,000 kWh	15	673,690	647,444	96%	561,030	83%
Overall		75	1,171,714	1,109,337	95%	906,280	77%

Source: DNV KEMA Analysis

Table 30: ESJ Verified Annual Electricity Savings in On-Site Sample by Measure Category

Measure Category	Annual Ex Ante Electricity Savings (kWh)	Baseline 1		Baseline 2	
		Annual Ex Post Electricity Savings (kWh)	Realization Rate	Annual Ex Post Electricity Savings (kWh)	Realization Rate
LED Luminaires, Reach-in Refrigeration Cases	804,198	783,340	97%	580,283	72%
Motion Sensors for LED Luminaires in Refrigeration Cases	123,708	107,419	87%	107,419	87%
Controls for Refrigeration Equipment	157,485	157,485	100%	157,485	100%
Beverage Merchandise Cooler Controllers	31,266	26,634	85%	26,634	85%
CFLs in Refrigerated Spaces	28,405	18,837	66%	18,837	66%
CFLs in Nonrefrigerated Spaces	26,652	15,622	59%	15,622	59%
Overall	1,171,714	1,109,337	95%	906,280	77%

Source: DNV KEMA Analysis

Below, the same pair of tables shows the demand savings in the sample for each stratum, in Table 31, and for each measure category, in Table 32.

Table 31: ESJ Verified Demand Savings in On-Site Sample by Savings Stratum

Stratum	Range of Stratum	Project Sites in Sample	Ex Ante Demand Savings (kW)	Baseline 1		Baseline 2	
				Ex Post Demand Savings (kW)	Realization Rate	Ex Post Demand Savings (kW)	Realization Rate
1	Less than 5,000 kWh	15	3	3	98%	3	98%
2	≥ 5,000 kWh and < 8,500 kWh	15	12	11	90%	9	69%
3	≥ 8,500 kWh and < 12,000 kWh	15	17	17	102%	14	83%
4	≥ 12,000 kWh and < 18,000 kWh	15	26	23	91%	17	70%
5	≥ 18,000 kWh	15	63	61	97%	52	82%
Overall		75	121	115	95%	95	79%

Source: DNV KEMA Analysis

Table 32: ESJ Verified Demand Savings in On-Site Sample by Measure Category

Measure Category	Ex Ante Demand Savings (kW)	Baseline 1		Baseline 2	
		Ex Post Demand Savings (kW)	Realization Rate	Ex Post Demand Savings (kW)	Realization Rate
LED Luminaires, Reach-in Refrigeration Cases	101	100	99%	80	79%
Controls for Refrigeration Equipment	8	8	100%	8	100%
CFLs in Refrigerated Spaces	8	5	66%	5	66%
CFLs in Nonrefrigerated Spaces	4	2	63%	2	63%
Overall	121	115	95%	95	79%

Source: DNV KEMA Analysis

Next, the same pair of tables show the natural gas savings in the sample for each stratum, in Table 33, and for each measure category, in Table 34.

Table 33: ESJ Verified Annual Natural Gas Savings in On-Site Sample by Savings Stratum

Stratum	Range of Stratum	Project Sites in Sample	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1		Baseline 2	
				Annual Ex Post Natural Gas Savings (therms)	Realization Rate	Annual Ex Post Natural Gas Savings (therms)	Realization Rate
1	Less than 5,000 kWh	15	(110)	(169)	154%	(169)	154%
2	≥ 5,000 kWh and < 8,500 kWh	15	(92)	(76)	83%	(76)	83%
3	≥ 8,500 kWh and < 12,000 kWh	15	(81)	(68)	83%	(68)	83%
4	≥ 12,000 kWh and < 18,000 kWh	15	(413)	(262)	64%	(262)	64%
5	≥ 18,000 kWh	15	(21)	22	(108%)	22	(108%)
Overall		75	(717)	(553)	77%	(553)	77%

Source: DNV KEMA Analysis

Table 34: ESJ Verified Annual Natural Gas Savings in On-Site Sample by Measure Category

Measure Category	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1		Baseline 2	
		Annual Ex Post Natural Gas Savings (therms)	Realization Rate	Annual Ex Post Natural Gas Savings (therms)	Realization Rate
Controls for Refrigeration Equipment	31	31	100%	31	100%
CFLs in Nonrefrigerated Spaces[20]	(748)	(584)	78%	(584)	78%
Overall	(717)	(553)	77%	(553)	77%

Source: DNV KEMA Analysis

20 According to the "Database for Energy Efficient Resources," California Public Utility Commission, 2008, negative natural gas savings often result when lighting efficiency upgrades occur within conditioned spaces. For instance, when incandescent lamps are replaced with CFLs, the space heating system must generate additional heat to compensate for the heat no longer produced by the operation of incandescent lamps. If the heating system is fueled by natural gas, then negative natural gas "savings" result.

Differences in Ex Ante and Verified Ex Post ESJ Energy Savings

Most of the differences between the ex post and ex ante savings were due to participants that had removed some of the retrofitted measures. Evaluators noticed this most often for direct-install measures: 41 percent of CFLs in nonrefrigerated spaces had been removed, 34 percent of CFLs in refrigerated spaces had been removed, and 15 percent of beverage merchandise cooler controllers had been removed. Among the contractor-installed measures, minor discrepancies between the linear footage of the reach-in case lighting observed on-site and that reported in the tracking database accounted for the slight differences between the ex ante and the ex post savings. In a few instances, the motion sensors for the reach-in case lighting had been disabled.

Gross Energy Savings for ESJ Program

The evaluation team extrapolated the verified savings for the project sites in the final sample to represent the gross, program-level savings for each stratum, yielding an overall Baseline 1 realization rate of 93 percent for annual electricity savings, as shown in Table 35. The gross savings for hourly demand and annual natural gas are shown in Table 36 and Table 37, respectively.

Table 35: ESJ Results – Program Gross Annual Electricity Savings

Measure Category	Annual Ex Ante Electricity Savings (kWh)[1]	Baseline 1		Baseline 2	
		Annual Gross Ex Post Electricity Savings (kWh)	Realization Rate	Annual Gross Ex Post Electricity Savings (kWh)	Realization Rate
LED Luminaires, Reach-in Refrigeration Cases	39,514,012	38,717,662	98%	29,489,672	75%
Motion Sensors for LED Luminaires in Refrigeration Cases	3,536,086	3,062,320	87%	3,062,320	87%
Controls for Refrigeration Equipment	12,186,215	12,186,137	100%	12,186,137	100%
Beverage Merchandise Cooler Controllers	2,634,450	2,244,675	85%	2,244,675	85%
CFLs in Refrigerated Spaces	2,467,321	1,273,920	52%	1,273,920	52%
CFLs in Nonrefrigerated Spaces	3,292,840	1,464,611	44%	1,464,611	44%
Overall	63,630,924	58,949,325	93%	49,721,335	78%

Source: DNV KEMA Analysis

Table 36: ESJ Results – Program Gross Demand Savings

Measure Category	Ex Ante Demand Savings (kW)	Baseline 1		Baseline 2	
		Gross Ex Post Demand Savings (kW)	Realization Rate	Gross Ex Post Demand Savings (kW)	Realization Rate
LED Luminaires, Reach-in Refrigeration Cases	5,040	4,978	99%	4,027	80%
Controls for Refrigeration Equipment	726	726	100%	726	100%
CFLs in Refrigerated Spaces	702	362	52%	362	52%
CFLs in Nonrefrigerated Spaces	468	224	48%	224	48%
Overall	6,936	6,290	91%	5,339	77%

Source: DNV KEMA Analysis

Table 37: ESJ Results – Program Gross Annual Natural Gas Savings

Measure Category	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1		Baseline 2	
		Annual Gross Ex Post Natural Gas Savings (therms)	Realization Rate	Annual Gross Ex Post Natural Gas Savings (therms)	Realization Rate
Controls for Refrigeration Equipment	2,312	2,312	100%	2,312	100%
CFLs in Refrigerated Spaces	(41)	0	0%	0	0%
CFLs in Nonrefrigerated Spaces	(97,194)	(59,083)	61%	(59,083)	61%[a]
Overall	(94,923)	(56,771)	60%	(56,771)	60%

[a] While negative savings for given measures lower the overall realization rate, the measure-specific realization rate is typically reported as a positive ratio.

Source: DNV KEMA Analysis

The natural gas savings were not significant as these were not the focus of the program. For nonrefrigerated CFLs, the savings were negative because CFLs produce less heat than incandescent lamps and, hence, increase the natural gas required to heat the occupied spaces. Hence, the overall realization rates for the natural gas do not provide a useful representation of the program, and it is more useful to look at the realization rates for individual measure categories. For CFLs installed in nonrefrigerated spaces, engineers found that a high percentage of them had been removed from service as of the site visits.

As discussed previously, ex post energy savings were estimated relative to two established baselines—the existing conditions found prior to energy efficiency measure implementation (Baseline 1), and either minimally code-compliant conditions or standard practice when no code is applicable (Baseline 2). Baseline 2 uses the pre-existing equipment as the measure baseline only until the end of the RUL of the existing equipment. For many sites, the ex ante savings estimates were nearly equal to the Baseline 1 ex post savings estimates. However, the implementer rarely took the RUL of existing equipment into account in calculating ex ante savings.

Evaluators discussed the RUL conditions of existing conditions with the facility and/or contract engineers. When these contacts could not provide estimates but agreed that the existing equipment was on the verge of failure, the evaluator assigned a default RUL of one year and calculated the remainder of the lifetime savings against standard practice or minimally code-compliant conditions. For this reason, Baseline 2 ex post savings would likely always be consistently lower than Baseline 1 ex post savings.

Precision of ESJ Program Savings

As mentioned in the description of the evaluation approach, DNV KEMA used model-based statistical sampling methods to select the sample with the goal of achieving relative precision of the overall program ex post savings estimates within ± 10 percent at the 90 percent confidence level (90/10 precision). The team stratified the ESJ population and selected the sample based on ex ante annual electricity savings, as provided in the interim tracking data. Table 38 shows the gross energy savings, confidence intervals, relative precision, and standard error for the program. The evaluation team calculated the gross savings that the realization rates achieved by the measure in the sample. The team calculated the relative precision by dividing the confidence interval proportion by the realization rate. Hence, where the realization rate is near to 100 percent, the confidence interval and relative precision are nearly equal.

Table 38: ESJ Results – Precision of Gross Savings

Results and Precision Metrics	Baseline 1				Baseline 2			
	Annual Ex Post Electricity Savings (GWh)	Ex Post Demand Savings (MW)	Annual Ex Post Natural Gas Savings (therms)	Annual Ex Post Source Energy Savings (MMBtu)	Annual Ex Post Electricity Savings (GWh)	Ex Post Demand Savings (MW)	Annual Ex Post Natural Gas Savings (therms)	Annual Ex Post Source Energy Savings (MMBtu)
ESJ Gross Savings	58.9	6.3	(56,771)	597.9	49.7	5.3	(56,771)	503.4
90% Confidence Interval Savings	± 3.9	± 0.2	±(10,058)	± 17.6	± 3.3	± 0.4	±(10,058)	± 33.2
90% Confidence Interval Proportion, ± percent	7%	3%	18%	3%	7%	7%	18%	7%
Relative Precision, percent	7%	3%	30%	3%	8%	9%	30%	8%
Standard Error, percent	4%	2%	11%	2%	4%	4%	8%	4%

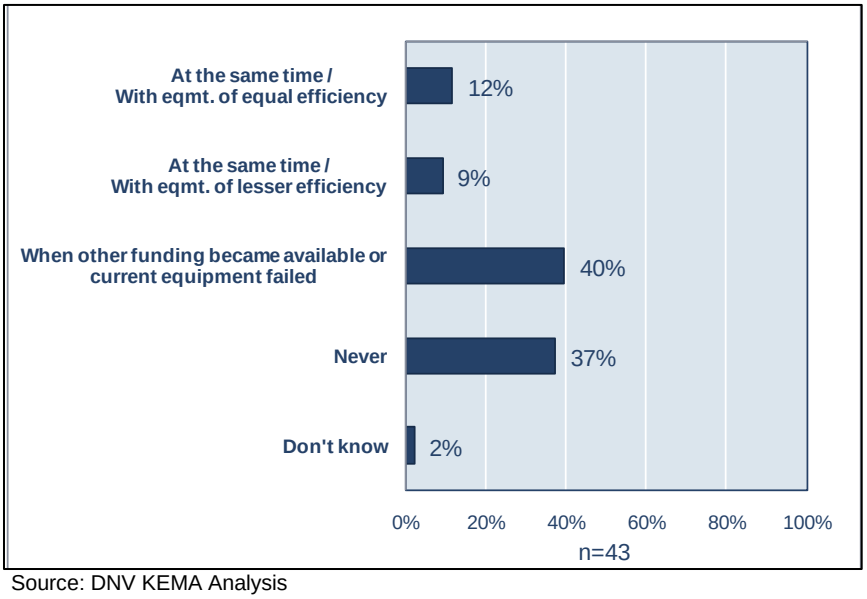
Source: DNV KEMA Analysis

ESJ Net Energy Savings Results

The purpose of ESJ was to provide grocery/convenience stores and restaurants with financial assistance to implement emerging energy efficiency technologies. The evaluation team designed the CATI survey instrument to learn more about the program's influence on implemented projects and to enable estimating a net-to-gross (NTG) ratio for ESJ.

Participants were asked whether the project, without ESJ, would have proceeded and, if so, whether the timing of the project might have differed. Of those surveyed, 77 percent indicated that their projects would not have proceeded until finding another funding source or until current equipment failed. Another 9 percent of respondents noted that had their projects proceeded, they would have installed less efficient measures than those installed through the program. As shown in Figure 7, 12 percent of respondents indicated that they would have installed the same EEMs at the same type without the assistance of ESJ.

Figure 7: ESJ Influence on Project Timing and Efficiency Outcome



Source: DNV KEMA Analysis

Using this result and weighing the responses relative to their contribution to the savings in the sample, evaluators concluded that nearly 98 percent, ± 11 percent, of the energy savings from ESJ are attributable to the program. That is, evaluators calculated free ridership as 2.3 percent and the net-to-gross ratio as 0.978. Using an NTG of 0.978, the net savings are presented in Table 39 through Table 41.

Table 39: ESJ Results – Net Annual Electricity Savings

Measure Category	Ex Ante Annual Electricity Savings (kWh)	Baseline 1	Baseline 2
		Annual Net-Adjusted Ex Post Electricity Savings (kWh)	Annual Net-Adjusted Ex Post Electricity Savings (kWh)
LED Luminaires, Reach-in Refrigeration Cases	39,514,012	37,865,873	28,840,900
Motion Sensors for LED Luminaires in Refrigeration Cases	3,536,086	2,994,949	2,994,949
Controls for Refrigeration Equipment	12,186,215	11,918,042	11,918,042
Beverage Merchandise Cooler Controllers	2,634,450	2,195,292	2,195,292
CFLs in Refrigerated Spaces	2,467,321	1,245,894	1,245,894
CFLs in Nonrefrigerated Spaces	3,292,840	1,432,390	1,432,390
Overall	63,630,924	57,652,440	48,627,467

Source: DNV KEMA Analysis

Table 40: ESJ Results – Net Demand Savings

Measure Category	Ex Ante Demand Savings (kW)	Baseline 1	Baseline 2
		Net-Adjusted Ex Post Demand Savings (kW)	Net-Adjusted Ex Post Demand Savings (kW)
LED Luminaires, Reach-in Refrigeration Cases	5,040	4,869	3,939
Controls for Refrigeration Equipment	726	710	710
CFLs in Refrigerated Spaces	702	354	354
CFLs in Nonrefrigerated Spaces	468	219	219
Overall	6,936	6,152	5,222

Source: DNV KEMA Analysis

Table 41: ESJ Results – Net Annual Natural Gas Savings

Measure Category	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1	Baseline 2
		Annual Net-Adjusted Ex Post Natural Gas Savings (therms)	Annual Net-Adjusted Ex Post Natural Gas Savings (therms)
Controls for Refrigeration Equipment	2,312	2,261	2,261
CFLs in Refrigerated Spaced	(41)	0	0
CFLs in Nonrefrigerated Spaces	(97,194)	(57,783)	(57,783)
Overall	(94,923)	(55,522)	(55,522)

Source: DNV KEMA Analysis

ESJ Life-Cycle Energy Savings Results

The evaluation team calculated life-cycle savings over the lifetimes of each EEM. Evaluators assigned each measure an EUL that was determined using the referenced sources as indicated in Table 42. Evaluators summed savings for each year of EUL over the entire span of the life of the measure to determine its life-cycle savings. For the measures retrofitted through this program, the EULs ranges from 2.6 years for CFLs to 16 years for refrigeration controls. ESJ yielded 488,061,832 kWh and -112,901 therms of life-cycle savings using Baseline 1 and 433,911,989 kWh and -112,901 therms using Baseline 2.

Table 42: ESJ Results – Life-Cycle Electricity and Natural Gas Savings

Measure Category	EUL (years)	Life-Cycle Net-Adjusted Ex Post Electricity Savings (kWh)		Life-Cycle Net-Adjusted Ex Post Natural Gas Savings (therms)	
		Baseline 1	Baseline 2	Baseline 1	Baseline 2
LED Luminaires, Reach-in Refrigeration Cases	6 [21]	227,195,240	173,045,397	0	0
Motion Sensors for LED Luminaires in Refrigeration Cases	8 [25]	23,959,589	23,959,589	0	0
Controls for Refrigeration Equipment	16 [22]	190,688,674	190,688,674	36,179	36,179
Beverage Merchandise Cooler Controllers	15 [23]	32,929,384	32,929,384	0	0
CFLs in Refrigerated Spaces	7.7 [24]	9,593,380	9,593,380	0	0
CFLs in Nonrefrigerated Spaces	2.6 [25]	3,695,565	3,695,565	(149,080)	(149,080)
Overall		488,061,832	433,911,989	(112,901)	(112,901)

Source: DNV KEMA Analysis

ESJ Avoided Greenhouse Gas Emissions

Based upon the annual net energy savings for electricity and natural gas, evaluators determined that the net annual avoided GHG emissions totaled 17,749 metric tons of CO_2 per year and 152,156 metric tons of CO_2 for the net life cycle for Baseline 1, as shown in Table 43.

21 PECI, *Reach-in Case Lighting, Linear Fluorescent to Light-Emitting Diode with and without Motion Sensor (Revision 3)*, 2010.

22 "Database for Energy Efficient Resources," California Public Utility Commission, 2005.

23 PECI, *Refrigeration – Beverage Merchandiser Controller (Revision 2)*, 2010.

24 PECI, *Walk in Lighting – 100W Incandescent to 27W CFL*, 2010.

25 PECI, *CFL, 23W Lamp, Integral or Modular, Tube or Spiral or Flood (Revision 1)*, 2010.

Table 43: ESJ Results – Annual and Life-Cycle Avoided Greenhouse Gas Emissions

ESJ Measure Category	Annual Net-Adjusted Avoided GHG Emissions (metric tons)		Life-Cycle Net-Adjusted Avoided GHG Emissions (metric tons)	
	Baseline 1	Baseline 2	Baseline 1	Baseline 2
LED Luminaires, Reach-in Refrigeration Cases	11,851	9,027	71,108	54,160
Motion Sensors for LED Luminaires in Refrigeration Cases	937	937	7,499	7,499
Controls for Refrigeration Equipment	3,742	3,742	59,874	59,874
Beverage Merchandise Cooler Controllers	687	687	10,306	10,306
CFLs in Refrigerated Spaces	390	390	3,003	3,003
CFLs in Nonrefrigerated Spaces	142	142	366	366
Overall	17,749	14,925	152,156	135,208

Source: DNV KEMA Analysis

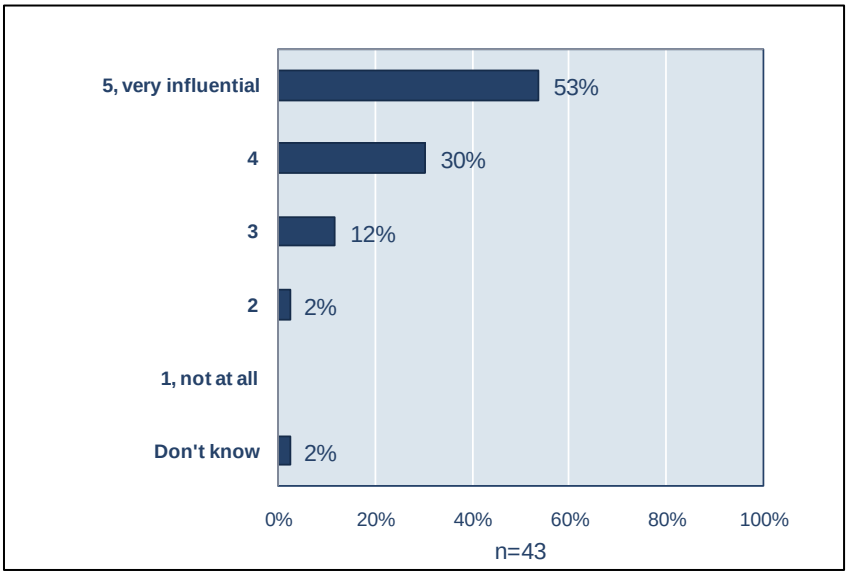
ESJ Program Role and Influence

The purpose of the ESJ program was to provide financial assistance to implement energy efficiency retrofits in grocery/convenience stores and restaurants. Evaluators designed the CATI survey instrument to learn more about the influence of the program on the retrofit projects.

ESJ Program Role on Project Implementation

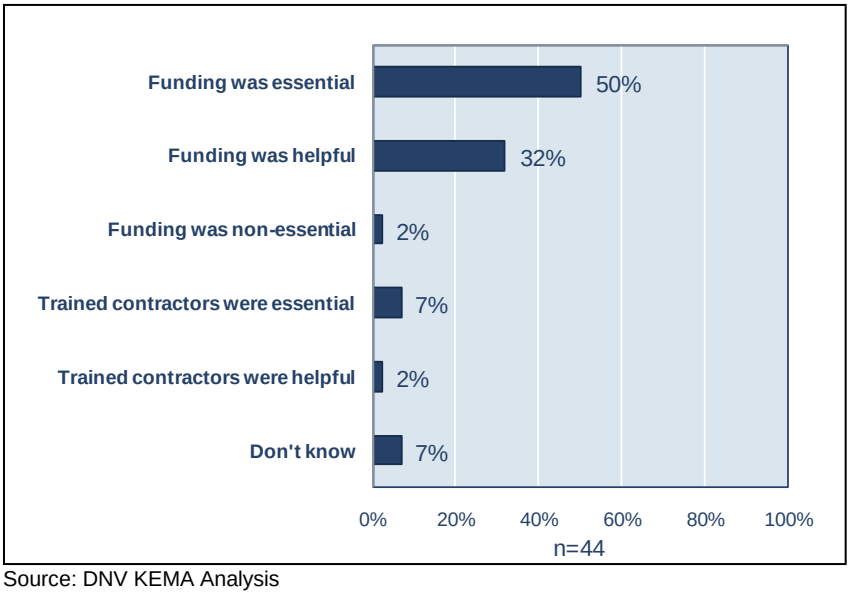
Participants were asked to indicate, using a scale of 1 to 5, the influence of ESJ on the project. In general, participants found that the program had been influential to the completion of the project, with 83 percent reporting a 4 or 5, as shown in Figure 8. Figure 9 shows that, when asked to describe the ways in which the program was helpful to the project, 50 percent reported that the funding provided by the program was essential.

Figure 8: Influence of ESJ Program on Project Implementation



Source: DNV KEMA Analysis

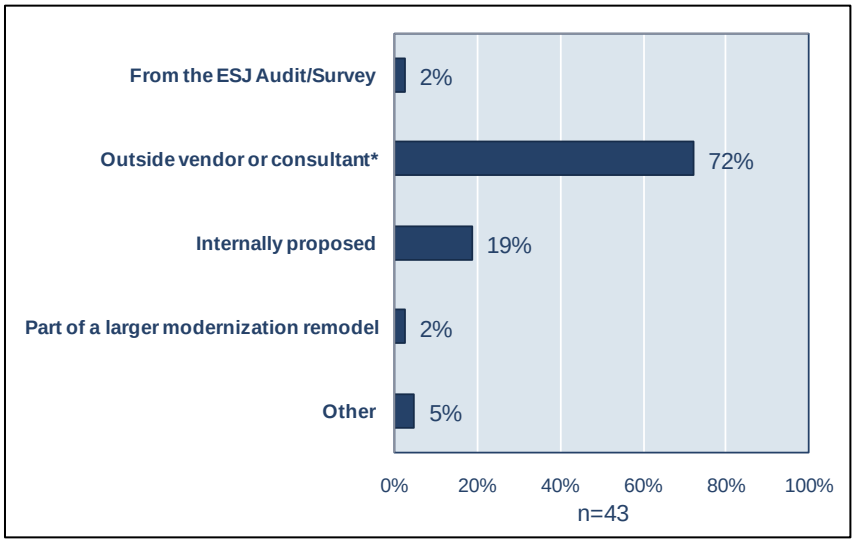
Figure 9: Reported Ways in Which ESJ Program Facilitated Project Completion



Source: DNV KEMA Analysis

When asked where the idea for the project originated, 74 percent indicated that it had either originated from the ESJ audit or through any of the other possible ESJ channels, as shown in Figure 10.

Figure 10: Project Idea Origination for ESJ Participants



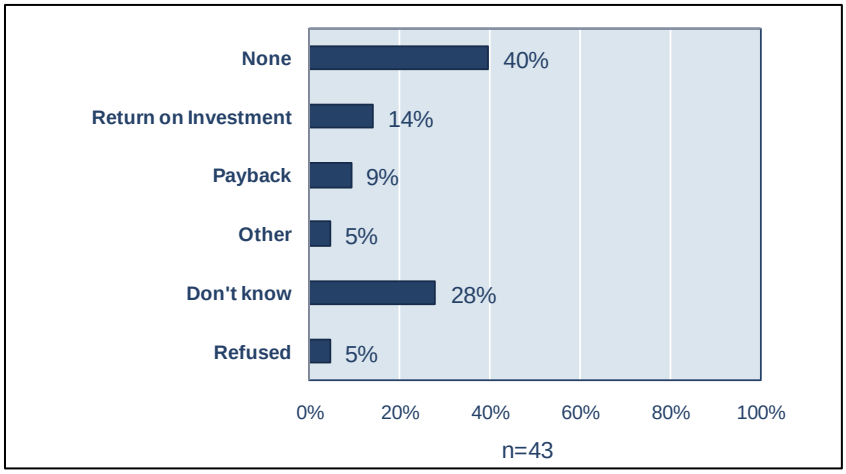
*These could include Energy Upgrade California website, IOU, ESJ website, or local contractor.
Source: DNV KEMA Analysis

ESJ Decision-Making Factors Influencing Project Implementation

To learn more about the kinds of information relied upon by ESJ participants, the interviewer asked a series of questions to discuss other factors that may have influenced project implementation, such as costs and/or energy savings.

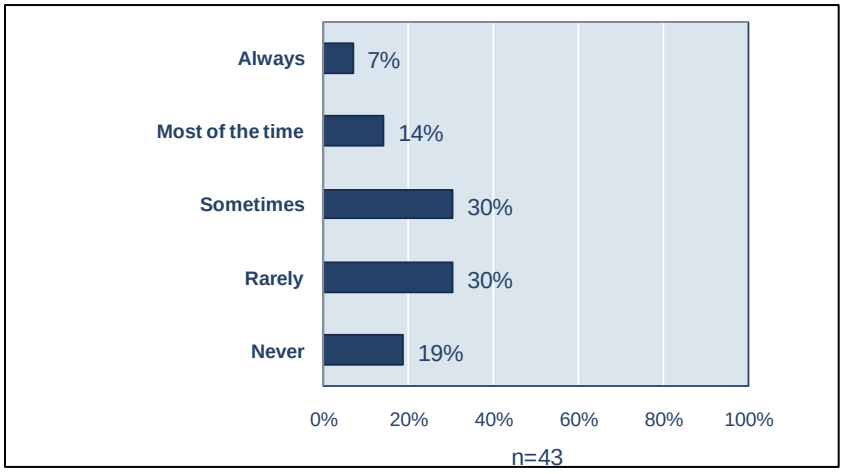
Interviewers asked participants to provide information regarding the financial calculations they use to determine whether to proceed with capital improvements, such as energy efficiency equipment upgrades. Most participants surveyed reported not using any particular calculation tool, as shown in Figure 11. Despite these responses, when asked whether they consider the entire life-cycle cost of equipment when making decisions about such purchases, roughly half of those surveyed reported doing so, as shown in Figure 12. Since interviews did not conduct any additional probing, no further explanation is available.

Figure 11: Financial Calculations Preferred by ESJ Participants



Source: DNV KEMA Analysis

Figure 12: Use of Life-Cycle Equipment Costs Among ESJ Participants

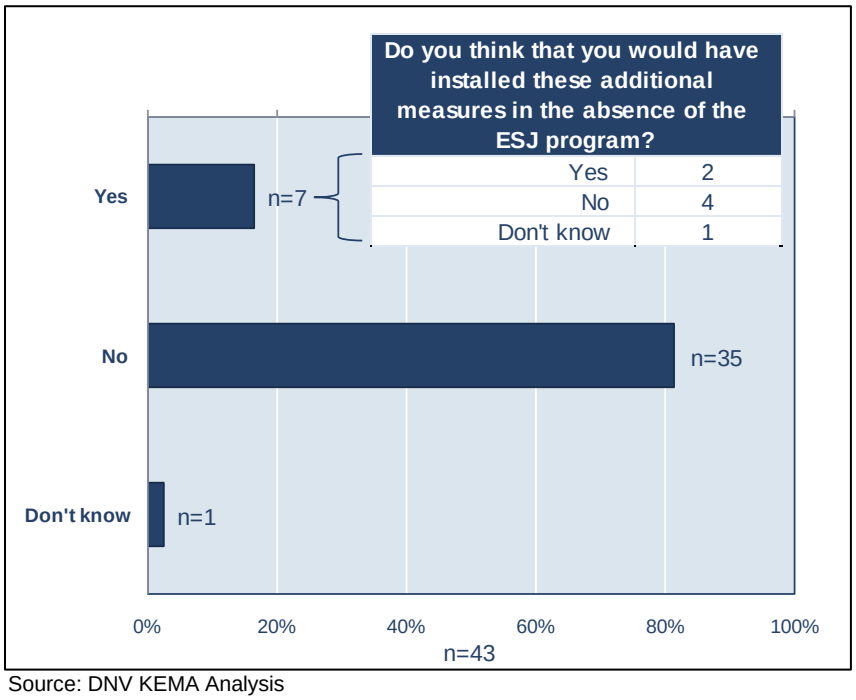


Source: DNV KEMA Analysis

ESJ Evidence of Participant Spillover

Evaluators designed survey questions to determine whether participants undertook any projects similar to but outside ESJ subsequent to their participation. Sixteen percent of those surveyed reported having undertaken one or more additional project(s) that were directly influenced by their participation in ESJ without incentives, as shown in Figure 13. Of the seven participants who indicated having installed additional measures outside the program, two believed that the additional project would have occurred in the absence of ESJ. (See table embedded in Figure 13.) Given these findings, there is some evidence of possible spillover energy savings attributable to ESJ that amount to 11 percent.

Figure 13: Energy Efficiency Project Undertaken Subsequent to ESJ



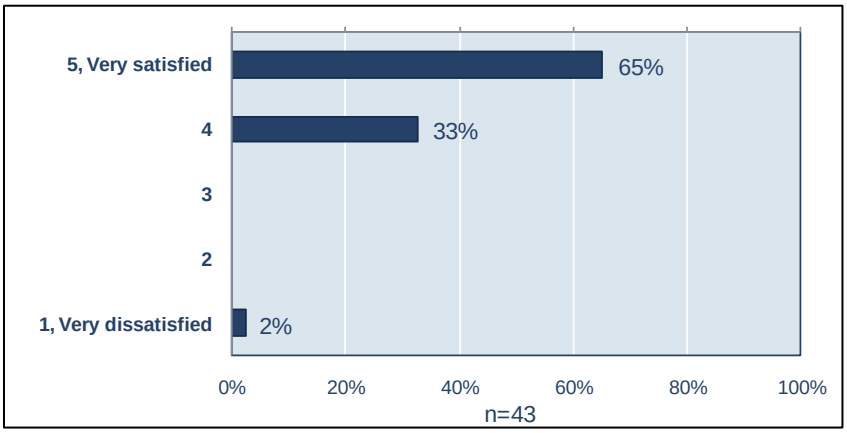
Source: DNV KEMA Analysis

ESJ Program Delivery

ESJ Participant Satisfaction

Many survey questions asked about the participant satisfaction with various facets of the program. By and large, participants surveyed were overwhelmingly satisfied with the program. When asked to rate their satisfaction with the program-installed equipment, 98 percent of respondents provided a rating of a 4 or 5, as shown in Figure 14.

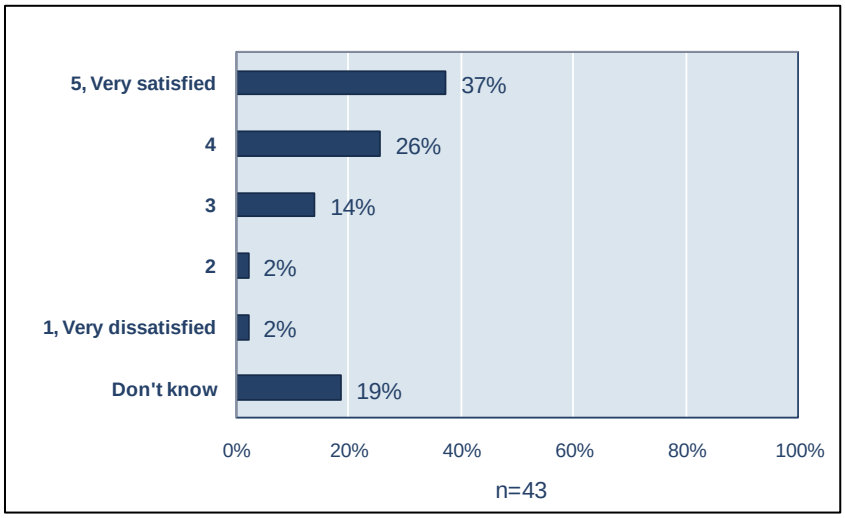
Figure 14: ESJ Program Equipment Satisfaction



Source: DNV KEMA Analysis

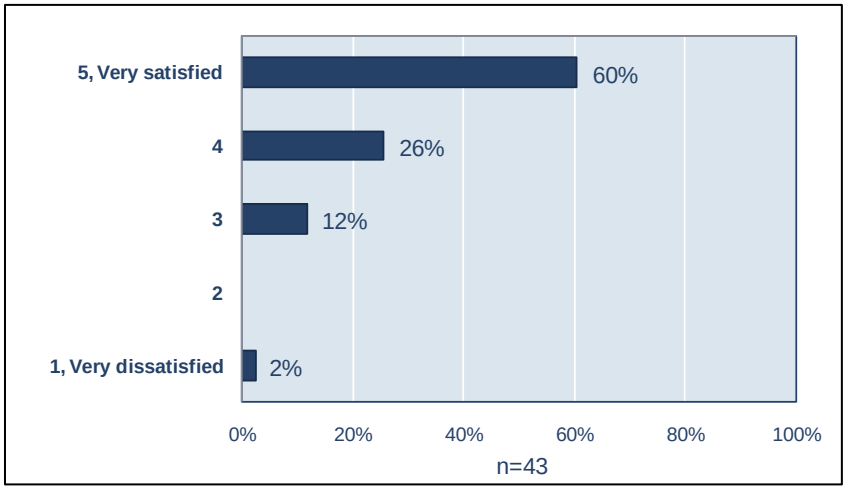
When asked to rate the CCC surveyor's services, there was more spread among the responses, but 63 percent reported their satisfaction ratings either a 4 or 5, as shown in Figure 15. When asked to rate the contractor's installation services, there was an even higher degree of satisfaction, with 86 percent reporting their satisfaction ratings either a 4 or 5, as shown in Figure 16.

Figure 15: ESJ CCC Surveyor Satisfaction



Source: DNV KEMA Analysis

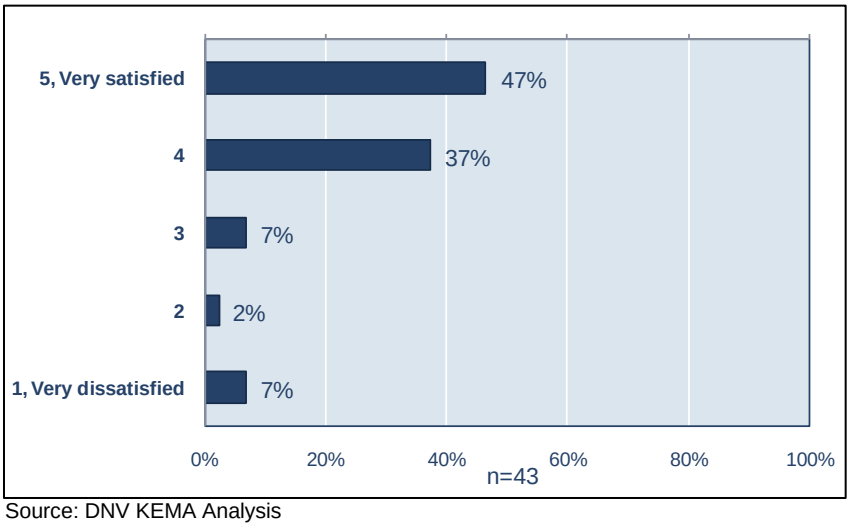
Figure 16: ESJ Contractor Installation Satisfaction



Source: DNV KEMA Analysis

When asked to rate their satisfaction with the information provided to them regarding the benefits of energy efficiency, participants reported a high degree of satisfaction, with 84 percent reporting their satisfaction ratings either a 4 or 5, as shown in Figure 17.

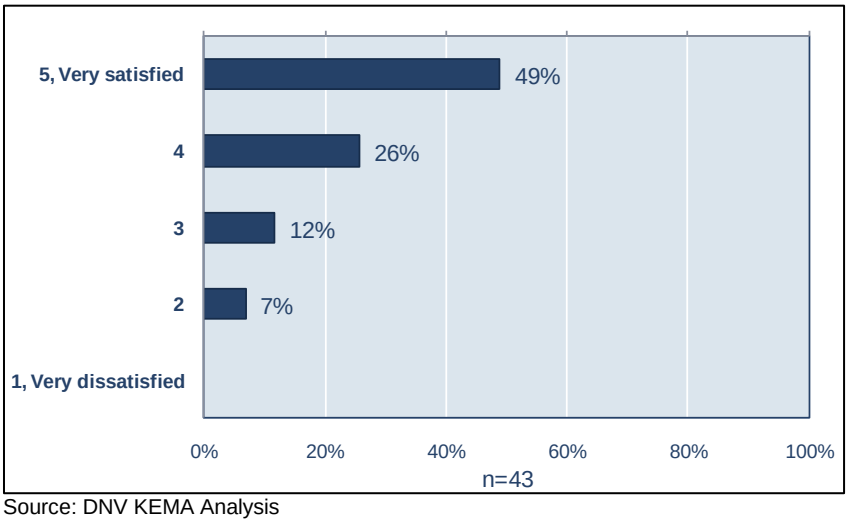
Figure 17: Satisfaction With Energy Efficiency Information Provided by ESJ



Source: DNV KEMA Analysis

When asked to rate the technical services provided by ESJ, there was a fairly high degree of satisfaction, with 75 percent of participants rating their satisfaction using either a 4 or 5, as shown in Figure 18.

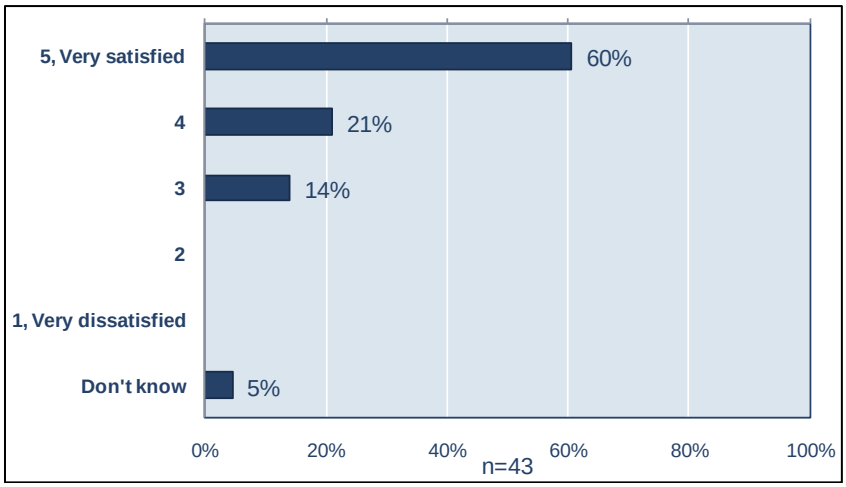
Figure 18: Satisfaction With Technical Assistance/Communication by ESJ



Source: DNV KEMA Analysis

When asked to rate ESJ coordination with them, there was a high degree of satisfaction, with 81 percent reporting their satisfaction ratings either a 4 or 5, as shown in Figure 19.

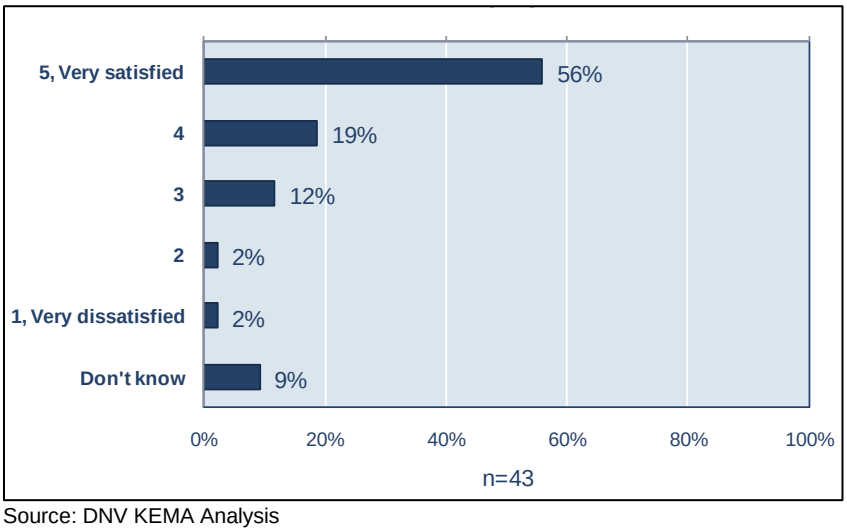
Figure 19: Satisfaction With ESJ Coordination



Source: DNV KEMA Analysis

When asked to indicate their satisfaction with the incentive amount received for the installed measures, 75 percent rated their satisfaction using either a 4 or 5, as shown in Figure 20.

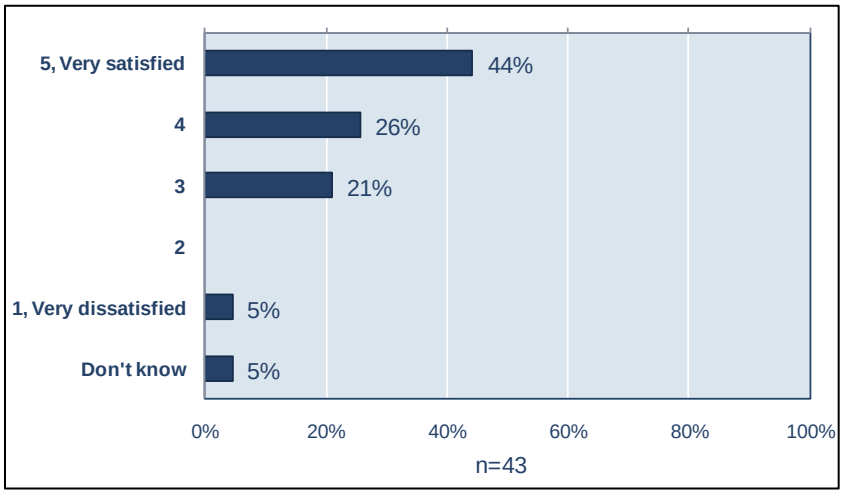
Figure 20: Satisfaction With Incentive Amount From ESJ



Source: DNV KEMA Analysis

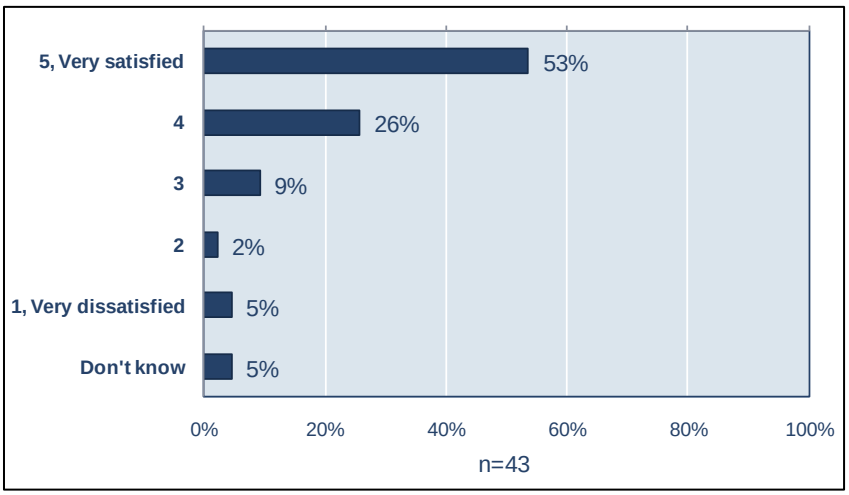
When asked how the installed measures compared with their expectations, most reported their satisfaction ratings either a 4 or 5 (70 percent), but 5 percent gave a rating of 1, as shown in Figure 21. Upon asking about their satisfaction with the cost savings due to the resulting energy savings, most reported their satisfaction ratings either a 4 or 5 (79 percent), but again, 5 percent were "Very dissatisfied," as shown in Figure 22.

Figure 21: Satisfaction With Energy Savings due to ESJ



Source: DNV KEMA Analysis

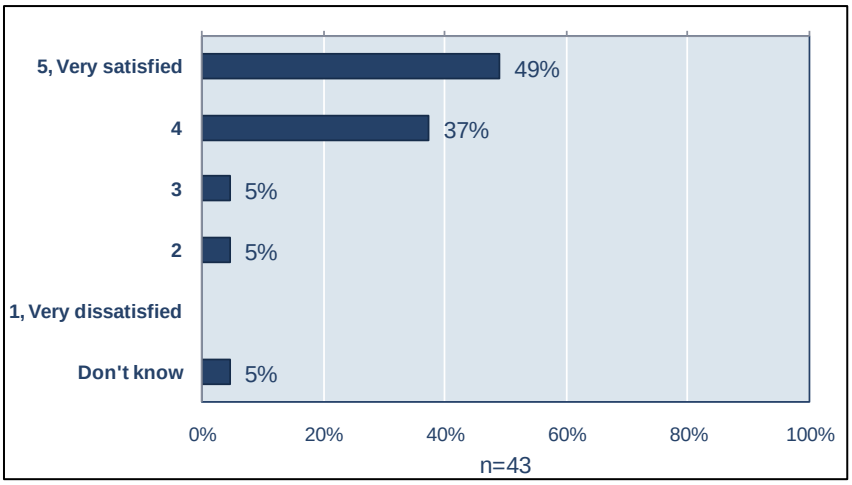
Figure 22: Satisfaction With Energy Cost Reductions due to ESJ



Source: DNV KEMA Analysis

When asked to rate their satisfaction with the incentive application process, 86 percent provided a rating of 4 or 5, as shown in Figure 23.

Figure 23: Satisfaction With Incentive Application Process for ESJ



Source: DNV KEMA Analysis

ESJ Market Actor Feedback

During in-depth interviews with ESJ market actors, interviewers asked only a handful of questions that spurred comments regarding their satisfaction with the program delivery since satisfaction was not a significant goal of the market actor interview design. That said, some findings regarding satisfaction emerged as follows:

- All CCC surveyors indicated that their skills and knowledge regarding the benefits of EEMs had increased. The training provided valuable communication skills for interacting with the program customers.
- All CCC surveyors cited learning how to talk with customers as a very valuable skill they obtained through the program, and all were very positive about their experience with the program.
- Three market actors complained that the installed equipment quality was lower than expected. Separately, one participant complained about equipment quality to a member of the evaluation team during an on-site visit. One contractor said some bulbs installed by other contractors through the program were lower quality and were burning out prematurely.
- Two contractors indicated that PECI did not allocate sufficient numbers of staff during the program period and experienced long delays to schedule preinspection visits.
- According to one of the CCC surveyors interviewed, the long lag time between the time of the survey and the contractor installation led to dissatisfaction among some participants.

- All but one of the CCC surveyors felt that the participants like the program and all felt the program was successful in removing the cost barrier.
- Six contractors saw an increase in business and profits as a result of the program.
- Based on the early success of ESJ program's LED reach-in refrigeration case lighting uptake, one manufacturer increased lighting inventory to meet the anticipated demand. Because the program did not sustain the high demand experienced early in the program, the program shifted its goals and conducted far fewer surveys than originally planned. As a result, one manufacturer was left with a lot of unused inventory.

ESJ Market Effects

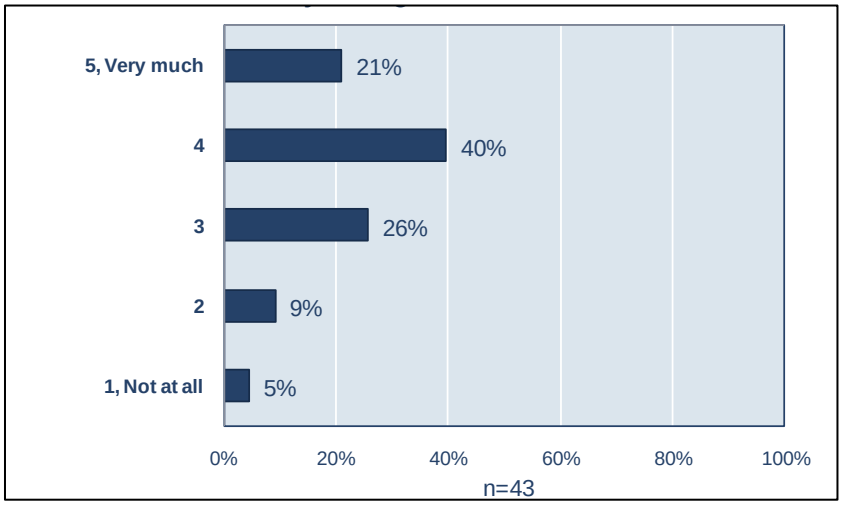
California's Energy Efficiency Evaluation Protocols[26] defines market effects as "a change in the structure of the market or the behavior of participants in a market that is reflective of an increase in the adoption of energy-efficiency products, services, or practices and is causally related to market interventions," with particular emphasis on quantification of spillover effects. This section presents findings from ESJ participant surveys and market actors interviews that focused on market effects.

26 TecMarket Works, *California Energy Efficiency Evaluation Protocols*, 2006.

ESJ Participant Knowledge and Plans

During the survey, participants were asked about any changes to their behaviors to date caused by participating in ESJ. Interviewers asked participants to compare their awareness of energy-efficient equipment and practices relative to that before participation in ESJ, and roughly half of those asked thought they knew more than before, as shown in Figure 24 and Table 44.

Figure 24: ESJ-Spurred Improvement to Knowledge Regarding Energy Efficiency



Source: DNV KEMA Analysis

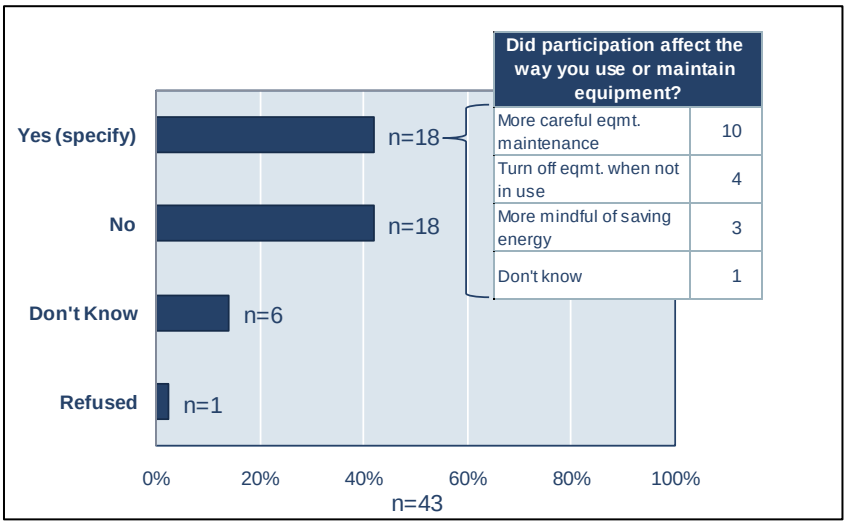
Table 44: ESJ Participant Assessment of Energy Efficiency Awareness

Self-Reported Current Awareness of Energy-Efficient Equipment and Practices Compared to Before Participation in ESJ, n.	
Greater than before	22
The same	21
Total Respondents	43

Source: DNV KEMA Analysis

On the other hand, fewer than half of those surveyed reported having made any changes to their maintenance practices as a result of their participation in ESJ, as shown in Figure 25. Of those that said they had made changes, many indicated that they were more careful about equipment maintenance. (See table embedded in Figure 25.)

Figure 25: Maintenance Practice Improvements due to ESJ

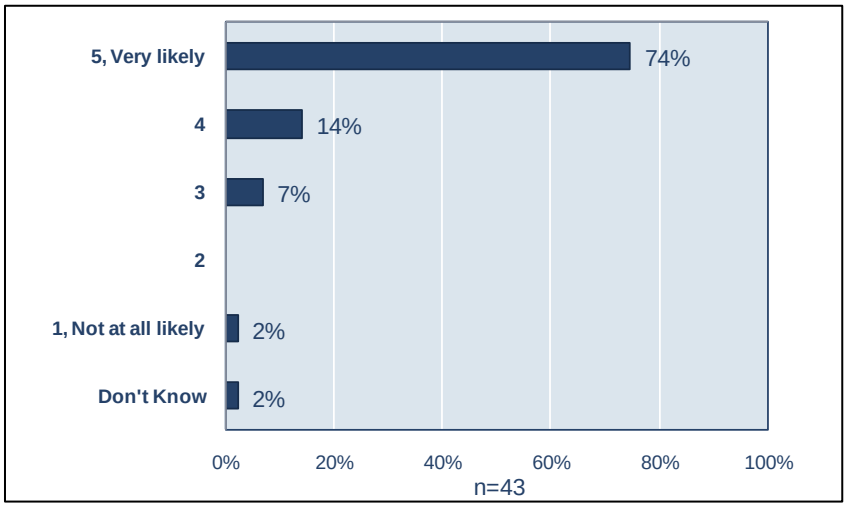


Did participation affect the way you use or maintain equipment?	
More careful eqmt. maintenance	10
Turn off eqmt. when not in use	4
More mindful of saving energy	3
Don't know	1

Source: DNV KEMA Analysis

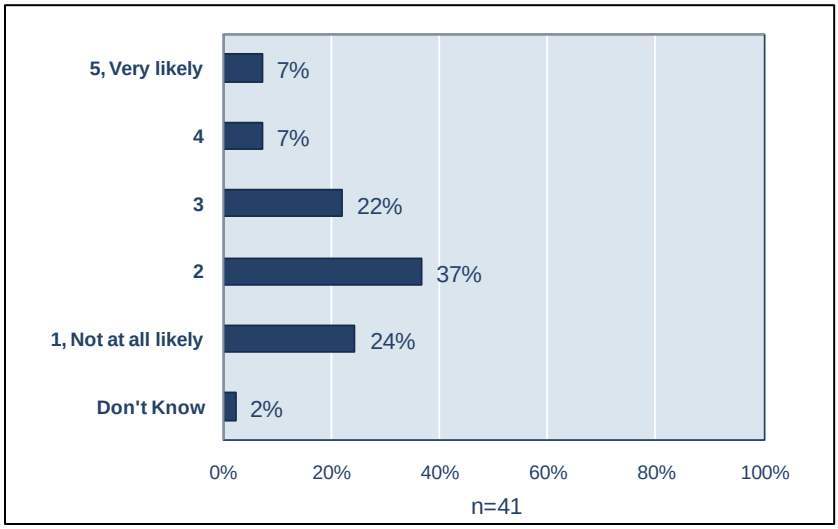
In an effort to learn about how ESJ participants might behave in the future, they were asked to report the likelihood of engaging in similar types of projects in the future with and without incentives, as shown in Figure 26 and Figure 27. With incentives, 88 percent reported their likelihood to engage in similar kinds of energy efficient projects in the future as a 4 or 5; without incentives, that proportion drops to 14 percent.

Figure 26: Likelihood of Future Projects With Incentives due to ESJ



Source: DNV KEMA Analysis

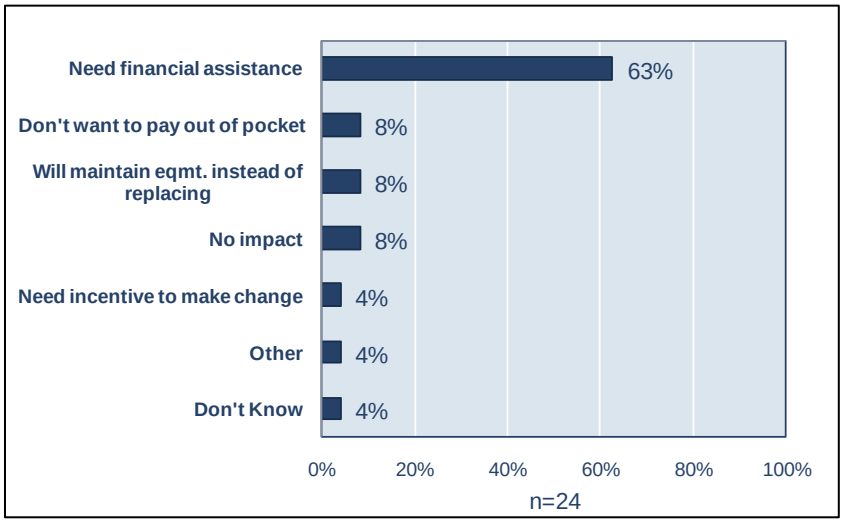
Figure 27: Likelihood of Similar Future Projects w/o Incentives Like ESJ



Source: DNV KEMA Analysis

For those that rated their likelihood to engage in similar projects without incentives with a 1 or 2, interviewers asked an additional question to probe for their primary reason: three-quarters indicated that they would need financial incentives to proceed, as shown in Figure 28.

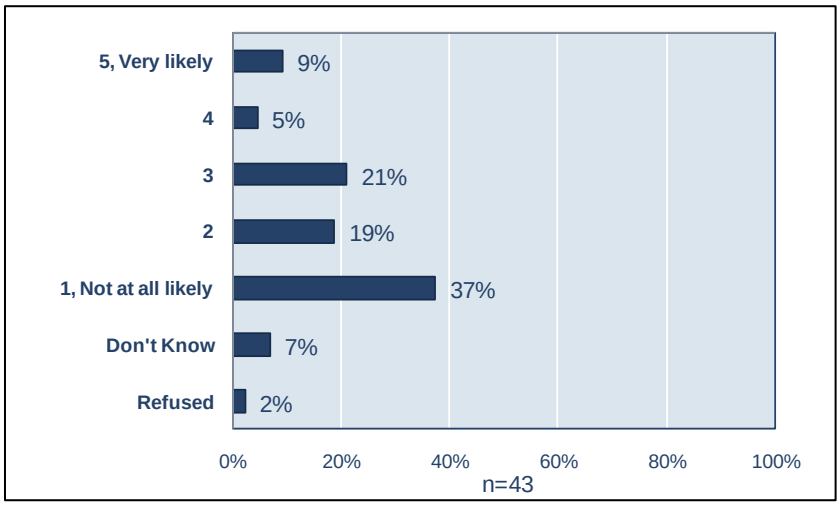
Figure 28: Reasons Given Not to Pursue Similar Future Projects Without Similar Incentives



Source: DNV KEMA Analysis

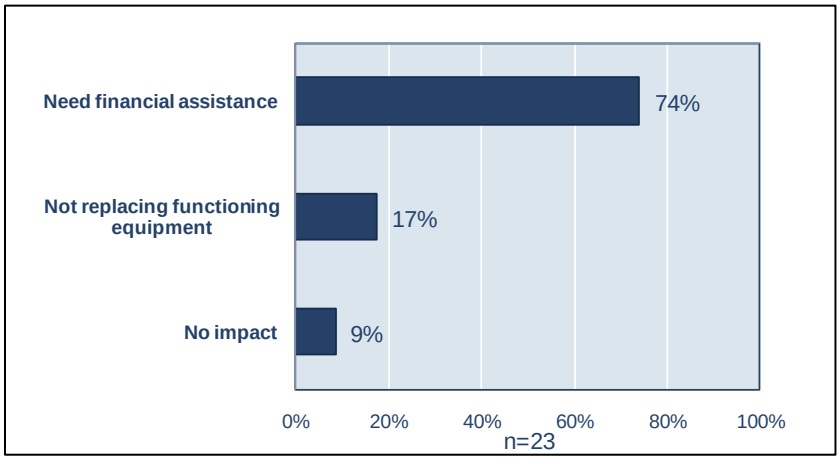
The interviewer repeated the preceding questions to determine the likelihood of engaging in other types of energy efficiency equipment upgrades within the next two years, and Figure 29 and Figure 30 provide the responses. More than half of participants (56 percent) rated their likelihood to proceed *without* financial incentives as a 1 or 2.

Figure 29: Likelihood of Other EE Projects Types Without Incentives Like ESJ



Source: DNV KEMA Analysis

Figure 30: Reasons for Not Pursuing Other EE Project Types Without ESJ Incentives



Source: DNV KEMA Analysis

These findings support the notion that the grocery/convenience store and restaurant markets are particularly difficult to reach without concerted and sustained efforts and substantial financial incentives. Furthermore, the decision-making process for this market is, for many participants, not particularly formal or well-established. This suggests that the combined direct-installation and contractor-installation method of delivery was quite effective and made

it possible to reach many that had never before participated in a rebate program. On the other hand, sustained EEM uptake in the small and medium grocery/convenience and restaurant markets will likely require continued financial subsidization.

ESJ Workforce Development and Training

The evaluation team used interviews with CCC surveyors and contractors to answer the following research questions designed to assess their levels of skills and knowledge:

- Do the CCC surveyors understand the benefits of EEMs?
- Are the CCC surveyors able to understand and communicate the benefits of energy efficiency, energy efficiency upgrades, the Program, and partnering IOU programs?
- Did adequate numbers of installation contractors attend the training?
- Have the skills and knowledge of the contractors regarding EEMs increased? Have the skills and knowledge been transferred within contractor firms?

All CCC surveyors interviewed reported that they learned a lot about the value of EEMs from the training and learned how to communicate the benefits of the measures to customers.

CCC surveyors had a good understanding of the program and how it worked – and were able to communicate that effectively to customers. They were aware of some but not all of the partnering utility programs and encouraged customers to contact their utility for more information.

> *"Being associated with ESJ made me come out of my shell. I didn't speak much. Because of the program I became more comfortable talking with store owners." – CCC surveyor*

The contractors felt that an adequate number of their staff attended the trainings. The contractors interviewed already had advanced levels of knowledge about energy efficiency and did not learn a great deal from the training. However, most contractors did say they learned more about the specific measures included in the program and the paperwork required. Three of the eight contractors interviewed felt the training was a waste of their time. Most reported that they took what they learned from the program and used it to inform and train other staff members within their firm.

ESJ Job Creation

PECI reported that, according to the official federal calculation method, the program has retained or added more than 135 contractor and CCC surveyor jobs in 12 months. PECI based this method on a spending calculation: for every 92,000 dollars spent, one job is counted. PECI also provided direct hire information to the evaluation team.

In addition to the program data provided by PECI, the evaluation team used interviews with CCC surveyors, contractors, and manufacturers to answer the following research questions designed to assess whether the ESJ program created jobs:

- Did the CCC surveyors obtain marketable skills?

- Were CCC surveyors eventually hired by participating contractors or other companies?
- Has the contractor increased the number of full-time employees (FTE) as a result of the program?
- Have the installation contractors been able to network with manufacturers?

Most CCC surveyors felt they had obtained marketable skills and were optimistic about their job prospects in the industry. Some expressed the desire to learn more, specifically mentioning the need to know more about compressors. One CCC surveyor expressed disappointment that he did not get a job through the program.

> *"I was hoping this would lead to a job already, but I think I need to take more classes"– CCC surveyor*

According to CCC surveyors and contractors, participating contractors hired two CCC surveyors. Two contractors said they did not hire CCC surveyors but felt that the CCC surveyors developed valuable skills working with rebate programs and understanding the paperwork involved in obtaining rebates. One contractor complained that the CCC surveyors' skills were not promoted to contractors as part of the program.

> *"At no time were we given a list of surveyors or introduced to surveyors in the program. I would have probably hired one or two. But I never had the opportunity." – Participating contractor*

Although contractors hired a limited number of surveyors, the majority of contractors increased the number of FTEs and/or avoided layoffs during the program period due to an increase in business caused by the program. Based on the variety of responses, it seems likely that each interviewee defined an FTE somewhat differently. However, some of these contractors were facing layoffs, now that the program had ended.

> *"We hired three to four people as a result of the program. Probably will have to let one go." – Participating contractor*

> *"We hired a significant number of employees and trained them during the program. Staff increased during the program and then decreased when [the] program ended. But we were able to keep a few. Our business was increasing on its own. I can't say in the end that the program made any difference." – Participating contractor*

> *"We added 15—20 FTEs kept five to seven and will probably be able to keep them for the foreseeable future." – Participating contractor*

> *"We hired two people and plan to keep them on." – Participating contractor*

One contractor noted that, while a lot of the program focus was on the number of jobs created, it has not accounted for or taken responsibility for the jobs lost by those companies that ramped up for the program, but did not have the capital to pay salaries for four to five months while waiting for a preinspection.

Three of the eight contractors felt they established relationships with more manufacturers as a result of the program. The manufacturers also reported that the program helped them build additional relationships with contractors.

> *"Our ability to connect more with contractors has enabled us to reach more retailers looking to reduce energy and help advise them on LED lighting technology as they make the switch over from traditional fluorescent." – Participating manufacturer*

As previously indicated, there was some evidence from contractors that PECI was not adequately staffed during the program period. Contractors reported long delays to schedule preinspection visits. Also, during one of the on-site visits, a participating contractor told an evaluation team member that PECI laid off between 15 and 20 percent of their staff during the program period.

ESJ Increased Business for Contractors

Evaluators used interviews with contractors to answer the following research questions designed to assess whether contractors saw an increase in business due to the program:

- Have contractors noticed a significant uptake in their business? Has revenue increased?
- Is the contractor's business more profitable as a result of the program?
- Are these changes sustainable in the absence of the program?

Six of the eight contractors interviewed have seen an increase in business because of the program. One contractor said he saw $350,000 in increased business because of the program. Another said 8 percent of his sales were due to the program. These contractors did not think the growth in sales was sustainable without the program; – they expected sales to decrease once the program was over.

> *"It's a great program. The government more than got their investment back." – Participating contractor*

> *"I have seen an uptake in my business – somewhat. It's tempered by the poor economy." – Participating contractor*

> *"We are getting tons of work from connections made through the program." – Participating contractor*

One contractor said he lost money as a result of participation in the program.

> *"My business has been less profitable. The program has cost me a lot of money. I had to spend $50,000 on items I wasn't able to install and additional customer service calls. I'm still getting calls today from customers we promised to do the work for but were never able to get approved. I had to do a lot of extra paperwork. It got worse every month." – Participating contractor*

Four contractors agreed that the whole process has been very slow – delays in scheduling the surveys or preinspections led to a build-up of inventory stocks and installation delays.

Respondents also mentioned delays in rebate payments. Two contractors felt the risks and benefits they would incur by participating were neither well nor fairly communicated to them at the outset. Because of perceived changes to the way PECI implemented the program, there were more competition and fewer sales than they had initially expected.

These comments are supported by the ESJ final report in that, of the 83 firms that went through the contractor training, 73 went on to become participating contractors in the program and, of those, only 43 participating contractors went on to perform installations rebated under the program. Though not explained by PECI, it is possible the success of the program early on affected the participating contractors that never provided any ESJ installations.

During the participating manufacturer interviews, manufacturers openly discussed the effect of the program on their sales. Three partner manufacturers said they were at least somewhat disappointed in the program, claiming it did not deliver as much sales as they expected. Examples cited include:

- One manufacturer said he received no sales from the program.
- Two of the three said being a partner had no advantages.
- One complaint was that, while four manufacturers were engaged to provide training and invest in stocking the product during the planning phase, these manufacturers learned that other manufacturers were allowed to join in selling products under the program during the kick-off webinar.
- One manufacturer said his company stocked $1 million worth of lights for the program and provided training free of charge. After selling lights to about 13,000 customers, the manufacturer was told to pull back on marketing so the program would not run out of funds too quickly. The manufacturer reported having done so and ultimately was left with a half-million dollars worth of stock.

ESJ Reduced Equipment Cost

The evaluation team used interviews with market actors and surveys with participants to answer the following research questions, designed to assess whether the cost of the measures decreased during the program period:

- Have the retail prices of the measures changed?
- How much of an influence did the incentives have on the ultimate purchase decision?
- Would the job/equipment have been sold without the program incentive?
- Has the availability of measures or the product design changed?
- Have factors outside the control of the program affected the cost or availability of the measures?

Contractors had mixed opinions on the retail price of the measures; four contractors said the price has come down since the program began, while four said the price has increased.

Although they would not share specific pricing data, one manufacturer said the value customers were receiving for their investment was increasing.

> *"LED technology is constantly improving and thus enables us to improve the value customers receive for their investment in Immersion LED refrigerated-display lighting solutions." – Participating manufacturer*

Evaluators attributed any changes in price to advances in technology; price change was not attributable to the program.

Seven of the eight contractors said the incentive was the only reason they sold the measures. The other contractor said he would have been able to close a quarter of the jobs without the incentive.

> *"The incentives got a lot of people off the fence. It spurred the market. The lighting looks great in the stores. Their competitors are taking notice." – Participating contractor*

Manufacturers agreed, saying the size of the incentives from ESJ really helped launch the LED refrigerator lighting market. It influenced people to invest in the new technology, and now their competitors were seeing what they did and want to do it, too.

There is no evidence, however, to indicate that the availability and design of the measures had been affected by the program, nor that outside factors had influenced the availability of the measures.

ESJ Increased Demand for Energy Efficiency Measures

Interviews with market actors and surveys with participants were used to answer the following research questions designed to assess whether the demand for EEMs has increased:

- What are the barriers to purchasing the measures? Did the program address the barriers?
- In the absence of the program, would those barriers continue to be reduced?
- What is the market share for the measures promoted through the program?
- Is the market share sustainable or likely to continue to increase in the absence of the program?
- Is there evidence that nonparticipating customers are installing the measures?
- Are contractors recommending the measures to customers?

All CCC surveyors and contractors interviewed cited cost as the main barrier to purchasing these measures. Customer distrust was another barrier identified by CCC surveyors. Many customers are distrustful because, in the past, companies have come in and promised them

savings that were not realized. Others fear the program is too good to be true. The program was successful in addressing these barriers.

> *"Many customers had bad experiences with companies who promised energy savings but then their bills actually went up. This has led them to be distrustful. Getting past that was the most difficult. But once people listened to them and realized it was legitimate, they were very satisfied." – CCC surveyor*

> *"It took some effort to convince them that putting new expensive lights in would actually save them money" – CCC surveyor*

> *"People are suspicious of the program. It's too good to be true. They think there is a catch." – Participating contractor*

> *"Advancements in LED technology and utility rebates from PECI and other programs are shrinking payback periods, driving ROI potential to even greater heights." – Participating manufacturer*

According to one of the CCC surveyors, the program occasionally exacerbated participation barriers. Long lag times between survey completion and contractor installation were reported to have caused dissatisfaction among customers sometimes.

One manufacturer and one contractor indicated some LEDs included and installed under the program were substandard. They did not all meet LM80 testing standard, and some installed products had shown signs of fading that may require replacement in two years. One CCC surveyor said he had complaints from some customers about bulbs burning out already.

A few CCC surveyors also felt the program did not run long enough to have a significant influence in the market – they felt it should have run longer. All the contractors agreed, saying the barriers will not continue to be reduced without the program.

One manufacturer disagreed, saying the barriers will continue to be reduced.

> *"We find that, as LED technology advances and customers gain more knowledge of the widespread savings and benefits that they can achieve with LED refrigerated display lighting technology, more retailers are enticed to make the switch from traditional lighting." – Participating manufacturer*

Most contractors said that nonparticipating customers are beginning to show interest in the measures and they recommend the measures to other customers not involved in the ESJ program.

Manufacturers were not willing to divulge the market share of the measures installed in California, and contractor estimates were across the board, ranging from 5 percent to 70 percent. Most contractors felt market share would continue to increase but very slowly.

> *"It will increase slightly. Some chains have done some stores through the program and will continue (although much slower) with the remaining stores. I don't think we'll ever be able to convince the mom and pop stores." – Participating contractor*

No evidence, however, was found through the in-depth interviews to suggest that promotion of the product by manufacturers has increased due to the program.

ESJ Conclusions and Recommendations

ESJ Conclusions

Overall, ESJ was an enormously successful subrecipient program that delivered six types of targeted retrofits by way of direct-install and contractor-installed channels to slightly more than 7,000 grocery/convenience stores and restaurants throughout California.

ESJ Program Energy Savings

Using Baseline 1 results from 75 on-site visits conducted at a representative sample of ESJ project sites, the evaluation team determined that the subrecipient program provided 57.6 GWh of net annual electricity savings, 6.2 MW of net demand savings and -55,522 therms of net natural gas savings. These annual savings result in net annual avoided GHG emissions of 17,749 metric tons of CO_2. The net life-cycle savings attributable to ESJ come to 488 GWh of electricity, -12,901 therms of natural gas, and avoided GHG emissions totaling 151,939 metric tons of CO_2.

ESJ Program Implementation Effectiveness

The evaluation team determined that ESJ was a largely well-run program that was very well-received by participating customers and, to a lesser extent, by the program partners. In fact, the uptake of the promoted measures as the program ramped up was so great that the program had committed its entire rebate budget nearly nine months prior to the program's conclusion.

Participants expressed a high degree of satisfaction with many program delivery facets, including CCC surveyor services, contractor installations, rebate application processes, and reporting requirements. Most ESJ participants surveyed achieved both energy savings and cost reductions comparable to what they expected and were satisfied with the energy efficiency information and technical assistance provided to them. Furthermore, slightly more than half reported that their participation affected the way they maintained or used equipment, suggesting that some effects may persist.

Most ESJ participants are very likely to participate in a similar program if that program offers incentives similar to ESJ (74 percent). Without incentives, however, only a tiny fraction of participants report a high likely of participating in a similar program (7 percent). Nearly two-thirds (63 percent) of participants indicated that they would still need financial assistance to proceed with similar projects in the future.

ESJ Market Effects

The program increased the skills and energy efficiency knowledge among the CCC surveyors. Two of the CCC surveyors interviewed went on to be hired by participating contractors. That said, contractors indicated that they were not adequately informed of the skills and knowledge

of the trained CCC surveyors and that they might have hired them if more information had been shared. Among participants, however, nearly half indicated that the program did not greatly increase their awareness of EEM and practices and their benefits. Among contractors, few improvements were reported that were not specific to the processes required for ESJ partnering – in general, contractors reported already having been savvy about energy efficiency before the program.

While a few lasting jobs were created by ESJ, there no evidence to support that the majority of the jobs created during the program will be sustained beyond the end of the program. CCC surveyors, in general, were satisfied with the training but had hoped for longer-lasting employment.

In-depth interviews with market actors did not find evidence that the prices of the ESJ-promoted measures have decreased. A few contractors did report, however, that they had experienced more inquiries from nonparticipants regarding the program EEMs and expect slow but gradual growth in these markets.

ESJ Recommendations

ESJ Ex Ante Savings Tracking

One of the major challenges faced by the evaluation team involved the tracking database design that allowed only for the demand savings per measure to be stored to one-hundredth of a kilowatt. Since the references from which the demand savings were drawn provided them to one-thousandth of a kilowatt, rounding errors were widespread. To allow for a more meaningful assessment of the demand savings provided by ESJ, it was necessary to replace all of the ex ante demand savings in the tracking data to equal those provided in the 2005 DEER database, for the advanced refrigeration controls, and utility work -papers, for the lighting measures.

ESJ Program Delivery

Contractors and manufacturers often reported discrepancies between their expectations of the amount of business that would come their way via ESJ and the actual amount of business received. For future programs, it will be important to foster trust with these market actors and take steps to keep them informed when program goals shift. Had the contractors and manufacturers known that the program incentives had run out long before the conclusion of the program or that the uptake had far surpassed expectations early in the program, they might have had the opportunity to adapt their own purchasing and hiring decisions accordingly. Furthermore, given that some contractors complained about the long wait time for preretrofit inspections, steps should be taken to shorten this lag time in the future.

ESJ Market Effects

Fewer than 10 percent of participants surveyed are likely to participate again without incentives. Any new programs must offer substantial financial incentives to be successful, while the grocery/convenience store and restaurants market remains reluctant to install EEMs without them. Also, where workforce-training efforts aim to lead to long-term employment, the program must ensure that potential employers are fully aware of the newly trained workers.

CHAPTER 5:
Energy Technology Assistance Program

ETAP-Specific Evaluation Design Elements

ETAP On-Site Visit Sample Design

The evaluation team stratified the population, provided in state-level tracking data,[27] by the total estimated annual source energy savings (in kilo British thermal units [kBtu]) per unique address, or project site (a given project site typically includes multiple measures and/or phases). Table 45 illustrates the four energy savings strata chosen, the resulting annual source-level savings distribution based upon the interim ETAP population, and the target evaluation sample.

Table 45: ETAP On-Site Sample Design Stratification for Interim Tracking Data

Stratum	Annual Ex Ante Source Energy Savings Range in Strata (kBtu)	Interim Tracking Data			Project Sites in Target Sample
		Project Sites in Population	Annual Ex Ante Source Energy Savings (kBtu)	Savings Proportion	
1	< 1,500,000 kBtu	65	40,108,185	15%	8
2	≥ 1,500,000 kBtu and < 3,000,000 kBtu	22	47,464,029	18%	8
3	≥ 3,000,000 kBtu and < 12,000,000 kBtu	13	60,264,493	22%	7
4	≥ 12,000,000 kBtu	4	123,205,986	45%	4
Total		104	271,042,693	100%	27

Source: DNV KEMA Analysis

Table 46 shows the distribution of savings across the EEM categories for both the interim tracking data and the target sample.

27 The ETAP evaluation sample design was based on the interim program tracking data as of November 2011. At that time, only 104 project sites had been committed. The final program tracking data were obtained in October 2012 and contained final information regarding 114 project sites.

Table 46: ETAP On-Site Sample Design by Measure Category

Measure Category	Interim Program Tracking Data		Target Sample	
	Annual Ex Ante Source Energy Savings (kBtu)	Proportion of Savings	Annual Ex Ante Source Energy Savings (kBtu)	Proportion of Savings
Bilevel Luminaires for Garages and Parking Lots	103,922,283	38%	31,825,795	18%
Wireless HVAC Controls	145,689,715	54%	135,303,584	76%
Wireless Lighting Controls	21,430,695	8%	11,576,881	6%
Total	271,042,693	100%	178,706,260	100%

Source: DNV KEMA Analysis

ETAP Participant Survey Sample Design

Similar to the on-site sample design, evaluators stratified the population by claimed annual source energy savings per project site, as shown in Table 47. Evaluators chose a target of 27 participant surveys.

Table 47: ETAP Participant CATI Sample Design

Stratum	Annual Ex Ante Source Energy Savings Range in Strata (kBtu)	Project Sites in Population	Project Sites in Target Sample
1	< 1,500,000 kBtu	65	8
2	≥ 1,500,000 kBtu and < 3,000,000 kBtu	22	8
3	≥ 3,000,000 kBtu and < 12,000,000 kBtu	13	7
4	≥ 12,000,000 kBtu	4	4
Total		104	27

Source: DNV KEMA Analysis

ETAP Market Actor Interview Approach and Sample Design

Using the ETAP logic model and program theory as guides, evaluators interviewed a representative subset of market actors to learn to what extent program achieved its objectives. The research questions listed in Table 48 sought to elicit feedback from market actors regarding ETAP market effects.

Table 48: Research Questions for ETAP Market Effects Assessment

ETAP Outcomes	Research Questions	Data Sources
Increase facility managers/workers knowledge of new energy-efficient technologies (short-term outcome)	• Has knowledge of new energy-efficient (EE) technologies increased? • What factors influenced knowledge of said technologies?	• Interviews with facility and agency managers • Interviews with partner program manager
Accelerated installation of energy-efficient technologies in target market (medium-term outcome)	• Have new EE technologies been installed? • What spurred/supported the installation of these new EE technologies? • Would EE technologies have been installed without the program?	• Interviews with facility and agency managers • Interviews with partner program manager
Properly installed and maintained projects (medium-term outcome)	• How well or how differently is EE equipment maintained at implementing sites? • Has the program influenced equipment maintenance at sites? • Have market actors initiated additional EE installations outside of the program? • How prepared or eager are agencies to install EE technologies in the future?	• Interviews with facility and agency managers • Interviews with nonparticipating facility and agency managers

Source: DNV KEMA Analysis

Evaluators used interview results to draw conclusions about the program's effectiveness to achieve its short- and intermediate-term market transformation goals and to overcome adoption barriers. Energy Solutions' ETAP program manager supplied initial contacts for 17 individuals in organizations that provided technical, marketing, and workforce development services in support of the program. The target sample of ETAP market actor interviews is shown in Table 49.

Table 49: ETAP Market Actor Interview Sample Plan

Market Actor	Population Provided	Target Sample
Vendors (HVAC and Lighting)	8	3—4
Community partners in marketing, technical assistance and workforce development	9	5—6
Total	17	8—10

Source: DNV KEMA Analysis

ETAP Evaluation Results

This section presents overall evaluation results for the ETAP, including presentation and discussions of the disposition of the final sample, verified savings, realization rates, precision estimates, and the program's overall gross energy savings results, including summaries by

measure category. Next, the authors report participant survey results gathered using CATI technology. Finally, authors provide market actor interview findings to discuss the program's effects.

ETAP Final Dispositions

ETAP On-Site Visit Final Sample

As indicated in the previous section, the evaluation team set out to verify the gross savings achieved by the ETAP targeted retrofits by using a stratified random sample design to yield a precision equal to or better than ± 10 percent at the 90 percent confidence interval. The design was developed based upon the results of the program population provided in the tracking data provided by Energy Solutions for project sites completed or committed to as of November 2011. The evaluation team stratified the population by total annual source energy savings claimed per unique address, referred to as *project sites*. (A project site may include multiple phases at a given address.) This approach allowed for sampling a larger percentage of the project sites that fell within the upper strata to produce a better representation of the energy savings of the overall program. Table 50 illustrates the four strata chosen during the sample design and the resulting distribution of annual electricity savings resulting from program participation for the final ETAP population in Energy Solutions' tracking data.

Table 50: ETAP Final On-Site Disposition by Savings Stratum

Stratum	Ranges of Strata by Annual Ex Ante Source Energy Savings (kBtu)	Final ETAP Tracking Data			
		Project Sites in Population	Annual Ex Ante Source Energy Savings (kBtu)	Project Sites in Sample	Annual Ex Ante Source Energy Savings (kBtu)
1	< 1,500,000 kBtu	70	34,653,611	8	5,662,304
2	≥ 1,500,000 kBtu and < 3,000,000 kBtu	24	50,598,316	8	18,336,499
3	≥ 3,000,000 kBtu and < 12,000,000 kBtu	14	66,033,668	7	32,983,725
4	≥ 12,000,000 kBtu	6	179,308,070	4	122,775,147
Total		114	330,593,665	27	179,757,675

Source: DNV KEMA Analysis

Table 51 shows the distribution of savings by measure categories across the ETAP, both for the population and for the project sites contained in the primary sample. Visits to the 27 project sites in the primary sample yielded gross verified savings for 27 measure installations. The evaluation team scheduled and conducted the on-site visits from the primary and backup sample.

Table 51: ETAP Final On-Site Disposition by Measure Category

Measure Category	Final Population		Final Sample	
	Annual Ex Ante Source Energy Savings (kBtu)	Proportion of Savings	Annual Ex Ante Source Energy Savings (kBtu)	Proportion of Savings
Bilevel Luminaires for Garages and Parking Lots	121,268,601	37%	33,377,958	19%
Wireless HVAC Controls	186,415,852	56%	134,874,770	75%
Wireless Lighting Controls	22,909,212	7%	11,504,947	6%
Total	330,593,665	100%	179,757,675	100%

Source: DNV KEMA Analysis

ETAP Participant Survey Final Sample

The same sample design was used for the participant CATI survey as had been used for the impact study design—a randomized sample within each of four strata for a target of 27. The final number of completed participant interviews was 27. CATIs were conducted between early March and mid-June 2012.

Table 52: ETAP Final Participant CATI Disposition

Reported CATI Disposition	ETAP
Target	27
Completed Interviews	27
Number of Dialings	286
Number of Contacts	78
Average Length (minutes)	19.2

Source: DNV KEMA Analysis

To quantify the uncertainty around each CATI response, Appendix E provides a table of confidence intervals for ETAP where the total number of respondents to a question equals 27. The widest confidence intervals occur when exactly 50 percent of respondents provide a given answer. For those instances where either 49 percent or 51 percent of the ETAP participants (n=13 or 14, respectively) provided a given response, the confidence interval around the proportion is ± 14 percent. As the proportion of participants who provided a given response shifts away from 50 percent, in either direction, the confidence interval around that proportion gradually approaches 0 percent. For those instances where either 4 percent or 96 percent of the ETAP participants (n=1 or 26, respectively) provided a given response, the confidence interval around the proportion is ± 5 percent.

ETAP Market Actor Interview Final Sample

To ascertain the effects of ETAP on the California municipal building market, the evaluation team spoke with a representative subset of market actors. Results from the interviews were used to draw conclusions about the program's effectiveness at achieving short- and intermediate-term market transformation goals and overcoming barriers to adoption. The target disposition of ETAP market actor interviews is in Table 53.

Table 53: ETAP Final Market Actor Interview Disposition

Market Actor	Target	Final Sample
Vendors (HVAC and Lighting)	3—4	7
Community partners in marketing, technical assistance and workforce development	5—6	6
Total	8—10	13

Source: DNV KEMA Analysis

ETAP Gross Energy Savings

To determine the overall ETAP savings, the verified, or ex post, savings were determined for a sample of project sites by performing on-site visits and engineering analyses.

ETAP Verified Energy Savings

SBW Consulting, a subcontractor to DNV KEMA, scheduled and conducted the on-site visits from the primary and backup sample. Using data collected during on-site visits to participant facilities, evaluators determined the verified annual electricity savings of the sample by stratum and by measure category respectively, as shown in Table 54 and

Table 55.

Table 54: ETAP Verified Annual Electricity Savings in On-Site Sample by Savings Stratum

Stratum	Ranges of Strata by Annual Ex Ante Source Energy Savings (kBtu)	Project Sites in Sample	Annual Ex Ante Electricity Savings (kWh)	Baseline 1		Baseline 2	
				Annual Ex Post Electricity Savings (kWh)	Realization Rate	Annual Ex Post Electricity Savings (kWh)	Realization Rate
1	< 1,500,000 kBtu	8	496,288	480,464	97%	480,464	97%
2	≥ 1,500,000 kBtu and < 3,000,000 kBtu	8	1,705,588	1,767,197	104%	1,767,197	104%
3	≥ 3,000,000 kBtu and < 12,000,000 kBtu	7	2,151,292	2,571,113	120%	2,571,113	120%
4	≥ 12,000,000 kBtu	4	6,731,853	8,302,871	123%	8,302,871	123%
Overall		27	11,085,021	13,121,645	118%	13,121,645	118%

Source: DNV KEMA Analysis

Table 55: ETAP Verified Annual Electricity Savings in On-Site Sample by Measure Category

Measure Category	Annual Ex Ante Electricity Savings (kWh)	Baseline 1		Baseline 2	
		Annual Gross Ex Post Electricity Savings (kWh)	Realization Rate	Annual Gross Ex Post Electricity Savings (kWh)	Realization Rate
Bilevel Luminaires for Garages and Parking Lots	3,260,840	3,888,293	119%	3,888,293	119%
Wireless HVAC Controls	6,700,212	8,127,318	121%	8,127,318	121%
Wireless Lighting Controls	1,123,969	1,106,034	98%	1,106,034	98%
Overall	11,085,021	13,121,645	118%	13,121,645	118%

Source: DNV KEMA Analysis

Again, using the data collected during on-site visits to participant facilities, evaluators determined the verified demand savings of the sample by stratum and by measure category respectively, as shown in Table 56 and Table 57.

Table 56: ETAP Verified Demand Savings in On-Site Sample by Savings Stratum

Stratum	Ranges of Strata by Annual Ex Ante Source Energy Savings (kBtu)	Project Sites in Sample	Ex Ante Demand Savings (kW)	Baseline 1		Baseline 2	
				Ex Post Demand Savings (kW)	Realization Rate	Ex Post Demand Savings (kW)	Realization Rate
1	< 1,500,000 kBtu	8	32	84	263%	84	263%
2	≥ 1,500,000 kBtu and < 3,000,000 kBtu	8	108	78	73%	78	73%
3	≥ 3,000,000 kBtu and < 12,000,000 kBtu	7	109	150	137%	150	137%
4	≥ 12,000,000 kBtu	4	175	226	129%	226	129%
Overall		27	424	538	127%	538	127%

Source: DNV KEMA Analysis

Table 57: ETAP Verified Demand Savings in On-Site Sample by Measure Category

Measure Category	Ex Ante Demand Savings (kW)	Baseline 1		Baseline 2	
		Ex Post Demand Savings (kW)	Realization Rate	Ex Post Demand Savings (kW)	Realization Rate
Bilevel Luminaires for Garages and Parking Lots	317	358	113%	358	113%
Wireless HVAC Controls	46	81	178%	81	178%
Wireless Lighting Controls	61	99	163%	99	163%
Overall	424	538	127%	538	127%

Source: DNV KEMA Analysis

Again, using data collected during on-site visits to participant facilities, evaluators determined the verified natural gas savings of the sample by stratum and by measure category, respectively, as shown in Table 58 and Table 59.

Table 58: ETAP Verified Annual Natural Gas Savings in On-Site Sample by Savings Stratum

Stratum	Ranges of Strata by Annual Ex Ante Source Energy Savings (kBtu)	Project Sites in Sample	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1		Baseline 2	
				Annual Ex Post Natural Gas Savings (therms)	Realization Rate	Annual Ex Post Natural Gas Savings (therms)	Realization Rate
1	< 1,500,000 kBtu	8	5,823	7,329	126%	7,329	126%
2	≥ 1,500,000 kBtu and < 3,000,000 kBtu	8	8,781	8,781	100%	8,781	100%
3	≥ 3,000,000 kBtu and < 12,000,000 kBtu	7	109,631	101,814	93%	101,814	93%
4	≥ 12,000,000 kBtu	4	538,679	645,407	120%	645,407	120%
Overall		27	662,914	763,331	115%	763,331	115%

Source: DNV KEMA Analysis

Table 59: ETAP Verified Annual Natural Gas Savings in On-Site Sample by Measure Category

Measure Category	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1		Baseline 2	
		Annual Ex Post Natural Gas Savings (therms)	Realization Rate	Annual Ex Post Natural Gas Savings (therms)	Realization Rate
Wireless HVAC Controls	662,914	763,331	115%	763,331	115%
Overall	662,914	763,331	115%	763,331	115%

Source: DNV KEMA Analysis

ETAP Differences in Ex Ante and Verified Ex Post Energy Savings

The ex ante and ex post savings were identical at about half of the sites visited (48 percent). Discrepancies for the remaining sites are explained by the following:

- **Measures not installed as reported:** Commonly, this meant that either the number of items installed or the preretrofit or postretrofit wattage differed from those reported in the ex ante savings documentation. This result was most common with lighting projects. For example, at one project site, the ex ante savings calculations assumed preretrofit fixtures were high-pressure sodium at 465 watts (W) each. However, an interview of the

site contact revealed that the replaced lamps had been metal halide at 506 W each. Moreover, some preretrofit fixtures were reported as two-lamp fixtures when, in actuality, they were single-lamp fixtures and resulted in fewer lamp replacements than planned.

- **Different hours of operation:** There were also a number of measures, both lighting and HVAC, where the hours of operation reported in ex ante documentation differed from those reported while on site. For example, at one project site, the ex ante documentation reported that 104 of the retrofitted fixtures operated 24 hours per day and seven days per week, but an interview with the site contact revealed that only 63 of those fixtures operated continuously.
- **Different model inputs:** Both the implementer and evaluator used the same engineering spreadsheet to calculate savings for HVAC controls measures. However, the inputs to the spreadsheet were often modified by the evaluator to better represent the operation as observed or reported during the on-site visit. For example, at one project site, the static-pressure reset schedule used for the ex ante savings calculations was outdated, and the evaluator updated the input values based upon information gathered during the on-site visit to determine the ex post savings. In this case, the adjustment to the static pressure reset schedule resulted in a realization rate of 386 percent for the verified annual electricity savings.

ETAP Gross Energy Savings

Evaluators extrapolated the verified savings for the sites in the sample to represent overall program energy savings. As shown in Table 60 through Table 62, gross energy savings totaled 23,113,206 kWh of annual electricity, 1,349 kW of demand, and 990,827 therms of annual natural gas. Overall realization rates were 100 percent for gross annual electricity savings, 100 percent for gross demand, and 105 percent for gross annual natural gas savings. The savings and realization rates are shown by measure category for comparison.

As previously discussed, evaluators estimated the gross ex post energy savings relative to two established baselines—the existing conditions found prior to implementation of an energy efficiency measure (Baseline 1) and either minimally code-compliant conditions or standard practice when no code is applicable (Baseline 2). Baseline 2 uses the pre-existing equipment as the measure baseline only until the end of the RUL of the existing equipment. While two baselines were considered, evaluators determined Baseline 1 and Baseline 2 savings to be equal for ETAP since the measures installed have no code requirements in place. Evaluators determined that Baselines 1 and 2 are equal for all the EEMs implemented by ETAP since there are no building codes in place to suggest that the preretrofit equipment differed from industry standard practice.

Table 60: ETAP Results – Gross Annual Electricity Savings

Measure Category	Annual Ex Ante Electricity Savings (kWh)	Baseline 1		Baseline 2	
		Annual Gross Ex Post Electricity Savings (kWh)	Realization Rate	Annual Gross Ex Post Electricity Savings (kWh)	Realization Rate
Bilevel Luminaires at Garages, and Parking Lots	11,847,265	11,628,062	98%	11,628,062	98%
Wireless HVAC Controls	8,950,180	9,238,694	103%	9,238,694	103%
Wireless Lighting Controls	2,238,102	2,246,450	100%	2,246,450	100%
Overall	23,035,547	23,113,206	100%	23,113,206	100%

Source: DNV KEMA Analysis

Table 61: ETAP Results – Gross Demand Savings

Measure Category	Ex Ante Demand Savings (kW)	Baseline 1		Baseline 2	
		Gross Ex Post Demand Savings (kW)	Realization Rate	Gross Ex Post Demand Savings (kW)	Realization Rate
Bilevel Lighting Luminaires for Garages and Parking Lots	970	938	97%	938	97%
Wireless HVAC Controls	160	148	93%	148	93%
Wireless Lighting Controls	217	263	122%	263	122%
Overall	1,347	1,349	100%	1,349	100%

Source: DNV KEMA Analysis

Table 62: ETAP Results – Gross Annual Natural Gas Savings

Measure Category	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1		Baseline 2	
		Annual Gross Ex Post Natural Gas Savings (therms)	Realization Rate	Annual Gross Ex Post Natural Gas Savings (therms)	Realization Rate
Wireless HVAC Controls	948,018	990,827	105%	990,827	105%
Overall	948,018	990,827	105%	990,827	105%

Source: DNV KEMA Analysis

Precision of ETAP Program Savings

As mentioned in the description of the evaluation approach, DNV KEMA used model-based statistical sampling methods to select the sample with the goal of achieving relative precision of the overall program ex post savings estimates within ± 10 percent at the 90 percent confidence level (90/10 precision). The team stratified the ETAP population and selected the sample based on ex ante annual source energy savings, as provided in the interim tracking data. Table 63 shows the gross energy savings, confidence intervals, relative precision, and standard error for the program. After the evaluation team calculated the gross savings and the realization rates achieved by the measure category in the sample, the relative precision was determined by dividing the confidence interval proportion by the realization rate. Hence, where the realization rate is near to 100 percent, the confidence interval and relative precision are nearly equal.

Table 63: ETAP Results – Precision of Gross Savings

Results and Precision Metrics	Baseline 1				Baseline 2			
	Gross Annual Ex Post Electricity Savings (GWh)	Gross Ex Post Demand Savings (MW)	Gross Annual Ex Post Natural Gas Savings (therms)	Gross Annual Ex Post Source Energy Savings (MMBtu)	Gross Annual Ex Post Electricity Savings (GWh)	Gross Ex Post Demand Savings (MW)	Gross Annual Ex Post Natural Gas Savings (therms)	Gross Annual Ex Post Source Energy Savings (MMBtu)
ETAP Gross Savings	23.1	1.3	990,827	335.6	23.1	1.3	990,827	335.6
90% Confidence Interval Savings	± 0.3	± 0.1	± 10,410	± 3.6	± 0.3	± 0.1	± 10,410	± 3.6
90% Confidence Interval Proportion, ± percent	1%	4%	1%	1%	1%	4%	1%	1%
Relative Precision, percent	1%	4%	1%	1%	1%	4%	1%	1%
Standard Error, percent	1%	2%	1%	1%	1%	2%	1%	1%

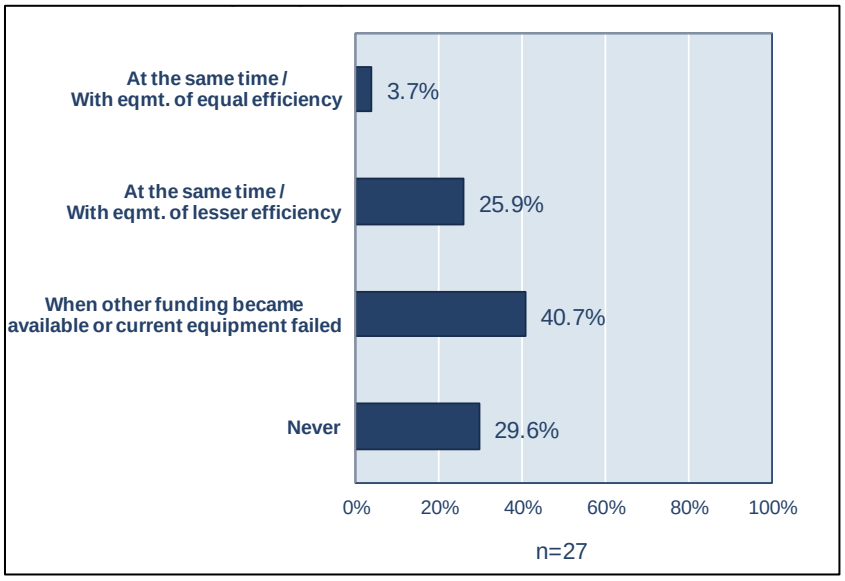
Source: DNV KEMA Analysis

ETAP Net Energy Savings Results

Since the purpose of ETAP was to provide municipal entities financial assistance to implement emerging energy efficiency technologies, the evaluation team designed the CATI survey instrument to learn more about the program's influence on implemented projects and to enable estimating a net-to-gross ratio for ETAP.

Of those surveyed, 71 percent indicated that their projects would never have proceeded or would not have proceeded until finding another funding source or until current equipment failed. Another 26 percent of respondents noted that had their projects proceeded, they would have installed less efficient measures than those installed through the program. Nearly 4 percent of respondents indicated that they would have installed the same EEMs at the same type without the assistance of ETAP, as shown in Figure 31.

Figure 31: ETAP Influence on Project Timing and Efficiency Outcome



Source: DNV KEMA Analysis

Once these results were weighted by the savings in the respondent sample, the program level percentage of free ridership dropped to less than 1 percent. Evaluators concluded that more than 99 percent, ± 7 percent, of the energy savings from ETAP are attributable to the program. Hence, the net-to-gross ratio (NTG) for ETAP is 0.995, and the net savings are shown in Table 64 through Table 66.

Table 64: ETAP Results – Net Annual Electricity Savings

Measure Category	Annual Ex Ante Electricity Savings (kWh)	Baseline 1	Baseline 2
		Annual Net-Adjusted Ex Post Electricity Savings (kWh)	Annual Net-Adjusted Ex Post Electricity Savings (kWh)
Bilevel Luminaires for Garages and Parking Lots	11,847,265	11,571,120	11,571,120
Wireless HVAC Controls	8,950,180	9,193,453	9,193,453
Wireless Lighting Controls	2,238,102	2,235,449	2,235,449
Total	23,035,547	23,000,022	23,000,022

Source: DNV KEMA Analysis

Table 65: ETAP Results – Net Demand Savings

Measure Category	Ex Ante Demand Savings (kW)	Baseline 1	Baseline 2
		Net-Adjusted Ex Post Demand Savings (kW)	Net-Adjusted Ex Post Demand Savings (kW)
Bilevel Luminaires for Garages and Parking Lots	970	934	934
Wireless HVAC Controls	160	148	148
Wireless Lighting Controls	217	262	262
Total	1,347	1,344	1,344

Source: DNV KEMA Analysis

Table 66: ETAP Results – Net Annual Natural Gas Savings

Measure Category	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1	Baseline 2
		Annual Net-Adjusted Ex Post Natural Gas Savings (therms)	Annual Net-Adjusted Ex Post Natural Gas Savings (therms)
Wireless HVAC Controls	948,018	985,975	985,975
Total	948,018	985,975	985,975

Source: DNV KEMA Analysis

ETAP Life-Cycle Energy Savings Results

The evaluation team calculated life-cycle savings over the lifetimes of each EEM. Evaluators assigned each measure an EUL that was determined using the "Database for Energy Efficient Resources" (DEER), as indicated in Table 67. Evaluators summed savings for each year of EUL over the entire span of the life of the measure to determine its life-cycle savings. For this program, all three retrofitted measure categories were determined to have an EUL of 15 years, thus yielding 345,000,321 kWh and 14,789,624 therms of net life-cycle savings due to the program.

Table 67: ETAP Results – Net Life-Cycle Electricity and Natural Gas Savings

Measure Category	EUL (years)[28]	Life-Cycle Net-Adjusted Ex Post Electricity Savings (kWh)		Life-Cycle Net-Adjusted Ex Post Natural Gas Savings (therms)	
		Baseline 1	Baseline 2	Baseline 1	Baseline 2
Bilevel Luminaires, Garages and Parking Lots	15	173,566,801	173,566,801	0	0
Wireless HVAC Controls	15	137,901,788	137,901,788	14,789,624	14,789,624
Wireless Lighting Controls	15	33,531,732	33,531,732	0	0
Total		345,000,321	345,000,321	14,789,624	14,789,624

Source: DNV KEMA Analysis

ETAP Avoided Greenhouse Gas Emissions

Based upon the annual net energy savings of electricity and natural gas, evaluators determined that the net annual avoided GHG emissions total 12,427 metric tons of CO_2; the net life-cycle avoided GHG emissions total 186,402 metric tons. These are shown in Table 68.

28 "Database for Energy Efficient Resources," California Public Utility Commission, 2005.

Table 68: ETAP Results – Annual and Life-Cycle Avoided Greenhouse Gas Emissions

ETAP Measure	Annual Net-Adjusted Avoided GHG Emissions (metric tons)		Life-Cycle Net-Adjusted Avoided GHG Emissions (metric tons)	
	Baseline 1	Baseline 2	Baseline 1	Baseline 2
Bilevel Luminaires at Garages and Parking Lots	3,622	3,622	54,323	54,323
Wireless HVAC Controls	8,105	8,105	121,584	121,584
Wireless Lighting Controls	700	700	10,495	10,495
Total	12,427	12,427	186,402	186,402

Source: DNV KEMA Analysis

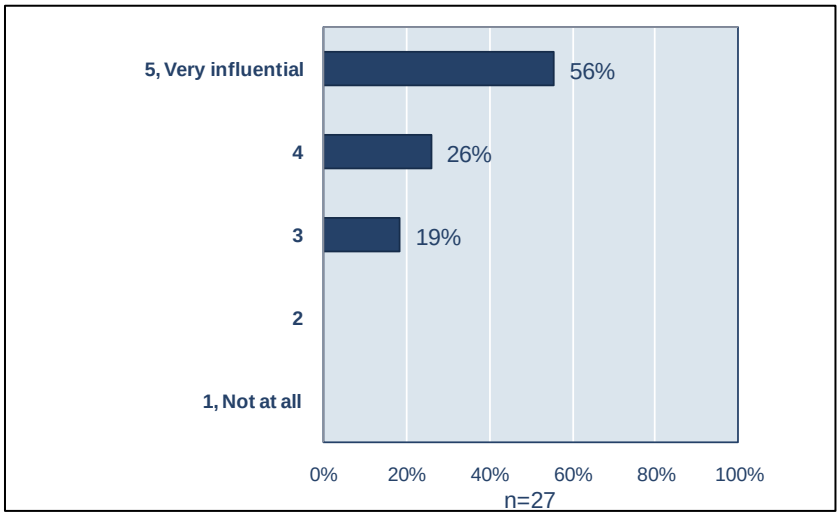
ETAP Role and Influence

A full discussion of the survey results related to the role and influence of ETAP on project implementation is presented below.

ETAP Role on Project Implementation

In general, participants found the program as being very influential to the completion of a project, as shown in Figure 32, with 82 percent of respondents ranking the program influence at a 4 or 5.

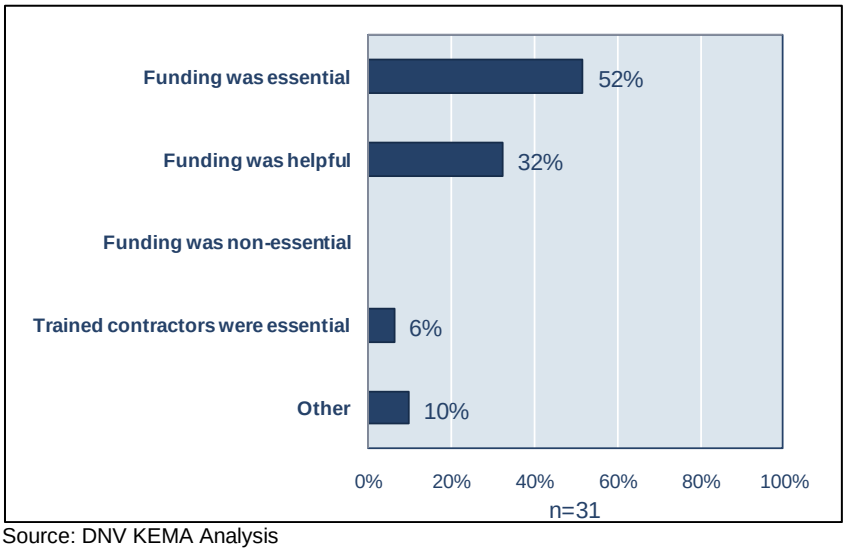
Figure 32: ETAP Influence on Project Implementation



Source: DNV KEMA Analysis

Furthermore, 52 percent of respondents reported that program funding was essential, as shown in Figure 33.

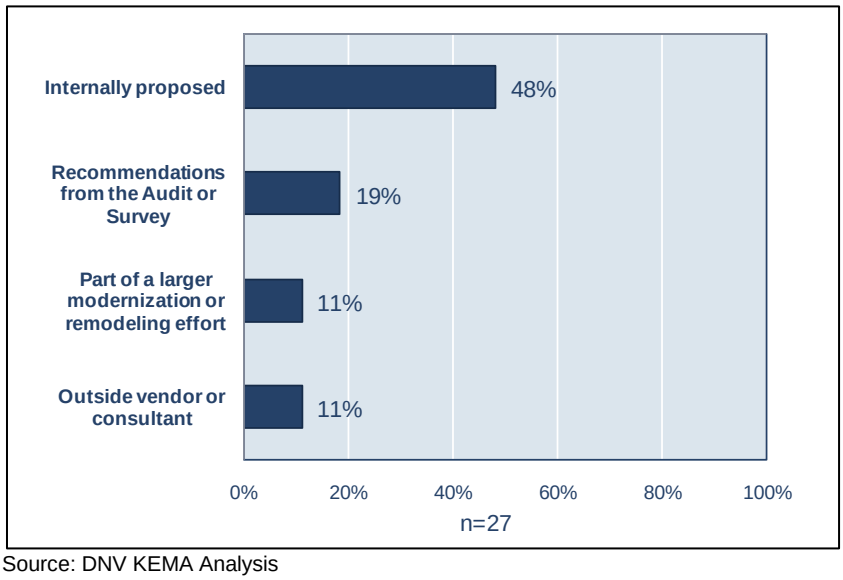
Figure 33: Reported Ways in Which ETAP Facilitated Project Completion



Source: DNV KEMA Analysis

When asked where the idea for the project originated, roughly 59 percent indicated that their projects were proposed either internally or as part of a renovation or remodeling project, as shown in Figure 34. Since it is unlikely that nearly half of the participants developed the idea in-house, it suggests that the contact provided by the implementer was not the initial decision maker.

Figure 34: Project Idea Origination for ETAP Participants



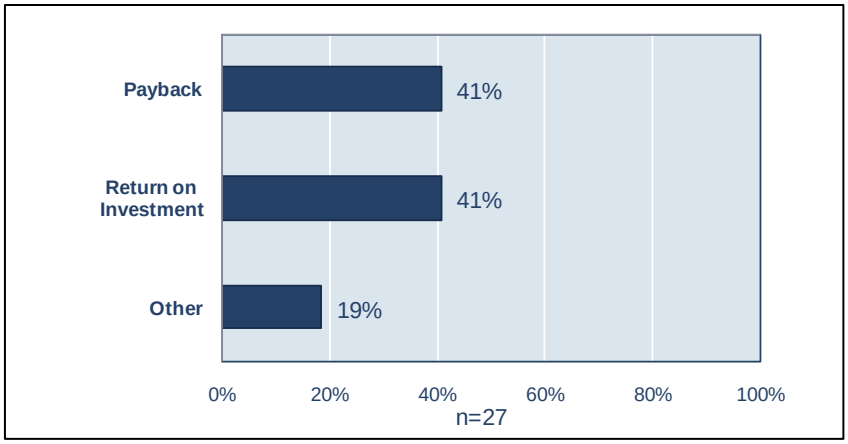
Source: DNV KEMA Analysis

Decision-Making Factors Influencing ETAP Participation

To learn more about the kinds of information ETAP participants used to inform their decisions, evaluators asked participants a series of questions that discussed other factors that may have influenced their project's implementation, such as costs and/or energy savings.

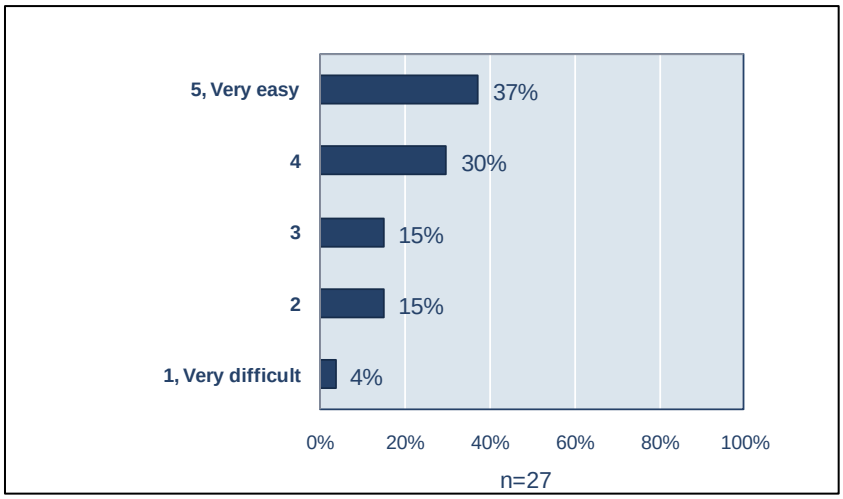
Surveyed participants were evenly split – at 41 percent apiece – between using payback-period and return-on-investment calculations, as shown in Figure 35. Furthermore, 67 percent of respondents ranked the ease of justifying their projects as a 4 or 5, using their organization's preferred financial calculation, as shown in Figure 36.

Figure 35: Financial Calculations Preferred by ETAP Participants



Source: DNV KEMA Analysis

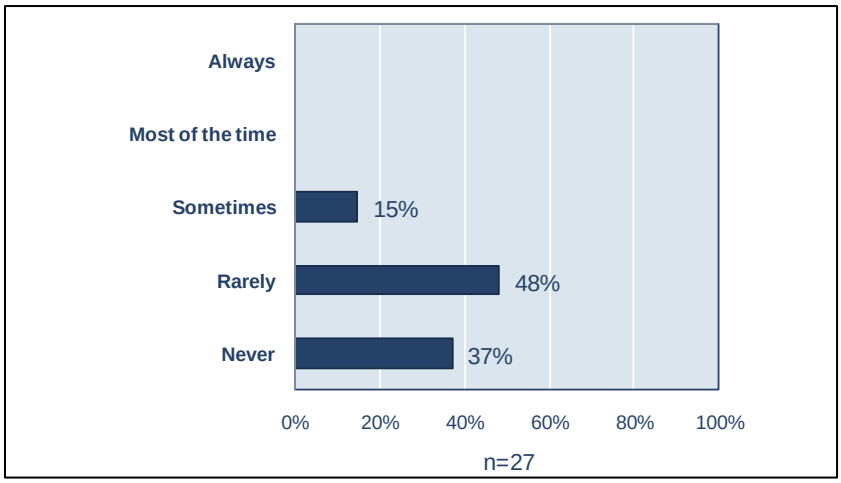
Figure 36: ETAP Participants' Ease of Determining Financial Calculation



Source: DNV KEMA Analysis

Most participants surveyed rarely or never considered the entire life-cycle cost of the equipment, as shown in Figure 37; only 15 percent consider it sometimes.

Figure 37: Use of Life-Cycle Equipment Costs Among ETAP Participants

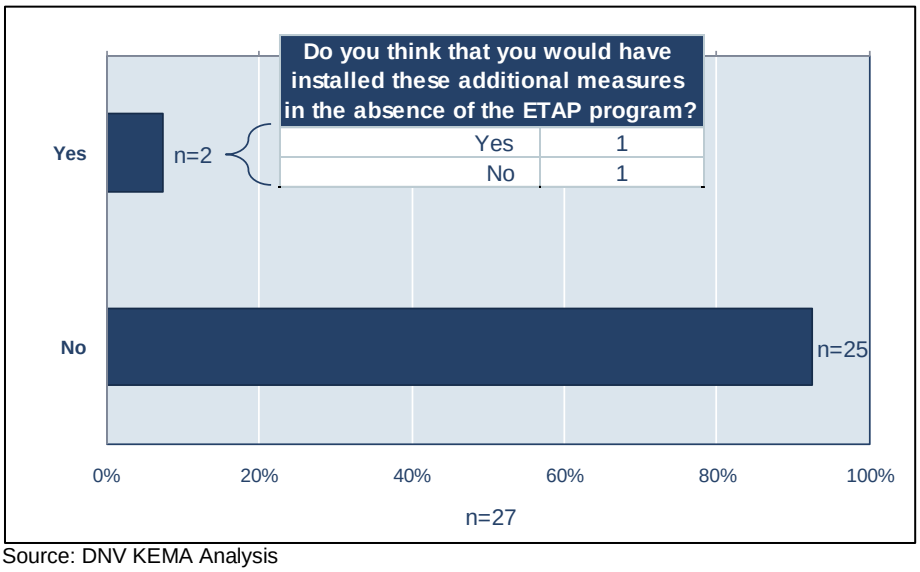


Source: DNV KEMA Analysis

Evidence of ETAP Participant Spillover

Evaluators designed several survey questions to determine whether participants undertook any projects similar to but outside of ETAP subsequent to their participation. Very few (7 percent) of those surveyed reported having undertaken additional project(s), as shown in Figure 38. Of the two participants who indicated having installed additional measures outside the program, one believed that the additional project would have occurred ETAP. (See table embedded in Figure 38.) Given these findings, there is limited evidence of possible spillover energy savings attributable to ETAP.

Figure 38: Energy Efficiency Project Undertaken Subsequent to ETAP



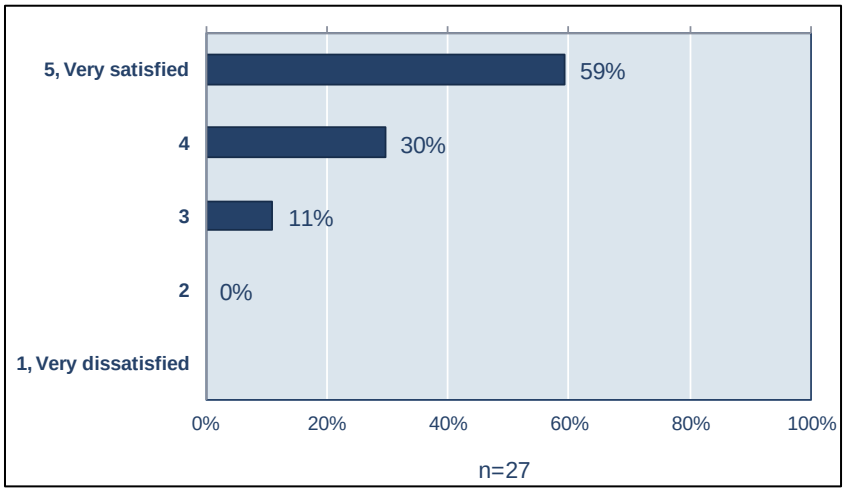
Source: DNV KEMA Analysis

ETAP Program Delivery

ETAP Participant Satisfaction

Many survey questions asked about participants' satisfaction with various program facets. ETAP participants surveyed were overwhelmingly satisfied with the program. When asked to rate their satisfaction with the program-installed equipment, 89 percent reported their satisfaction as a 4 or 5, as shown in Figure 39.

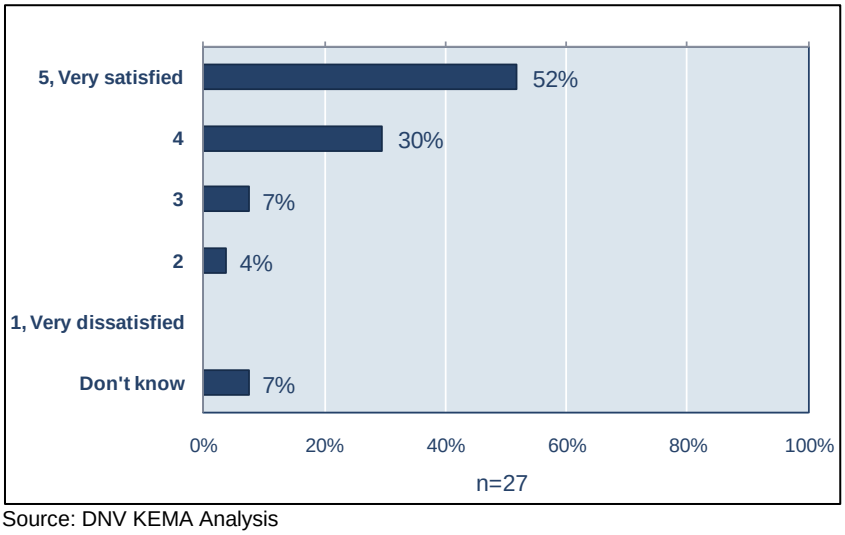
Figure 39: ETAP Equipment Satisfaction



Source: DNV KEMA Analysis

When asked to rate their project's surveyor and accompanying auditing services, 82 percent of respondents reported their satisfaction as a 4 or 5, as shown in Figure 40.

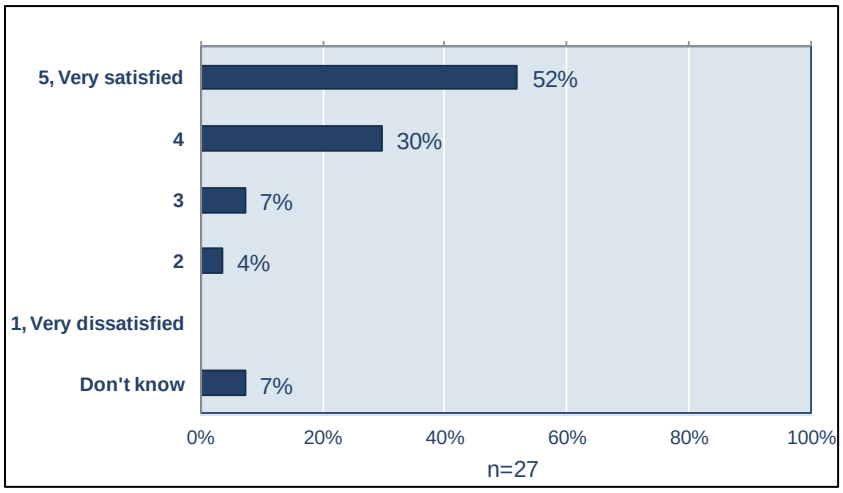
Figure 40: ETAP Surveyor Audit Service Satisfaction



Source: DNV KEMA Analysis

When asked to rate their contractor's installation services, overall responses were identical to those regarding the surveyors, as shown in Figure 41.

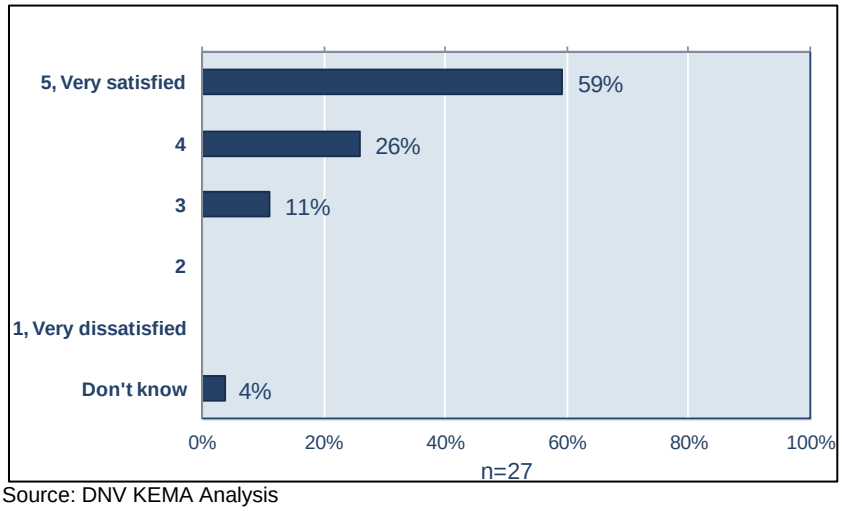
Figure 41: ETAP Contractor Installation Satisfaction



Source: DNV KEMA Analysis

When asked to rate their satisfaction with the energy efficiency benefits information provided, 85 percent of respondents reported their satisfaction as a 4 or 5, as shown in Figure 42.

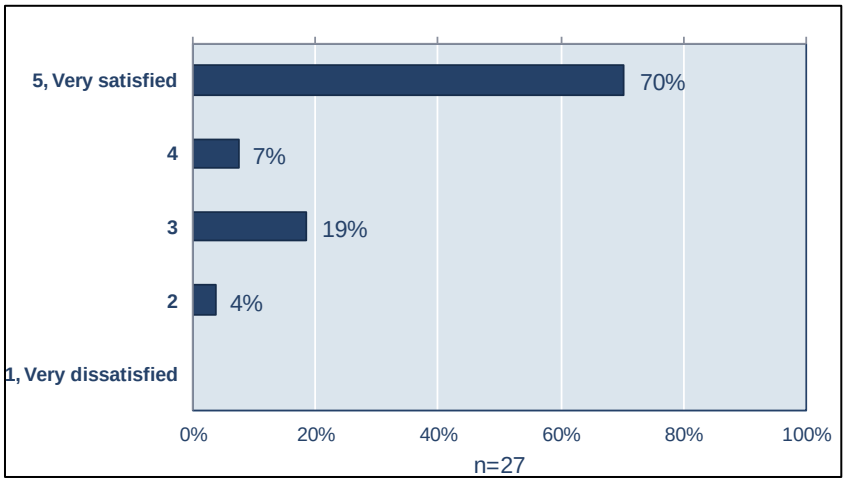
Figure 42: Satisfaction With Energy Efficiency Information Provided by ETAP



Source: DNV KEMA Analysis

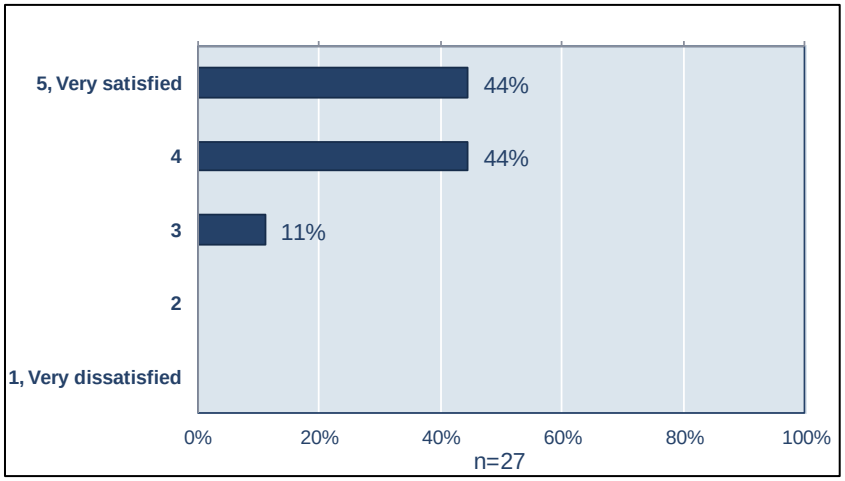
When asked to rate the technical assistance and communications of ETAP, a primary program objective, respondents reported a high degree of satisfaction, with about three-quarters of respondents giving a rating of a 4 or 5, as shown in Figure 43. When asked to rate the project coordination offered by ETAP, respondents also indicated a high degree of satisfaction, with 88 percent of respondents giving a 4 or 5, as shown in Figure 44.

Figure 43: Satisfaction With ETAP Technical Assistance/Communication



Source: DNV KEMA Analysis

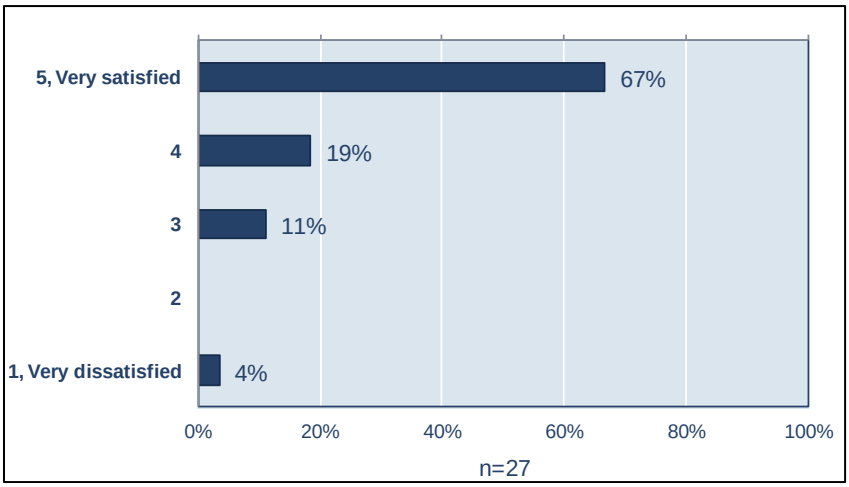
Figure 44: Satisfaction With ETAP Coordination



Source: DNV KEMA Analysis

When asked to rate satisfaction with the amount received from ETAP, 86 percent gave a rating of a 4 or 5, as shown in Figure 45.

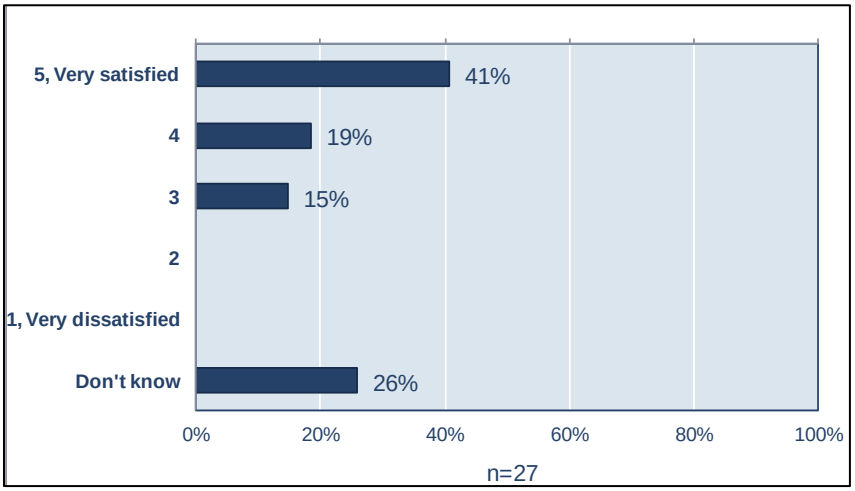
Figure 45: Satisfaction With Incentive Amount Received From ETAP



Source: DNV KEMA Analysis

When asked how energy savings for their installed measures compared to their expectations, most respondents gave a rating of a 4 or 5 (60 percent), as shown in Figure 46. A surprising 26 percent reported not knowing – this could be a result of (1) the late completion date of some projects, relative to the program's conclusion, or (2) participants not having sufficient experience yet with the equipment to have formed an opinion.

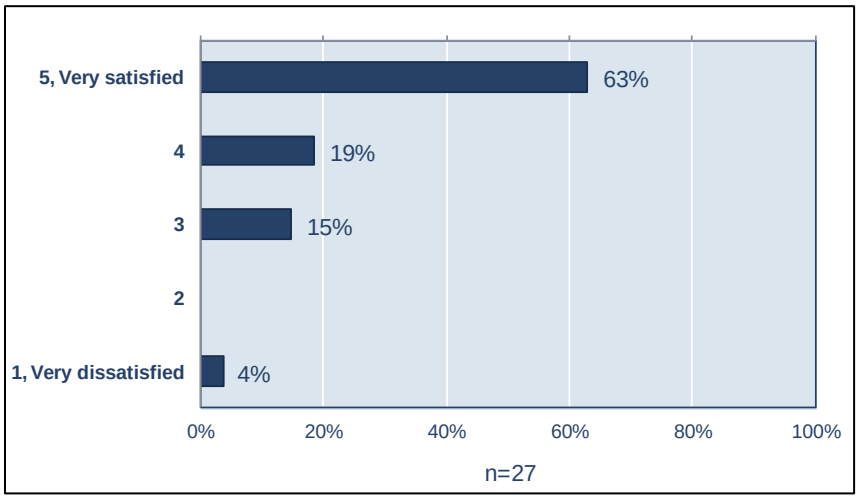
Figure 46: Satisfaction With Energy Savings due to ETAP



Source: DNV KEMA Analysis

Given how many participants reported not knowing whether they were satisfied with the energy savings, it is somewhat surprising that participants could answer the next question about the ability to control energy costs, as shown in Figure 47. The majority rated their satisfaction as a 4 or 5 (82 percent), but 4 percent were gave a rating of 1.

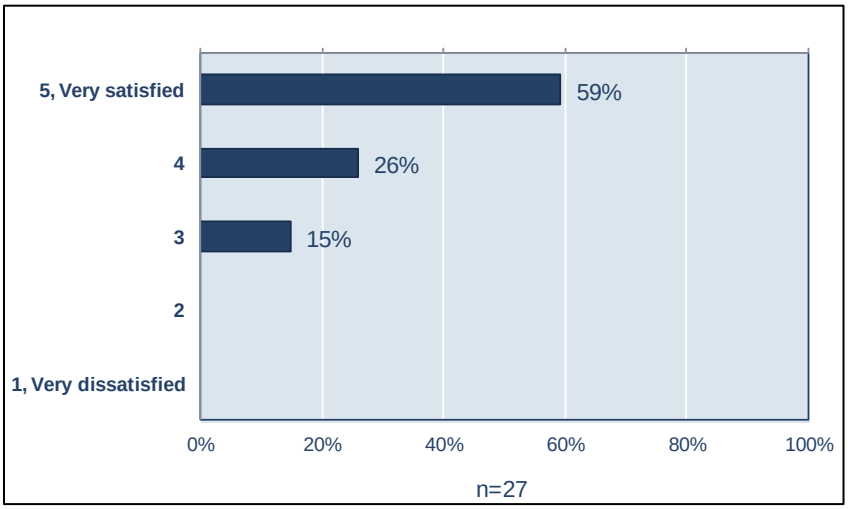
Figure 47: Satisfaction With Energy Cost Reductions due to ETAP



Source: DNV KEMA Analysis

Most ETAP respondents rated their satisfaction with the incentive application process as a 4 or 5 (85 percent), as shown in Figure 48.

Figure 48: Satisfaction With Incentive Application Process for ETAP



Source: DNV KEMA Analysis

ETAP Market Actor Interviews

During in-depth interviews, ETAP market actors (vendors and community partners) described their relationship with the program as an evolving combination of technical, marketing, and workforce development. Among those interviewed:

- Seven served the program's technical needs, such as designating appropriate products for rebates, assisting in writing ETAP program guidelines, and specifying specific project design assistance. Of those seven, four also participated in workforce development.
- Seven were involved in workforce development, including providing support and training for contractors and linking trained workers with potential projects. (Four of these seven market actors also served the program's technical needs.)
- Three supported program marketing, such as creating and promoting technology case studies and marketing the program to business partners.

Interviewees were asked how they became involved with the program. Most, 6 out of 13, had a prior relationship with Energy Solutions and were asked to participate. Two were competitors for ARRA funding and proposed a partnership with ETAP after funding was awarded.

ETAP Marketing Strategy and Tactics

As mentioned earlier, ETAP sought to increase California municipalities' awareness, knowledge, and interest in energy efficiency technology and to support participating contractors' ability to identify applications, specify the correct energy-efficient technology, and install these correctly.

A variety of marketing strategies and tactics were used to increase municipalities' awareness interest and knowledge of the energy-efficient technologies of ETAP. The majority of interviewees, 9 out of 13, directly contacted targeted agencies, such as the Port of Oakland, local universities (the University of California [UC] Irvine, UC Berkeley, UC Davis, UC Los Angeles, and Pepperdine), and public agencies' and counties' existing client networks, and sent e-mail blasts to local governments, urban planners, and transportation departments.

Interviewees also mentioned using a variety of methods to market the program locally. Market actors provided technical assistance, such as guidance on modeling technologies, and created case studies of successful installations to further market the EEMs. Market actors also attended conferences, such as the California University System Manual Energy Conference and the California Higher Education and Sustainability conference, and discussed the benefits of ETAP. Almost half of the community partners used the promotional materials or attended program events of ETAP. Initially, vendors involved in selling energy efficient technologies were not included in direct marketing to customers. This changed about halfway through the program, thus enabling vendors, who were most knowledgeable about their product, to present information directly to targeted customers.

"At the start of the program, only Energy Solutions (ES) was doing the marketing. They wanted vendors to only train their staff. We created workbooks so their staff could explain technology [and] could talk with the agency customers. The process evolved six to nine months in and we could get involved more directly. Initially, ES was protective of customers and didn't let vendors reach out to them directly but we got much more involved in the latter part of the marketing effort."—Vendor

To train contractors, some vendors and community partners worked directly with contractors to identify opportunities, specify the correct energy efficient technology, and install these correctly. Community partners contracted with labor unions and contractor associations to adapt both the ETAP program marketing and supplemental training to fit program requirements.

"W*e provided marketing to all of our training affiliates so unemployed electricians knew there was a program coming down the line. The idea was to get the training linked with the employment. Over the course of 1.5 years, I met with the 22 training center directors, did presentations to them both about ETAP and the training reimbursement that was available. You need to repeat and repeat your message and stay on the message and you need to continue to put the information out there because you may miss someone, such as new contractors or people who are moving into a different field. Our industry is very fluid, so we wanted to make sure at every point in the industry there was some contact with the companies we serve. The idea was to get the technology out to contractors who were selling it and electricians who were designing or installing it. The idea was to turn these technologies into common knowledge. You have to reach the contractors from the business perspective. Contractors tend to be risk-averse and they don't want to bid on work and projects that they don't know how to do, which is why the information needs to get distilled from management on down. It can't be just be presented as an opportunity to make money—it also has to include risk mitigation through training. Also, anytime there is a linkage with utilities, contractors listen." – Community partner*

Key ETAP Marketing Messages

Evaluators asked interviewees what key messages they used to promote the program to customers. Six out of 13 mentioned the cost savings through rebates. (*"It's a once in a lifetime opportunity, and it could be worth a significant amount of money.")* Almost half of the market actors mentioned the value of energy savings over time. *("The message when you are trying to sell a lighting technology is the energy savings, and, by extension, these are the cost savings over time.")* Two emphasized that the program's duration was limited and used that message to motivate government agencies to act faster. Another interviewee emphasized the importance of trust in the program and the technology.

"The design of the program itself was an important message. It was designed specifically for local governments, and the funding provided a service where they can get energy efficient technologies almost for free. That general message is a good one, and having experience with these programs in general, I recognized that that message is received better from a trusted local community partner as opposed to a contractor that they might worry was just trying to make a sale." – Community partner

ETAP focused specifically on local government and special districts. Vendors and community partners were asked about the most effective marketing strategies for those targeted end users. Eight out of 13 interviewees did not have any additional responses beyond those listed. One emphasized the importance of case studies and presentations. A few stated that including vendors in marketing was very important. Initially, vendors were excluded from marketing in preference of neutral, third-party community partners. Though some interviewees mentioned that building trust in new technologies was important, there was also a conflicting observation. Some community partners and vendors stated that it was a great benefit to include vendors in marketing because they had a more detailed and in-depth understanding of the uses and abilities of the new technology, as indicated in the following comment.

> *"In retrospect, I think ETAP was too cautious initially about vendors approaching customers. I think they felt they had to be neutral and protect the customers. But Energy Solutions didn't know our products as well as we did, so it was hard for them to sell the products well. After they built some trust with us, we started to aid them in site visits. Qualified technical staff people who have the right problem solving skills were really key. Had we done this co-marketing earlier, we would have done more projects. It seemed like halfway through the program we weren't doing things fast enough, and then at the end it was a mad rush to get projects in, and it seemed like everything went faster to make it all happen. In the beginning we were a bit frustrated as the process was too slow, and then at the end we were moving as fast as everyone could support." – Vendor*

By the midway point of the program, there seemed to be a balance between the need for neutrality and the need for detailed, technology-specific information. Community partners were able to rely on relationships with trusted vendors to explain technology without aggressive marketing.

Additionally, two interviewees discussed challenges faced in marketing the program. One stated that additional materials would have been useful, and another stated that a lack of customer resources inhibited marketing key messages.

> *"It would have been nice to have more materials on hand. There was no comprehensive information to share with all stakeholders that could say what the program was and what was required." – Vendor*

ETAP faced an additional challenge in marketing the program because potential clients had recently terminated jobs, including key contact people in facility management. At one location, for example, the facility manager position was eliminated due to budget cuts, and no replacement was anticipated. As a result, there was no contact person to sell or explain ETAP benefits.

> *"A significant amount of work was expended on projects that never came to fruition. There is a lot of educational work and a significant amount of agencies out there that considered it because of the incentive but didn't really have a good understanding of the solutions and implications of the solutions. Also, for certain customers it's not a good fit because they don't have adequate staffing. County and municipal agency cutbacks to staffing and internal funding had a major*

impact. Some of agencies are losing key facility management people who have critical understanding, and with the reduction of staff, then there isn't anyone on -site to have good understanding of what committing to an energy reduction plan would mean. Any time you buy something, there is maintenance, and some agencies didn't have the resources to deal with maintenance. As a vendor, that was a bigger challenge for us." – Vendor

"Most municipalities do not have staff with the skill set necessary to understand these projects. The people who they relied on with that knowledge have been laid off. The amount of attrition that has occurred is phenomenal. Municipalities have lost key people who know their systems. The decision-makers do not have the technical capacity to feel comfortable making decisions. There is real need to translate the technical requirements for municipalities. One of the things I think would be extraordinarily helpful would be to provide more technical information trainings to decision-makers in order to increase their comfort level with energy efficiency strategies and technologies." – Vendor

ETAP market actors also tried to attract contractors to participate in the program. Since most interviewees did not have direct contact with contractors, they were not able to comment on which marketing element was most effective to engage contractors. Two interviewees noted working intensely with contractors throughout the program's life. Accessing pre-existing contacts and professional relationships and emphasizing the program's tight deadline were important factors to attract contractors.

"We have a long list of approved contractors, and some agencies had their own preferred contractors. Those contractors, once they knew there was money and a hard deadline, were very motivated. Most of the time, the contractors were familiar with our technology as they were trained in prior projects. We predated ETAP in trying to create market awareness and demand, so we did have contractors ready to bid who were fairly knowledgeable." – Community partner

Finally, interviewees ranked the marketing's effectiveness to encourage the adoption of energy-efficient technologies. Ranking was graded on a scale of 1 to 5, with 5 meaning "Very Effective" and 1 meaning "Not at all Effective." Of the seven interviewees who provided a numerical ranking, four gave marketing effectiveness a 4, citing reasons such as *"ES did great outreach,"* and *"it was a little rough in the beginning – then did well."* Two gave it a 5 because of the overall productivity of the program. One respondent gave it a 2 because "*there should have been more integration with contractors and technical people."*

Overall ETAP Impact

When asked, "What worked well with the program?", four interviewees stated that strong program marketing and contractor outreach efforts were particularly successful at reaching diverse municipal agencies throughout California. Four stated that strong program management by Energy Solutions also was very important.

Vendors supplied detailed comments such as the following:

"Energy Solutions did a great job and helped us develop an energy model to use on various projects. They also did a really good job in getting agencies into the program, executing projects,

identifying roadblocks, and then getting the projects to go forward. Overall, management was really strong." – Vendor

"The levels of incentives were great. Also, it was pretty easy to get a rebate reservation. That means, for each project, we could provide the specification 'kilowatt-hours saved' and quickly get an estimate from Energy Solutions of how much they were willing to incentivize. They were really good at modeling energy efficiency." – Vendor

Most interviewees emphasized the effect that ETAP had, in particular in supporting energy-efficient technology adoption that would not have occurred otherwise.

"There were a lot of projects that happened just because ETAP was there. Without an extra incentive, a lot of people who had access to funds still wouldn't have installed energy-efficient technologies, or they wouldn't have done it to the same level that they did. For example, an end user would have replaced lights but not had occupancy sensors installed, and those little differences in projects will have huge energy savings." – Vendor

Evaluators asked interviewees what could be improved about ETAP. Although the short project timeline was a motivating factor for some organizations (as noted earlier), it was also a challenge. A number of interviewees felt great time pressure towards the end of program, and one recommended marketing incentives before the program began. Five community partners recommended including vendors in marketing efforts. Two community partners recommended including a greater variety of partners, overall.

"…manufacturers from the start would have had more success without appearing like a one stop shop." – Vendor

"Awareness could have been better toward to beginning. Prior to the incentive window opening, advertising to the public would have been good to show what the incentive is, then people could have had projects ready for the time period. It could have been more front-loaded instead of end-loaded for the period of performance. Having a funding model that includes a small amount of funding for education and advertising before incentive starts might be useful for future incentive programs." – Vendor

"The initial barring of direct communication between technology providers and clients really made things hard. I understand that ES needed to be an independent advisor for clients and, obviously, we are incentivized to sell our own product, but we have years of experience with our product and we can understand end-user needs and educate about our technology. The program really started taking off when direct contact was permitted with end users." – Vendor

Another program challenge was a mismatch between high-technology offerings and end-user staff resources.

"Each agency has its own unique situation and limited ability to adopt certain energy-efficient measures. Certain solutions, for example, changing T12 to T8s require no maintenance and won't change how you do business. Other types of technologies have more energy-efficient capabilities but require more involvement and maintenance. A lot of those systems are able to be

self-monitoring, and their value comes from having someone in the agency who can utilize that, but if the organization laid off the facility manager, and there isn't anyone to train, then it's problematic. For example, one project involved training maintenance people on proper operation. As the project was nearing completion, we were informed that we needed to contact a specific individual to train them, and it turned out they had been laid off two months prior. This is the climate now. Yes, end users could use money to do programs, but if they do not have people to manage programs on-site, then they need to stick with absolutely simple technologies. ETAP was very successful, in part, because of going after overlooked areas that had not been served by traditional solutions. On the other hand, because there was a lot of learning to do regarding these non-traditional solutions, it doesn't work when the organizations are laying off half their workforce." – Vendor

When asked to rank the program's overall effectiveness on a scale of 1 to 5, two-thirds of interviewees rated the program with a 4 or a five.

ETAP Market Effects

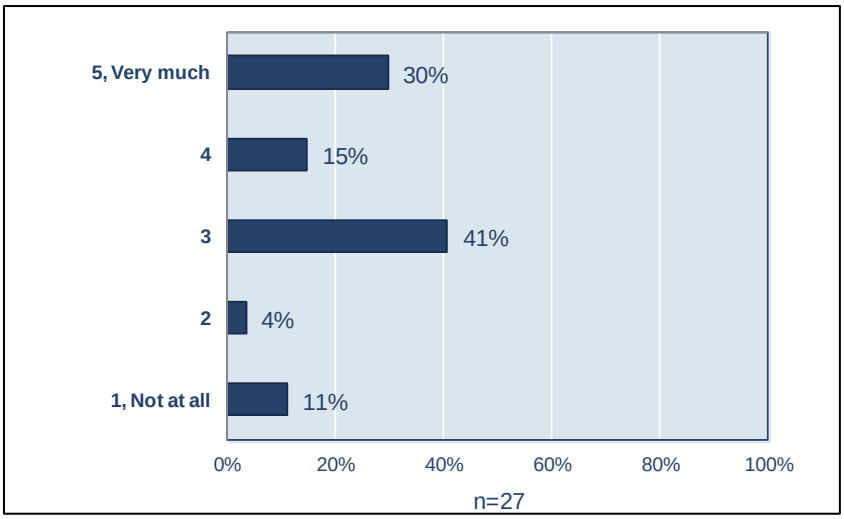
California's Energy Efficiency Evaluation Protocols[26] defines market effects as "a change in the structure of the market or the behavior of participants in a market that is reflective of an increase in the adoption of energy-efficiency products, services, or practices and is causally related to market interventions," with particular emphasis on quantification of spillover effects. This section presents findings from ETAP participant surveys and market actors interviews that focused on market effects.

ETAP Participants

As part of the program's follow-up survey, participants were asked about any changes to their behaviors to date caused by participating in ETAP. Specifically, the survey asked participants to compare their awareness of energy-efficient equipment and practices relative to those prior to their participation in ETAP.

Nearly one-half of participants rated the increase in their knowledge at the time of the survey compared to before the program as a 4 or 5, (45 percent) as shown in Figure 49 and Table 69.

Figure 49: ETAP Effects on Energy Efficiency Knowledge



Source: DNV KEMA Analysis

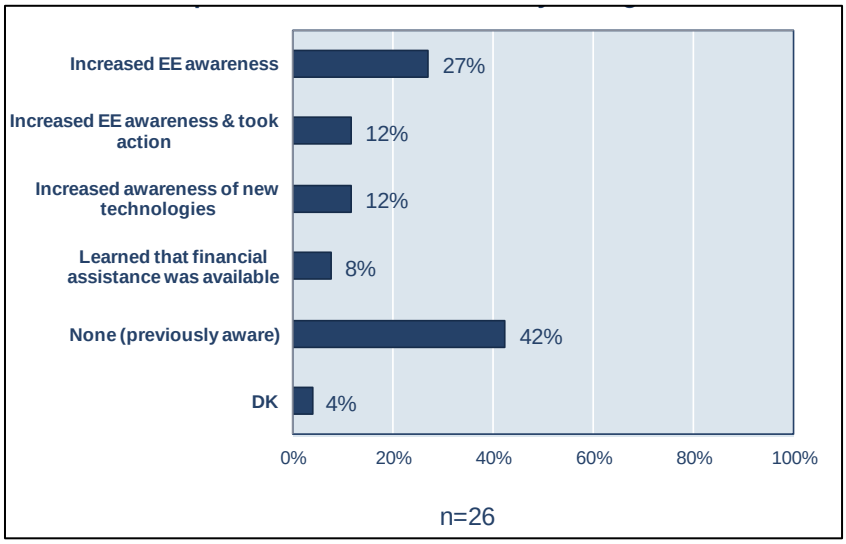
Table 69: ETAP Participant Assessment of Energy Efficiency Awareness

Self-Reported Current Awareness of Energy-Efficient Equipment and Practices Compared to *Before* ETAP Participation, n	
The same	15
Greater than before	12
Total Respondents	27

Source: DNV KEMA Analysis

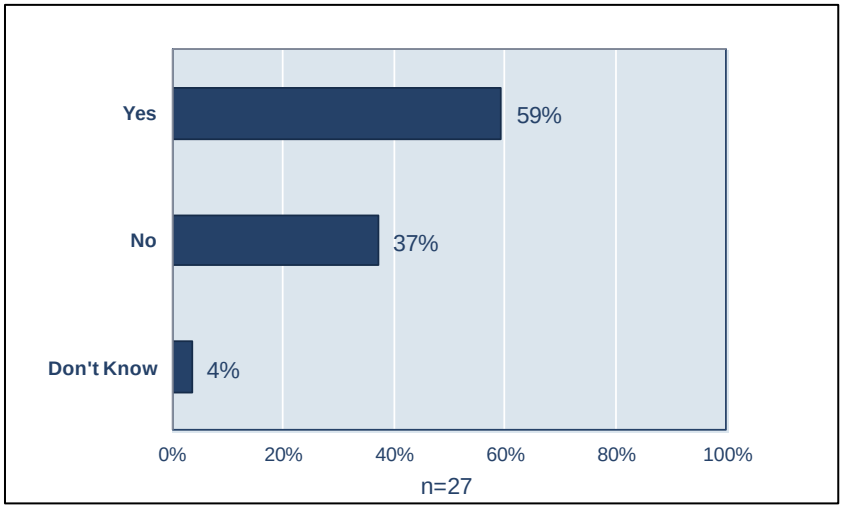
When asked to indicate the ways that their increased awareness changed their behaviors, the results are mixed. As shown in Figure 50, 42 percent reported that they had made no changes since their awareness was high prior to participating in ETAP. On the other hand, more than half reported having made changes to their maintenance practices as a result of their participation in ETAP, as shown in Figure 51.

Figure 50: Energy Efficiency Awareness Shifts due to ETAP



Source: DNV KEMA Analysis

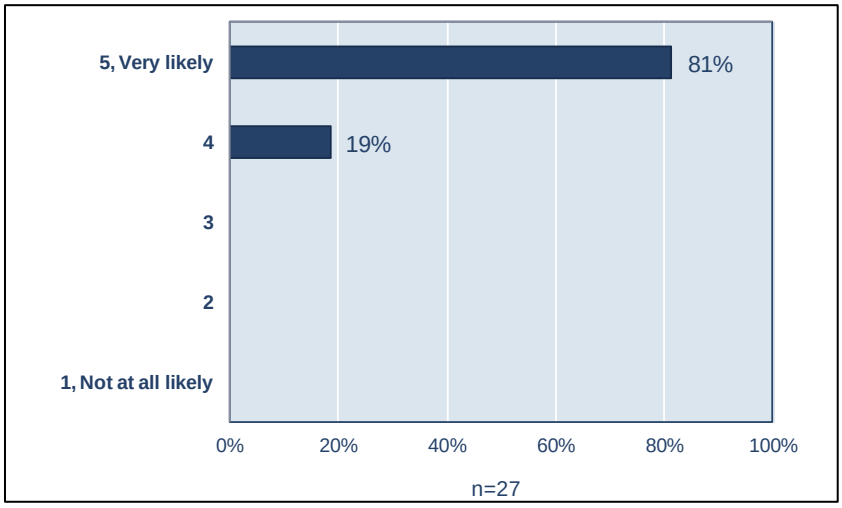
Figure 51: Maintenance Practice Improvements due to ETAP



Source: DNV KEMA Analysis

In addition, 81 percent of respondents reported being "very likely" to engage in similar types of projects in the future with incentives, as shown in Figure 52. In fact, all participants reported a 4 or 5 when rating their likelihood to engage in similar kinds of energy-efficient projects in the future with incentives.

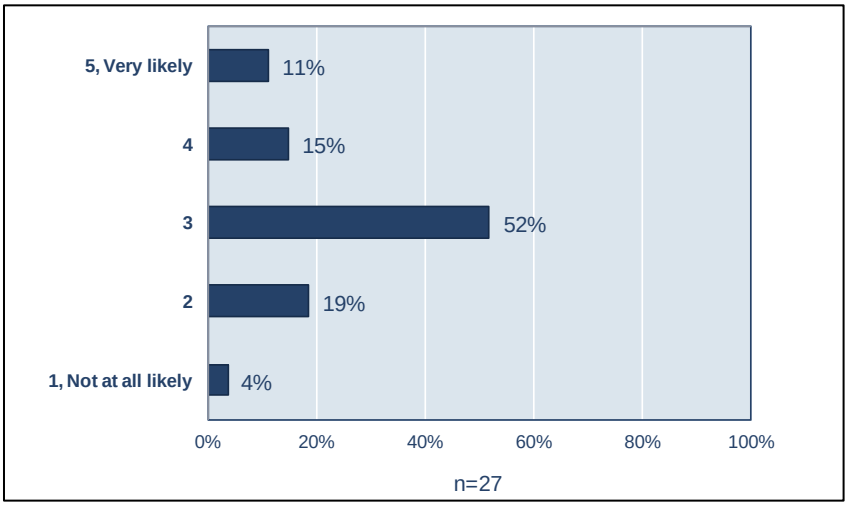
Figure 52: Likelihood of Future Projects With Incentives Similar to ETAP



Source: DNV KEMA Analysis

Without incentives, however, the proportion likely to invest in a future project (with a rating of 4 or 5) dropped to 26 percent, as shown in Figure 53.

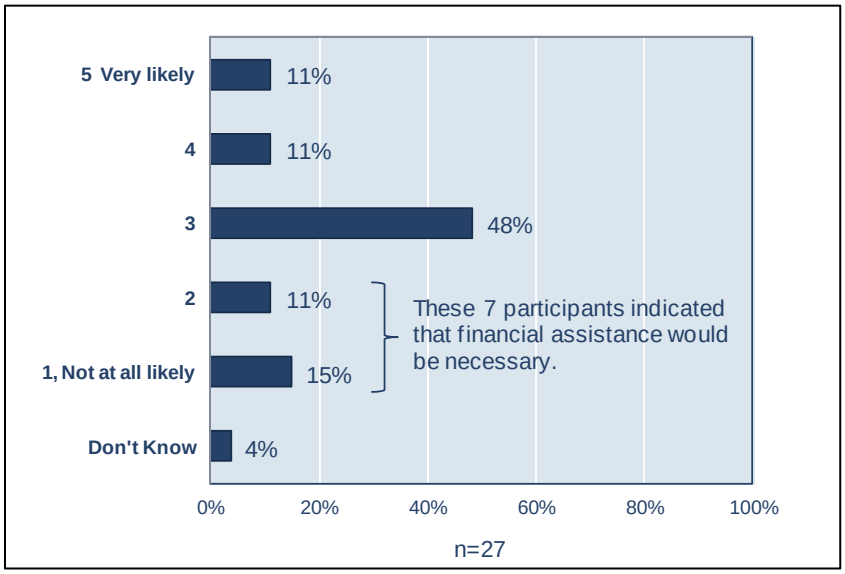
Figure 53: Likelihood of Future Projects Similar to ETAP Without Incentives



Source: DNV KEMA Analysis

When asked about the likelihood of engaging in other types of energy efficiency equipment upgrades, 26 percent of ETAP participants responded with a 1 or 2 to rate their likelihood of proceeding without financial incentives, as shown in Figure 54.

Figure 54: Likelihood of Other EE Projects Types Without ETAP Incentives



Source: DNV KEMA Analysis

The responses to the preceding questions suggest that, though knowledge, attitudes, and, to some degree, equipment maintenance behavior improved among participants, energy efficiency measure uptake in the municipal market will require continued incentives via financial subsidies.

ETAP Workforce Development

Promoting workforce development was an important program goal. ETAP achieved its workforce development goals, as shown in Table 70. In some cases, the numbers far exceeded program goals, and, overall, the interviews responded positively about workforce development as well.

Table 70: ETAP Workforce Development Efforts

Audience	Workforce Development	Goal	Achieved
Participants	Technology Seminars Held	6	6
	Attendee Count	60	229
Electricians	Lighting Trainings Held	n/a	7
	Attendee Count	40	40
HVAC Installers	Workshops Held	n/a	2
	Workshop Attendee Count	20	20
Interns	Internships Granted	4	4

Source: DNV KEMA Analysis

Though most of the interviewees were not directly involved with contractor's businesses, those who were observed that vendors and contractors expanded their business as a result of the program. About half of the interviewees (five) stated there were a number of developments for vendor and contractor workforce.

> *"Our field support team officially grew during that time because of demand created by ETAP. It also supported an addition of at least one contractor job." – Vendor*

There was a challenge with workforce development, as one interviewee mentioned, "*a disconnect*" existing between trained contractors and ETAP-funded jobs. One interviewee observed that, although the program provided training, it did not require trained contractors to work ETAP-funded jobs. According to initial program plans, CALCPT was a program requirement; its removal was met with an adverse response.

> *"The electricians we were training were supposed to be connected to those projects in that particular area that they were trained. To my knowledge that did not occur. There was no stipulation to my knowledge that the people who were contracting ETAP funded projects for the municipalities were the same electricians who are CALCPT-certified. Consequently, if you don't require your contractors to be CALCPT-certified, why would customers pay higher prices for people who are? The projects should have required CALCPT-certified electricians to qualify for these government/CEC rebates." – Community partner*

ETAP Training

One of the two ETAP main goals was to contribute to the supply of workers trained in specific energy-efficient technologies. Training included seminars and webinars on energy efficiency initiatives, as well as client management and relevant software applications. Nine out of the 13 interviewees said that ETAP provided training as part of program administration. Five appreciated that the training development was collaborative in nature. Interviewees described their understanding of and experiences with ETAP-sponsored training favorably.

"I participated in webinars which were well attended and well organized. Manufacturers had a low profile presence because it was not about selling. Webinars also drove traffic to the website to get more information." – Vendor

"There were 66 electricians trained throughout the state. There was additional training for ETAP from the Department of Labor grant, and they funded training for 1,500 electricians. Some of the larger parts of the state ramped up training through this grant. The purpose of the advanced lighting control program which ETAP was promoting was to get 1) get it out to contractors who are selling it and 2) to electricians to increase awareness of the technology so that it becomes common knowledge." – Community partner

Rate of ETAP Technology Uptake

To accelerate uptake of three types of advanced energy efficiency technologies in local government and education markets, ETAP sought to increase the overall awareness, knowledge, interest in energy efficiency technologies, and capabilities of participating contractors to complete energy-efficient upgrades. One-third of interviewees declined to speak about end-use customers' level of comprehension. Those five interviewees indicated that they were unaware if the program increased awareness, knowledge, or interest. Authors list remaining interviewees' responses on the following pages.

Three interviewees stated that the program definitely increased awareness of new technology. (*"With all the outreach ES did and we did, a lot of people learned about [the] technology.")* Another stated that ETAP served an important function in raising awareness about energy efficiency, specifically for municipalities.

"The average municipality or facility manager would think that the utilization of energy-efficient technology would be reserved for organizations that have lots of money. The ETAP program, regardless of whether the facility was able to complete the installation, provided exposure to the technologies. Public agencies realized that the technologies were neither as expensive nor as hard to install as they had previously imagined. ETAP educated individuals on what is out there." – Vendor

One interviewee thought that customers were already aware of available technologies and that awareness was increasing overall: "*There is so much going on. The California Public Utility Commission has funding to work with local government programs as well. Awareness is lifting statewide as a result*." Two interviewees responded that – though they felt the program increased awareness, money, and communication – barriers to such projects would persist beyond the program.

"I think it's definitely increased the awareness. Utility people were talking about it, and there were seminars, case studies and a lot different information was generated. But people's memories are short, and the trouble with all these entities is that they can't really afford to do energy efficiency projects without the program. They just don't have the money. Now that the money is gone, I don't think they will continue to do these projects. You know they're interested and knowledgeable, but they just don't have the money." – Vendor

"Cross communication between departments is almost nonexistent. Any strategy to get folks from different departments of municipal agencies into the same room is important. The people who were working with ETAP knew this." – Community partner

Evaluators asked interviewees if the program increased technology-specific knowledge. Four responded that customers that installed energy-efficient technologies increased their knowledge. Customers became engaged as their project progressed; as a result, their knowledge increased.

"People who completed projects had a much more detailed understanding than before." – Vendor

Another interviewee felt that though customers did not understand the details of the new technology, with ETAP they understood the monetary savings of energy efficiency.

"I don't think customers have knowledge of energy-efficient technologies. I know that they have information about ways they can save money. Customers don't know the technical part, but they did get the message that they can save money." – Vendor

Interviewees were asked about the program success at generating interest in energy-efficient technologies. All eight of the interviewees that provided a response stated that the program increased interest in EEMs. Three stated that interest increased due to money-saving technologies, three because of project experience, and two because of program support and education.

"People realize that the measures are economically feasible. You would have to be daft to not be interested in saving money, and ETAP allowed individuals to see how feasible it is to bring in energy-efficient technologies, even without incentives. For some, where the incentive is 50 percent, then yes, the only way they could do it is with incentive. But in another case, the payback was six or seven years on a $300,000 project, and the incentive rebate was only $3,000. Municipalities and agencies were forced to look at the economic reality of the project, and that is a first step" – Vendor

"More projects got done than would have been done without the program. From my personal experience with the projects, most of them would not have happened without extra money because of budget constraints." – Vendor

"Within certain agencies, the program shifted long-term thinking and made it possible for facility managers to look for long-term solutions." – Vendor

Interviewees were asked if the program increased contractor's knowledge of energy-efficient technologies or changed their behaviors in any way. Once again, most did not have the information or experience to address this topic, but two stated that the field-team support staff grew, and one observed that the program supported contractor jobs, in general.

"The technology has become mainstream, which was a goal for ETAP. When we first started the program, we had two to three cities and a few universities like Stanford and UC Berkeley, but, at the end, we had half a dozen counties and universities who had the equipment installed. It took a technology that was probably for early adopters – people who were willing to take risks – and

moved it into mainstream. ETAP helped accelerate adoption of these energy-efficient technologies. Without the program it would probably take another year or two years to get to the same level of comfort or adoption in the marketplace without this accelerator boost from ETAP." – Vendor

ETAP Conclusions and Recommendations

ETAP Conclusions

Overall, ETAP was a very successful subrecipient program that delivered targeted retrofits to 114 project sites at municipal and higher education buildings in California by way of three major measure categories. Nearly two-thirds of these project sites involved bilevel luminaires for garages and parking lots, 16 involved other types of luminaires with wireless controls, and 27 involved wireless controls for existing constant-volume HVAC systems.

ETAP Energy Savings

Using the Baseline 1 results from 27 on-site visits conducted at a representative sample of program project sites, the evaluation team determined that ETAP provided 23 GWh of net annual electricity savings, 1.3 MW of net demand savings, and 985,975 therms of net natural gas savings. These annual savings yield net annual avoided GHG emissions of 12,427 metric tons of CO_2. The net life-cycle savings attributable to ETAP include 345 GWh of electricity and 14.8 million therms of natural gas in addition to avoided GHG emissions of 186,402 metric tons of CO_2.

ETAP Implementation Effectiveness

The evaluation team determined that ETAP was a well-run program that was very well-received by participating customers and participating partner organization. Therefore, very few recommendations for improvement can be made.

Participants expressed a high degree of satisfaction with many program delivery facets, including surveyor/audit services, contractor installations, rebate application processes, and reporting requirements. Most ETAP participants surveyed achieved both energy savings and cost reductions comparable to what they expected and were satisfied with the energy efficiency information and technical assistance provided to them. Furthermore, slightly more than half reported that their participation affected the way they maintained or used equipment, suggesting that some effects may persist.

Most ETAP participants are highly likely to participate in a similar program if that program offers incentives similar to ETAP. On the other hand, without incentives, only one-quarter would be likely to participate. This is not surprising in a market characterized by tight budgets, competing project priorities, and multiple layers for decision-making.

ETAP Market Effects

Though each of the market actor interviews provided different perspectives on ETAP, several successes emerged, indicating that the program affected the municipal and educational facility markets in several ways.

First, Energy Solutions successfully used partnerships with local organizations, including the Association of Bay Area Governments, the Southern California Association of Governments, and the Local Government Commission that greatly benefited program outcomes. Without these partnerships early on, the program would not have been able to expand at the rate it did.

In addition, the program instituted several marketing tactics, but the most successful seems to have been the case studies. These help reduce barriers for potential participants by clearly explaining the technologies and reducing the uncertainly about performance.

Additional evidence of market effects comes from participants' reporting increased awareness, knowledge, and interest – across multiple market segments – attributable to ETAP.

Finally, most interviewees noted that the program marketing approaches, combined with the technology expertise of the vendors, built trust with facility managers and were important factors for program success. Interviewees remarked that the program did a good job of balancing between objective program marketing and specific technological expertise.

ETAP Recommendations

Ex Ante ETAP Savings Tracking

Since the ex ante savings were challenging to track, develop standards for project-tracking databases that include requiring unique records for each measure at a given project site. This practice will help managers track whether similar ex ante savings methodologies are being used across projects and facilitate program evaluations. Additional challenges presented by the ETAP project tracking included the following:

- Wireless HVAC controls savings were provided to the evaluation team in a separate spreadsheet from the other two measure categories.
- Ex ante demand savings methodologies for wireless lighting controls varied between project sites.
- Installed measure quantities were provided for bilevel luminaires at parking facilities, but not for the other two measure categories. While these can be challenging to quantify, it is essential to devise a programwide approach.

ETAP Program Delivery

Only one-quarter of participants surveyed would be likely to participate again without incentives. This is due mainly to budget reductions for state-funded entities. While these budget reductions are in place, adoption of new technologies and even basic retrofits will require cost subsidies to continue at the pace set by ETAP. Any new programs must offer substantial financial incentives to be successful while these conditions exist.

Even though most participants were satisfied with the operation of the program, one area they were less satisfied with was reporting. Future programs should review reporting requirements and possibly streamline these by reducing the level of information required, redesigning forms, or providing training to contractors.

ETAP Market Effects

Through the markets actor interviews, evaluators identified several opportunities for improvement:

- Workforce development is a diverse and disaggregated endeavor. Training needs vary by technology and by market actors. Future programs should emphasize and understand the level of effort required for project management coordination among technical experts, marketing agencies, and professional organizations before, during, and after the program. Coordination of these entities at the program outset will reduce curriculum development and participant recruiting time.
- It is necessary to allow sufficient time to test and identify effective marketing messages for programs targeting atypical markets. For ETAP, working with local government agencies was a process with which most vendors were unfamiliar. This hindered finding effective project marketing approaches initially, and to some extent, delayed program penetration. Since the case studies proved to be an effective marketing strategy, future programs should employ this approach for complex measures. While not done for ETAP, creating a general program brochure to explain the program and its processes would be a helpful supplement to the case studies.

During program implementation, targeted municipalities experienced high employee turnover and job losses of facility managers due to budget reductions. Regardless of economic conditions, future programs targeting this or similar markets should consider:

- Allocating more time for training staff and producing detailed training materials to facilitate educating non-engineering staff about the applications and financial benefits of promoted technologies.
- Developing and providing very specific support and technical assistance to vendors and participants regarding all aspects of the program including training offerings and the application and reporting processes.

CHAPTER 6:
Oakland Shines

OS-Specific Evaluation Design Elements

OS On-Site Visit Sample Design

The evaluation team stratified the population, as provided in state-level tracking data,[29] by the total estimated annual source energy savings (in kilo British thermal units [kBtu]) per site. Table 71 illustrates the five energy savings strata chosen and the resulting annual source-level savings distribution for OS population, as well as the evaluation sample.

Table 71: OS On-Site Sample Design Stratification for Interim Tracking Data

Stratum	Annual Source Energy Ex Ante Savings Range in Strata (kBtu)	Interim Tracking Data		Target Sample	
		Project Sites in Population, N	Annual Ex Ante Source Energy Savings (kBtu)	Project Sites in Sample	Ex Ante Source Energy Savings (kBtu)
1	< 72,000 kBtu	103	4,296,091	6	324,343
2	≥ 72,000 kBtu and < 150,000 kBtu	51	5,026,456	5	621,977
3	≥ 150,000 kBtu and < 500,000 kBtu	20	6,201,283	5	1,152,216
4	≥ 500,000 kBtu and < 2,200,000 kBtu	7	9,097,238	5	6,376,253
5	≥ 2,200,000 kBtu	6	26,502,911	6	25,750,157
Total		187	51,123,979	27	34,224,946

Source: DNV KEMA Analysis

Table 72 shows the savings distribution by measure category.

29 The evaluation sample was originally designed based on program tracking data through October 2011. At that time, only 187 participant sites had been committed. The final program-tracking data were obtained in October 2012 and contained information regarding 195 sites. As such, the original sample design was based on 187 projects, but the final sample disposition was ultimately compared to the full program, or 195 projects.

Table 72: OS On-Site Sample Design by Measure Category

Measure Category	Interim Tracking Data		Target Sample	
	Annual Ex Ante Source Energy Savings (kBtu)	Savings Proportion	Annual Ex Ante Source Energy Savings (kBtu)	Savings Proportion
Bilevel Luminaires for Garages and Parking Lots	22,777,877	45%	15,677,020	46%
LED Luminaires for Refrigeration Cases	7,908,105	15%	526,826	2%
Lighting and Wireless Controls	2,845,642	6%	495,427	1%
Wireless HVAC Controls	17,592,355	34%	17,525,673	51%
Total	51,123,979	100%	34,224,946	100%

Source: DNV KEMA Analysis

OS Participant Survey Sample Design

Evaluators used the same sample stratification design for participant surveys as was used for the on-site visits and attempted to reach the same project site contacts, as shown in Table 73.

Table 73: OS Participant CATI Sample Design

Stratum	Annual Source Energy Ex Ante Savings Range in Strata (kBtu)	Interim Project Sites in Population, N	Target Sample
1	< 72,000 kBtu	103	6
2	≥ 72,000 kBtu and < 150,000 kBtu	51	5
3	≥ 150,000 kBtu and < 500,000 kBtu	20	5
4	≥ 500,000 kBtu and < 2,200,000 kBtu	7	5
5	≥ 2,200,000 kBtu	6	6
Total		187	27

Source: DNV KEMA Analysis

OS Market Actor Interview Approach and Sample Design

Using the OS logic model and program theory as guides, evaluators interviewed a representative subset of market actors to learn to what extent program achieved its objectives. The interviewees included participating facility managers, agency managers, and partner program managers. Evaluators used interview results in coordination with other data collection

methods to draw conclusions about the program's effectiveness to achieve its short- and intermediate-term market transformation goals and to overcome adoption barriers. Evaluators also developed recommendations for future programs at the end of the section. The research questions listed in Table 74 were used as guides to elicit feedback from market actors regarding OS market effects.

Table 74: Research Questions for OS Market Effects Assessment

OS Outcomes	Research Questions	Data Sources
Increased knowledge and awareness of new energy-efficient technologies by increasing marketing and outreach	• Has knowledge of new EE technologies increased? • What does their level of knowledge entail and how was it gained?	Interviews with partner program managers Interviews with program contractors
Behavior changes/increased market activity spurred by increasing market activity	• Has there been an increase in interest for the technologies promoted by the program? • Has there been an increase in activity for other types of EE upgrades? • Have the prices for these EEMs changed since they began participating?	Interviews with partner program managers Interviews with program contractors
Increased work opportunities, support through EE marketing, outreach, funding and training, leads to increased jobs in the EE technology	• How is support for EE projects changing workload? • Are training participants able to apply these new skills on the job?	Interviews with partner program managers Interviews with program contractors

Source: DNV KEMA Analysis

QuEST's OS program manager supplied initial contacts for 13 individuals in organizations that provided technical, marketing, and workforce development services in support of the program. The targeted disposition of market actor interviews is shown in Table 75.

Table 75: OS Market Actor Interview Sample Plan

Market Actor	Population Provided by QuEST	Interview Target
Program Partner Managers (including utility, government, and community partners)	12	6—7
Program Contractors	1	2—3
Total	13	8—10

Source: DNV KEMA Analysis

OS Evaluation Results

This section presents overall evaluation results for the Oakland Shines Program, including presentation and discussions of the disposition of the final sample, verified savings, realization rates, precision estimates, and the program's overall gross energy savings results, including measure-type summaries. Next, the authors report participant survey results gathered using CATI technology. Finally, authors provide market actor interview findings to discuss the program's effects.

OS Final Dispositions

OS On-Site Visit Final Sample

As indicated in the previous section, the evaluation team set out to verify the gross savings achieved by the OS targeted retrofits by using a stratified random sample design to yield a precision equal to or better than ± 10 percent at the 90 percent confidence interval. A subcontractor to DNV KEMA, kW Engineering, scheduled and conducted the on-site visits from the primary and backup sample. Table 76 illustrates the five strata chosen during the sample design and the resulting distribution of annual electricity savings resulting from program participation for the final OS population in QuEST's tracking data. When compared to the interim tracking data, the number of project sites increased, but the overall ex ante savings decreased slightly. The implementer was unable to verify the savings due to all the components at a couple of the project sites by the close of the program and had to reduce some of the claimed savings. These adjustments to the final tracking data caused some sites to shift from one stratum into an adjacent one.

Table 76: OS Final On-Site Disposition by Savings Stratum

Stratum	Ranges of Strata by Annual Ex Ante Source Energy Savings (kBtu)	Final Tracking Data			
		Project Sites in Population	Annual Ex Ante Source Energy Savings (kBtu)	Project Sites in Sample	Annual Ex Ante Source Energy Savings (kBtu)
1	< 72,000 kBtu	106	4,304,607	6	324,343
2	≥ 72,000 kBtu and < 150,000 kBtu	55	5,355,933	5	621,977
3	≥ 150,000 kBtu and < 500,000 kBtu	21	6,067,964	5	1,152,216
4	≥ 500,000 kBtu and < 2,200,000 kBtu	6	6,376,252	5	6,376,253
5	≥ 2,200,000 kBtu	7	28,621,345	6	25,750,157
Total		195	50,726,101	27	34,224,946

Source: DNV KEMA Analysis

Table 77 shows the distribution of savings by measure categories across the OS, both for the final population and for the sites contained in the final sample. The evaluation team scheduled and conducted the on-site visits from the primary and backup sample.

Table 77: OS Final On-Site Disposition by Measure Category

Measure Category	Final Population		Final Sample	
	Annual Ex Ante Source Energy Savings (kBtu)	Savings Proportion	Annual Ex Ante Source Energy Savings (kBtu)	Savings Proportion
Bilevel Lighting at Garages and Parking Lots	23,936,897	47%	15,677,020	46%
LED Luminaires for Refrigeration Cases	8,200,315	16%	526,826	2%
Lighting and Wireless Controls	1,063,216	2%	495,427	1%
Wireless HVAC Controls	17,525,673	34%	17,525,673	51%
Total	50,726,101	99%	34,224,946	100%

Source: DNV KEMA Analysis

OS Participant Survey Final Sample

The same sample design was used for the participant CATI survey effort as had been used for the impact study design—a randomized sample within each of five strata for a target of 27. CATIs were conducted between early March and mid-June 2012. The CATI subcontractor struggled to reach participants, and it became necessary to increase the original number of attempts per participant from 10 to 20. The targeted number of surveys, however, still proved to be out of reach, and only 16 surveys could be completed. The reasons provided by the CATI subcontractor for not being able to complete more surveys include refusals to participate, hang-ups midway through survey, telephone numbers no longer in service, and language barriers. Furthermore, due to challenges reaching the site contacts at the same projects that were in the final on-site sample, a fraction of the participant survey respondents differed from those 27 project sites that received an on-site visit. Table 78 shows the final disposition of the telephone surveys of OS participants.

Table 78: OS Final Participant CATI Disposition

Reported CATI Disposition	OS Participants
Target	27
Completed Interviews	16
Number of Dialings	458
Number of Contacts	221
Average Length (minutes)	16.5

Source: DNV KEMA Analysis

To quantify the uncertainty around each CATI response, Appendix E provides a table of confidence intervals for OS where the total number of respondents to a question equals 16. The widest confidence intervals occur when exactly 50 percent of respondents provide a given answer. For those instances where 50 percent of the OS participants (n=8) provided a given response, the confidence interval around the proportion is ± 20 percent. As the proportion of participants that provided a given response shifts away from 50 percent, in either direction, the confidence interval around that proportion gradually approaches 0 percent. For those instances where either 6 percent or 94 percent of the OS participants (n=1 or 15, respectively) provided a given response, the confidence interval around the proportion is ± 10 percent.

OS Market Actor Interview Final Sample

To ascertain the effects of OS on Oakland buildings, the evaluation team spoke with a representative subset of market actors. Results from the interviews were used to draw conclusions about the program's effectiveness at achieving short- and intermediate-term market transformation goals and overcoming barriers to adoption. Some of those contacted were not directly involved with OS but were able to provide names of additional contacts to capture a more comprehensive perspective on the program's design, delivery, and effects. While the evaluators were not able to interview as many contractors as targeted, the team reached out to more partners than initially targeted. The final disposition of OS market actor interviews is shown in Table 79.

Table 79: OS Final Market Actor Interview Disposition

Market Actor	Target	Final Sample
Program Partner Managers (including utility, government, and community partners)	6—7	10
Program Contractors	2—3	1
Total	8—10	11

Source: DNV KEMA Analysis

OS Gross Energy Savings

To determine the OS savings for the subrecipient program, as a whole, the verified, or ex post, savings were determined for a sample of project sites by performing on-site visits and engineering analyses.

OS Verified Energy Savings

Resulting from data collected during on-site visits to participant facilities, evaluators determined the sample's gross annual electricity savings by strata and by measure category respectively, as shown in Table 80 and Table 81. The realization rate at the project sites in the sample came to 80 percent, using Baseline 1, and 77 percent, using Baseline 2. The LED luminaires for refrigeration cases had the highest measure-specific realization rate of 126 percent, using Baseline 1.

Table 80: OS Verified Annual Electricity Savings in On-Site Sample by Savings Stratum

Stratum	Ranges of Strata by Annual Ex Ante Source Energy Savings (kBtu)	Project Sites in Sample	Annual Ex Ante Electricity Savings (kWh)	Baseline 1		Baseline 2	
				Annual Ex Post Electricity Savings (kWh)	Realization Rate	Annual Ex Post Electricity Savings (kWh)	Realization Rate
1	< 72,000 kBtu	6	31,934	38,419	120%	34,557	108%
2	≥ 72,000 kBtu and < 150,000 kBtu	5	60,764	70,957	117%	53,386	88%
3	≥ 150,000 kBtu and < 500,000 kBtu	5	134,311	153,419	114%	150,470	112%
4	≥ 500,000 kBtu and < 2,200,000 kBtu	5	596,684	462,323	78%	462,323	78%
5	≥ 2,200,000 kBtu	6	1,871,645	1,429,908	76%	1,385,512	74%
Overall		27	2,695,338	2,155,026	80%	2,086,248	77%

Source: DNV KEMA Analysis

Table 81: OS Verified Annual Electricity Savings in On-Site Sample by Measure Category

Measure Category	Annual Ex Ante Electricity Savings (kWh)	Baseline 1		Baseline 2	
		Annual Ex Post Electricity Savings (kWh)	Realization Rate	Annual Ex Post Electricity Savings (kWh)	Realization Rate
Bilevel Lighting at Garages and Parking Lots	1,536,217	1,175,896	76%	1,118,408	73%
LED Luminaires for Refrigeration Cases	51,468	64,892	126%	53,603	104%
Lighting and Wireless Controls	65,734	77,057	117%	77,057	117%
Wireless HVAC Controls	1,041,918	837,180	80%	837,180	80%
Overall[a]	2,695,337	2,155,025	80%	2,086,248	77%

[a] Due to rounding errors, overall sums may differ slightly when adding savings by strata or by measures.

Source: DNV KEMA Analysis

Resulting from data collected during on-site visits to participant facilities, evaluators determined the gross demand savings of the sample by strata and by measure category respectively, as shown in Table 82 and Table 83.

Table 82: OS Verified Demand Savings in On-Site Sample by Savings Stratum

Stratum	Ranges of Strata by Annual Ex Ante Source Energy Savings (kBtu)	Project Sites in Sample	Ex Ante Demand Savings (kW)	Baseline 1		Baseline 2	
				Ex Post Demand Savings (kW)	Realization Rate	Ex Post Demand Savings (kW)	Realization Rate
1	< 72,000 kBtu	6	5	7	151%	6	136%
2	≥ 72,000 kBtu and < 150,000 kBtu	5	6	7	122%	5	81%
3	≥ 150,000 kBtu and < 500,000 kBtu	5	15	22	145%	22	145%
4	≥ 500,000 kBtu and < 2,200,000 kBtu	5	160	96	60%	96	60%
5	≥ 2,200,000 kBtu	6	292	578	198%	578	198%
Overall		27	478	710	149%	707	148%

Source: DNV KEMA Analysis

Table 83: OS Verified Demand Savings in On-site Sample by Measure Category

Measure Category	Ex Ante Demand Savings (kW)	Baseline 1		Baseline 2	
		Ex Post Demand Savings (kW)	Realization Rate	Ex Post Demand Savings (kW)	Realization Rate
Bilevel Lighting at Garages and Parking Lots	92	109	118%	108	117%
LED Luminaires for Refrigeration Cases	8	11	140%	9	116%
Lighting and Wireless Controls	11	12	112%	12	112%
Wireless HVAC Controls	367	578	157%	578	157%
Overall[a]	478	710	149%	707	148%

[a] Due to rounding errors, overall sums may differ slightly when adding savings by strata or by measures.

Source: DNV KEMA Analysis

Resulting from data collected during on-site visits to participant facilities, evaluators determined the sample's gross natural gas savings by strata and by measure category respectively, as shown in Table 84 and Table 85.

Table 84: OS Verified Annual Natural Gas Savings in On-Site Sample by Savings Stratum

Stratum	Ranges of Strata by Annual Ex Ante Source Energy Savings (kBtu)	Project Sites in Sample	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1		Baseline 2	
				Annual Ex Post Natural Gas Savings (therms)	Realization Rate	Annual Ex Post Natural Gas Savings (therms)	Realization Rate
1	< 72,000 kBtu	6	(25)	(38)	152%	(38)	152%
2	≥ 72,000 kBtu and < 150,000 kBtu	5	0	0	-	0	-
3	≥ 150,000 kBtu and < 500,000 kBtu	5	(2,226)	(2,717)	122%	(2,717)	122%
4	≥ 500,000 kBtu and < 2,200,000 kBtu	5	2,686	1,397	52%	1,397	52%
5	≥ 2,200,000 kBtu	6	65,920	16,549	25%	16,549	25%
Overall		27	66,355	15,191	23%	15,191	23%

Source: DNV KEMA Analysis

Table 85: OS Verified Annual Natural Gas Savings in On-Site Sample by Measure Category

Measure Category	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1		Baseline 2	
		Annual Ex Post Natural Gas Savings (therms)	Realization Rate	Annual Ex Post Natural Gas Savings (therms)	Realization Rate
Bilevel Lighting at Garages and Parking Lots	(477)	(696)	146%	(696)	146%
Lighting and Wireless Controls	(1,774)	(2,059)	116%	(2,059)	116%
Wireless HVAC Controls	68,606	17,946	26%	17,946	26%
Overall	66,355	15,191	23%	15,191	23%

Source: DNV KEMA Analysis

Since the realization rates for the annual natural gas savings are significantly lower than those for the annual electricity and demand savings, more scrutiny was required to verify the ex post savings. Evaluators summarized these discrepancies in the section that follows.

Differences in Ex Ante and Verified Ex Post OS Energy Savings

The ex ante and ex post savings were identical at about half of the sites visited (48 percent). The discrepancies for the remaining sites are explained by the following:

- **Measures not installed as reported**: Commonly, this meant that the number of items installed or preretrofit or postretrofit wattage differed from those reported in the ex ante savings documentation. This was most common with lighting projects. For example, ex ante calculations for one site show the installation of 280 35/70 W and 48 20/40 W bilevel induction fixtures with occupancy sensors, but the on-site surveyor found a total of 320 35/70 W and no 20/40 W bilevel induction lights. In this instance, QuEST's method was appropriate, but the ex post savings had shifted proportionately for all three metrics: annual electricity savings, demand savings, and increased natural gas consumption.
- **Different hours of operation**: There were also a number of measures, both lighting and HVAC, where the hours of operation reported in ex ante documentation differed from those reported while on-site. For example, for one project site, submitted calculations show that the installed lights operate at high output for 30 percent of the time and at low output for 70 percent of the time. However, logger data showed that fixtures spent an average of 69.3 percent of the time at high output and 30.7 percent of the time at low output.
- **Wireless HVAC Controls**: The evaluation team used the same model as QuEST, but some of the inputs used in the model were updated to reflect conditions found on site. In several cases, the on-site visit revealed that either the setpoints or the schedules differed from those used by QuEST. The method used by the models was valid and was

not modified by the evaluators, but the changes to the model inputs sometimes led to significant differences between the ex ante and the ex post savings.

- **Unclear ex ante savings documentation**: There were numerous sites where the ex ante savings in the final tracking data did not match what had previously been reported by QuEST in the site-specific documentation. For example, one site had demand savings reported to be 6.95 kW in the final tracking data but 38.0 kW in the more detailed savings calculations provided by QuEST in the spring of 2012. It was not clear what caused these inconsistencies, but they were rather common, especially for demand savings. Some of these inconsistencies could have been more easily sorted out if QuEST had provided a unique record to track each EEM installed at a given project site. In many instances, multiple types of EEMs were rolled up into a single record in the tracking data.

Gross Energy Savings for OS

Evaluators extrapolated the verified savings for the sample sites to represent overall program energy savings. For Baseline 1 savings, gross annual energy savings totaled 3.75 GWh and 14,033 therms for electricity and natural gas usage, and gross total demand reduction amounted to 991 kW. Baseline 1 realization rates were determined to be 87 percent for gross annual electricity savings, 151 percent for gross total demand, and 21 percent for gross annual natural gas savings. Program-level energy savings are shown by measure category in Table 86 through Table 88.

As discussed previously, evaluators estimated ex post energy savings relative to two established baselines – the existing conditions found prior to implementation of an energy efficiency measure (Baseline 1) and either minimally code-compliant conditions or standard practice when no code is applicable (Baseline 2). Baseline 2 uses the pre-existing equipment as the measure baseline only until the end of the RUL of the existing equipment.

However, evaluators determined Baseline 1 and Baseline 2 savings to be equal for most measures installed through OS since most of the measures installed have no code requirements in place. In addition, many measures involved the installation of wireless controls for existing equipment – this is a non-standard installation practice. For some of the bilevel lighting installations and some of the LED luminaires for refrigeration cases, however, code requirements exist that are more energy-efficient than the replaced equipment and resulted in lower Baseline 2 savings.

For Baseline 2 savings, gross annual energy savings totaled 3,482,558 kWh and 14,033 therms for electricity and natural gas usage, and gross total demand reduction amounted to 961 kW, as shown in Table 86 through Table 86. Baseline 2 realization rates were determined to be 81 percent for gross annual electricity savings, 146 percent for gross total demand, and 21 percent for gross annual natural gas savings.

Table 86: OS Results – Gross Annual Electricity Savings

Measure Category	Annual Ex Ante Electricity Savings (kWh)	Baseline 1		Baseline 2	
		Annual Gross Ex Post Electricity Savings (kWh)	Realization Rate	Annual Gross Ex Post Electricity Savings (kWh)	Realization Rate
Bilevel Lighting at Garages and Parking Lots	2,338,501	1,736,667	74%	1,651,435	71%
LED Luminaires for Refrigeration Cases	801,125	1,021,357	128%	836,273	104%
Lighting and Wireless Controls	135,016	156,679	116%	156,679	116%
Wireless HVAC Controls	1,041,918	838,171	80%	838,171	80%
Overall	4,316,560	3,752,874	87%	3,482,558	81%

Source: DNV KEMA Analysis

Table 87: OS Results – Gross Demand Savings

Measure Category	Ex Ante Demand Savings (kW)	Baseline 1		Baseline 2	
		Gross Ex Post Demand Savings (kW)	Realization Rate	Gross Ex Post Demand Savings (kW)	Realization Rate
Bilevel Lighting at Garages and Parking Lots	151	176	117%	176	116%
LED Luminaires for Refrigeration Cases	118	165	140%	135	114%
Lighting and Wireless Controls	367	627	171%	627	171%
Wireless HVAC Controls	21	23	107%	23	107%
Overall	657	991	151%	961	146%

Source: DNV KEMA Analysis

Table 88: OS Results – Gross Annual Natural Gas Savings

Measure Category	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1		Baseline 2	
		Annual Ex Post Natural Gas Savings (therms)	Realization Rate	Annual Ex Post Natural Gas Savings (therms)	Realization Rate
Lighting and Wireless Controls	(3,188)	(3,689)	116%	(3,689)	116%
Wireless HVAC Controls	68,606	17,722	26%	17,722	26%
Overall	65,418	14,033	21%	14,033	21%

Source: DNV KEMA Analysis

Precision of OS Program Savings

As mentioned in the description of the evaluation approach, DNV KEMA used model-based statistical sampling methods to select the sample with the goal of achieving relative precision of the overall program ex post savings estimates within ± 10 percent at the 90 percent confidence level (90/10 precision). The team stratified the OS population and selected the sample based on ex ante annual source energy savings as provided in the interim tracking data. Table 89 shows the gross energy savings, confidence intervals, relative precision, and standard error for the program. The evaluation team calculated the gross savings the realization rates achieved by the measure in the sample. The team calculated the relative precision by dividing the confidence interval proportion by the realization rate. Hence, where the realization rate is near to 100 percent, the confidence interval and relative precision are nearly equal.

Table 89: OS Results – Precision of Gross Savings

Results and Precision Metrics	Baseline 1				Baseline 2			
	Annual Gross Ex Post Electricity Savings (GWh)	Gross Ex Post Demand Savings (kW)	Annual Gross Ex Post Natural Gas Savings (therms)	Annual Gross Ex Post Source Energy Savings (MMBtu)	Annual Gross Ex Post Electricity Savings (GWh)	Gross Ex Post Demand Savings (kW)	Annual Gross Ex Post Natural Gas Savings (therms)	Annual Gross Ex Post Source Energy Savings (MMBtu)
OS Gross Savings	3.8	991	14,033	39.7	3.5	961	14,033	37.0
90% Confidence Interval Savings	± 0.1	± 207	± 149	± 0.8	± 0.1	± 201	± 149	± 0.7
90% Confidence Interval Proportion, ± percent	2%	21%	1%	2%	2%	21%	1%	2%
Relative Precision, percent	3%	13%	4%	3%	3%	13%	4%	3%
Standard Error, percent	1%	12%	1%	1%	1%	12%	1%	1%

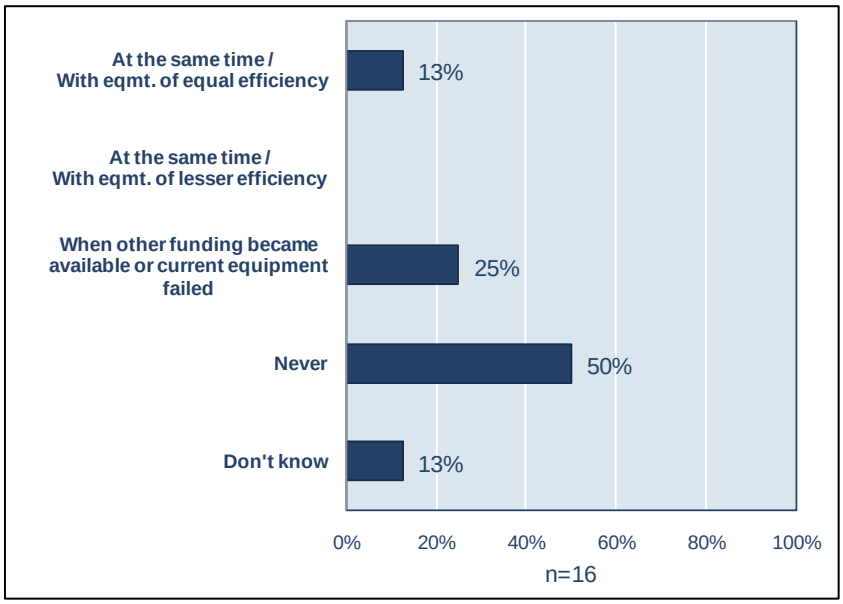
Source: DNV KEMA Analysis

OS Net Energy Savings Results

The OS purpose was to provide financial assistance to implement emerging energy efficiency technologies. The evaluation team designed the CATI survey instrument to learn more about the program's influence on implemented projects and to enable estimating a net-to-gross (NTG) ratio for OS.

One-quarter (25 percent) of those surveyed indicated that their projects would not have proceeded until finding another funding source or until current equipment failed. Fifty percent indicated the project never would have proceeded. Thirteen percent of respondents indicated that they would have installed the same EEMs at the same time without the assistance of OS. These results are presented in Figure 55.

Figure 55: Without OS, Self-Reported Project Timing and Efficiency Outcome



Source: DNV KEMA Analysis

When these results were weighted for their effect on the program-level savings, evaluators preliminarily concluded that 94 percent ± 15 percent of the gross energy savings are attributable to the OS program. That is, evaluators calculated free ridership as 6 percent and the net-to-gross ratio as 0.94. Using an NTG of 0.94, the net savings were determined and presented in Table 90 through Table 92.

Table 90: OS Results – Net Annual Electricity Savings

Measure Category	Annual Ex Ante Electricity Savings (kWh)	Baseline 1	Baseline 2
		Annual Net-Adjusted Ex Post Electricity Savings (kWh)	Annual Net-Adjusted Ex Post Electricity Savings (kWh)
Bilevel Lighting at Garages and Parking Lots	2,338,501	1,632,631	1,552,505
LED Luminaires for Refrigeration Cases	801,125	960,172	786,176
Lighting and Wireless Controls	135,016	147,293	147,293
Wireless HVAC Controls	1,041,918	787,960	787,960
Total	4,316,560	3,528,056	3,273,934

Source: DNV KEMA Analysis

Table 91: OS Results – Net Demand Savings

Measure Category	Ex Ante Demand Savings (kW)	Baseline 1	Baseline 2
		Net-Adjusted Ex Post Demand Savings (kW)	Net-Adjusted Ex Post Demand Savings (kW)
Bilevel Lighting at Garages and Parking Lots	151	166	165
LED Luminaires for Refrigeration Cases	118	155	127
Lighting and Wireless Controls	367	590	590
Wireless HVAC Controls	21	21	21
Total	657	932	903

Source: DNV KEMA Analysis

Table 92: OS Results – Net Annual Natural Gas Savings

Measure Category	Annual Ex Ante Natural Gas Savings (therms)	Baseline 1	Baseline 2
		Annual Net-Adjusted Ex Post Natural Gas Savings (therms)	Annual Net-Adjusted Ex Post Natural Gas Savings (therms)
Lighting and Wireless Controls	(3,188)	(3,468)	(3,468)
Wireless HVAC Controls	68,606	16,660	16,660
Total	65,418	13,192	13,192

Source: DNV KEMA Analysis

OS Life-Cycle Energy Savings Results

The evaluation team calculated life-cycle savings over the lifetimes of each EEM. Evaluators assigned each measure an EUL that was determined using the referenced sources as indicated in Table 93. Evaluators summed savings for each year of EUL over the entire span of the life of the measure to determine the life-cycle savings. For this program, the retrofitted measures were determined to have an EUL of between 6 and 15 years, thus yielding 44,279,301 kWh and 197,891 therms of life-cycle savings for Baseline 1 and 42,033,433 kWh and, again, 197,891 thousand therms for Baseline 2, as shown in Table 93.

Table 93: OS Results – Net Life-Cycle Electricity and Natural Gas Savings

Measure Category	EUL (years)	Life-Cycle Net-Adjusted Ex Post Electricity Savings (kWh)		Life-Cycle Net-Adjusted Ex Post Natural Gas Savings (therms)	
		Baseline 1	Baseline 2	Baseline 1	Baseline 2
Bilevel Lighting at Garages and Parking Lots	15 [30]	24,489,467	23,287,577	-	-
LED Luminaires for Refrigeration Cases	6 [31]	5,761,033	4,717,055	-	-
Lighting and Wireless Controls	8-15 [34]	2,209,394	2,209,394	(52,015)	(52,015)
Wireless HVAC Controls	15 [34]	11,819,407	11,819,407	249,906	249,906
Total		44,279,301	42,033,433	197,891	197,891

Source: DNV KEMA Analysis

30 "Database for Energy Efficient Resources," California Public Utility Commission, 2005.

31 Pacific Gas & Electric. *LED Refrigeration Case Lighting (Revision 1)*. 2009.

OS Avoided Greenhouse Gas Emissions

Using the annual net energy savings for Baseline 1, evaluators calculated that the net annual and life-cycle avoided GHG emissions to be 1,175 metric tons and 14,908 metric tons, respectively; and, for Baseline 2, 1,095 metric and 14,205 metric tons, respectively, as shown in Table 94.

Table 94: OS Results – Annual and Life-Cycle Avoided Greenhouse Gas Emissions

OS Measure	Annual Net-Adjusted Ex Post Avoided GHG Emissions (metric tons)		Life-Cycle Net-Adjusted Ex Post Avoided GHG Emissions (metric tons)	
	Baseline 1	Baseline 2	Baseline 1	Baseline 2
Bilevel Lighting at Garages and Parking Lots	511	486	7,665	7,289
LED Luminaires for Refrigeration Cases	301	246	1,803	1,476
Lighting and Wireless Controls	28	28	2,017	2,017
Wireless HVAC Controls	335	335	3,423	3,423
Total	1,175	1,095	14,908	14,205

Source: DNV KEMA Analysis

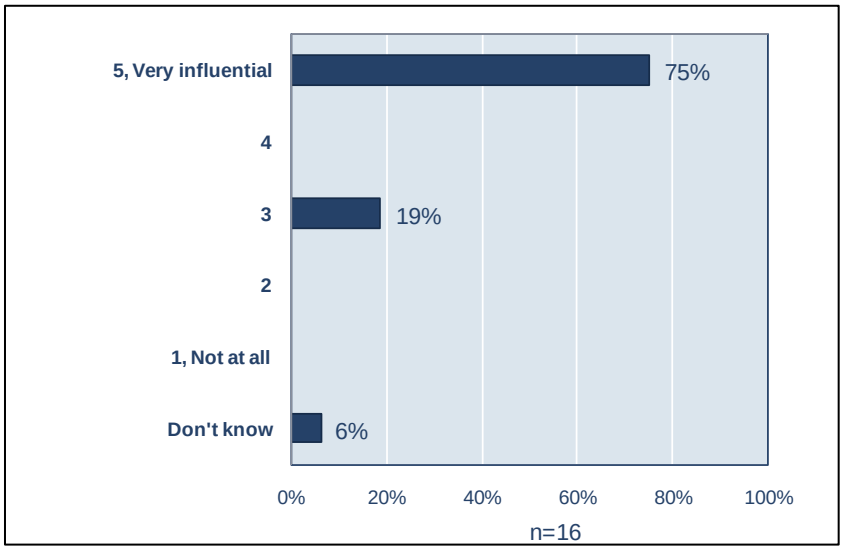
OS Program Role and Influence, According to Participants

The purpose of OS was to provide municipal entities with financial assistance to implement emerging energy efficiency technologies. The evaluation team designed the CATI survey instrument to learn more about the program's role and influence on participant decision-making. Some of these results were used to estimate the overall net-to-gross ratio for OS. A full discussion of the survey results related to the program's role and influence on project implementation is presented.

OS Program Role in Project Implementation

Three-quarters of respondents found the program to have been very influential (with a rating of 5) to their project's completion, as shown in Figure 56.

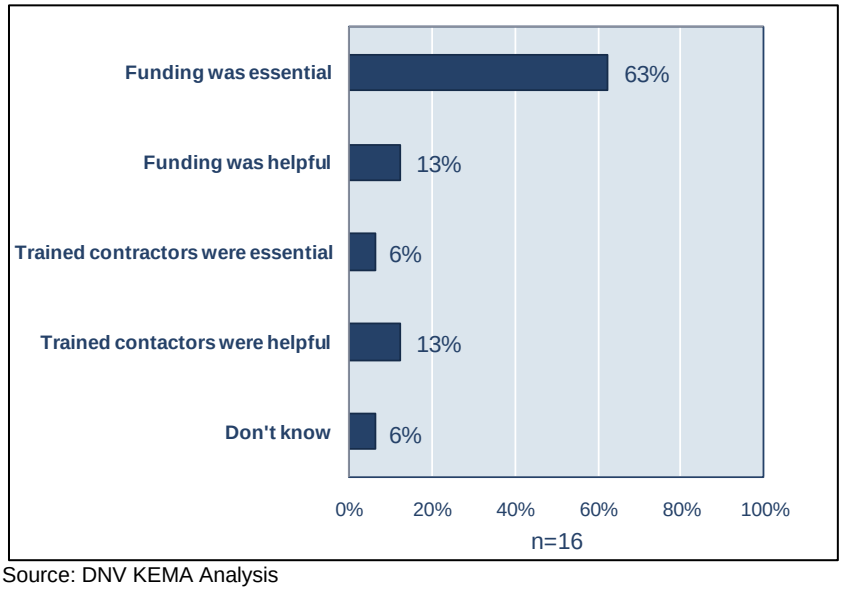
Figure 56: OS Influence on Project Implementation



Source: DNV KEMA Analysis

Furthermore, 63 percent of respondents reported that the program's funding was essential, as shown in Figure 57.

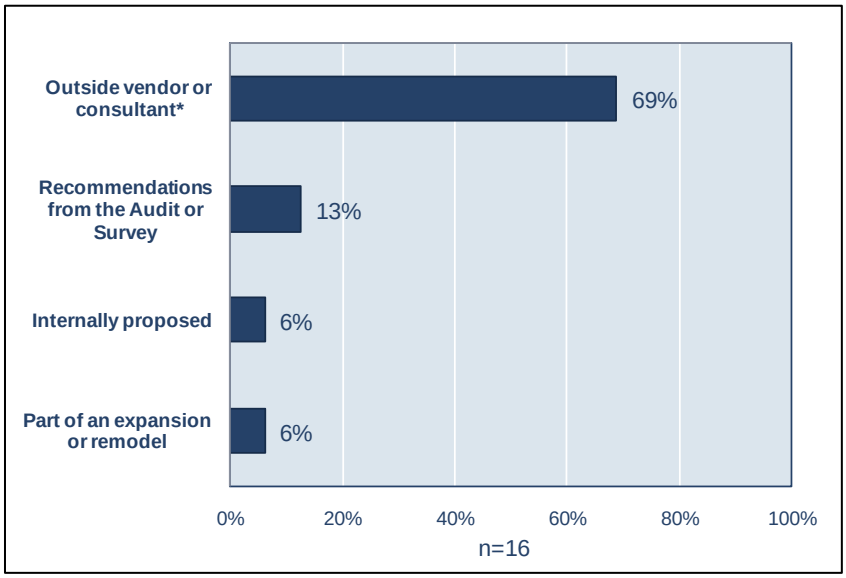
Figure 57: Reported Ways in Which OS Facilitated Project Completion



Source: DNV KEMA Analysis

When asked where the idea for the project originated, roughly 82 percent indicated that their projects were proposed either by an outside vendor or consultant or as a result of the survey, as shown in Figure 58.

Figure 58: Project Idea Origination for OS Participants



*These could include Energy Upgrade California website, IOU, OS website, or local contractor

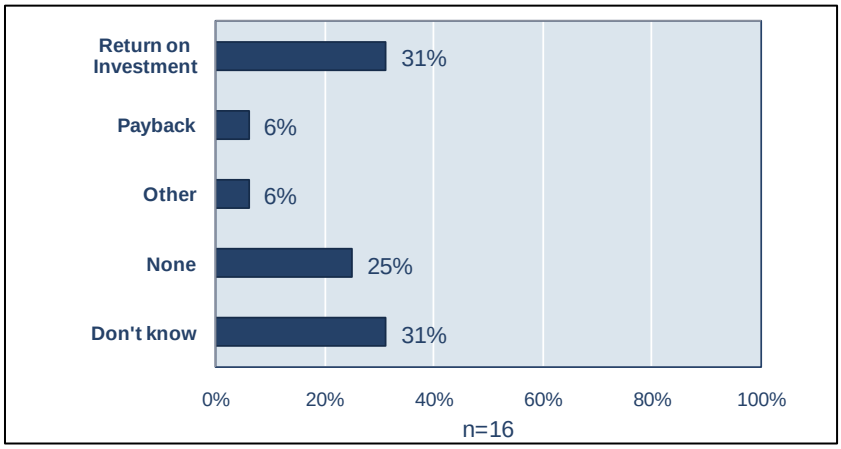
Source: DNV KEMA Analysis

OS Decision-Making Factors Influencing Project

To learn more about the kinds of information OS participants used to base their decisions, evaluators asked participants a series of questions that discussed other factors that may have influenced their project's implementation, such as costs and/or energy savings.

More than half of participants surveyed reported not using or not knowing whether financial calculations are regularly used for project decisions, as shown in Figure 59; 31 percent use return-on-investment calculations.

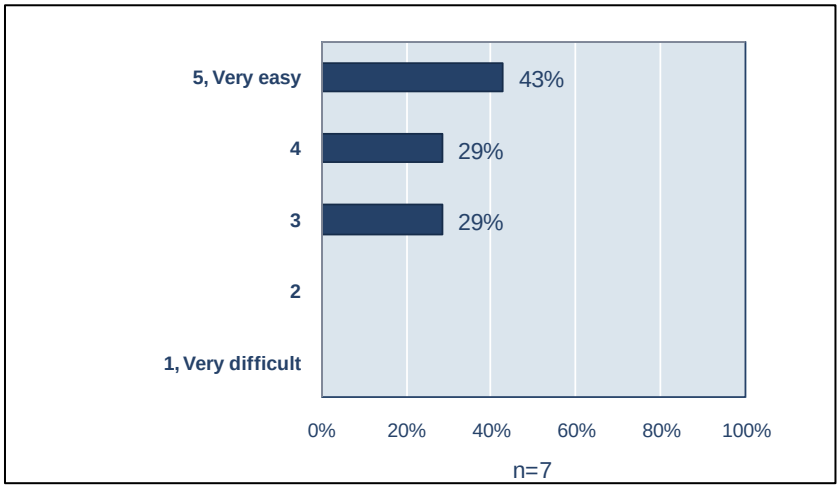
Figure 59: Financial Calculations Preferred, If Any, by OS Participants



Source: DNV KEMA Analysis

Using a scale of 1 to 5, where 1 means "Not at all easy" and 5 means "Very easy," participants were asked about the difficulty of justifying the retrofit when using their organization's preferred financial calculation. As shown in Figure 60, 72 percent of respondents rated the ease of determining whether they met their organization's financial requirement at either a 4 or 5.

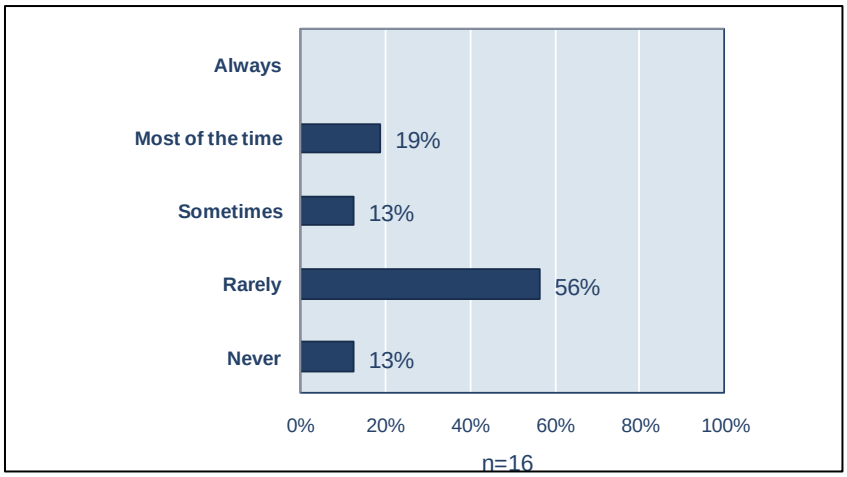
Figure 60: OS Participants' Ease of Determining Whether Financial Requirements Were Met



Source: DNV KEMA Analysis

Most participants surveyed rarely or never considered the entire life-cycle cost of the equipment, as shown in Figure 61; only 19 percent consider it most of the time.

Figure 61: Use of Life-Cycle Equipment Costs Among OS Participants

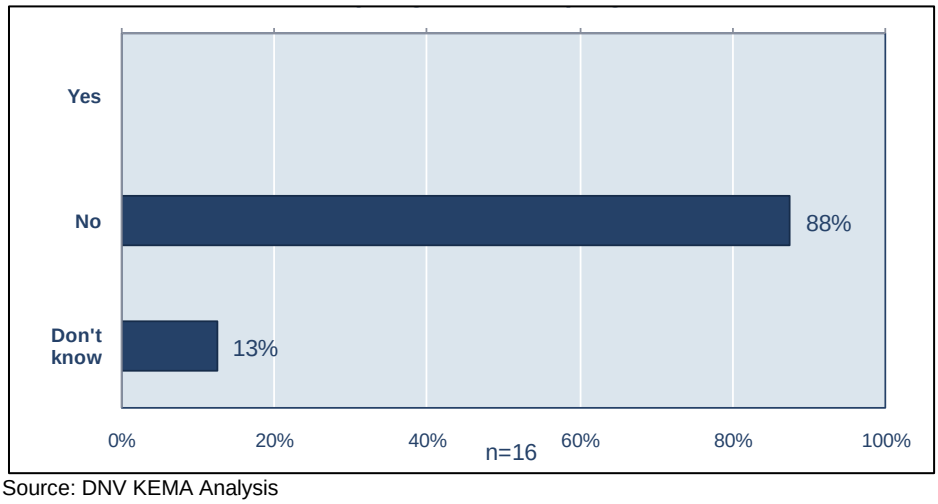


Source: DNV KEMA Analysis

Evidence of OS Participant Spillover

Evaluators designed several survey questions to determine whether participants undertook any projects similar to but outside of OS subsequent to their participation. None of those surveyed reported having undertaken additional project(s), as shown in Figure 62. Given these findings, there is no evidence of possible spillover energy savings attributable to OS.

Figure 62: Energy Efficiency Project Undertaken Subsequent to OS



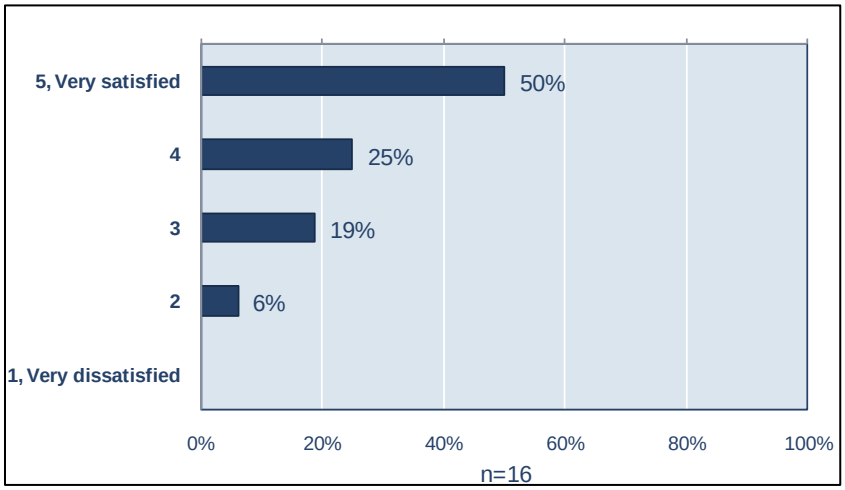
Source: DNV KEMA Analysis

OS Program Delivery

OS Program Satisfaction Reported by Participants

Many survey questions asked about participants' satisfaction with various program facets. OS participants surveyed were overwhelmingly satisfied with the program. When asked to rate their satisfaction with the program-installed equipment, 75 percent provided a rating of a 4 or 5, as shown in Figure 63.

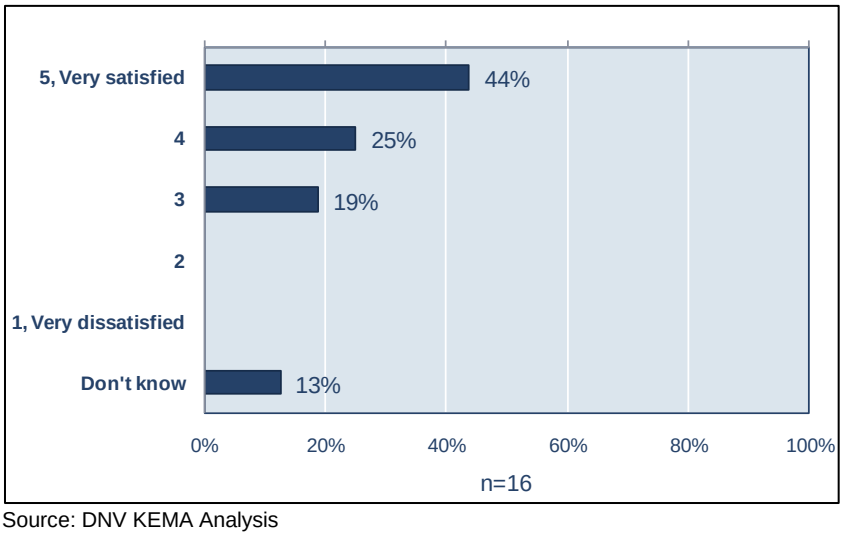
Figure 63: OS Equipment Satisfaction



Source: DNV KEMA Analysis

When asked to rate their project's surveyor and accompanying auditing services, respondents reported a fairly high degree of satisfaction, with 69 percent providing a rating of a 4 or 5, as shown in Figure 64.

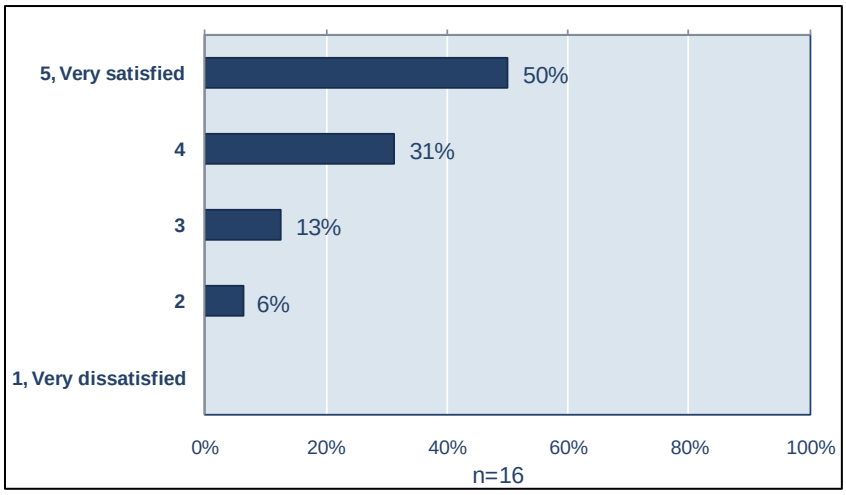
Figure 64: OS Surveyor Audit Service Satisfaction



Source: DNV KEMA Analysis

When asked to rate their contractor's installation services, participants reported a high degree of satisfaction, with 81 percent providing a rating of a 4 or 5, as shown in Figure 65.

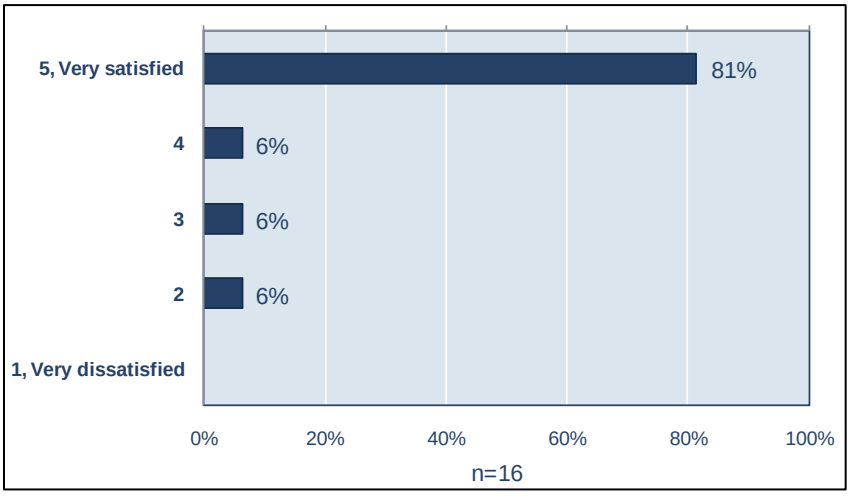
Figure 65: OS Contractor Installation Satisfaction



Source: DNV KEMA Analysis

When asked to rate their satisfaction with the energy efficiency benefits information provided, participants reported a high degree of satisfaction, with 87 percent providing a rating of a 4 or 5, as shown in Figure 66.

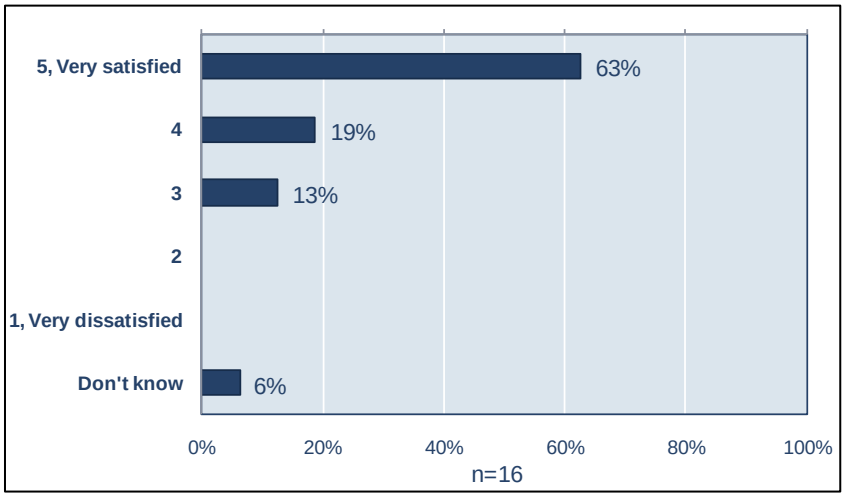
Figure 66: Satisfaction With Energy Efficiency Information Provided by OS



Source: DNV KEMA Analysis

When asked to rate the technical assistance and communications of OS, a primary program objective, respondents reported a high degree of satisfaction, with 82 percent rating their satisfaction using a 4 or 5, as shown in Figure 67.

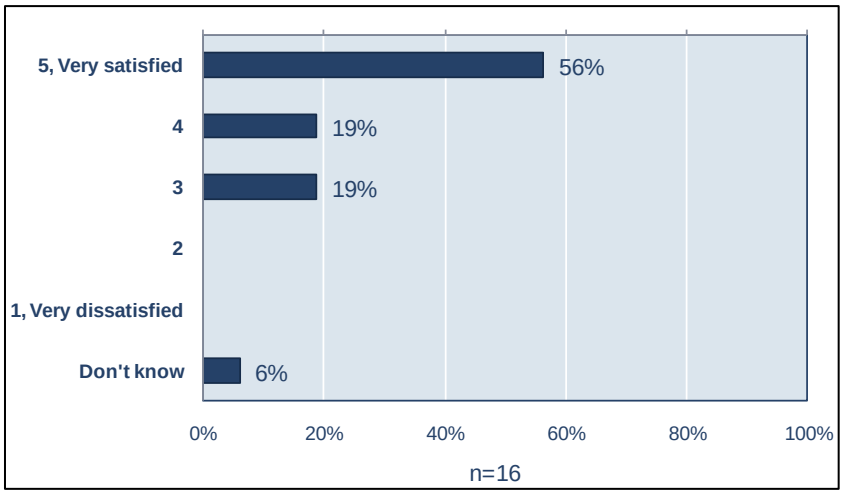
Figure 67: Satisfaction With OS Technical Assistance/Communication



Source: DNV KEMA Analysis

When asked to rate the project coordination of OS with them, respondents also indicated a high degree of satisfaction, with 75 percent reporting a rating of a 4 or 5, as shown in Figure 68.

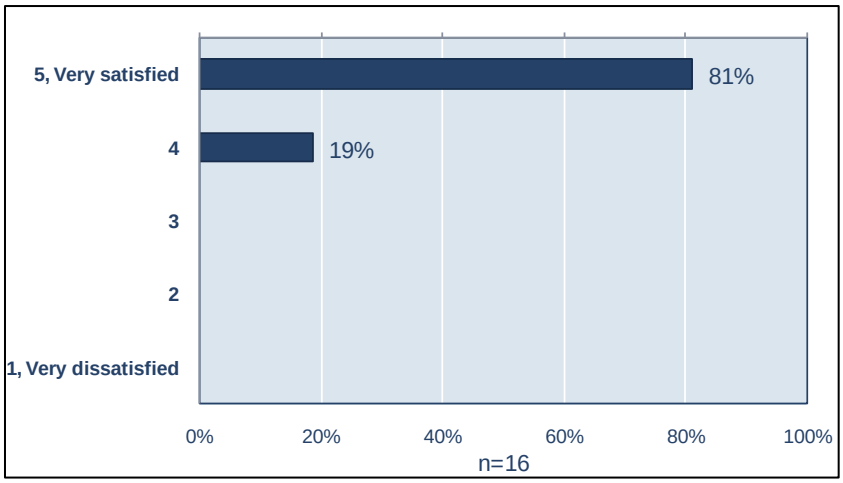
Figure 68: Satisfaction With OS Coordination



Source: DNV KEMA Analysis

When asked to rate satisfaction with the amount received from OS, all surveyed participants rated their satisfaction using a 4 or 5, as shown in Figure 69.

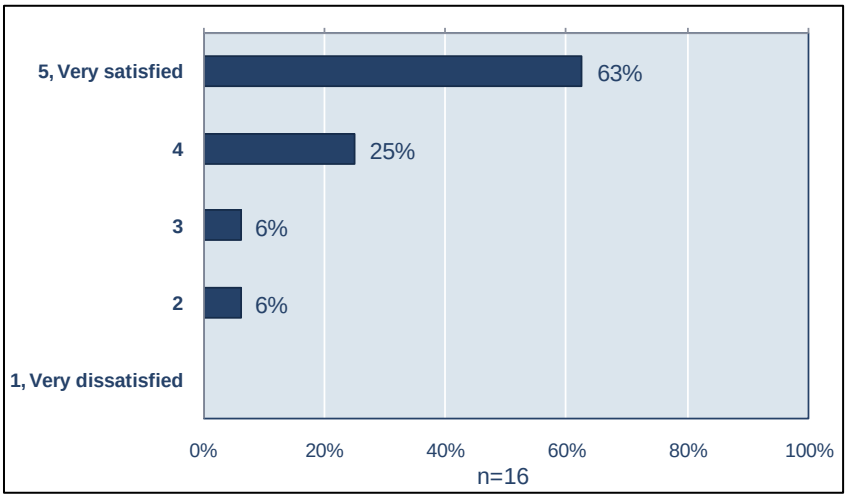
Figure 69: Satisfaction With Incentive Amount Received From OS



Source: DNV KEMA Analysis

When asked how energy savings for their installed measures compared to their expectations, most respondents rated their satisfaction using a 4 or 5 (88 percent), but 6 percent gave a rating of 2, as shown in Figure 70.

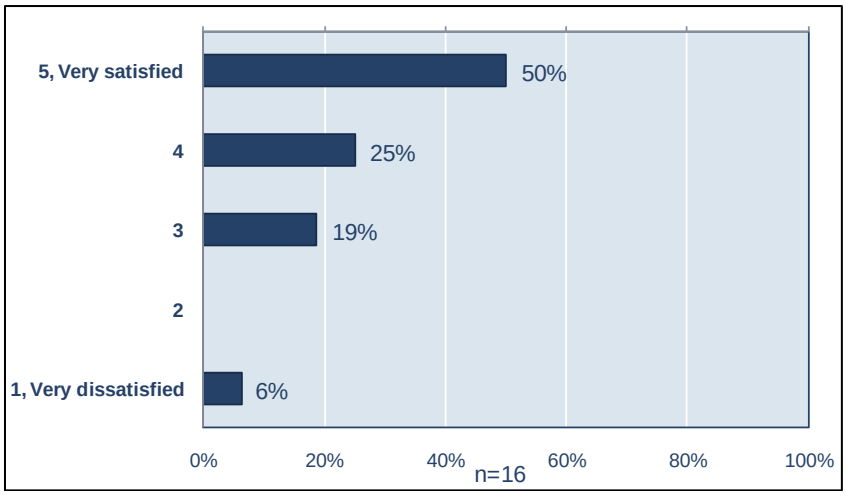
Figure 70: Satisfaction With Energy Savings due to OS Retrofits



Source: DNV KEMA Analysis

When asked about their satisfaction with the cost savings that resulted from measure energy savings, 75 percent rated their satisfaction using a 4 or 5, as shown in Figure 71.

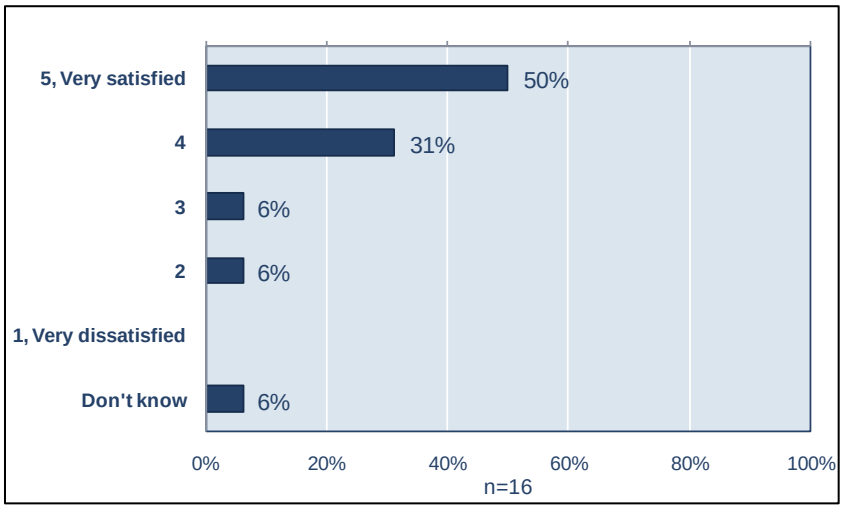
Figure 71: Satisfaction With Energy Cost Reductions due to OS



Source: DNV KEMA Analysis

Most OS participants rated their satisfaction with the incentive application process using either a 4 or 5 (81 percent), as shown in Figure 72.

Figure 72: Satisfaction With Incentive Application Process for OS



Source: DNV KEMA Analysis

OS Marketing Strategy Assessment Reported by Market Actors

To learn more about the effectiveness of the market strategy of the Oakland Shines program, market actors affiliated with the program were interviewed. (See Table 79 for interviewee

categories.) All the interviewees engaged in some kind of marketing or program promotion. The primary method reported by 8 of 11 interviewees was direct contact with targeted businesses. The evaluators analyzed the interviews and reported results regarding the marketing strategy and tactics, as well as the key marketing messages.

Two-thirds of the interviewees stated that the outreach and multiple marketing methods worked especially well. Two interviewees indicated that the native Cantonese/Mandarin speakers were important for program success in sections of the city. In addition, program events and financial incentives were cited as factors contributing to program acceptance.

> *"What really worked was getting out there and spreading the word, a lot of these larger companies have departments dedicated to making the businesses more 'green,' but small business owners don't have those resources. Going and talking to them face-to-face was a very successful way to tell them about all the programs they were qualified for." – Utility Partner*

> *"OS used native language speakers, which worked well, also CESC (Community Energy Services Corporation) outreach to contractors worked well, and the CESC process for moving projects through the system was important and necessary: getting contractors signed up, getting projects assigned, inspected and installed, moving into invoicing and rebates, holding customers hands through the project." – Community Partner*

> *"The marketing flyer worked well because it explained the existence of the project, the money, the verification of contractor, and that the finished project would get inspected multiple times. The flyer provided an added level of believability. Business owners were then able to verify in their own heads that this was real." – Participating Contractor*

An additional comment of interest came up in one interview with a PG&E account manager around energy savings.

> *"I'm given an individual goal for energy efficiency every year as an account manager. PG&E could claim OS energy savings. The fact that I had OS meant I was able to capture over one megawatt of energy savings, which is the first time in my entire PG&E career that I was able to hit a number that high." – Utility Partner*

Interviewees were also asked what improvements could have been made to the OS program. They listed a variety of challenges that include the short time frame and abrupt budget ending (three out of nine), slow initial development/coordination (four out of nine), gaining access to buildings (one out of nine), restrictions on rebates (two out of nine), slow payment of rebates (two interviewees), and time-consuming audit reports (one interviewee). A couple of suggestions made by market actors are quoted as follows:

> *"Better development in the onset, and more partnering and strategic planning with PG&E would have prevented a loss of a significant amount of time." – Utility Partner*

> *"I would say they definitely needed more time to implement the program. The one challenge, as far as emerging technologies, was that the HVAC thermostat wireless just really didn't fit with small commercial." – Community Partner*

OS accomplished the program rollout in a compressed period, so there was pressure to complete projects quickly. OS was successful in supporting projects but also experienced some challenges in timely payment. Slow payments had negative effects on participating contractors. Of note, one interviewee mentioned that two contractors went out of business and attributed it to the slow payment of rebates from OS.

> *"They should pay faster. They were extremely slow. It took months to process the payment for rebates. And contractors like ourselves, we had half a million out with prevailing wages. It was really harsh to be so slow. The systems were in place for pre/post inspections and verifications, there wasn't that much to do. There was a lot of pressure to get the project done fast, but they could have paid faster and kept people in business." – Participant Contractor*

Despite a few areas for improvement identified by some, interviewees overall were satisfied with the program. All agreed that, in many ways, Oakland Shines accomplished its goals using effective tactics.

OS Marketing Tactics Effectiveness Reported by Market Actors

In addition to facilitating direct contact among many of the program's market actors and the targeted businesses, the program also worked with business or professional agencies, political figures, or Oakland community organizations. Pre-existing relationships were important to marketing the program.

> *"We used our network of business through our business assistance center and posted notices to our ethnic chamber and chamber of commerce. We also worked with Business Improvement districts, which represent close to 800 businesses, Jack London Development, Port of Oakland, a number of business associations and merchants, as well as the various clients that we work with through our own city development efforts." – Local Government Partner*

OS used multiple marketing methods to reach the stakeholder groups in Oakland. Roughly two-thirds called business contacts regularly to promote the program. Four interviewees engaged in door-to-door marketing that sometimes included free energy audits. The door-to-door energy audits were a common and successful tool for partner agencies and contractors to attract end-use customers.

> *"60-75 percent [of projects] came in through team canvassing, some came in through QuEST outreach, and some came in through contractors' referral." – Community Partner*

This "boots on the ground" marketing approach also resulted in better understanding of client needs and contributed to successful projects.

> *"We had some volunteers walking the street at least 4 or 5 times distributing fliers about the program. Most of the time, the businesses were contacting us about participating in the program." – Local Government Partner*

> *"There was outreach by both the Community Energy Services Corporation (CESC) and QuEST. There were 40 or so larger buildings that QuEST was responsible for contacting – the highrises, the BOMA groups, and local chambers and community districts. CESC was on-the-ground,*

door-to-door outreach. It was a very thorough outreach to downtown Oakland: twice a week multiple teams with native language Chinese speakers, (an) outreach coordinator trained to explain program, a PG&E representative to explain other options and validate the program, and (an) auditor to audit the site. There was also a second sweep targeting people who had not participated." – Community Partner

"We specifically targeted liquor stores and grocery stores because we saw that the case lighting for reach-in door was an easy one to install quickly. Normally, it's fluorescent lighting and, with OS, business owners could change it out for LEDs. We decided to market mainly to that specific market sector. Few businesses do not have LED cases now." – Community Partner

Six interviewees also mentioned using mailers or print ads. Other marketing mentioned by interviewees included sharing potential contacts with OS; sending program promotional e-mails; e-mail with specific high-tech products and corresponding rebates; promoting at various town meetings; introducing the program on regular radio appearance; and handing out pencils, bookmarks, and applications during canvassing.

The program anticipated a stronger role for electronic social media, but face-to-face contact emerged as a key driver for program activity.

"Face-to-face meetings were the most effective marketing and outreach method. You have to talk to people. You can't just send an e-mail and hope that it's enough. You have to field questions, and sometime they will drill down with more questions. It was on-going between e-mail, phone, and customer visits to reassure the customer the that the program was legit, the money was real, and the opportunity was real." – Community Partner

OS Marketing Message Highlights Reported by Market Actors

Interviewees reported having used multiple messages to promote the program to customers. The most common key message reported by interviewees, however, was also the most straightforward and emphasized energy efficiency or sustainability benefits of engaging in the program. Almost one-third of interviewees mentioned the following messages:

- The opportunity was available for a limited time.
- There would be significant cost savings over time.
- This would improve Oakland, overall.

Two interviewees mentioned the high rebates and the opportunity to get a free energy assessment. One interviewee simply provided basic program information, and one, the contractor, said that maintenance avoidance was also an important motivating message.

The rebates were very important to customers, and most interviewees mentioned that the rebates were an important part of their message. Interestingly, the local character of the program also seemed to be an important message of interviewees and end -users.

"This was a program for Oakland, to 'green' Oakland, and make it more energy-efficient." – Local Government Partner

"This is government stimulus money, and the high-tech, high-end products are really fantastic. If businesses had been dreaming of but haven't because the cost capital outlay is much too much, this is a one-time opportunity to take advantage of their dream list. And it was successful." – Utility Partner

"It definitely was a program that would offer cost savings over time, and when businesses looked at the math, they would find that the program was going to be very beneficial to them. Not only would it affect the bottom line and make them more energy-efficient, (but) that it was Oakland's commitment to sustainability to energy efficiency." – Local Government Partner

To attract business owners, specifically, most interviewees listed engaging in a conversation as the way to recruit eligible participants. About half also stated that a combination of phone, e-mail, and face-to-face communication created the most successful marketing (5 out of 10 interviewees). Marketing messages emphasized several positive attributes, but, as discussed earlier, interviewees found pre-existing contacts and referrals from City of Oakland officials and PG&E collaboration helpful. Three interviewees emphasized the importance of the city's endorsement. A few others also mentioned the importance of having materials translated into customers' languages, including Cantonese, Mandarin, and other South East Asian languages so that language was not a barrier to participation.

In addition to language and culture, another barrier for some businesses was the initial suspicion about the legitimacy of the program. Interviewees discussed different ways to foster trust, including visiting businesses in person and providing documentation of endorsement by City of Oakland officials.

"The city's role in the outreach was helpful because it provided legitimacy. The level of sophistication varied in our target area, some small businesses needed more one-on-one education to help them understand how their efficiency would be improved. OS also had attractive marketing materials, website, and the branding was appealing." – Local Government Partner

"In Chinatown, we thought that would be hard because it was a tight community with many small(businesses), but we ended up doing better because we brought in native Chinese speakers in both Cantonese and Mandarin to explain the program, and once we got a few customers and they got the projects installed and saw the low cost, the word spread like wildfire, then our team was pulled in off the street by business owners. It was not only energy savings, but brighter, cleaner-looking lights installed at a low cost, and that was really important." – Local Government Partner

Most interviewees did not have direct contact with contractors and were not able to speak about what marketing was most effective for contractors. Two interviewees, one contractor and one who provided outreach to contractors, stated that new contractors were brought onto projects through referrals from QuEST or end-use customers. One interviewee discussed that, while smaller projects worked well, there were difficulties involved with large projects. The biggest

issue voiced was not enough procedural training for new contractors and the complex rebate process involved.

> *"We gave training on the program process and rebates. It wasn't smooth at all. We are installing jobs at large businesses where the customer, PG&E, and OS each paid a portion. And our staff were managing the rebate, so there were 4—6 people involved and it got confusing and difficult. Small projects went smoother. We found, in general, contractors we worked with previously we had a better time with because there was trust built, but [for] those new to it, [it] was difficult [at] larger jobs because there was a lot at stake. Still, all projects were installed and met deadlines." – Community Partner*

Overall, program partners were satisfied with the program services and offerings. Most explained their high ranking on a scale of 1 to 5, where 5 meant "very satisfied," simply by stating OS marketing was good overall or that it met its marketing goals because a significant number of people heard about it and elected to participate.

OS Market Effects

California's Energy Efficiency Evaluation Protocols[26] defines market effects as "a change in the structure of the market or the behavior of participants in a market that is reflective of an increase in the adoption of energy-efficiency products, services, or practices and is causally related to market interventions," with particular emphasis on quantification of spillover effects. This section presents findings from OS participant surveys and market actors interviews that focused on market effects.

To meet its energy efficiency goals, OS sought to increase awareness, knowledge, and interest in energy efficiency technology in the Oakland area, as well as increase the capabilities of participating contractors to complete energy-efficient upgrades in the target areas.

Eight interviewees were able to speak about overall market effects of the program. All stated that the program greatly increased awareness of new, energy-efficient technologies in the area originally targeted by the program.

> *"Large property owners learned about new technologies such as the bilevel light and wireless HVAC and now they're seeing the cost savings." – Local Government Partner*

> *"It did have an effect on a lot of the businesses. Before the program, I think even if they were concerned about cost of their energy use, they weren't concerned about energy efficiency. Now they are more aware of energy efficiency." – Community Partner*

Interviewees were divided as to whether knowledge of energy-efficient technologies was increased in Oakland generally. More than half of the interviewees stated that there was an increase in dialogue between agencies and building owners. Half of the interviewees stated that some knowledge increased, perhaps more for contractors than business owners.

> *"There was a lot of discussion about it and I know there was big effort on behalf of the city of Oakland to get business owners engaged in these kind of upgrades, to green the city as much as*

possible, so there was a lot of dialogue within the city that was effective." – Local Government Partner

"Oakland already had some knowledge and appreciation and commitment to energy efficiency in the socially progressive community that we have. But I think OS help educated us on ways to help business be more successful at using energy efficiency and a cost savings mechanism." – Local Government Partner

"There are two kinds of people we are dealing with: one that really doesn't care and only wants free stuff. While the other group, the majority, are really concerned about saving energy. When we gave out free light bulbs, they asked a lot of questions about the technology and the programs that are available to help conserve energy at both their companies and their homes. It's important that the program can engage people and find ways to give them information so they can take action." – Local Government Partner

Almost one-half did not feel that the program had a lasting impact on energy efficiency knowledge from a customer perspective. They did feel, however, that participating contractors had increased their knowledge of emerging energy efficiency options overall, and that this understanding of energy efficiency would continue beyond the program.

"I don't think it has had an impact on business owners' knowledge at all. They know they have better fancy lights, but that's it. However, contractors are now more adept at advanced technologies and know more overall." – Community Partner

"We have quite a community here of consultants, we actually have a green building policy and retrofit efforts that relate to weatherization. We are improving our own buildings, and I think there is a bigger awareness of Oakland being a center point for consultants." – Community Partner

While most interviewees recognized there was a great deal of interest around the program, some stated that interest was less than expected, in part because Oakland was already focused on energy efficiency.

"Property owners jumped at it and were really eager to participate. Obviously, there were benefits to doing it with the OS program and definitely really great incentives."—Local Government Partner

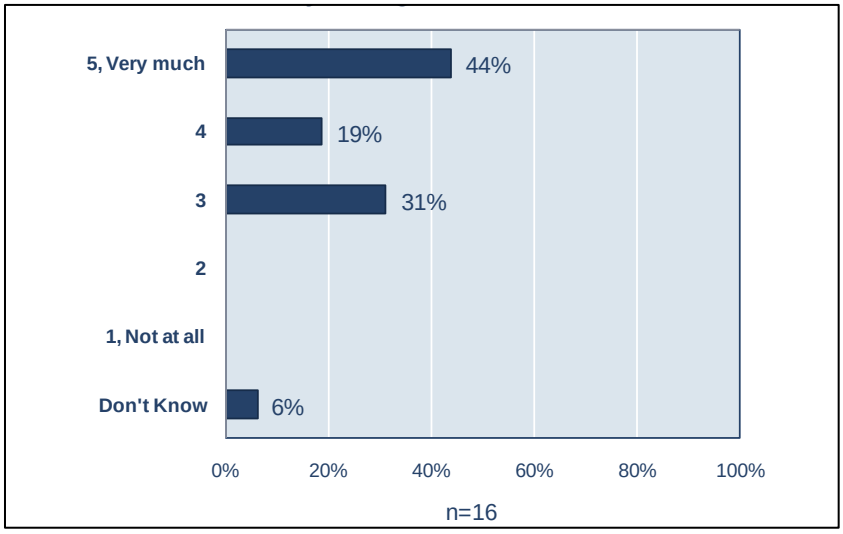
"Before this program I never had people asking me about energy efficiency, but now they want to help save and tend to understand what we need to do. Energy costs are getting higher every day."—Local Government Partner

"Oakland is already interested in energy efficiency, very green. We found out during canvassing that downtown was more efficient than anyone knew. I don't think more interest was driven, there was already a lot. There was a lot of interest in programs to increase viability of Oakland. Oakland pride was important."—Community Partner

OS Effects Reported by Participants

As part of the program's follow-up survey, participants were asked about any changes to their behaviors to date caused by participating in OS using a scale of 1 to 5 where 1 means "Not at all" and 5 means "Very much." Nearly all participants (94 percent) rated the improvement to their knowledge regarding EE technologies using a 3, 4, or 5, as shown in Figure 73.

Figure 73: OS Effects on Energy Efficiency Knowledge



Source: DNV KEMA Analysis

In addition, the survey asked participants to compare their awareness of energy-efficient equipment and practices relative to their prior participation in OS. Slightly over half of respondents indicated they knew more at the time of the survey than before the program, as shown in Table 95.

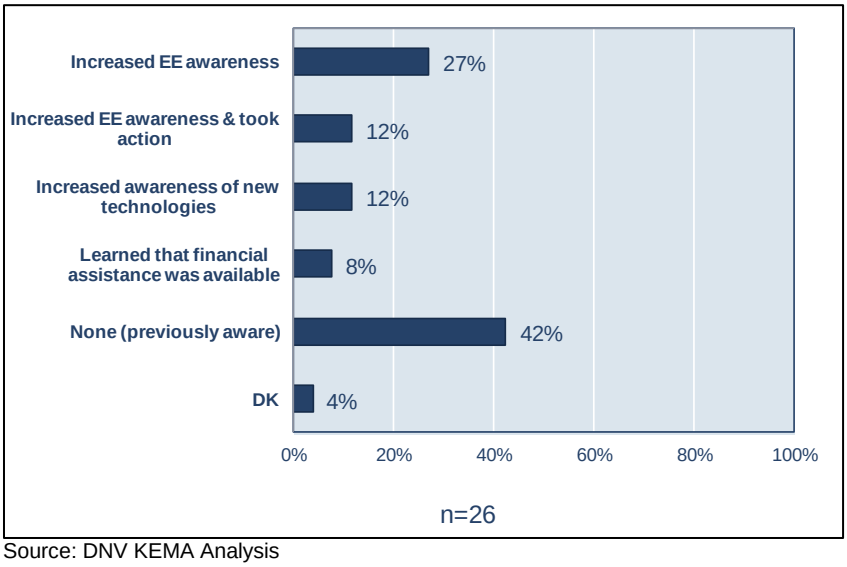
Table 95: OS Participant Assessment of Energy Efficiency Awareness

Self-Reported Current Awareness of Energy-Efficient Equipment and Practices Compared to *Before* OS Participation, n	
The same	6
Greater than before	9
Refused	1
Total Respondents	16

Source: DNV KEMA Analysis

When asked whether their energy efficiency awareness changed by participating in the program, more than half indicated that it had increased, as shown in Figure 74. A small proportion, 12 percent, also indicated that their increased awareness had led them to make changes accordingly.

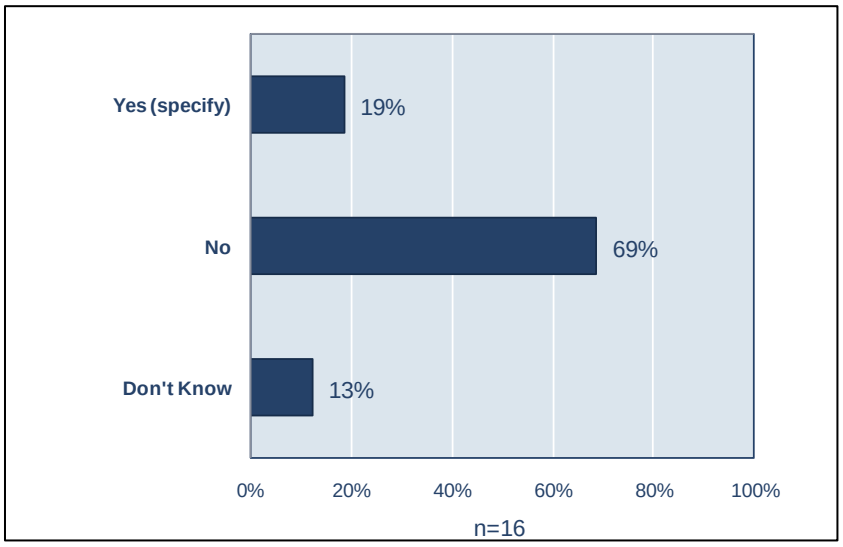
Figure 74: Energy Efficiency Awareness Shifts due to OS



Source: DNV KEMA Analysis

When asked whether their maintenance practices or equipment usage had shifted as a result of their participation in OS, only 19 percent said "Yes," as shown in Figure 75. Those that answered "Yes" were asked to list the kinds of shifts that occurred (multiple answers accepted),[32] as shown in Table 96.

Figure 75: Maintenance Practice Improvements due to OS



Source: DNV KEMA Analysis

Table 96: Equipment Usage and Maintenance Changes due to OS Participation

Self-reported Changes Due to OS Participation, n	
Adjusted operation of equipment. based on need	4
More careful equipment maintenance	10
More mindful of energy usage	3
Total responses from those 3 participants that responded "Yes" when asked "Has your participation in the program affected the way that you maintain or use your equipment?"	17[33]

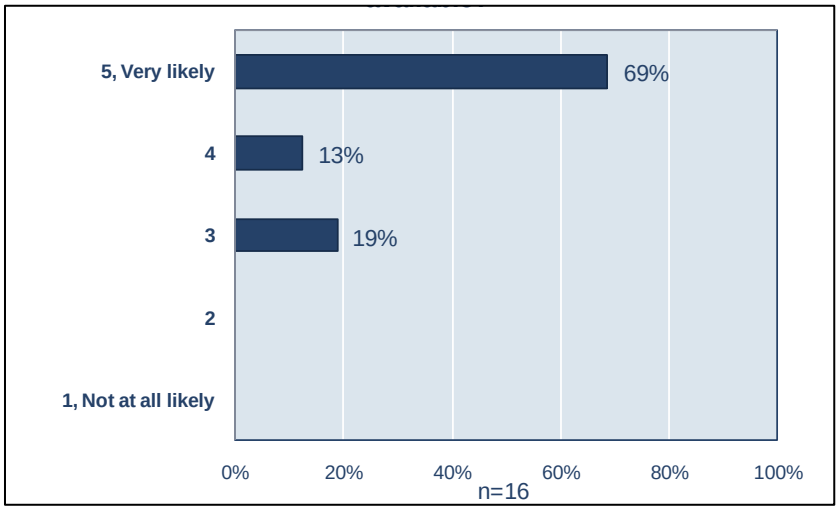
Source: DNV KEMA Analysis

32 The number of responses for this question was larger than the sample size because multiple answers were accepted.

33 The number of responses for this question was larger than the sample size because multiple answers were accepted.

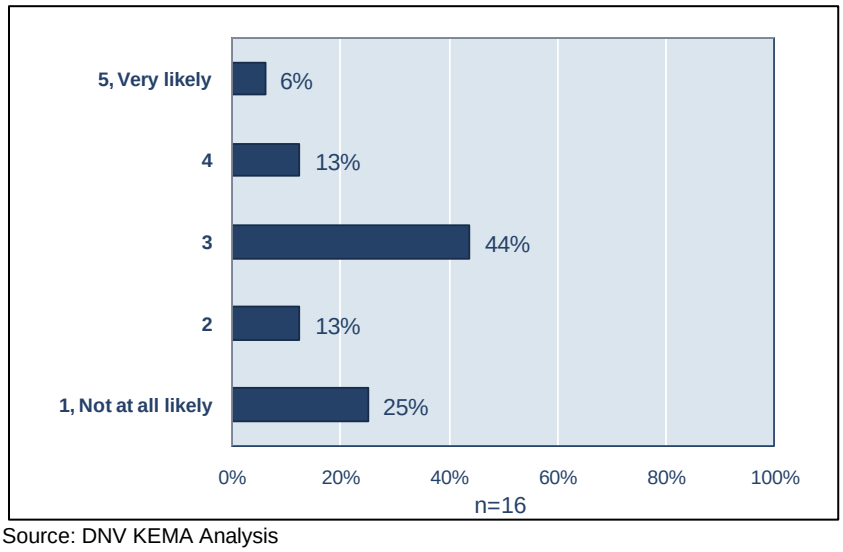
With incentives, 82 percent of respondents rated their likelihood to engage in similar kinds of energy efficient projects in the future at a 4 or 5, as shown in Figure 76. Without incentives, those most likely to initiate a project dropped to 19 percent with another 44 percent indicating a 3, as shown in Figure 77. One quarter of respondents indicated that they were "Not at all likely" to pursue similar projects in the future without incentives.

Figure 76: Likelihood of Future Projects With Incentives Similar to OS



Source: DNV KEMA Analysis

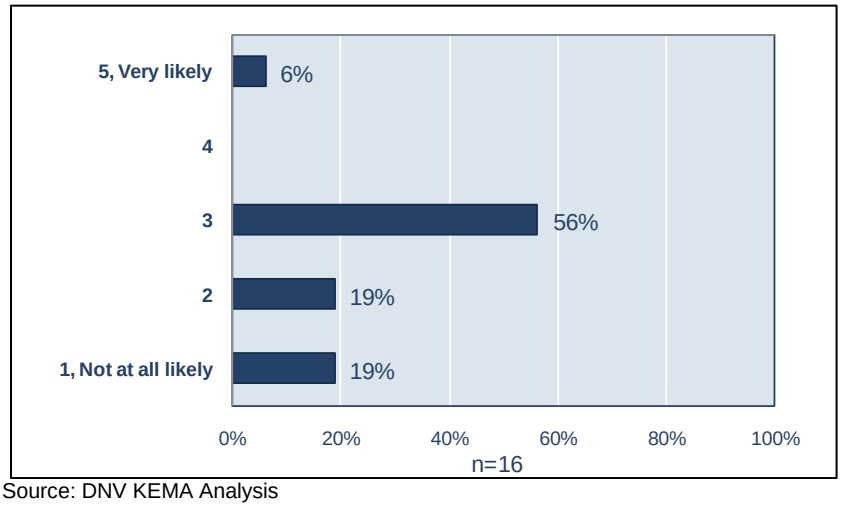
Figure 77: Likelihood of Future Projects Similar to OS Without Incentives



Source: DNV KEMA Analysis

When asked about the likelihood of engaging in other types of energy efficiency equipment upgrades without financial incentives, only 6 percent of OS participants rated their likelihood at a 4 or 5, as shown in Figure 78.

Figure 78: Likelihood of Other EE Projects Types Without OS Incentives



Source: DNV KEMA Analysis

Results for these questions suggest that inroads were made toward increasing interest in EE projects among Oakland businesses. They also indicate that, while the program may have helped generate momentum toward reducing energy consumption in Oakland buildings/businesses and reaching its goals, it is only a start. A continued, multi-pronged effort is needed to drive customers and contractors toward a sustainable local market for energy efficiency.

OS Effects on Workforce Reported by Market Actors

Workforce development was a major goal of this program. Anecdotally, four out of the eight interviewees had heard that some jobs creation did occur, though the only two that any respondent could recall were interns hired at CESC.

> *"Two graduates from Laney Green Jobs program were hired at CESC. I don't know if there were any other permanent jobs created." – Community Partner*

> *"It had a positive impact on me because I learned so much. Also, it had a great impact on my life because it got me hired full time at CESC." – Community Partner*

As mentioned previously, in the Market Actor Response section, one interviewee stated that the lag in rebate payment caused two contractors to go out of business effectively reducing the workforce available.

One of the three main energy savings of the program was to *"create jobs through collaboration with City Governments and Investor Owned Utilities. OS worked to achieve that impact in a number of ways*

including training of partner agencies to generate more contracts for energy-efficiency contractors and consultants."

> *"There were more jobs for them and Oakland Shines helped the contractor get more work in downtown Oakland and increase revenue." – Participant Contractor*

Almost all interviewees stated that OS engaged in training of some kind. More than one-half stated that OS provided useful information. Three specifically mentioned that OS provided useful marketing materials. In addition, three replied that OS provided training on software documentation; two were part of the workforce development internship program and received training on *"lighting training, basics of energy auditing, a variety of training, customer service, phone etiquette."*

> *"I personally learned a lot through the process, particularly understanding how the products translated to operational savings for businesses. It was an educational process about the field of energy efficiency and business activity." – Local Government Partner*

Four of 11 interviewees described their training experience as a collaborative process with OS.

> *"(Partner agency) developed training information concurrently with QuEST. Also, there was a training on the QuEST documentation system and how it stores information on who we contacted, audit totals, who wants to participate." – Utility Partner*

OS Conclusions and Recommendations

OS Conclusions

Overall, OS was a very successful subrecipient program that delivered four major types of targeted retrofits to 195 project sites at commercial and higher education buildings in Oakland. Forty-nine of these project sites involved bilevel luminaires for garages and parking lots, 16 involved other types of luminaires with wireless controls, 158 involved LED luminaires at refrigeration cases, and 5 involved retrofitting wireless controls at existing constant-volume HVAC systems.[34]

OS Program Energy Savings

Using the Baseline 1 results from 27 on-site visits conducted at a representative sample of OS project sites, the evaluation team determined that the subrecipient program provided 3.53 GWh of net annual electricity savings, 932 kW of net demand savings, and 13,192 therms of net natural gas savings. These annual savings yield net annual avoided GHG emissions of 1,175 metric tons of CO_2. The net life-cycle savings attributable to OS equal 44.3 GWh of electricity, 197,891 therms of natural gas, and avoided GHG emissions equal to 14,908 metric tons of CO_2.

[34] The measure category numbers are greater than the number of project sites because some included multiple measures at a single address.

OS Program Implementation Effectiveness

The evaluation team determined that OS was a well-run program that was also well received by participating customers and participating partner organization, and, therefore, few recommendations for improvement can be made.

Participants expressed a high degree of satisfaction with many program delivery facets, including surveyor/audit services, contractor installations, rebate application processes, and reporting requirements. Most OS participants surveyed achieved both energy savings and cost reductions comparable to what they expected and were satisfied with the energy efficiency information and technical assistance provided to them.

Most OS participants are highly likely to participate in a similar program if that program offers incentives similar to OS. Even more interesting, however, is that more than half of the surveyed participants indicated moderate willingness to install other EEMs without incentives in the next two years. Given that Oakland has long been an economically disadvantaged area, this is encouraging progress.

OS Market Effects

The program did initiate several lasting effects on the aging building market in Oakland:

- QuEST successfully created or strengthened partnerships with local organizations. These partnerships benefited the program but also demonstrated a successful agency/business partnership model for future programs or initiatives.
- There were concrete examples of workforce development resulting from OS-supported training programs, but there was also mention of workforce loss because of the program.
- Interviewees mentioned a number of marketing strategies, such as face-to-face discussions and relationship building, which were particularly successful and may be useful recommendations for future programs looking to make significant changes with similar communities.

OS Recommendations

OS Marketing

Continue to maintain or build relationships with community groups and agencies to foster trust and awareness of energy efficiency options.

Relationship building remains a viable tactic to build awareness and gain trust in targeted regions. For future campaigns, consider allocating more resources devoted to door-to-door and community event marketing, including translators, at the beginning of the program rather than relying heavily on electronic social media or traditional advertising channels. This shift was enormously helpful to Oakland Shines.

Spend more time during the program design phase to estimate the potential uptake within the targeted region for each EEM. By having a better understanding of the current penetration of energy-efficient lighting in the large office buildings in the downtown Oakland corridor , fewer resources could have been devoted to promoting that technology at the beginning of the program.

OS Training

While training contractors on energy-efficient technologies was reported as helpful for some, future programs should consider providing additional instruction regarding rebate processing and the time required for payment. By providing clear expectations at the outset, contractors and partners are able to anticipate cash flows and manage workforce levels more effectively.

OS Savings Tracking Database

The evaluation team encountered substantial challenges because QuEST had developed an overly simple tracking system. For instance, all measures at a given project site were rolled up into a single row within the tracking spreadsheet. It is standard practice, however, for a unique row to be provided for each measure category, such as "lighting equipment" or "lighting controls," and each characteristic, such as wattage or control strategy. For each row, provide a description of the preretrofit equipment so that the appropriate baseline can be established during the evaluation. To allow for more knowledge regarding the penetration of measure categories and different building types, categorize the type, square footage, and occupant status, such as owner or tenant, of each project site. The tables in Appendix C illustrate the differences in detail captured per project site between the Oakland Shines the EnergySmart Jobs programs – the level of detail in PECI's tracking database provided much of, though not all, the detail to facilitate evaluation.

OS Demand Savings Determination

The Energy Commission uses a different demand savings definition than the IOUs, but QuEST did not consistently use that definition. At some project sites, they mistakenly used the peak demand savings definition that is used by the IOUs. For instance, according to the Energy Commission's definition, QuEST should have always claimed demand savings for bilevel lighting, but this was done only some of the time. For future programs, a very clear explanation of the demand savings definition to be used should be provided to all implementers and evaluators to avoid inconsistencies.

OS Program Delivery

Overall participants and partners were satisfied with the program. The one issue that came up repeatedly was the timing of reimbursement for contractors. The concerns about many months' lag between invoice and payment may discourage qualified contractors from participating in future programs. In addition to enhancing the contractor training described, programs need to devote more resources to improving the reimbursement process to accommodate less capitalized companies to reduce frustration. This should lead to broader acceptance of the program, a better perception of the program, and increased participation.

CHAPTER 7: Glossary

ARRA	American Recovery and Reinvestment Act of 2009
BART	Bay Area Rapid Transit
Baseline 1	energy usage of the preretrofit equipment and operating conditions
Baseline 2	energy usage of the industry standard practice equipment and operating conditions
CALCTP	California Advanced Lighting Controls Training Program
CATI	computer-assisted telephone interview
CAV	constant air volume types of ventilation systems
CEDA	Community and Economic Development Agency
CESC	Community Energy Services Corporation
CEWTP	Clean Energy Workforce Training Program
CFL	compact florescent lamp
Confidence interval	upper/lower limit of estimate, at the 90 percent confidence level in this report
DEER	Database for Energy Efficient Resources
DOE	U.S. Department of Energy
DSP	duct static pressure
EE	energy efficiency or energy-efficient
EEM	energy efficiency measure, installation of equipment, subsystems or systems, or modification of equipment, subsystems, systems, or operations on the customer side of the meter, for the purpose of reducing energy and/or demand (and, hence, energy and/or demand costs) at a comparable level of service[35]

35 National Action Plan for Energy Efficiency (2007). Model Energy Efficiency Program Impact Evaluation Guide. Prepared by Steven R. Schiller, Schiller Consulting, Inc. www.epa.gov/eeactionplan

EMS	energy management system
EM&V	evaluation, measurement, and verification
Energy Commission	California Energy Commission
ESJ	EnergySmart Jobs, subrecipient program
ETAP	Energy Technology Assistance Program, subrecipient program
EUL	effective useful life
Ex ante	program savings claimed at its conclusion
Ex post	program savings verified by an independent evaluator
GEP	Global Energy Partners, subcontractor to DNV KEMA
GHG	greenhouse gas
GWh	gigawatt-hour
HVAC	heating, ventilation, and air-conditioning
IOU	investor-owned utility
IPMVP	International Performance Measurement and Verification Protocol
kBtu	kilo British thermal unit
kW	kilowatt
kWh	kilowatt-hour
LED	light-emitting diode
M&V	measurement and verification
MCR	Municipal and Commercial Targeted Measure Retrofit, State Energy Program
Measure	energy efficient improvement
MH	metal halide
MW	megawatt
MWh	megawatt-hour
NTG ratio	net-to-gross ratio, proportion of ex post gross energy savings attributable to a program
OAT	outside air temperature

OS	Oakland Shines, subrecipient program
POU	publicly owned utilities
PPE	personal protective equipment
Project site	activity or course of action involving one or multiple energy efficiency measures at a single facility or site[35]
PTS	Program Tracking System for ESJ
Realization rate	ratio of ex post gross savings and ex ante gross savings, percent
Relative precision	ratio of the precision of a given measurement and the value of the measurement
RUL	remaining useful life
SA	supply air
SAT	supply air temperature
SEP	State Energy Program
TMY3	typical meteorological year 3
VAV	variable air volume types of ventilation systems
VFD	variable frequency drive

APPENDIX A:
Detailed Evaluation Methodology

This appendix discusses the data collection and analysis methodologies observed during the evaluation. These were developed in alignment with the procedures set forth in the evaluation plan.

Data Collection Methods

This section discusses the evaluation team's approach to collecting site-specific evaluation data. Data collection fell into roughly five steps: data requests, site scheduling, site planning, site-specific measurement and verification (M&V) activities, and participant telephone surveys. Detailed data collection procedures are provided in Appendix B.

Data Requests

In October 2011, the evaluation team made an initial request to PECI, Energy Solutions, and QuEST for documentation related to Municipal and Commercial Building Targeted Measure Retrofit (MCR) project sites. This initial data request included detailed measure descriptions, savings calculation spreadsheets and related documentation, feasibility studies (as appropriate), and contractor, vendor, and equipment manufacturer information (where available).

DNV KEMA worked with the Energy Commission to collect consistent data organized into a spreadsheet tracking database.

Site Scheduling

For each sampled project site, an evaluation engineer contacted the site via e-mail or telephone to initiate the site planning process and to schedule the site visit and confirm project details. The evaluation team then notified the Energy Commission of upcoming site visits and obtained approval for the associated travel expenses.

Site Planning

The evaluation engineers developed data collection and analysis plans for each sampled project site. Site plans typically included brief descriptions of the data requirements and analysis approaches that would be used to determine both the preretrofit and postretrofit assumptions and conditions. Site plans also indicated specific M&V activities that could be conducted when site-specific constraints were known in advance.

Site-Specific M&V Activities

The evaluation team collected data to catalog preretrofit and postretrofit operations and conditions. At each site visit, an evaluation engineer verified the installation and proper operation of each energy efficiency measure (EEM). The engineer also collected equipment nameplate data, implementer calculations, and self-reported operational data as the minimum

data for all measures per site in the sample. The engineer interviewed site personnel to determine each measure's preretrofit and postretrofit operations, including operating conditions, load, operating hours, and control strategies. In addition to physically observing an installed measure, the engineer collected relevant data available from the site's contact, including self-reported data from facility personnel, contractor or vendor information, cut sheets and performance curves, billing data, and operational records.

Where applicable, the evaluation team also requested copies of collected site data that presented preretrofit and post-conditions, including logged equipment operating schedules, major equipment power and energy consumption or sensor records, and energy management system (EMS) trend data.

End-use metering data were collected to represent the post retrofit conditions when appropriate. As needed, data loggers were installed and long-term measurements were collected.

Telephone Surveys

Evaluators developed a participant survey instrument, which is located in Appendix C, to address research questions that could not be answered by other evaluation channels. One purpose of the survey was to provide the basis for determining net savings attributable to the program. A third-party CATI house administered this survey.

CATI surveyors screened facility contacts to identify the most appropriate person to interview based on his or her knowledge of the MCR subrecipient program and involvement with the project's implementation and other details. Generally this person was the site contact or a staff member at the project location.

Respondents were asked questions that ranged from their overall impression of the MCR subrecipient program to the financial criteria that helped the agency decide about participating. The survey also included questions to verify what measures were installed and determine the reasons behind the retrofit as well as where the idea for the project originated. An interview concluded with questions that asked about additional projects undertaken without program funding but may have been spurred by current program participation. These responses informed the spillover analysis, if participating sites implemented energy-efficient measures without incentives, grants, or loans from utility or government programs and were influenced by the program.

Site-Specific Analyses to Determine Savings

Calculating energy savings depends on the estimated base-case energy use of a given end use prior to a retrofit and the estimated energy use subsequent to the retrofit. As defined in the

International Performance Measurement and Verification Protocol (IPMV),[36] there are two ways to estimate savings:

Avoided energy basis. Avoided energy use quantifies savings in the reporting period relative to what energy use would have been without the EEM(s).

Normalized savings. ". . .the reduction in energy use or cost that occurred in the reporting period, relative to what would have occurred if the facility had been equipped and operated as it was in the baseline period but under a normal set of conditions."

For this evaluation, evaluators used the normalized savings approach to estimate savings. This approach assumes a fixed set of conditions in both the preretrofit and postretrofit cases. Thus the base-case conditions were established for the preretrofit conditions as follows:

- Preretrofit data were collected to establish the control scheme, operating conditions, equipment load, and equipment efficiency. In the absence of metered data, information from the implementer, site contact, as-built drawings, and research and engineering judgment were used to establish the base-case parameters.
- Postretrofit data were similarly collected, and base-case parameters were established.
- Both preretrofit and postretrofit data were normalized to the same operating conditions to establish savings estimates that could be directly compared.

Key Parameters and Terms

This study compares the forecasted energy savings (ex ante) with the savings calculated during the evaluation (ex post). The term *ex ante* refers to the savings estimates reported by the Energy Commission based on information from the program implementers. Savings estimates determined from the evaluation are referred to as *ex post savings*.

For each site within the sample, evaluators determined a measure's efficiency, measure life, and remaining useful life (RUL) of the preretrofit equipment.

Effective Useful Life of the Measure

California's Database for Energy Efficient Resources (DEER) was the primary source used to determine the effective useful life (EUL) of a given EEM. For measures not represented in the DEER, the source of the EUL was based on technical research, such as published reports.

36 Efficiency Valuation Organization. *International Performance Measurement and Verification Protocol, Concepts and Options for Determining Energy and Water Savings, Volume 1.* EVO 10000 – 1:2010, September 2010.

Remaining Useful Life

For all retrofit projects, evaluators estimated the number of years a piece of preretrofit equipment would have continued operating without the retrofit. Typically, evaluators spoke with the on-site contact and asked for the best estimate of the age of the preretrofit equipment. The RUL was determined to be the difference between the EUL of the equipment and the reported age of the equipment. Where on-site contacts did not know the age of the equipment or the equipment was older than its EUL, a minimum of one year RUL was used since the equipment was reported as functioning at the time of the retrofit.

Life-Cycle Savings Calculations

The evaluation team calculated life-cycle savings over the lifetime of the EEMs. Each measure was assigned an EUL, and the savings for each year of EUL were summed over the measure life to determine the life-cycle savings.

Energy savings calculated for this program are relative to two established baselines, referred to as Baseline 1 and Baseline 2.

Baseline 1 corresponds to the existing conditions found prior to the EEM's implementation and considers the operating efficiency of the equipment along with the control strategies found at that time. Life-cycle savings for Baseline 1 assumes that the pre-existing equipment would have operated for the full EUL of the new equipment regardless if the existing equipment was at the end of its useful life. The Energy Commission requested using this baseline to assist ARRA subrecipients that are comparing their observed preretrofit and postretrofit energy use and are using the savings to pay back loans.

Baseline 2 uses the pre-existing equipment as the measure baseline only until the end of the existing equipment's RUL. After that, an expected replacement baseline (for example, standard practice or code minimum) is used until the EUL is reached.

Gross Energy Savings Calculations

The gross site savings were calculated using the difference between energy usage for the measure-treated usage and the appropriate baseline. The savings were calculated using a spreadsheet analysis.

Spreadsheet Analysis

For lighting controls and interior lighting projects, the evaluation team's engineers determined savings by developing spreadsheets populated with the values gathered from site visits for wattage for each fixture types, counts by fixture type, and operating hours for both existing and preretrofit cases. Lighting logger data, which were deployed on representative circuits at the sites, were used to establish operating hours where possible. Typically, the lighting loggers were installed at representative locations containing several occupancy and usage types (offices, hallways, and garages) to establish annual operating hours for those types of locations. For exterior lighting projects, the operating hours were established by the hours of darkness.

For HVAC projects, evaluation engineers used the annual load regression analysis that the implementer provided. To analyze the data, implementers developed a binned regression curve relating the outdoor air temperature (OAT) data to power draw for each unit. Using the efficiency of the unit, implementers translated the power draw data into load data. The calculations used the Energy Commission weather data and the building schedule to determine the number of hours in each bin. The bin simulation estimated the energy consumption based on the building cooling/heating load, equipment efficiencies, supply air (SA) flow, and duct static pressure (DSP) for both the preretrofit and postretrofit cases. The bin simulation calculated the cooling load and heating load based on the OAT, return air temperature, outside air percentage, SA temperature, and SA flow. To calculate the ex ante energy savings, evaluators modified inputs as necessary based on what was found on-site.

Net-to-Gross Calculations

For each program, evaluators used participant survey responses to estimate to what extent the program was responsible for the realized savings. Specifically, the team asked participants what actions, if any, would have happened without the influence of the program. Evaluators subtracted, from 100 percent, the claimed savings-weighted percentage of those participants that indicated that they would have performed the same or an equally efficient retrofit at the same time in the absence of the program—these participants are referred to as free riders. Evaluators used this result as the net-to-gross (NTG) ratio and applied to the gross energy savings to determine the program's overall net savings.

APPENDIX B:
Data Collection Field Measurement Procedures

Introduction

This document outlines guidelines and expectations for planning and performing site-level evaluations and developing reporting documents for projects executed under the MCR subrecipient program. This guideline supplies general measure approaches, including data collection, field measurement, and analysis, for nearly all of the MCR project types. Consult this guide to determine a measure's appropriate data collection, field measurement, and analysis approach; this will help maintain consistency across the team of engineers who are working on these projects. The high-level measure approaches discussed in this guide indicate the expected level of rigor of each measure consistent with the evaluation plans.

This document is designed for experienced energy efficiency engineers who are capable of performing calculations for commercial EEMs. It is not intended to be a primer on how to calculate savings; rather, it serves as a companion to the final evaluation plan for MCR dated June 13, 2011. All team members are required to read and thoroughly understand the evaluation plan for the project site on which they are working. This document provides additional guidance for evaluating specific measures.

Site Plans

Evaluators need to generate a clear, concise site plan before the first site visit. Deliver this site plan with a travel request to DNV KEMA's task lead, Rachel Murray, no later than the preceding Tuesday for the week of the proposed site visit. The site plan, which should not exceed 500 words, should briefly describe the on-site approach that will be used for each project measure. Evaluators should also discuss any proposed metering as well as the analysis type that the evaluator will use during the site visit. A sample evaluation plan is provided to illustrate the level of detail and clarity evaluators should capture in their evaluation plan drafts.

Safety

Evaluators who visit project sites must have completed safety training relevant to each particular site. At a minimum, evaluators must complete, or be able to document completion of, driving safety, slips and falls, and ladder safety trainings. To conduct metering activities, electrical safety training is mandatory. Evaluators must bring with them and use personal protective equipment (PPE) as applicable for each task where required or necessary. At a minimum, evaluators must bring work gloves, closed-toed work shoes, and earplugs to each site. In addition, evaluators who go on-site must follow the safety requirements of the visited facility, including de-energizing equipment using industry-standard lockout-and-tagout practices when metering.

Measure Approaches for On-Site Activities and Analysis

This section details general measure approaches for the most prevalent measure types in the MCR program.

General Considerations

Program-specific survey instruments have been developed and approved by the Energy Commission for MCR. The evaluator must deliver the survey to the person identified as the decision maker for the EEMs installed. Fully completed, legible copies of all surveys must be provided to DNV KEMA.

Exterior/Interior Lighting and Lighting Controls

Lighting measures include a wide range of energy efficient controls, fixtures, and lamps, including linear fluorescents, light-emitting diode (LEDs), exit signs, compact fluorescents, and high bay lighting.

Calculating direct savings from lighting measures are dependent on all of the following variables:

- Baseline and installed fixture wattages
- Baseline and installed fixture counts
- Baseline and installed fixture operating hours.

In retrofit projects, fixture wattages and counts typically change. In controls projects—which involve occupancy sensors, daylighting sensors and/or timer controls—operating hours are generally affected. For project sites where both controls and new fixtures are installed, fixture wattages, counts, and hours of operation all become important. In all cases, the wattage, counts, and hours of operation for baseline and installed fixtures must be collected.

Determine savings by establishing values for wattage of each fixture type, counts by fixture type, and operating hours for both the installed and base cases for both lighting controls and interior lighting projects. For this evaluation, evaluators will verify the installation of all new fixtures. After verifying fixture counts, evaluators should discuss the operating schedules of all affected lights with the site contact. For retrofit project sites where the operating schedule is well-defined, metering is not necessary. Where the operating schedule is poorly defined, subject the fixture groups with the greatest expected usage variability to short-term (three to four weeks) time-of-use data logging to determine actual hours of operation; photocell based on/off loggers should be used for this task. For controls project sites, the usage reductions attributable to the implemented EEMs can be estimated or measured with time-of-use logging. Use appropriate references to estimate the fraction of annual lighting energy saved by lighting

controls.[37,38] In all cases, evaluators should ask site contacts for EMS trend data. If these data are available, it may be unnecessary to perform additional metered data collection.

Estimate values for fixture wattages by examining the power rating and ballast nameplate of the installed lamp. Evaluators should discuss the measure baseline specified in the project documentation with the site contact to verify that the fixture counts and types used in the ex ante analysis are appropriate for the ex post analysis. If not, request documentation specifying the actual pre-existing equipment (for example, an internally performed lighting inventory or a building lighting plan).

Following the retrieval of data loggers, evaluators should calculate savings for lighting project sites using a spreadsheet analysis. Operating schedules (developed from logger data), fixture counts, and the difference between the pre-existing and installed fixture wattages serve as the basis for savings calculations.

Refrigeration Case LEDs

Refrigeration case LED retrofits result in savings due to the reduction in the lighting fixture wattages. The verification of the lighting savings will be addressed using the same approach described above for exterior/interior lighting and control replacements.

Wireless HVAC Controls

Wireless HVAC control measures include:

- Constant-air-volume (CAV) to variable-air-volume (VAV) conversions.
- DSP resets.
- Supply air temperature (SAT) resets.
- Scheduling.
- Night and weekend setbacks.
- Optimal start/stop sequences.

For mechanical measures, evaluators should use a spreadsheet analysis, informed by metered data, when the air delivery system for a site changes in some measureable way.

The standard approach for *mechanical* measures is as follows:

1. Verify installation of the incentivized equipment (for example, wireless controls and/or variable frequency drives [VFDs]).

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37 Northeast Energy Efficiency Partnership. 2010. *Mid-Atlantic Technical Reference Manual, Version 1.0*.page 83.

38 *Business Programs Deemed Savings Manual V1.0*, State of Wisconsin (pages 4-192ff).

2. Document the nameplate information of the affected equipment. For example, in the case of a CAV-to-VAV conversion, the evaluator would document the supply fan motor nameplate of the air handler. Additionally, the evaluator shall record the nameplate of the source of cooling and heating. In most cases this would be from the chiller(s) and boiler(s).
3. Install data loggers to track operation of the equipment (kW meter for VFD applications and temperature data loggers for air-side applications). Depending on the number of measures installed, evaluators may meter either a sample of units or all the units.
4. Take spot measurements of equipment, if necessary (constant speed supply- and return-fan-related measures only). Use these measurements to verify the validity of metered data.
5. Discuss the equipment operations of the project site with a participant's building engineer. Record relevant information as presented in the field forms to the interpretation of the metered data. For instance, ask a site contact to indicate the high-limit SAT for the air handler operation and the minimum outside air set point if the SAT reset is based on OAT. These data can be cross-referenced with temperature logger data to verify the correct operation of the air handler.
6. Discuss the pre-existing equipment with a site contact or building engineer. Investigate the ways in which operations of the equipment may have changed as a result of the project.
7. Retrieve all data loggers after equipment monitoring.
8. Estimate the baseline equipment operation from data gathered from a site contact. Determine the measure's annual savings using either a bin model or an 8760 model; in either case, use typical meteorological year 3 (TMY3) weather data from a nearby weather station for all final savings projections.

Use simulation modeling to analyze air-side controls measures.

Reporting Requirements

Site reports should be succinct and should answer the following questions:

- Which measures were implemented?
- Were the measures installed as proposed?
- Does the baseline equipment listed for the project site seem reasonable given the observed facility conditions?
- How were savings determined for each implemented measure? What were the savings for each measure?
- If savings differed drastically from ex ante projections, why?

All calculations, tabulated results, and figures showing measurements shall be provided. The report will explain the analysis performed; backup spreadsheets with the detailed calculations will become part of the project site record.

The following results must be identified:

- Annual energy savings, based on the pre-existing equipment operation (Baseline 1).
- Measure life.
- RUL of the existing equipment, based on the decision-maker survey, information gathered during the site visit, and engineering judgment.
- Normal replacement annual energy savings (Baseline 2), if different from Baseline 1.
- Lifetime savings, based on Baseline 1.
- Lifetime savings, based on dual baseline of early replacement for the RUL of the equipment, followed by normal replacement savings for the remaining years of the measure.
- Realization rate, on a measure basis.

Energy savings for this program are calculated relative to two established baselines, referred to as Baseline 1 and Baseline 2. Baseline 1 considers the existing conditions found prior to the EEMs implementation and takes into account the equipment's operating efficiency along with the control strategies found at that time. Life-cycle savings for Baseline 1 assumes the pre-existing equipment would have continued to operate indefinitely, up to the EUL of the new equipment. In contrast, Baseline 2 uses the pre-existing equipment as the measure's baseline until the end of the existing equipment's RUL. After the remaining useful-life period, and up until the end of the EUL of the installed measure, the measure's expected-replacement baseline is used. This baseline considers either minimally code-compliant conditions or standard practice when no code is applicable.

DNV KEMA will distribute example reports once the first few reports are accepted by the Energy Commission. At that time, DNV KEMA will also distribute a reporting template to use for all site reports to maintain consistency.

Metering Protocols

Many project sites executed under the MCR subrecipient programs will require data logging of some kind. This section discusses the data logging instrumentation that evaluators shall use for these project sites. Evaluators shall inform a site contact about any proposed metering during their initial scheduling call for any project site that will require metering. Tell the site contact what will be installed, where it will be installed, and for how long. This way, equipment access or safety issues can be resolved before a site visit, and metering can occur as planned.

Installing power meters requires opening all panels and poses certain safety risks. All field staff working on this evaluation must complete appropriate courses on electrical safety, driving safety, and ladder safety, or provide documentation from another program indicating that similar training has been completed in these areas.

Lighting Loggers

Lighting operating hours will be determined using Onset 12-bit HOBO data loggers. The HOBO data loggers have a photocell that can measure the surrounding light intensity. These loggers will be placed near or in the lighting fixture, which is being targeted for measurement and left "on" for a defined length of time. The evaluator will use the measured lighting intensity to identify when the light fixture(s) were on or off. Additionally, the evaluator can use the lighting intensity to estimate the time the fixture operated at reduced light outputs.

Figure 79: Onset 12-bit HOBO® Data Logger

Photo Credit: Onset Computer Corporation

Sample Evaluation Plans

The following is a sample evaluation plans from the ARRA MCR program evaluation.

Example Plan 1: Community College Parking Garage (ETAP 1095)

This project site replaced 229 light fixtures in a parking structure at a community college in the Monterey Bay area. 175-watt metal halide (MH) lamps were replaced with linear fluorescent fixtures (2 x 32-watt and 25-watt lamps) with separate occupancy sensors and dimmable ballasts. Energy savings are achieved from (1) replacing the higher wattage MH lamps with the more efficient fluorescent lamps, and (2) adding bilevel controls that enable the fixtures to operate at low power levels during times of negligible occupancy.

The evaluator plans to estimate the energy savings from this measure by verifying the inputs in the simple spreadsheet calculation prepared by the program. Inputs include base-case and installed fixture wattages, quantities, operating hours, and percentages of time fixtures are at

high and low power levels. The evaluator will conduct a short interview with the site contact to verify hours of operation and existing fixture types. The evaluator will visually verify and inventory the new fixture installation. If data on percentage of time fixtures are at high/low power levels are not available during the site visit, then the evaluator will attempt to obtain program verification data files. If the latter is not available, then typical values will be used.

APPENDIX C:
Ex Ante and Ex Post Savings for Sampled Sites

EnergySmart Jobs

Table 97: ESJ Savings for Sampled Sites

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
0092	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	5,130	0.70	-	5,130	0.70	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	3,990	0.55	-	3,990	0.55	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	0	-	-
0123	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	985	0.14	(24.6)	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	11,374	1.45	-	11,374	1.45	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,692	0.20	-	1,692	0.20	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	3,102	0.37	-	3,102	0.37	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,410	0.17	-	1,410	0.17	-
0135	Motion sensor for LED, RET, < 4W/FT	624	-	-	0	-	-
	Motion sensor for LED, RET, < 4W/FT	650	-	-	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	3,384	0.41	-	3,102	0.37	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Reach-In Case Lighting, T10/T12 to LED, RET, <4W/FT	4,560	0.31	-	3,135	0.43	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	4,750	0.65	-	5,700	0.78	-
0164	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	8,840	-	-	26	-	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	22,695	3.12	-	19,380	2.66	-
	Refrigerated CFL - 100W incandescent to 27W CFL	1,196	0.34	-	0	-	-
0297	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	17,625	2.13	-	16,074	1.94	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	2,375	0.33	-	2,850	0.39	-
0306	Reach-In Case Lighting, T8 to LED, NEW, 4W/FT to 7.5W/FT	3,060	0.42	-	3,060	0.42	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	3,420	0.47	-	2,850	0.39	-
0320	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	252	0.03	(5.5)	226	0.03	(8.5)
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	2,538	0.31	-	2,538	0.31	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	2,538	0.31	-	2,538	0.31	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	17,766	2.14	-	17,766	2.14	-
	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	897	0.26	-
0406	Beverage Merchandise Cooler Controller	1,158	-	-	1,158	-	-
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	628	0.10	(31.0)	2,717	0.41	(101.6)
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-
0427	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	14,820	-	-	14,040	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	61,100	7.80	-	56,400	7.20	-
0500	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	5,200	-	-	5,200	-	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	12,480	-	-	12,480	-	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	18,870	2.59	-	14,025	1.93	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	24,480	3.36	-	24,480	3.36	-
0503	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	17,160	-	-	13,260	-	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	36,975	5.08	-	41,055	5.64	-
0504	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	15,165	2.11	(412.3)	7,018	1.05	(262.6)
0553	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	3,380	-	-	3,380	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	18,330	2.34	-	18,330	2.34	-
0606	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	2,340	-	-	2,340	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	8,460	1.08	-	8,460	1.08	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,410	0.17	-	1,410	0.17	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	0	-	-
	Refrigerated CFL - 100W incandescent to 27W CFL	1,794	0.51	-	0	-	-
0613	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	1,092	-	-	1,092	-	-
	Motion sensor for LED, RET, < 4W/FT	78	-	-	78	-	-
	Motion sensor for LED, RET, < 4W/FT	78	-	-	78	-	-
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	726	0.10	(19.1)	679	0.10	(25.4)
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	3,948	0.50	-	3,948	0.50	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	846	0.10	-	846	0.10	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	846	0.10	-	846	0.10	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
0680	Beverage Merchandise Cooler Controller	3,474	-	-	3,474	-	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	13,536	1.63	-	12,690	1.53	-
	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	0	-	-
0715	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	10,575	1.28	-	10,575	1.28	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	4,230	0.51	-	4,230	0.51	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	4,230	0.51	-	4,230	0.51	-
0732	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	7,755	0.94	-	9,165	1.11	-
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	897	0.26	-
0857	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	737	0.10	(18.6)	226	0.03	(8.5)
	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	598	0.17	-
0880	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	7,332	0.94	-	7,332	0.94	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,692	0.20	-	1,692	0.20	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	765	0.11	-	765	0.11	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	950	0.13	-	950	0.13	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	950	0.13	-	950	0.13	-
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	0	-	-
0886	Beverage Merchandise Cooler Controller	1,158	-	-	0	-	-
	Motion sensor for LED, RET, < 4W/FT	520	-	-	520	-	-
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	968	0.14	(25.5)	906	0.14	(33.9)
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	5,640	0.68	-	5,640	0.68	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	299	0.09	-
0919	Beverage Merchandise Cooler Controller	2,316	-	-	2,316	-	-
	Motion sensor for LED, RET, < 4W/FT	520	-	-	728	-	-
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	978	0.14	(26.6)	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	5,640	0.68	-	10,293	1.24	-
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	598	0.17	-
0928	Controller - Floating Head Pressure - Air Cooled	69,679	0.46	19.6	69,679	0.46	19.6
	Controller - Floating Suction Pressure - Air Cooled	18,504	1.84	2.3	18,504	1.84	2.3
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	0	-	-
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	0	-	-
0963	Beverage Merchandise Cooler Controller	1,158	-	-	1,158	-	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	10,998	1.33	-	5,076	0.61	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-
1086	Beverage Merchandise Cooler Controller	1,158	-	-	1,158	-	-
1108	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	10,998	0.94	-	7,332	0.94	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	2,280	0.41	-	3,384	0.41	-
1114	Beverage Merchandise Cooler Controller	2,316	-	-	2,316	-	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	598	0.17	-
1123	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	9,306	1.12	-	9,306	1.12	-
1202	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	1,170	-	-	1,170	-	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Motion sensor for LED, RET, < 4W/FT	130	-	-	130	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	4,230	0.54	-	4,230	0.54	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,410	0.17	-	1,410	0.17	-
1298	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-
1541	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	2,184	-	-	2,184	-	-
	Motion sensor for LED, RET, < 4W/FT	312	-	-	312	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	7,896	1.01	-	7,896	1.01	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	3,384	0.41	-	3,384	0.41	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-
1582	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	1,404	-	-	1,404	-	-
	Motion sensor for LED, RET, < 4W/FT	156	-	-	156	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	5,076	0.65	-	5,076	0.65	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,692	0.20	-	1,692	0.20	-
1660	Beverage Merchandise Cooler Controller	2,316	-	-	2,316	-	-
	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	1,092	-	-	1,092	-	-
	Motion sensor for LED, RET, < 4W/FT	156	-	-	156	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	3,948	0.50	-	3,948	0.50	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,692	0.20	-	1,692	0.20	-
1672	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	6,345	0.77	-	4,275	0.59	-
1823	Motion sensor for LED, RET, < 4W/FT	858	-	-	858	-	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	9,306	1.12	-	9,306	1.12	-
1897	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	679	0.10	(25.4)	226	0.03	(8.5)
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	226	0.03	(8.5)	226	0.03	(8.5)
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	3,525	0.43	-	3,525	0.43	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	2,375	0.33	-	2,375	0.33	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-
2047	Motion sensor for LED, RET, < 4W/FT	624	-	-	624	-	-
	Motion sensor for LED, RET, < 4W/FT	390	-	-	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	6,768	0.82	-	6,768	0.82	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	6,768	0.82	-	6,768	0.82	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	0	-	-
2067	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	14,382	1.73	-	16,074	1.94	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-
2075	Motion sensor for LED, RET, < 4W/FT	702	-	-	702	-	-
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	226	0.03	(8.5)	226	0.03	(8.5)
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	7,614	0.92	-	7,614	0.92	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	0	-	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	0	-	-
2094	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	468	-	-	936	-	-
	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	780	-	-	1,560	-	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Motion sensor for LED, RET, < 4W/FT	468	-	-	468	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	3,420	0.43	-	3,384	0.43	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	5,076	0.61	-	5,076	0.61	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	5,700	0.42	-	3,060	0.42	-
	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	897	0.26	-
2162	Beverage Merchandise Cooler Controller	2,316	-	-	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	2,820	0.36	-	2,820	0.36	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,692	0.20	-	1,692	0.20	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	1,224	0.17	-	1,224	0.17	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	1,140	0.16	-	1,140	0.16	-
2187	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	15,600	-	-	15,600	-	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	35,955	4.94	-	35,955	4.94	-
2231	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	14,382	1.73	-	14,382	1.73	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	4,750	0.65	-	4,750	0.65	-
	Refrigerated CFL - 100W incandescent to 27W CFL	1,196	0.34	-	1,196	0.34	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-
2243	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	11,280	1.36	-	11,280	1.36	-
2247	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	0	-	-
2299	Motion sensor for LED, RET, < 4W/FT	585	-	-	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	0	-	-	3,290	0.42	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	6,345	0.77	-	1,410	0.17	-
2306	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	13,536	1.63	-	13,536	1.63	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	3,384	0.41	-	2,538	0.31	-
	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	897	0.26	-
2357	Beverage Merchandise Cooler Controller	2,316	-	-	2,316	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	5,640	0.72	-	5,640	0.72	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	5,076	0.61	-	5,076	0.61	-
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	598	0.17	-
2432	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	6,768	0.82	-	6,768	0.82	-
2457	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	11,844	1.43	-	11,844	1.43	-
2469	Controller - Floating Head Pressure w/ Variable Speed Condenser Fans-Evap Cooled	57,694	2.60	7.8	57,694	2.60	7.8
	Controller - Floating Suction Pressure - Evap Cooled	11,609	2.60	1.3	11,609	2.60	1.3
2541	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	6,345	0.77	-	11,985	1.45	-
2564	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	7,755	0.94	-	7,614	0.92	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	2,850	0.39	-	2,850	0.39	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	10,260	1.40	-	11,970	1.64	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	7,980	1.09	-	8,550	1.17	-
2577	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	8,460	1.02	-	8,460	1.02	-
2584	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	936	-	-	0	-	-
	Motion sensor for LED, RET, < 4W/FT	156	-	-	0	-	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	3,384	0.43	-	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,692	0.20	-	0	-	-
2633	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	1,092	-	-	1,170	-	-
	Motion sensor for LED, RET, < 4W/FT	156	-	-	260	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	5,076	0.48	-	4,230	0.54	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	3,384	0.17	-	2,820	0.34	-
2643	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	1,040	-	-	1,040	-	-
	Motion sensor for LED, RET, < 4W/FT	130	-	-	130	-	-
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	243	0.03	(7.2)	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	3,760	0.48	-	3,760	0.48	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	1,410	0.17	-	1,410	0.17	-
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	598	0.17	-
2726	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	780	-	-	0	-	-
	Motion sensor for LED, RET, < 4W/FT	312	-	-	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	2,820	0.36	-	5,076	0.65	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	3,384	0.41	-	1,692	0.20	-
2776	Beverage Merchandise Cooler Controller	2,316	-	-	2,316	-	-
	Motion sensor for LED, RET, < 4W/FT	455	-	-	455	-	-
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	722	0.10	(20.9)	679	0.10	(25.4)
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	4,935	0.60	-	4,935	0.60	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	598	0.17	-
2814	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	6,768	0.82	-	6,768	0.82	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	5,922	0.71	-	5,922	0.71	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	2,280	0.31	-	2,280	0.31	-
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	0	-	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-
2966	Beverage Merchandise Cooler Controller	3,474	-	-	3,474	-	-
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	1,210	0.17	(31.9)	1,132	0.17	(42.4)
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	0	-	-
3051	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	897	0.26	-
3083	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	5,076	0.65	-	5,076	0.65	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	3,384	0.41	-	3,384	0.41	-
3268	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	1,710	0.23	-	1,710	0.23	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	8,550	1.17	-	9,120	1.25	-
	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	1,196	0.34	-
3308	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	1,404	-	-	1,404	-	-
	Motion sensor for LED, RET, < 4W/FT	156	-	-	156	-	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	2,754	0.38	-	2,754	0.38	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	1,140	0.16	-	1,140	0.16	-
3315	Beverage Merchandise Cooler Controller	3,474	-	-	3,474	-	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	1,210	0.17	(31.9)	906	0.14	(33.9)
	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	897	0.26	-
3455	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	10,270	-	-	10,270	-	-
	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	10,400	-	-	10,400	-	-
	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	734	0.10	(21.6)	0	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	41,360	5.28	-	41,360	5.28	-
	Reach-In Case Lighting, T8 to LED, RET, 4W/FT to 7.5W/FT	23,205	3.19	-	23,205	3.19	-
	Refrigerated CFL - 100W incandescent to 27W CFL	897	0.26	-	0	-	-
3498	Motion sensor for LED, RET, 4W/FT to 7.5W/FT	1,300	-	-	1,300	-	-
	Motion sensor for LED, RET, < 4W/FT	260	-	-	260	-	-
	Reach-In Case Lighting, T10/T12 to LED, 4W/FT to 7.5W/FT	4,700	0.60	-	4,700	0.60	-
	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	2,820	0.34	-	2,820	0.34	-
3525	Reach-In Case Lighting, T10/T12 to LED, < 4W/FT	7,050	0.85	-	7,050	0.85	-
	Reach-In Case Lighting, T8 to LED, RET, <4W/FT	3,990	0.55	-	3,990	0.55	-
3706	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	241	0.03	(7.0)	226	0.03	(8.5)
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-
3716	Refrigerated CFL - 100W incandescent to 27W CFL	1,196	0.34	-	1,196	0.34	-
3731	Nonrefrigerated CFL - 75W - 100W incandescent to 23 W CFL	720	0.10	(21.6)	226	0.03	(8.5)
	Refrigerated CFL - 100W incandescent to 27W CFL	598	0.17	-	598	0.17	-
3866	Refrigerated CFL - 100W incandescent to 27W CFL	1,196	0.34	-	1,196	0.34	-

ESJ Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
3991	Refrigerated CFL - 100W incandescent to 27W CFL	1,196	0.34	-	1,196	0.34	-
3999	Beverage Merchandise Cooler Controller	2,316	-	-	1,158	-	-
	Refrigerated CFL - 100W incandescent to 27W CFL	299	0.09	-	299	0.09	-

Source: DNV KEMA Analysis

Table 98: ETAP Savings for Sampled Sites

ETAP Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
0001	Wireless Lighting	248,209	22.31	-	248,209	22.31	-
0002	Bilevel Lighting	62,393	6.36	-	62,393	6.36	-
0004	Bilevel Lighting	275,512	17.34	-	253,713	11.44	-
0008	Bilevel Lighting	1,889,662	199.48	-	1,889,662	199.48	-
0009	Bilevel Lighting	655,504	64.53	-	655,504	64.53	-
0019	Wireless HVAC	119,184	29.74	3,971	119,184	29.74	3,971
0023	Wireless Lighting	376,932	19.72	-	407,333	24.23	-
0026	Wireless HVAC	17,725	4.10	3,358	68,356	4.10	3,358
0033	Wireless HVAC	300,805	-	22,759	255,721	-	18,607
0035	Bilevel Lighting	201,626	-	-	201,626	-	-
0039	Bilevel Lighting	138,143	10.60	-	138,143	10.60	-
0042	Wireless HVAC	432,500	-	61,937	432,500	-	61,937
0059	Bilevel Lighting	250,916	18.08	-	199,393	12.61	-
0060	Wireless HVAC	112,636	-	8,781	300,850	-	8,781
0064	Bilevel Lighting	90,112	-	-	83,993	-	-
0065	Bilevel Lighting	263,784	40.18	-	282,557	40.18	-
0068	Bilevel Lighting	300,827	17.68	-	225,121	6.64	-

ETAP Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
0074	Wireless HVAC	4,217,265	-	348,125	4,217,265	-	348,125
0075	Wireless HVAC	289,948	-	9,323	289,948	-	9,323
0076	Wireless Lighting	213,154	-	-	262,231	16.75	-
0081	Wireless HVAC	578,644	25.89	61,576	496,093	20.90	50,742
0082	Wireless Lighting	155,716	16.26	-	76,054	8.68	-
0088	Wireless HVAC	1,564,968	28.00	198,555	1,763,444	27.00	235,345
0089	Wireless Lighting	6,207	-	-	5,746	2.12	-
0092	Bilevel Lighting	34,331	6.20	-	34,331	6.20	-
0095	Wireless Lighting	106,461	25.06	-	106,461	25.06	-
0097	Wireless HVAC	183,957	-	23,142	183,957	-	23,142

Source: DNV KEMA Analysis

Oakland Shines

Table 99: OS Savings for Sampled Sites

OS Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
002	BI-LEVEL LIGHTING	128,159	10.24	-	107,912	6.90	-
010	BI-LEVEL LIGHTING	139,715	6.74	-	41,637	5.80	-
027	BI-LEVEL LIGHTING	2,926	0.02	-	3,260	0.09	-
	CUSTOM LIGHTING - EXTERIOR	187	-	-	261	0.06	-
	CUSTOM LIGHTING - INTERIOR	2,919	0.82	(25)	4,430	1.49	(38)
036	BI-LEVEL LIGHTING	9,338	0.52	-	9,687	0.44	-
039	BI-LEVEL LIGHTING	458,296	33.99	-	303,251	28.16	-
040	BI-LEVEL LIGHTING	239,152	6.90	-	239,356	30.30	-
042	BI-LEVEL LIGHTING	278,293	17.29	-	164,464	23.17	-
054	BI-LEVEL LIGHTING	17,080	2.71	(477)	24,924	2.10	(696)
061	CUSTOM LIGHTING - INTERIOR	62,628	9.95	(1,749)	72,366	10.47	(2,021)
063	BI-LEVEL LIGHTING	63,370	3.85	-	65,228	4.01	-
065	BI-LEVEL LIGHTING	12,930	0.72		13,412	0.61	-
066	BI-LEVEL LIGHTING	25,860	1.44	-	26,846	1.31	-
070	BI-LEVEL LIGHTING	119,426	6.35	-	133,203	8.83	-
084	BI-LEVEL LIGHTING	22,506	1.63	-	24,217	2.11	-
091	BI-LEVEL LIGHTING	18,500	1.94	-	18,500	1.94	-

OS Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
094	6FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	5,770	0.88	-	6,090	1.21	-
097	6FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	9,809	1.50	-	12,724	2.06	-
111	5FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	1,332	0.20	-	2,116	0.31	-
	6FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	5,770	0.88	-	8,361	1.21	-
121	6FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	8,655	1.32	-	11,223	1.81	-
125	5FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	1,665	0.26	-	1,655	0.38	-
	6FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	4,616	0.70	-	4,214	0.96	-
130	5FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	1,665	0.26	-	2,285	0.38	-
	6FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	5,193	0.79	-	6,551	1.08	-
137	5FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	4,662	0.71	-	6,627	1.07	-
166	5FT PREMIUM TIER - LED REFRIGERATION CASE LIGHTING	2,331	0.36	-	3,046	0.54	-
186	WIRELESS HVAC CONTROLS	146,014	133.00	2,686	114,343	71.00	1,397
187	WIRELESS HVAC CONTROLS	467,497	98.00	3,835	430,509	306.20	5,602
188	WIRELESS HVAC CONTROLS	179,136	18.00	52,040	99,040	52.80	8,068

OS Site ID	Measure Description	Ex Ante Savings			Ex Post Savings		
		Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)	Annual Electricity (kWh)	Demand (kW)	Annual Natural Gas (therms)
189	WIRELESS HVAC CONTROLS	206,886	110.00	9,568	160,422	137.69	2,742
	WIRELESS HVAC CONTROLS	42,385	8.00	477	32,866	10.01	137

Source: DNV KEMA Analysis

APPENDIX D:
Participant Computer Assisted Telephone Interviews

Participant CATI Guide

Table 100: CATI Variables

Variable Name	Location	IF =	Fill-in
<PROGRAM_NAME>	See first three characters of KEMASiteID in "Primary Sample" tab, Column	ESJ	EnergySmart Jobs Program
		ETA	Energy Technology Assistance Program, also called ETAP
		OSH	Oakland Shines Program
<PROGRAM>	See first three characters of KEMASiteID in "Primary Sample" tab, Column	ESJ	EnergySmart Jobs
		ETA	ETAP
		OSH	Oakland Shines
<CONTACT>	See "Primary Sample" tab, Column		See "Primary Sample" tab, Column
<MEAS_#>	For ESJ, see "Primary Sample" tab, Columns	A	Beverage Cooler Controller(s)
	For ETA, see "Primary Sample" tab, Column	B	Refrigeration Controller(s)
	If <MEASURE_#> = B,C or E, ask W9		
	For OSH, see "Primary Sample" tab, Column	C	Motion Sensor(s) for LED Lights
		D	CFL(s) for Nonrefrigerated Space(s)
		E	LEDs for Reach-In Case(s)
		F	CFL(s) for Refrigerated Space(s)
<MEAS_LIST>	ESJ might have up to six <MEAS_#> per site. ETA and OSH usually have only <MEAS_1>.		=<MEAS_1>, <MEAS_2>, <MEAS_3>, <MEAS_4>, <MEAS_5> and <MEAS_6>
<INSTALL_DATE>	See "Primary Sample" tab, Column		
<SITE_NAME>	See "Primary Sample" tab, Column		

<MEAS_#_QTY>	See "Primary Sample" tab, Column		

Source: DNV KEMA

W1. Hello. May I please speak with <%CONTACT>?

1. Yes

2. No [If contact refuses, record reason for refusal here (please note language if respondent does not speak English):_____]

My name is _____ and I am calling from Discovery Research on behalf of the California Energy Commission to help evaluate the <PROGRAM_NAME>. We'd like your opinion about the energy efficiency measures that were installed with funding from the <PROGRAM> program. The interview and any information that you provide will remain strictly confidential. We will not identify or attribute any of your comments to you or your organization.

W1a. According to our records, <SITE_NAME> implemented a project involving <%MEAS_LIST>

[IF <INSTALL_DATE> =BLANK,] is that correct?

[IF <INSTALL_DATE><>BLANK] on approximately <%INSTALL_DATE>, is that correct?

[IF W1a="Yes", CONTINUE.]

IF W1a="No"ask W1b and W1c

W1b. Can you please tell me what equipment you had installed?

1- Record Equipment

98. Don't Know

99. Refused 01

W1c. Can you tell me approximately when was that equipment installed?

1. Record Month and Date _____

98. Don't Know

99. Refused

W2. I was told by <PROGRAM> program that you were the most knowledgeable and the most involved with the decision to implement the project. Is that correct?

01. Yes Skip to W4

02. No

W3. Who would be the person most knowledgeable about the decision to implement the energy efficiency project that I just described?

01- Record Name

02- No longer with company [terminate this punch]

98 – Don't Know [terminate this punch]

99 - Refused [terminate this punch]

W3a. May I speak with him/her?

1- Yes

2- No, Not available at this time [arrange callback and thank]

3- No, Never Available [thank and terminate]

W4. What is your title?

01- Record Role

98 – Don't Know

99 – Refused

W5. Were there others that were instrumental in the project decision making, particularly the go/no-go decision? If so, what are their names and contact information?

01- Record Number of people

02- None / No others involved

98 – Don't Know

99 – Refused

W5a1. What was the name of the first person?

W5a2. What is their phone number?

W5b1. What was the name of the second person?

W5b2. What is their phone number?

W5c1. What was the name of the third person?

W5c2. What is their phone number?

Repeat W7-W8 for each measure

W7. As I mentioned previously, our records indicate there was a project implemented at <SITE NAME> consisting of <MEAS_#>. [MENTION THE PROJECT DETAILS, INCLUDING MEASURE NAME(S) AND QUANTITIES, DATES IF KNOWN]. Was this equipment installed as just described?

[FOR MULTIPLE MEASURES ONLY: say this for all measures after the first one, "There was also equipment installed consisting of <MEAS_#>. [MENTION THE PROJECT DETAILS, INCLUDING MEASURE NAME AND QUANTITIES, DATES IF KNOWN] Was this equipment installed as just described?]

01. Yes

02. Yes, but the measure count is different _____(record here)

03. No _____ (record actual details)

77. Other (Record Verbatim)

98. Don't Know (Prompt for name and contact info for someone that would know) Skip to W9

99. Refused

W8. In deciding to do a project of this type, there are usually a number of reasons why it may be undertaken. In your own words, can you tell me why your organization decided to install this equipment?

PROBE: Were there any other reasons?

[FOR MULTIPLE MEASURES ONLY: say this for all measures after the first one, "In your own words can you tell me why your organization decided to install this equipment?

PROBE: Were there any other reasons?]

11. To participate in/receive funding from the program

01. To replace old or outdated equipment

02. As part of a planned remodeling, build-out, or expansion

03. To gain more control over how the equipment was use

04. The maintenance downtime and associated expenses for the old equipment were too high

05. Had process problems and were seeking a solution

06. To improve measure performance

07. To improve the product quality

08. To comply with codes set by regulatory agencies

09. To improve facility safety

10. To comply with government policies regarding regular/normal maintenance/replacement policy

12. To protect the environment

13. To reduce energy costs

14. To reduce energy use/power outages

15. To update to the latest technology

77. Other (RECORD VERBATIM)

98.Don't know

99. Refused

W9. Were you actively involved in applying for the incentive for <SITE NAME>?

1. Yes

2. No

IF NO on W9,

W9a. Can you refer me to someone who would know?

1. Yes, _____[RECORD CONTACT NAME AND NUMBER HERE. CONTINUE WITH INTERVIEW]

98. Don't Know [CONTINUE WITH INTERVIEW]

99. Refused [CONTINUE WITH INTERVIEW]

A1. How did the idea for this project originate?

1. Internally proposed

2. Outside vendor or consultant (Probe: If applicable, was this person provided by the:

a. Energy Upgrade California website

b. A Utility Program,

c. A local government program,

d. A non-profit organization,

e. A <PROGRAM> website

f. Local contractor,

g. Some other type of Program, or

h. Non-program affiliated?

3. Recommendations from the Audit or Survey (Probe: If applicable, was this from :

a. <PROGRAM> representative,

b. A Utility Program,

c. Other program, or

d. Non-program representative

4. Part of a larger modernization or remodeling effort

5. Part of an expansion

77. Other _____(RECORD VERBATIM)

A2. How did the <PROGRAM> program assist in making this project happen?

01. Funding was essential, (was needed to move project forward),

02. Funding was helpful, (project may have proceeded without it, but incentive helped somewhat)

03. Funding was non-essential, (did not influence implementation)

04. Trained contractors was essential, (was needed to move project forward)

05. Trained contactors was helpful, (project may have proceeded without it, but access to trained contractor helped somewhat)

06. Trained contractor was non-essential, (did not influence implementation)

77. Other _____ (RECORD VERBATIM)

98. Don't Know, Can't remember

A3. Using a scale from 1 to 5, where 1 is "Not at all influential" and 5 is "Very influential" How influential was the <PROGRAM> Program to the implementation of the project.

01. Not at all influential

02.

03.

04.

05. Very influential

A4. Without assistance from the <PROGRAM> Program, the project

01. Would have been implemented exactly the same at exactly the same time

02. Would have been implemented at the same time but with less efficient equipment

03. Would have been delayed until another funding source was located or the existing equipment failed

04. Would not have proceeded

77. Other _____(RECORD VERBATIM)

A5. Was the project "co-funded" with other federal funding, state funding, utility or third party energy efficiency program incentives?

01. Yes (continue to A6)

02. No (Skip to F1)

98. Don't know

[If DON'T KNOW]

A5a. If you don't know, who would be the person that would know?

_____ [RECORD CONTACT NAME AND NUMBER HERE. SKIP TO F1]

Repeat A6-A9 for each measure

A6. What other cofunding was obtained for the <MEAS_#> project in addition to the <PROGRAM> incentive?

01. Utility funding (continue to A7)

02. ARRA Federal program funding (continue to A7)

03. Other non-ARRA Federal program funding (continue to A7)

04. Other state funding (continue to A7)

05. None (skip to F1)

98. Don't know (If you don't who would be the person that would know?_____) (skip to F1)

A7. What were the roles for the Cofunding source (source #)?

01. Funding was essential (was needed to move project forward),

02. Funding was helpful, (project may have proceeded without it, but this cofunding source helped somewhat)

03. Funding was non-essential, (this cofunding source did not influence implementation)

77. Other _____ (RECORD VERBATIM)

98. Don't Know, Can't remember

A8. Using a scale from 1 to 5, where 1 is "Not at all influential" and 5 is "Very influential" how influential was the Cofunding program (source #) to the implementation of the <MEAS_#> project

01. Not at all influential

02.

03.

04.

05. Very influential

A9. Without participation in and influence of the cofunding program (source #) that co-funded the <MEAS_#> project, the project READ LIST

01. Would have implemented exactly the same at exactly the same time

02. Would have implemented at the same time but with less efficient equipment

03. Would have been delayed until another funding source was located or the pre-existing equipment failed.

04. Would not have proceeded.

77. Other _____(RECORD VERBATIM)

98. Don't Know, Can't Remember DO NOT READ

F1. Are there criteria that your city/county uses before you update your energy equipment?

01. RECORD VERBATIM

02. No

98. Don't know

99. Refused

F2. What, if any, financial calculation does your organization make before proceeding with a project like this one?

01. Payback

02. Return on Investment

03. None (Skip to F4)

77. Other _____ (RECORD VERBATIM)

98. Don't know

99. Refused

F3. Using a scale of 1 to 5, where 1 is very difficult and 5 is not difficult at all, how difficult or easy was it to meet the necessary <F2> in order to move forward with the project?

01. Very difficult

02.

03.

04.

05. Not difficult at all

98 Don't know

99 Refused

If F3 = 1 or 2, ask F3a

F3a. What made it difficult? RECORD VERBATIM

F4. How often does your organization consider the entire life-cycle cost of the equipment, including energy costs, maintenance cost, when purchasing equipment? READ LIST

01. Never,

02. Rarely,

03. Sometimes,

04. Most of the time, or

05. Always

98. [Don't know]

99. [Refused]

<ON-SITE QUESTIONS>

Repeat F5-F7 for each measure

F5. Next we would like to know about the age and condition of the equipment that was replaced by <MEAS_#>. Approximately when was the old equipment purchased?

01. Record Verbatim

98. [Don't know]

99. [Refused]

F6. On the average, how many years do you normally use such equipment?

01. Record Verbatim

98. [Don't know]

99. [Refused]

F7. Which of the following best describes the condition of the existing equipment when it was replaced?

01. Fully functional

02. Fully functional but with significant problems

03. Non-functional

98. [Don't know]

99. [Refused]

<END ON-SITE QUESTIONS>

[note to CATI house: Randomize order of C1 through C11 for each respondent]

Now we would like to ask you to rate your satisfaction regarding specific aspects of the program.

Using a scale of 1-5 where 1 is “very dissatisfied” and 5 is “very satisfied” how would you rate:

C1.Equipment installed as part of this project

C2.Surveyor audit services

C3.Contractor installation services

C4. Information regarding benefits of energy efficiency

C5. Technical assistance from <PROGRAM> and communication by <PROGRAM>

C6. Coordination role of <PROGRAM>

C7. Incentive amount received for the project

C8. Savings achieved compared to expected

C9. Control of energy costs as part of this program

C10. Incentive application process

C11. Reporting requirements

01. Very dissatisfied

02.

03.

04.

05. Very Satisfied

98. Not Applicable

C12. Do you have any comments or suggestions on how to improve the <PROGRAM> program?

Record answer verbatim

SP1. Did you implement any additional energy efficiency measures at your organization that were directly influenced through your participation in the <PROGRAM> program that did not receive incentives, grants or loans through any utility or government program?

01. Yes (skip to SP2)

02. No (Skip to M1)

98. Refused (Skip to M1)

99. Don't know (Skip to M1)

SP2. Would you please describe how you were influenced and the details of the measure (such as count, efficiency, and so forth)?

Record answer verbatim

SP3. Do you think that you would have installed these additional measures in the absence of the <PROGRAM>?

01. Yes

02. No

98. Refused

99. Don't know

M1. On a scale from 1 to 5 with a 1 meaning "not at all" and a 5 meaning "very much, How much did your participation in the <PROGRAM> program improve your knowledge of energy efficient technologies and/or processes that would benefit your organization?

01. Not at all likely

02.

03.

04.

05. Very likely

M1a. Why do you say that? (RECORD VERBATIM)

M2. Compared to before you participated in the <PROGRAM> program, would you say that your current awareness of energy-efficient equipment and practices is greater, or about the same?

01. Greater than before

02. About the same

M3. Has your participation in the program affected the way that you maintain or use your equipment?

01. Yes (specify)

02. No

M4. On a scale from 1 to 5, where 1 is not at all likely and 5 is very likely, how likely is it that your organization will invest in additional retrofits similar to those installed through <PROGRAM> program if a rebate or other incentive is available?

01. Not at all likely

02.

03.

04.

05. Very likely

If 1 or 2 please ask M4a

M4a. Why is that?

M5. [ASK IF M4 =3 OR GREATER]. Using the same scale, how likely are you to invest in additional retrofits similar to those installed through <PROGRAM> program if a rebate or other incentive is NOT available?

01. Not at all likely

02.

03.

04.

05. Very likely

If 1 or 2 please ask M5a

M5a. Why is that?

M6. On a scale of 1 to 5 how likely are you to install any other energy efficiency equipment (other than ones similar to those installed through the program) without incentives, in the next 2 years?

01. Not at all likely

02.

03.

04.

05. Very likely

If 1 or 2 please ask M6a

M6a. Why is that?

Thank and terminate

Final CATI Dispositions

Below is the final disposition of the CATI conducted with program participants by Discovery Research Group (DRG) for the three MCR subrecipient programs.

Table 101: CATI Dispositions across the MCR Subrecipient Programs

Reported CATI Disposition	ESJ PECI	ETAP Energy Solutions	OS QuEST
Targets	75	27	27
Completed Interviews	43	27	16
Completes in Stratum 1	4	13	4
Completes in Stratum 2	9	8	2
Completes in Stratum 3	10	3	4
Completes in Stratum 4	10	3	4
Completes in Stratum 5	10	N/A	2
Number of Dialings	2,787	286	458
Number of Contacts	1,765	78	221
Disconnected Numbers	45	0	6
Computer/Fax Tones	36	0	2
Contacted	76	2	11
Business/Government	2	0	1
Language Barrier: Other	6	0	2
Language Barrier: Hindi	3	0	2

Reported CATI Disposition	ESJ PECI	ETAP Energy Solutions	OS QuEST
Language Barrier: Mandarin	1	0	0
Language Barrier: Korean	13	0	1
Language Barrier: Spanish	9	0	0
Wrong Number for Name Listed	42	2	5
Non-Final Dispositions	2,377	249	411
No Answer	492	24	84
Busy Signal	8	4	3
Answering Machine	441	180	142
Privacy Managers	0	0	0
Respondent Unavailable	1,166	25	143
Call-back (Scheduled)/Suspend	270	16	39
Refusals	149	2	7
Initial Ref (soft)/Hung up during introduction	113	2	4
Hung up during interview	24	0	2
Hard Refusal/Remove name req.	12	0	1
Ineligible	36	3	4
No longer w/co & no referral	36	3	4
Eligible but Incomplete	25	3	1
Over quota	0	2	0
Mid-Interview Terminate	25	1	1
Average Length (minutes)	17.35	19.20	16.50
Dialing Yield	76%	90%	77%
Net Effective Incidence (MRA)	65%	85%	81%

Source: DNV KEMA Analysis

APPENDIX E:
Confidence Intervals for Participant CATI Results

Based on the hypothesis that is being tested by a given survey question, a one- or two-sided test is used. These tests are described as follows:

- A hypothesis test designed to identify a difference from a hypothesized value in only one direction is called a one-sided test. A simple example of a one-sided test would offer two possible answers such as "yes" and "no."
- A hypothesis test designed to identify a difference from a hypothesized value in either direction is called a two-sided test. Most of the survey questions for MCR offer a Likert scale of one to five as possible answers; these are two-sided tests.

Regardless of the type of test used to test a given hypothesis, the following steps can be followed to determine the confidence interval associated with a given participant survey response:

1. Locate the table pertaining to the subrecipient program of interest from the three tables provided in this appendix, Table 102 through Table 104.
2. Within the relevant table, locate the row showing the number of participants that provided a given response. For instance, if three ESJ participants out of the 43 surveyed provided a given response, that corresponds to 7 percent of the survey sample.
3. Depending upon whether the response to a given question tests a one-sided or two-sided hypothesis, two confidence intervals are provided. Using the same example as in step 2, the confidence interval is ± 6 percent for a two-sided hypothesis test and ± 5 percent for a one-sided hypothesis test.

Energy Smart Jobs

Table 102: ESJ Confidence Intervals for Participant CATI Results

Number of Responses, n	CATI Completed, n	Program Population, N	Confidence Interval
	43	7,108	90%
	Proportion of Total CATI Respondents, percent	Confidence Intervals for Response Category, percent	
		2-sided Responses	1-sided Responses
0	0%	0%	0%
1	2%	4%	3%
2	5%	5%	4%
3	7%	6%	5%
4	9%	7%	6%
5	12%	8%	6%
6	14%	9%	7%
7	16%	9%	7%
8	19%	10%	8%
9	21%	10%	8%
10	23%	11%	8%
11	26%	11%	9%
12	28%	11%	9%
13	30%	11%	9%
14	33%	12%	9%
15	35%	12%	9%
16	37%	12%	9%
17	40%	12%	10%
18	42%	12%	10%
19	44%	12%	10%
20	47%	12%	10%
21	49%	13%	10%
22	51%	13%	10%
23	53%	12%	10%
24	56%	12%	10%
25	58%	12%	10%
26	60%	12%	10%
27	63%	12%	9%
28	65%	12%	9%

Number of Responses, n	CATI Completed, n	Program Population, N	Confidence Interval
	43	7,108	90%
	Proportion of Total CATI Respondents, percent	Confidence Intervals for Response Category, percent	
		2-sided Responses	1-sided Responses
29	67%	12%	9%
30	70%	11%	9%
31	72%	11%	9%
32	74%	11%	9%
33	77%	11%	8%
34	79%	10%	8%
35	81%	10%	8%
36	84%	9%	7%
37	86%	9%	7%
38	88%	8%	6%
39	91%	7%	6%
40	93%	6%	5%
41	95%	5%	4%
42	98%	4%	3%
43	100%	0%	0%

Source: DNV KEMA Analysis

Energy Technology Assistance Program

Table 103: ETAP Confidence Intervals for Participant CATI Results

Number of Responses, n	CATI Completed, n	Program Population, N	Confidence Interval
	27	114	90%
	Proportion of Total CATI Respondents, percent	Confidence Intervals for Response Category, percent	
		2-sided Responses	1-sided Responses
0	0%	0%	0%
1	4%	5%	4%
2	7%	7%	6%
3	11%	9%	7%
4	15%	10%	8%

Number of Responses, n	CATI Completed, n	Program Population, N	Confidence Interval
	27	114	90%
	Proportion of Total CATI Respondents, percent	Confidence Intervals for Response Category, percent	
		2-sided Responses	1-sided Responses
5	19%	11%	8%
6	22%	12%	9%
7	26%	12%	9%
8	30%	13%	10%
9	33%	13%	10%
10	37%	13%	10%
11	41%	14%	11%
12	44%	14%	11%
13	48%	14%	11%
14	52%	14%	11%
15	56%	14%	11%
16	59%	14%	11%
17	63%	13%	10%
18	67%	13%	10%
19	70%	13%	10%
20	74%	12%	9%
21	78%	12%	9%
22	81%	11%	8%
23	85%	10%	8%
24	89%	9%	7%
25	93%	7%	6%
26	96%	5%	4%
27	100%	0%	0%

Source: DNV KEMA Analysis

Oakland Shines

Table 104: OS Confidence Intervals for Participant CATI Results

Number of Responses, n	CATI Completed, n	Program Population, N	Confidence Interval
	16	**195**	**90%**
	Proportion of Total CATI Respondents, percent	**Confidence Intervals for Response Category, percent**	
		2-sided Responses	**1-sided Responses**
0	0%	0%	0%
1	6%	10%	7%
2	13%	13%	10%
3	19%	16%	12%
4	25%	17%	13%
5	31%	18%	14%
6	38%	19%	15%
7	44%	20%	15%
8	50%	20%	15%
9	56%	20%	15%
10	63%	19%	15%
11	69%	18%	14%
12	75%	17%	13%
13	81%	16%	12%
14	88%	13%	10%
15	94%	10%	7%
16	100%	0%	0%

Source: DNV KEMA Analysis

APPENDIX F:
Market Actor Interview Guides

Energy Smart Jobs

Interview Guide for Contractors

Call Log

Interviewer		Survey Length (min.)	
Completion Date			

Respondent Information

Contact Name	
Company Name	
Type of Contractor	
Phone	
E-mail	

Call Tracking

Date/Time	Notes/result/actions: (Who spoke to, new contact info, when to call back, and so forth)

Survey Summary

Topics to be addressed for Contractors – What do we hope to get from conducting this survey/ what questions can we answer? (For Internal Purposes only)

Contractor Information

- What are the characteristics of the contractors interviewed?

Skills and Knowledge

- Did an adequate number of employees and appropriate personnel attend the training?
- After training were the contractors able to understand and communicate the benefits of energy efficiency, energy efficiency upgrades, the Program, and partnering utility program?
- Have the skills and knowledge of the contractors regarding energy efficiency measures increased?
- Have the skills and knowledge been transferred within contractor firms (from technician to technician and/or sales staff)?

Job Creation

- Did the contractors hire any of the surveyors trained by the program?
- Have the installation contractors been able to network with Manufacturers?

Reduced Equipment Cost

- Has the retail price of the measures changed?
- How much of an influence did the incentives have on the ultimate purchase decision?
- Would the job/equipment have been sold without the incentive?

Increased Demand for Energy Efficiency Measures

- What are the barriers to purchasing the technologies supporting the measures?
- Did the program address the barriers?
- In the absence of the program, will those barriers continue to be reduced?
- What is the market share for the measures promoted through the program?
- Is the market share sustainable or likely to continue to increase in the absence of the program?
- Is there evidence that nonparticipating customers are installing the measures?
- Are contractors recommending the measures to customers?

Increased Business

- Have contractors noticed a significant uptake in their business? Has revenue increased?
- Is the contractor's business more profitable as a result of the program?
- Has the contractor increased the number of FTE's as a result of the program?
- Are these changes sustainable in the absence of the program?

Introductions and Finding Respondent

Hi, my name is ___ and I am calling from Global Energy Partners on behalf of the California Energy Commission. Global is an independent contractor hired to evaluate the Energy Commission's Energy Smart Jobs Program. I'm calling to ask you a few questions about your participation as a contractor in that program. Are you familiar with your company's

participation in the Energy Smart Jobs Program? If not, who would be the best person to speak with at your company about this subject?

All of your answers will be confidential. For our analysis, your responses will be anonymously aggregated with those from other companies that participated in the program.

- [IF THEY DON'T WANT TO TALK NOW, TRY TO GET A GOOD TIME TO CALL THEM BACK.]
- [IF RESPONDENT PROPOSES AN ALTERNATE CONTACT, OBTAIN NAME, BEST NUMBER AT WHICH TO REACH THE CONTACT, AND ANY INFO REGARDING BEST TIME TO CALL]
- [IF THEY HAVE QUESTIONS ABOUT OUR LEGITIMACY, THEY CAN CONTACT:]

Name	Monica Rudman
Energy Commission	phone # 916-654-4462
Energy Commission e-mail	mrudman@energy.state.ca.us

- [IF THEY ASK ABOUT TIME LENGTH OF SURVEY, SAY BETWEEN 15 AND 30__ MINUTES]
- [IF THEY AGREE TO TALK SAY: THANKS FOR TAKING THE TIME TO SPEAK WITH US. LET'S GET STARTED.]

About the Contractor

Let me start by getting a little information about you and your company.

1. What is your job title or role?
2. When did you attend the Energy Smart Jobs contractor training?
3. What percentage of your annual contracted work has been a direct result of contact through the Energy Smart Jobs program?

[IF NEEDED, please estimate to nearest whole number. Do not use ranges. Please use "999" for "don't know"]

   a. In 2011? _____% 999. DK

4. How did you become involved in the Energy Smart Jobs program?
5. Why did you or your company decide to participate in the program?

Skills and Knowledge

6. How many employees at your company have been trained by the Energy Smart Jobs program?

7. Are there enough trained employees in your company to get all the work generated by the program completed?
8. After the training were you able to understand and communicate the benefits of energy efficiency, energy efficiency upgrades, the program, and the partnering utility programs? If no, what additional knowledge/training is needed? Describe responses to each topic.
9. Do you feel the customers you worked with understand the benefits of the technology/equipment you installed? If not, what was not clear?
10. Did they adequately understand the program eligibility requirements, enrollment process, and the incentive structure? If not, what was not clear? Describe responses to each topic.
11. Do you feel you know more about energy efficiency technologies and their benefits than you did prior to participating in the program? If so, does this include technology in addition to that which received rebates from ESJ? Probe for reasons
12. Did you share your knowledge about energy efficiency with other employees in your firm who have not attended the ESJ training? If so, how did you do this?

Job Creation

13. How many new employees has your company hired in 2011 as a result of the ESJ program? Compare to PECI tracking information as part of the analysis.

[FOR CLARIFICATION, Hiring can be due to anticipation of future business from ESJ or to accommodate an increase in current business due to ESJ. Please specify full time or part time and how long those employees worked or are expected to work at your company.]

[EXAMPLE ANSWER: "3 people were hired for 6 months, 8 people are expected to stay on for 3+ years, one person is expected to be part time for a year"]

Type of Employee	Length of Employment (Duration)	Number of Full Time Employees	Number of Part Time Employees
	3 months		
	6 months		
	1 year		
	2-3 years		
	3+ years		
	Other: _____		

14. Were any of the employees you hired originally surveyors trained by the ESJ program? If no, why not? If yes, how many and what proportion of new hires are from the ESJ program?

15. [ASK IF ADDED EMPLOYEES AS A RESULT OF THE PROGRAM] Do you expect to continue to grow and hire more employees? When the program ends do you think the number of employees at your firm will continue to increase, stay the same or decrease?

16. Do you plan to hire any [additional] ESJ trained surveyors in 2012? If no, why not?

17. Do you think the surveyors have marketable skills due to their experience with the program?

18. Have you had a chance to network with manufacturers as a result of the ESJ program? If you already had relationships with these manufacturers were you able to expand or improve those relationships? If so, how has this benefitted you or your business? Which manufacturers?

Reduced Equipment Cost/Availability of Equipment

19. Has the price of refrigeration controls or LED refrigerator case lighting changed since the ESJ program began? Has the availability, quality, or other aspect of these technologies changed or improved since the ESJ program began?

20. What other factors external to the Program could have affected the price of these technologies?

21. Are the measures readily available? Do you stock the measures, or do you order them for each sale? How long do you have to wait for the equipment once you order it?

22. Do you expect the price to change in 2012? Do you think the price will go down in the future? Probe for reasons.

23. How much of a difference do you think the incentives made in the customers' decision to have the measures installed? Probe for reasons.

24. Do you think you could have sold the measures to customers anyway – even if there was no program or incentive? Why or why not?

Increased Demand for EE Measures

25. What are the barriers to selling refrigeration controls and LED refrigerator case lighting? Note: Barriers might be different for each.

26. Does the ESJ program help reduce those barriers? What else could it do?

27. Do you think the market now has enough interest in lighting and refrigeration controls to keep reducing the barriers to implementation?

28. What proportion of existing commercial refrigeration-sites have these types of efficient measures - beverage cooler controls, refrigeration controls and LED refrigerator case lighting?
29. Is the market share of these measures sustainable or likely to continue to increase in the absence of the program?
30. Have customers not involved in the ESJ program requested or purchased the measures?
31. Do you recommend these measures to customers not involved in the program?
32. Has the design of the measures changed at all since the program began? Are there any design changes that you would recommend?

Increased Business for Contractors

33. Have you noticed an increase in your business as a result of the ESJ program? Have your revenues increased?
34. Is your business more profitable as a result of the program?
35. Do you expect these changes to continue? When the program ends do you think your business, revenues and profit will continue to grow, stay the same or decrease? Probe for reasons.

Conclusion of Interview

36. Are there any changes or enhancements that you would make to the Energy Smart Jobs program?
37. Is there anything else you would like to discuss that we haven't covered today?

Thank you for taking the time to participate in the survey.

Interview Guide for Manufacturers

Call Log

Interviewer		Survey Length (min.)	
Completion Date			

Respondent Information

Contact Name	
Company Name	
Type of Manufacturer	
Phone	
E-mail	

Call Tracking

Date/Time	Notes/result/actions: (Who spoke to, new contact info, when to call back, and so forth)

Survey Summary

Topics to be addressed for Manufacturers – What do we hope to get from conducting this survey/ what questions can we answer? (For Internal Purposes only)

Manufacturer Information

- What are the characteristics of the manufacturers interviewed?

Job Creation

- Have the installation contractors been able to network with Manufacturers?

Reduced Equipment Cost

- Has the retail price of the measures changed?

- Have other aspects of the measures changed (for example, availability, features, ease of installation)

Increased Demand for EE Measures

- What are the barriers to purchasing the measures?
- Did the program address the barriers?
- In the absence of the program, will those barriers continue to be reduced?
- What is the market share for the measures promoted through the program?
- Is the market share sustainable or likely to continue to increase in the absence of the program?
- Is there evidence that nonparticipating customers are installing the measures?

Introductions and Finding Respondent

Hi, my name is ___ and I am calling from Global Energy Partners on behalf of the California Energy Commission. Global is an independent contractor hired to evaluate the Energy Commission's Energy Smart Jobs Program, also called ESJ. I'm calling to ask you a few questions about your participation as a manufacturer in that program. Are you familiar with your company's participation in the Energy Smart Jobs Program? If not, who would be the best person to speak with at your company about this subject?

All of your answers will be confidential. For our analysis your responses will be anonymously aggregated with those from other companies that participated in the program.

- [IF THEY DON'T WANT TO TALK NOW, TRY TO GET A GOOD TIME TO CALL THEM BACK.]
- [IF RESPONDENT PROPOSES AN ALTERNATE CONTACT, OBTAIN NAME, BEST NUMBER AT WHICH TO REACH THE CONTACT, AND ANY INFO REGARDING BEST TIME TO CALL]
- [IF THEY HAVE QUESTIONS ABOUT OUR LEGITIMACY, THEY CAN CONTACT:]

Name	Monica Rudman
Energy Commission phone #	916-654-4462
Energy Commission e-mail	mrudman@energy.state.ca.us

- [IF THEY ASK ABOUT TIME LENGTH OF SURVEY, SAY BETWEEN 15 AND 30 MINUTES]
- [IF THEY AGREE TO TALK SAY: THANKS FOR TAKING THE TIME TO SPEAK WITH US. LET'S GET STARTED.]

About the Manufacturer

Let me start by getting a little information about you and your company.

1. What is your job title or role?
2. What percentage of your annual sales has been a direct result of services provided and equipment installed through the Energy Smart Jobs program?

[IF NEEDED, please estimate to nearest whole number. Do not use ranges. Please use "999" for "don't know"]

   a. In 2011? _____% 999 DK

3. How did you become involved in the Energy Smart Jobs program?
4. Why did you or your company decide to participate in the program?

Job Creation

5. Have you had more contact with contractors as a result of the ESJ program? If so, how has this benefitted you or your business? Which contractors?
6. Have you added more jobs as a result of the program? If so, how many? Do you expect these jobs to continue when the program ends?

Reduced Equipment Cost

7. Has the price of [APPLICABLE PRODUCT (refrigeration controls or LED refrigerator case lighting)] changed since the ESJ program began?
8. How much has the ESJ program influenced the price (change in price)?
9. What other factors external to the Program could have affected the price of [APPLICABLE PRODUCT (refrigeration controls or LED refrigerator case lighting)]?
10. Do you expect the price of [APPLICABLE PRODUCT (refrigeration controls or LED refrigerator case lighting)] to change in 2012? Do you think the price will go up or down in the future? Probe for reasons.
11. Are the [APPLICABLE PRODUCT (refrigeration controls or LED refrigerator case lighting)] readily available?
12. Have there been any outside/uncontrollable factors that have affected the availability of the measures (for example, natural disaster such as Tsunami in Japan, worker strike, transportation/shipping issues, and so forth)?

13. Are you able to keep up with the demand for the product? Did you make any changes to increase production since the program began? Are those changes likely to continue after the program ends?

Increased Demand for EE Measures

14. What are the barriers to selling [APPLICABLE PRODUCT (refrigeration controls and LED refrigerator case lighting)]? Note: Barriers might be different for each.

15. Does the ESJ program help reduce those barriers? What else could it do?

16. Do you think the market now has enough interest in [APPLICABLE PRODUCT (refrigeration controls and LED refrigerator case lighting)] to keep reducing the barriers to implementation?

17. What proportion of existing commercial refrigeration-sites has [APPLICABLE PRODUCT (refrigeration controls and LED refrigerator case lighting)]?

18. Is the market share of these products sustainable or likely to continue to increase in the absence of the program?

19. Do you now promote these [APPLICABLE PRODUCT (refrigeration controls and LED refrigerator case lighting)] more than you did prior to the ESJ program? Do you plan to keep promoting these products in the future – even after the program ends?

20. How much of your sales are attributable to customers involved in the ESJ program? Are you selling this equipment outside of the program, that is, to customers who have not participated in the program?

21. Do you have any plans to expand your line of [APPLICABLE PRODUCT (refrigeration controls and LED refrigerator case lighting)] to include more efficient products? Do you plan to shift your product mix and manufacture a greater share of highly energy efficient equipment and less standard efficiency equipment?

22. How did your experience in the ESJ program affect these decisions?

23. Has the design of the [APPLICABLE PRODUCT (refrigeration controls and LED refrigerator case lighting)] changed since the program began? Do you have any plans to change or improve the design?

24. Have you seen an increase in the competition in the marketplace with respect to [APPLICABLE PRODUCT (refrigeration controls and LED refrigerator case lighting)]?

Conclusion of Interview

25. Are there any changes or enhancements that you would make to the Energy Smart Jobs program?

26. Is there anything else you would like to discuss that we haven't covered today?

Thank you for taking the time to participate in the survey.

Interview Guide for Surveyors

Call Log

Interviewer		Survey Length (min.)	
Completion Date			

Respondent Information

Contact Name	
Phone	
E-mail	

Call Tracking

Date/Time	Notes/result/actions: (Who spoke to, new contact info, when to call back, and so forth)

Survey Summary

Topics to be addressed for Surveyors – What do we hope to get from conducting this survey/ what questions can we answer? (For Internal Purposes only)

Surveyor Information

- What are the characteristics of the surveyors interviewed?
    1. Education
    2. Reasons for joining the program
    3. Job history

Skills and Knowledge

- Do the surveyors understand the benefits of EE measures?
- After training were the surveyors able to communicate the benefits of energy efficiency, energy efficiency upgrades, the Program, and partnering utility program?
- Did their skills and knowledge increase/improve as they worked on the program?

Job Creation

- Did the surveyors obtain marketable skills?
- Did the contractors or other companies hire any of the surveyors trained by the program?

Increased Demand for EE Measures

- What barriers to purchasing and installing efficient equipment did the surveyors encounter in the field as they conducted surveys?

Introductions and Finding Respondent

Hi, my name is ___ and I am calling from Global Energy Partners on behalf of the California Energy Commission. Global is an independent contractor hired to evaluate the Energy Commission's Energy Smart Jobs Program. I'm calling to ask you a few questions about your participation as a surveyor in that program. Is this a good time for us to talk?

All of your answers will be confidential. For our analysis your responses will be anonymously aggregated with those from other surveyors that participated in the program.

- [IF THEY DON'T WANT TO TALK NOW, TRY TO GET A GOOD TIME TO CALL THEM BACK.]
- [IF THEY HAVE QUESTIONS ABOUT OUR LEGITIMACY, THEY CAN CONTACT:]

Name	Monica Rudman
Energy Commission phone #	916-654-4462
Energy Commission e-mail	mrudman@energy.state.ca.us

- [IF THEY ASK ABOUT TIME LENGTH OF SURVEY, SAY BETWEEN 10 AND 20 MINUTES]
- [IF THEY AGREE TO TALK SAY: THANKS FOR TAKING THE TIME TO SPEAK WITH US. LET'S GET STARTED.]

About the Surveyor

Let me start by getting a little information about you.

1. What is your current job title or role?
2. What is your current level of education?
3. When did you attend the Energy Smart Jobs surveyor training?
4. How did you become involved in the Energy Smart Jobs program?
5. Why did you decide to participate in the program?

Skills and Knowledge

6. In your own words, what is your understanding of the benefits of energy efficiency technologies?
7. After the training were you able to communicate the benefits of energy efficiency, energy efficiency upgrades, the program, and the partnering utility programs? If no, what additional knowledge/training is needed?
8. Do you feel the customers you worked with understand the benefits of the measures you recommended and installed? Probe for reasons.
9. Did the customers adequately understand the program eligibility requirements, enrollment process, and the incentive structure? Probe for reasons.
10. Do you feel you know more about energy efficiency measures and their benefits now, than you did prior to participating in the program? Probe for reasons.

Job Creation

11. Were you employed prior to the ESJ program? What type of job did you have prior to the program?
12. Have you been hired by a contracting firm or other company as a result of the training and experience you received in the ESJ program? Probe for reasons.
13. Do you know of any other surveyors who got hired or received job offers from contracting firms or other companies as a result of the training and experience they received in the ESJ program?
14. Do you think you now have marketable skills due to your experience with the program?
15. Are you optimistic about your ability to continue to work in this field? Probe for reasons.

Increased Demand for EE Measures

16. What are the barriers to customers installing beverage cooler controls and CFLs at these sites on their own? Note: Barriers might be different for each. May need to probe with specific barriers.
17. Does the ESJ program help reduce those barriers? What else could it do?

Conclusion of Interview

18. Are there any changes or enhancements that you would make to the Energy Smart Jobs program?

19. Is there anything else you would like to discuss that we haven't covered today?

Thank you for taking the time to participate in the survey.

Energy Technology Assistance Program

Interview Guide

Interview Date/Time:

Name of Interviewer:

Name of Program Manager:

Name of Organization:

Interview Length:

Notes:

Interview Research Objectives

Program Delivery

Awareness and knowledge of the program

Market effects / Transformation

Introduction

May I please speak with < name>?

Hello, my name is _____ and I'm calling from DNV KEMA, Inc. on behalf of the California Energy Commission. We are contacting program managers as part of an assessment of the Energy Technology Assistance Program (ETAP). Your feedback would be very helpful. Is this a good time to speak to you about the program?

[IF ASKED] Your responses will be confidential and will be aggregated. We will not attribute anything you say directly to you or your firm.

Background

I would like to start by getting a little background information about you and your role in the Energy Technology Assistance Program (ETAP).

B1. How many full time employees work for your company?

B2. How many employees worked on the ETAP projects?

B3. What kind of products or services does your company offer?

B4. Please describe your role? (probe for job title, length of employment and responsibilities)

B4a. What was your main role and responsibility for ETAP?

1. Provide technical services (Technical service team)
2. Provide program management (Program Management team)
3. Provide support to agencies (Agency team)
4. Provide marketing support to the program (Marketing team)
5. Provide workforce training (Workforce Development team)
6. Other_____

B4b. How long were you involved in the Program (months)?

Program Delivery

D1. How did you get involved in the program?

D2. When did you first hear about the program?

D3. Did ETAP provide you with any training?

D3a. [If yes,] What did the training consist of?

D4. Did you contact targeted agencies, building owners or others in the community about ETAP (directly or indirectly)?

D4a. If yes, which agencies did you contact?

D4b. If yes, how often did you make contact these agencies?

Marketing Strategy and Tactics

Next, I want to talk to you about how the Program marketing strategy.

S1. How did you market the program locally?

S2. What methods did you use to market the program?

S3. What were are some of the key messages that you marketed about the program?

S4. Which part of the marketing and outreach effort was the most effective at attracting local governments and special districts?

S5. Which part of the marketing and outreach effort was the most effective at attracting contractors?

S6. On a scale of 1 to 5, where 5 is "Very Effective" and 1 is "Not at all Effective," how effective do you think the overall marketing approach was in encouraging the energy efficient technologies?

1. Not at all effective

2. ……

3. ……

4. ……

5. Very effective

88. Don't Know [continue to "Marketing Effects/Transformation"]

S6a. Why do you say that?

Market Effects / Transformation

Now I want to ask you a few questions about the Program's influence on targeted businesses and other agencies.

M1. What effect, if any, has the Program had on local agencies' awareness of three different measure areas targeted by the program? [Ask for each]

1. Parking lot and parking garage bilevel lighting fixtures?

2. Wireless lighting controls?

3. Wireless HVAC controls?

M1a. Why do you say that? [probe about local agencies and contractors]

M2 What effect, if any, has the Program had on local agencies' knowledge of energy efficient technologies?

1. Parking lot and parking garage bilevel lighting fixtures?

2. Wireless lighting controls?

3. Wireless HVAC controls?

M2a Why do you say that? [probe about local agencies and contractors]

M3 What effect, if any, has the program had on interest in energy efficient upgrades?

M3a Why do you say that? [probe about local agencies and contractors]

M4. What effect, if any, has the program had on the behavior or capabilities of energy-efficiency contractors and consultants?

M4a. Can you provide any examples of these kinds of results?

M5. In what ways has your experience in the Program influenced your involvement in energy efficiency d? [Probe: Anything related to job placement or training programs? Anything else?]

M6. What workforce development has ETAP supported? [probe for full time or part time and how long those employees worked or are expected to work.]

M7. Do you expect your involvement in promoting energy efficiency to continue beyond the program?

M7a. Why is that? (Probe: Were they already doing it? Now a part of a coalition?)

M8. In your opinion, has energy efficient technology upgrades increased on following measures promoted by the Program:

1. Parking lot and parking garage bilevel lighting fixtures?
2. Wireless lighting controls?
3. Wireless HVAC controls?

M8a. Why or why not?

Overall Program Impact

My final questions I have for you are regarding your overall feedback towards the Program.

O1. From your perspective, what aspects of the Program did you find to work well or were helpful to local businesses?

O2. What aspects of the Program would you change or improve upon if you could?

O2a. [If not already answered] What do you see as the key challenges for this Program?

O3. On a scale of 1 to 5, where 5 is "Very effective" and 1 is "Not at all effective," how effective do you think the Program was as a whole?

1. Not at all effective
2. ……
3. ……
4. ……
5. Very effective

88. Don't Know [continue to O4]

O3a. Why do you say that?

O4. To conclude, do you have any final comments about the OS Program that you would like to share with me?

O5. Are there any recommendations or anything else we haven't covered that you think I should know about the Program?

This concludes the questions that I have for you. We thank you for your very valuable input.

Oakland Shines

Interview Guide

Interview Date/Time:

Name of Interviewer:

Name of Contractor:

Name of company:

Interview Length:

Notes:

Interview Research Objectives

Increase Awareness and Knowledge

Marketing and Customer Acquisition

Market effects / transformation

Introduction:

May I please speak with < name>?

Hello, my name is _____ and I'm calling from DNV KEMA, Inc. on behalf of the California Energy Commission. We are contacting contractors in the Oakland area as part of an assessment of the Oakland Shines (OS) Program. Your feedback would be very helpful. Is this a good time to speak to you about the program?

[IF ASKED] Your responses will be confidential and if possible will be aggregated with other contractor surveys. We will not attribute anything you say directly to you or your company.

Background information

I would like to start by getting a little background information about you and your role in the Oakland Shines program.

B1. How many full time employees work for your company?

B2. What is the average number of jobs your company completes in a year?

B3. How many jobs have you completed with the OS program?

B4. How many employees worked on OS projects?

B5. What kind of products or services does your company offer?

B6. Please describe your role? (probe for job title, length of employment and responsibilities)

B6a. What was your main role and responsibility for the Oakland Shines program?

Program Delivery

D1. How did you get involved in the Oakland Shines program?

D2. When did you first hear about the program?

D3. Were there any other contracting companies involved in the Oakland Shines program? (if so who?)

D4. Did Oakland Shines provide you with any training?

D4a. [If yes,] What did the training consist of?

D5. Do you perform any energy audits on behalf of the program?

D5a. If yes, how did you get leads?

D6. For projects where you do not perform a survey, how are projects assigned?

Marketing Strategy and Tactics

Next, I want to talk to you about how the Program has been marketed.

S1. How did you market the program locally?

S2. What methods did you use to market the program?

S3. What were are some of the key messages that you marketed about the program?

S4. What other marketing are you aware of? (if yes, please describe)

PG&E marketing?

Program Partners marketing?

Special events?

Other contractors marketing?

OS brand?

Anything else?

S5. Which part of the marketing and outreach effort was the most effective at attracting building owners?

S6. On a scale of 1 to 5, where 5 is "Very Effective" and 1 is "Not at all Effective," how effective do you think the overall marketing approach was in encouraging the energy efficient technologies?

1. Not at all effective
2. ……
3. ……
4. ……
5. Very effective

88. Don't Know [continue to "Marketing Effects/Transformation"]

S6a. Why do you say that?

Market Effects / Transformation

Now I want to ask you a few questions about the Program's influence on targeted businesses and other agencies.

M1. What effect, if any, has the Oakland Shines program had on awareness of energy efficient technologies?

M1a. Why do you say that? [probe about contractors and customers]

M2. What effect, if any, has the Oakland Shines program had on interest in energy efficient upgrades?

M3a. Why do you say that? [probe about contractors and customers]

M3. What effect, if any, has the Oakland Shines program had on the behavior or capabilities of energy-efficiency contractors and consultants?

M5b. Can you provide any examples of these kinds of results?

M4. In what ways has your experience in the Program influenced your involvement in energy efficiency in Oakland? [Probe: Anything related to job placement or training programs? Anything else?]

M5. How often do customers have you install equipment in addition to the program equipment- even if it's not energy efficient equipment?

M6. Were any positions retained as a result of the additional work from project?

M6a. [If yes] How many new employees has your company hired in 2011 as a result of the work generated?

M6b. [If yes] Did you hire any graduates from energy efficiency training programs?

[FOR CLARIFICATION, Hiring can be due to anticipation of future business from <SITE> or to accommodate an increase in current business due to <SITE>. Please specify full time or part time and how long those employees worked or are expected to work at your company.]

[EXAMPLE ANSWER: "3 people were hired for 6 months, 8 people are expected to stay on for 3+ years, one person is expected to be part time for a year"]

Type of Employee (Full/Part)	Length of Employment (Duration)	Graduate of EE Training	Number of Employees

M7. After OS projects end, do you think the number of employees at your firm will increase, stay the same or decrease?

M7a. Why?

M8. Have you noticed any changes in equipment you sell since you started with the program?

M8a. If yes, what were they? (probe for price, efficiency level)

M8b. If yes, do you expect to continue promoting energy efficiency to continue beyond the OS program has ended?

M9. What percentage of your sales or installations are high efficiency products now?

M9a has that changed since Oakland Shines?

T6. Did you have any new business relationships with any of the following entities through the program?

1. PG&E _____
2. City of Oakland _____
3. Chamber of Commerce _____
4. BOMA _____
5. CEDA _____
6. Downtown Oakland Business District _____

7. None [SKIP TO "T6"]

T6b. For each of the following entities that you worked with during the program, do you have plans for ongoing or future work after the program? If so what?

1. PG&E _____
2. City of Oakland _____
3. Chamber of Commerce _____
4. BOMA_____
5. CEDA _____
6. Downtown Oakland Business District _____

Overall Program Impact

My final questions I have for you are regarding your overall feedback towards the Program.

O1. From your perspective, what aspects of the Program did you find to work well or were helpful?

O2. What aspects of the Program would you change or improve upon if you could?

O2a. [If not already answered] What do you see as the key challenges for this Program?

O3. On a scale of 1 to 5, where 5 is "Very effective" and 1 is "Not at all effective," how effective do you think the Program was as a whole?

1. Not at all effective
2. ……
3. ……
4. ……
5. Very effective

88. Don't Know [continue to O4]

O3a. Why do you say that?

O5. Are there any recommendations or anything else we haven't covered that you think I should know about the Program?

This concludes the questions that I have for you. We thank you for your very valuable input.