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IMPACT AND PROCESS EVALUATION FINAL REPORT

for

QUEST'S 2004-5 CALIFORNIA PROCESS OPTIMIZATION PROCESS PROGRAM

(SDG&E Program #1165-04; PG&E Program #1159-04)

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EXECUTIVE SUMMARY

Background

The main goal of the 2004-5 California Process Optimization Program (CalPOP Program) was to provide cost-effective, long-lasting energy and demand savings through implementation of energy efficiency measures installed at small wastewater treatment facilities in the Pacific Gas and Electric (PG&E) and San Diego Gas and Electric (SDG&E) service areas. For each participating facility, the Program Implementer, Quantum Consulting, Inc. (now QuEST), prepared an analysis of key energy efficiency opportunities, estimated the energy, demand & cost savings from their implementation, the cost for their implementation and the amount of financial or direct assistance QuEST could provide towards implementation of each measure. QuEST understood that the plants' primary goal is to maintain compliance with its discharge permit. Operations as well as capital improvements were recommended under the program.

The evaluation, measurement, and verification effort described in this report was designed to accomplish multiple objectives, including assessing energy savings achieved, measuring program cost-effectiveness, providing feedback on program implementation, and assessing overall performance and continuing need for the program.

Methodology

Implementer was successful in facilitating the implementation of at least one energy efficiency measure at eight facilities. This evaluation relied on a variety of information and data sources to assess the net energy savings and effectiveness of each implemented measure. The methods used to obtain information and data included conducting an on-site pre- and post-implementation investigation of all EEMs at all eight facilities, conducting short-term metering at four of the facilities (consistent with the approved EM&V plan), conducting interviews with key plant operations staff at all eight facilities, analyzing information obtain from the plants provided in response to specific data requests, and conducting telephone surveys with key personnel who had responsibility for decision-making about whether to implement one or more EEMs. In addition, data, analysis and other information developed by Implementer were reviewed in detail for all eight facilities. The impact portion of this EM&V report was conducted consistent with the requirements of IPMVP Option B: Retrofit Isolation. The process evaluation was based, primarily, on the results from the in-depth interview protocol conducted with key staff at all eight facilities that participated in the Program and one interview with key staff at a facility that ultimately did not implement an EEM. Other industry experts were interviewed to assist in the development of the protocol and to assess the results of the staff interviews.

For each Program participant, Evaluator collected data and performed the requisite analysis to estimate gross energy savings and their effective useful life. In addition, the Evaluator also assessed early replacement issues and the level of free-ridership among participants in order to calculate net energy savings, net realization rates, Net-to-Gross Ratios and to assess the cost-effectiveness of the Program.

Goals and Results

The stated goals of the Program were to enroll 10 participants, obtain net first year savings of 4.0 million kWh and obtain 400 kW of first year average peak reduction. Approximately 70% of the savings were to be from the PG&E service territory and 30% from the SDG&E service territory. In the end, the program claimed 8 participants, whose first year evaluated net savings were 2.35 million kWh and evaluated first year average peak reduction was 282 million kW, corresponding to achieving 59% and 71% of the net goals for the first year energy and demand savings, respectively.

Overall, the Program had first year gross and net realization rates of 88% and 68%, respectively for energy savings. The Program had first year average peak demand reduction gross and net realization rates of 98% and 71%, respectively. There were 7 program participants from the PG&E service territory, but there was only 1 program participant from the SDG&E territory. The vast majority of the savings were achieved in the PG&E service territory.

The table below compares the cost-benefit ratios and net benefits originally proposed by the Program with the final evaluated results. These indicate that the CalPOP Program was cost-effective in the PG&E service area, but not in the SDG&E area. Overall, the Program was cost-effective.

	TRC Parameter	Projected (from PIP)	Evaluated
PG&E			
	Costs	$966,626	$899,058
	Benefits	$2,353,638	$1,938,387
	Net Benefits*	$1,387,012	$1,039,329
	TRC Ratio*	2.43	2.16
SDG&E			
	Costs	$424,917	$227,496
	Benefits	$1,008,051	$33,705
	Net Benefits*	$583,134	($193,791)
	TRC Ratio*	2.37	0.13
Overall Program			
	Costs	$1,391,543	$1,126,554
	Benefits	$3,361,689	$1,972,091
	Net Benefits*	$1,970,146	$845,537
	TRC Ratio*	2.42	1.75

* Note: in some cases, PIP values are inconsistent, so we assumed Costs and Benefits were correct and recalculated Net Benefits and Ratio.

The process portion of the evaluation examined administrative effectiveness, program delivery, and customer satisfaction in addition to free-ridership and effective useful life. Overall, the process evaluation identified many positive aspects about the Program. In general, participants expressed high levels of satisfaction with all areas of the program. They reported that Program representatives, with a few exceptions, were courteous and professional. The best aspect of the Program for participants was the free engineering analysis, while the worst was the length of time it took to complete the engineering analysis. The main reason respondents gave for not participating in the Program was lack of funds.

Conclusions

Overall, the CalPOP Program was 72% as cost-effective as was originally proposed. In the PG&E service area the Program was about 89% as cost-effective as was originally proposed. However, in the SDG&E service area, the program was not cost-effective, primarily owing to the fact that only one facility completed implementation in that service territory and the net energy savings at that facility were small. Several facilities that had expressed interest in participating in the Program were not able to participate due to their funding limitations.

The Program had a definitive positive impact on creating energy savings among the targeted wastewater treatment plants. There is a need for a program of this nature to stimulate energy efficiency improvements in small, resource-limited plants and Implementer effectively delivered a useful program to nearly all of the facilities. Most participants required some program assistance in order to effectively implement the energy efficiency measures. The Program provided two primary functions which had direct influence on successfully implementing efficiency measures: the Program removed the project planning and execution burden from plant staff and/or the Program provided the analysis and financial stimulation needed in getting projects of this nature approved by authorizing bodies.

Overall, program administration and delivery was found to be effective. Customers for the most part responded well to the program and were satisfied with the results. Several participants reported that the Program exceeded their expectations. The Program was found to have a strong influence on customers implementing energy saving measures with only one case of free-ridership reported.

Wastewater treatment plants, especially small resource-limited plants, are reluctant to execute process changes. Barriers to implementing energy efficiency measures are not limited to staff and financial resources. Risk aversion and technological skepticism are barriers that also need to be addressed.

1. Introduction

This report describes the results of an impact and process evaluation of the California Process Optimization Program (CalPOP or the "Program") operated in the service areas of Pacific Gas and Electric (PG&E) and San Diego Gas & Electric (SDG&E) during 2004 and 2005. CalPOP was offered by Quantum Consulting (now QuEST, hereafter referred to as the "Implementer"). This evaluation of the Program was conducted by SBW Consulting, Inc. and Glacier Consulting Group (hereafter referred to collectively as the "Evaluation Team" or the "Evaluators.").

1.1 Program Description

The primary goal of the CalPOP Program was to provide cost-effective, long lasting energy and demand savings through implementation of energy efficiency programs with small wastewater treatment plants in PG&E and SDG&E service territories. For each participating plant, Implementer identified one or more energy efficiency measures (EEMs) and worked with plant staff to implement at least one EEM while the plant continued to comply with the limits of its discharge permit. The Program achieved long-term persistent energy savings by implementing "hard" EEMs (e.g., via hardware that must be installed with tools and software changes that require specialized skills that cannot be easily reversed) and by providing monitoring tools and operator training. Implementer worked to maximize the value of the Program by identifying multiple EEMs at plants when those opportunities were observed and by providing consistent customer support throughout project development, installation, start-up and training phases of the project.

The Program targeted smaller wastewater treatment facilities both municipal and institutional, since many of the larger treatment facilities have either participated in efficiency programs with utilities or have the resources to undertake energy efficiency measures without program assistance. The Program provided a no-cost engineering analysis that identified and recommended cost-effective EEMs to plant management. In addition, financial incentives were paid to those Program Participants that implemented one or more of Implementer's recommendations. At some facilities, rather than pay an incentive, Implementer provided the installation of the EEM as a turnkey product.

Implementer employed a step-by-step process to recruit facilities to participate in the Program and to work with facilities to implement cost-effective EEMs. This process included iterative contact with plant management, conducting site investigations, obtaining plant information and data, analyzing the information and developing recommendations for implementing EEMs. For each participant that implemented one or more EEMs, Implementer worked as needed through all phases of technical analysis of EEMs, developing project budgets, securing bids, obtaining management and council approvals as needed at each phase, to enable implementation of projects. Some facilities managed the implementation of the EEM, at other facilities Implementer managed the implementation or provided turnkey implementation of the EEMs. Implementer worked with some facilities that at some phase through the recruitment, analysis of energy savings opportunities, costing, management approval or budget approval process, a roadblock was encountered and ultimately no EEM was implemented.

After receiving an expression of interest in Program participation, Implementer conducted an initial walk-through of the facility to determine whether sufficient energy savings potential existed to justify participation in the Program. If sufficient potential was found and the customer agreed to continue, Implementer conducted a more detailed analysis of potential EEMs of greatest interest to the facility management. These analyses usually involved the installation of metering equipment to obtain baseline energy consumption relevant to the EEM. The analyses contained an estimate of the energy savings expected from implementation of the measure and an estimate of the incentive Implementer would provide the customer to facilitate the implementation of the measure. The amount of incentive Implementer offered to provide was in relation to the cost for implementation and the amount of energy

savings anticipated from the measure's implementation. If the plant management decided to proceed with implementation of an EEM, management signed a funding request letter and Implementer prepared a final installation report, obtained bids and worked with management to seek budgetary approval from Council or other final decision maker. The recruitment, engineering analysis and budget approval assistance provided by Implementer was funded entirely by the CalPOP Program.

Program objectives for the PG&E/SDG&E CalPOP Program are summarized in Table 1-1.

Table 1.1: Program Objectives

		Gross electric savings			Net electric savings*		
Utility	Number of projects	First-year kWh	Lifetime kWh	Average peak kW	First-year kWh	Lifetime kWh	Average peak kW
PG&E							
Program Goals	7	3,500,000	70,000,000	350.0	2,800,000	56,000,000	280.0
SDG&E							
Program Goals	3	1,500,000	30,000,000	150.0	1,200,000	24,000,000	120.0
Total							
Program Goals	10	5,000,000	100,000,000	500.0	4,000,000	80,000,000	400.0

* Program assumed a net-to-gross ratio of 0.8.

1.2 Program Theory

As an industry, water and wastewater account for nearly seven percent of the state's total energy consumption. In particular, wastewater treatment facilities are typically one of local governments' largest energy users. Most of the large wastewater treatment plants have worked with either their local utility or a consultant to improve the energy efficiency of their operations. However, many of the small treatment plants have not been approached by either the local utility or consults to assist plant staff with energy efficiency improvements. In addition, most small treatment plants have a very limited number of staff, the staff has had little training in the area of energy efficiency and their efforts are focused on meeting effluent permit requirements. Some staff who have ideas for improving the energy efficiency of their facility lack the skills to demonstrate to their management that their ideas are cost-effective. Managers are often confronted with budget limitations that restrict their ability to invest in energy efficiency measures they believe to be cost effective.

CalPOP focused on bringing energy efficiency improvements to small wastewater treatment plants, plants that treat flow up to 15 million gallons per day. All the plants that participated in the CalPOP Program were municipal or institutional in nature, though future programs could include industrial and agricultural facilities. CalPOP provided key components that enabled energy efficiency projects to be implemented at small plants. Participation in CalPOP provided treatment plant staff with efficiency ideas and provided plant management with an independent assessment of the costs and benefits of implementing those measures. In addition, CalPOP provided a portion of the funds to implement measures and often provided the staffing to complete the installation. Many of the CalPOP projects were implemented as 'turnkey' projects. While the efficiency measures were installed, CalPOP provided plant staff hands-on training on how to utilize and maintain the equipment, so that energy savings will persist. By providing the engineering expertise and financial incentives, significant energy savings were realized at small wastewater treatment facilities, that otherwise would probably not have occurred.

1.3 EM&V Objectives

This Evaluation, Measurement, and Verification (EM&V) Report on the 2004-5 CalPOP Program was designed to meet the objectives listed in the California Public Utility Commission Energy Efficiency Policy Manual[1]. These objectives, and the manner in which they were achieved, are as follows:

1. Measuring level of energy and peak demand savings achieved.

   The primary objective of this EM&V project was to verify the amount of annual energy savings and peak electric demand reductions[2] from the CalPOP Program for each energy utility service territory. This objective was accomplished by evaluating pre- and post-implementation data consistent with the International Performance Measurement and Verification Protocol (IPMVP), Option B – Retrofit Isolation, which calls for short-term metering at the device level.

   Evaluator performed detailed reviews of the implementer's data collection and analyses of savings for all of the implemented projects. This detailed review included an inspection of each plant prior to implementation of the EEM(s) and an inspection of each plant following implementation of the EEM, to confirm implementation and obtain data as appropriate.

   Evaluator obtained additional information from plant staff to compare plant operations during the data collection periods and to assess any seasonal changes. Using available information, calculated verified gross savings. To determine net savings, a net-to-gross ratio was determined through in-depth interviews of industry experts and program participants, as well as secondary research into measure baseline conditions. Based on measure life information obtained during plant visits, communication with manufacturers, and relevant industry experience, the effective useful life for each measure was estimated and net kW and annual net kWh savings estimates for the program and each participating utility for each year over the expected 20-year time horizon were calculated.

2. Measuring cost-effectiveness.

   Evaluator prepared measurement-based estimates of verified energy and demand savings. In addition, a process evaluation was conducted in order to compute a net-to-gross ratio. A re-assessment of the Program cost-effectiveness was prepared. This was accomplished by computing a total resource cost (TRC) value for each utility using the respective workbook developed for the program implementation plan (PIP) and the results of the savings analysis.

3. Providing ongoing feedback, corrective/constructive guidance regarding implementation of programs.

   The impact evaluation provided verified savings estimates as soon as they become available for each project. In theory, this would allow the implementer to make improvements as the Program proceeded, although in practice, the timing was such that this feedback did not occur until near the end of the Program. The process evaluation provided feedback on program delivery, although again the timing did not permit mid-course adjustments.

[1] Version 2, prepared by the Energy Division, and released in August 2003.

[2] Defined as the average kW reduction during the period Monday-Friday 12 p.m. – 7 p.m., during the months of June through September (consistent with the *CPUC Energy Efficiency Policy Manual, Version 2*).

4. Providing up-front market assessments and baseline analysis.

   The CalPOP Program was offered in the SCE and PG&E territories as one of the 2002-2003 Third Party Energy Efficiency Programs. Recruitment information and results from that program substantially informed the savings and recruitment targets for the 2004-2005 CalPOP Program. Similarly, the EM&V results of this Program provide additional market and baseline information regarding future programs.

5. Measuring indicators of effectiveness of the specific programs, including testing of the assumptions that underlie the program theory and approach.

   The results from this verification report provide information regarding the effectiveness of the Program. Information collected during the process evaluation provides further insights into how well the program approach worked.

6. Assessing the overall levels of performance and success.

   This evaluation of Program savings and cost-effectiveness provides a complete assessment of the Program's performance and success from an energy perspective.

7. Informing decisions regarding compensation and final payments.

   To the extent that the CPUC finds these EM&V results to be useful, the EM&V efforts satisfy this objective.

8. Helping to assess whether there is a continuing need for the program.

   A formal market baseline assessment was not included in the scope of this effort, however the Implementer's experience in marketing the program provides some indication of how difficult it would be to expand the program beyond the current targets. The results of this evaluation provide bases for predicting unit savings, free-ridership, customer satisfaction, and market barriers that might exist in subsequent phases, thus helping the CPUC assess whether continuing the program would be worthwhile.

1.4 Report Overview

The report is organized as follows:

Chapter 2 - Methodology	Describes the approach for analyzing gross and net savings, assessing the Program process, and calculating results for each utility service area and the entire program.
Chapter 3 - Results	Presents evaluation findings on gross and net savings for each utility and the program overall, as well as savings life and program cost-effectiveness. Also documents process interview results.
Chapter 4 - Conclusions	Provides conclusions based on the analysis results.

Chapter 5 - Appendix	Contains the interview protocol for the process evaluation of participants, and an official record of comments on the draft version of this report (this later item to be included following submittal of review comments).

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2. Methodology

2.1 Overview

Implementer was successful in facilitating the implementation of at least one EEM at eight facilities. This evaluation relied on a variety of techniques and data sources to assess the net energy savings and effectiveness of the Program. These techniques included on-site pre- and post-implementation investigation of all EEMs at all eight facilities, short-term metering and one-time measurements conducted at four of the facilities (consistent with the approved EM&V plan), interviews with key plant operations staff at all eight facilities, results from specific data requests from the plants, and telephone surveys with key personnel with responsibility for decision-making about whether to implement EEMs. In addition, data, analysis and information developed by Implementer was reviewed in detail for all eight facilities. The impact portion of this EM&V report was conducted consistent with the requirements of IPMVP Option B: Retrofit Isolation. The process evaluation was based, primarily, on the results from the in-depth interview protocol conducted with key staff at all eight facilities that participated in the Program and one interview with key staff at a facility that ultimately did not implement an EEM. Other industry experts were interviewed to assist in the development of the protocol and to assess the results of the staff interviews.

The evaluation methodology was designed to answer the following questions:

1. What is the total program savings (annual electric energy and peak demand) for each utility? The Evaluation Team estimated gross annual energy and peak demand savings for all EEMs at each of the eight facilities. The results from the process evaluation of each facility was applied to the gross savings for each facility in order to determine the net savings for each facility. The results for each facility were grouped according to utility service area and total energy savings were then calculated for each utility as well as for all facilities combined.

2. What is the ratio of net savings to gross savings? The ratio of net savings to gross savings was calculated by facility, utility service area and for all facilities combined.

3. What is the program's cost-effectiveness? The Evaluation Team entered the realized program savings in each of Implementer's PIP workbook, by utility, and calculated new TRC values, by utility, to determine actual cost-effectiveness. TRC values were also calculated for all eight facilities combined.

4. What mid-stream corrections can the program make to improve savings estimates and participant satisfaction? Both the impact and process evaluations were to provide Implementer with results for each evaluated project as they became available, so that Implementer could improve savings estimates for future projects. As the program and evaluation unfolded, however, the timing precluded any meaningful mid-course feedback.

5. To what extent has the program achieved its goals? The results from this evaluation of Program savings and cost-effectiveness provide an assessment of Implementer's success towards achieving its Program goals.

6. How well overall has the Program performed, and how might it improve in the future? The in-depth interviews of key staff conducted for the process evaluation provides information about Program strengths, weaknesses, and area for improvement for subsequent offerings of this type of program. This information coupled with Implementer's marketing and recruitment experience should provide a basis for judging how effective similar programs might be in the future.

2.2 Approach to Impact Evaluation

Each wastewater treatment facility is a unique facility. Wastewater treatment plants are designed based on several factors including information about the service area for which it provides treatment, specific geographical constraints and operational, staffing and financial constraints, to identify a few. In addition, the staff at engineering firms that design wastewater treatment plants have differing opinions regarding selection of processes and equipment. Further, operation of each facility is dependent on several variables including decisions of the specific staff and the extent to which the flows and loads that the facility must treat are consistent with the constructed facility (i.e. a new facility may be treating a 'small' fraction of the flows and loads it will eventually be treating, conversely a facility may be required to provide treatment to flows and loads that are near the plant's capacity). For these reasons, in order for Implementer to assess the potential energy savings from implementation of a specific EEM, Implementer needs to collect baseline information for each measure. When the Program budget and initial EM&V plan were developed, they were developed on the basis that Implementer would obtain baseline data in order to estimate the energy savings opportunity for each potential EEM and further, that data would be used for the EM&V analysis. Subsequently, the approved EM&V plan was also based on the premise that Implementer would obtain the baseline data for use in the EM&V process. Due to the design of Implementer's Program, Implementer also needed to determine energy savings from each EEM. Thus, Implementer needed to collect post-implementation data. Due to overall budget constraints, the approved EM&V plan was based on Evaluator conducting data collection on 4 of the EEMs and conducting a detailed review of Implementer's work on 4 of the EEMs. As stated previously, Implementer's program objective was to implement 7 EEMs in the PG&E service territory and 3 EEMs in the SDG&E territory. Consequently, the Evaluation Team sought to allocate its monitoring to a selection of facilities in each service territory. Ultimately, at least 1 EEM was implemented at each of 7 facilities in the PG&E service territory and several EEMs were implemented at 1 facility in the SDG&E territory. Post-implementation data was collected by the Evaluation Team at 3 of the facilities in the PG&E service territory and at the 1 facility in the SDG&E territory. In addition, the Evaluation Team reviewed in detail all of the information obtained about each of the EEMs implemented. This information included data collected during detailed on-site pre- and post-implementation investigations, data requested from plant staff following the post-implementation site investigation, follow-up telephone discussions with plant staff and Implementer's data. The Evaluation Team conducted post-implementation monitoring and measurement at those facilities that Implementer reported had achieved the largest amount of energy savings. Gross first year energy and demand savings were calculated by the Evaluation Team for each implemented EEM based upon the information obtained from the sources described above. In addition, the Evaluation Team assigned an initial expected lifetime of 20 years for each EEM, in accordance with the guidelines for this Program.

The Evaluation Team issued a draft EM&V report that was reviewed by Implementer. Subsequently, Implementer recommended the energy savings at 2 of the facilities should be significantly greater than Evaluator had concluded. Evaluator undertook a very detailed information and data collection effort in order to develop a re-assessment of the energy savings at those facilities.

2.3 Approach to the Process Evaluation

The process evaluation was developed primarily upon the results of in-depth interviews with a key staff member of each the participants. The interview protocol was developed following informal discussions with several industry experts in order to gain an understanding of the issues faced by the participants. In addition to input from industry experts, the Evaluation Team conducted a literature search for applicable information. The goal of this secondary research task was to supplement the in-depth interview protocol design and to obtain additional information to compare to the findings of the interviews. Unfortunately,

the Team was not able to secure secondary research on the relevant topics as a result of the custom nature of the implemented measures and the relatively new technology that was implemented.

An in-depth interview protocol containing both open-ended and close-ended questions was developed to gather information pertinent to the evaluation objectives (see Appendix _ for a copy of the protocol). The protocol addressed program participant satisfaction, program training, implementation processes, and NTGR relevant questions. As respondents completed installation of program measures, each was interviewed. A total of nine respondents were interviewed beginning in April of 2006 and ending in October of 2006. Implementer reported energy savings achievements for eight participants, of which all eight participants were interviewed (only six of the eight were interviewed for process related information and all eight were interviewed for calculating the NTGR), a 100 percent response rate. A ninth interview took place with one facility, initially listed as a participant, but later the Implementer removed them from the participant list. No energy savings associated with that facility are included in the NTGR or projected impacts. However, comments about Program processes from this facility that ultimately did not participate in the Program are included in the findings of the process evaluation.

The initial measure lifetimes established previously were modified upward or downward only if a compelling reason existed to do so. For example, a compelling reason to reduce the measure lifetime was based on information from a participant contact, who indicated that an EEM that had been implemented was going to be demolished in a few years as part of a facility expansion. Only in very clear instances did we deviate from the standard table of measure lives.

Assessments of early replacement and free-ridership for each EEM, relied on self-reported information collected from each participant's responses to questions such as the ones below, from the participant survey.

Q24. Prior to becoming involved with CalPOP, were you aware that EEM technology was available?

Q27. How much longer [would you have operated the existing system] before you would have replaced it?

Q28. Before your involvement with CalPOP, would you have replaced the old system with the EEM or the same or a similar system?

Q31. If you had never heard of or gotten involved with CalPOP, would you have installed the EEM?

The results of this process evaluation are based on the qualitative findings from in-depth participant interviews. Given a lack of market data and applicable existing research, these findings are the ***best available*** for calculating a NTGR. These findings should be considered in the context of qualitative data and even though all program participants were interviewed, qualitative research is best suited for exploring a **range** of attitudes and opinions. The fact that these results are based on data from 100 percent of the program participant population provides more credibility and reliability to these findings

2.4 Program Savings and Cost-Effectiveness

The results from the process evaluation were used with the evaluated gross energy and demand savings and initial measure lives to calculate evaluated net energy and demand savings, and to determine the final lifetime energy savings by EEM. These results were then reduced to net energy and demand savings and lifetime energy savings by facility. [The need to conduct calculations at the measure level then

aggregating to the facility level resulted from several facilities implementing 2 EEMs.] The gross realization rates, evaluated net realization rates and NTGR were calculated by facility, by utility service area and for the total Program. The cost-effectiveness for each utility (PG&E and SDG&E) was calculated, as well as the overall Program cost-effectiveness.

1. Evaluator calculated the evaluated first year gross energy and first year average peak demand savings for each EEM. After establishing the initial lifetime for each EEM, the evaluated gross lifetime energy savings were calculated and the evaluated gross lifetime average peak demand savings were calculated for each EEM. These results were then reduced to facility level evaluated savings.

2. Using the values from the program gross savings (first year energy savings, lifetime energy savings, average peak demand savings for the first year and average peak demand savings for the lifetime) in-conjunction with the corresponding evaluated gross savings, the gross realization rates were calculated by facility, by utility and for the total Program.

3. The results from the process evaluation and the evaluated gross savings were used to calculate the evaluated net first year and lifetime energy savings for each EEM. In addition, the evaluated net first year demand and lifetime demand savings were also calculated for each EEM. These values were reduced to the facility level.

4. Using evaluated net savings and dividing by the corresponding program net savings, the Net Realization Rates for the first year and lifetime energy savings were calculated, by facility, utility and for the total Program.

5. Using evaluated net savings and dividing by the corresponding evaluated gross savings, the NTGR for the first year energy savings and lifetime energy savings were calculated, by facility, utility and for the total Program.

6. Lastly, the program cost-effectiveness was calculated by modifying Implementer's final approved workbook for each utility by inserting the total number of projects and the average verified unit savings for those projects. The results of the cost-effectiveness analysis was compared to the projected cost-effectiveness from Implementer's PIP, for each utility and for the total Program.

3. Results

3.1 Reported Accomplishments

The CalPOP Program implementation plan set goals of implementing EEMs at 10 facilities, 7 in the PG&E territory and 3 in the SDG&E territory. The gross energy savings goals were to achieve 3,500,000 kWh of gross first year savings in the PG&E territory and 1,500,00 kWh of gross first year savings in the SDG&E territory. A detailed breakdown of the Program goals and Implementer's claimed savings are provided in detail in Table 3-1. From an energy savings standpoint, Implementer's claimed net lifetime energy savings exceeded the PG&E goal by 12% but fell far short of the SDG&E goal, claiming 28% of that goal had been achieved. Similarly, claimed net average peak demand savings exceeded the goal for PG&E by 27% but claimed 32% of the net SDG&E goal was achieved. In total, claimed net first year and lifetime electric savings were 87% of the goal and average peak demand reduction was 99% of the goal.

Table 3.1: Program Goals and Claimed Savings

		Gross electric savings			Net electric savings*		
Utility	Number of projects	First-year kWh	Lifetime kWh	Average peak kW	First-year kWh	Lifetime kWh	Average peak kW
PG&E							
Program Goals	7	3,500,000	70,000,000	350.0	2,800,000	56,000,000	280.0
Claimed Results	7	3,914,692	78,293,840	445.6	3,131,754	62,635,072	356.5
Claimed % of goal	**100%**	**112%**	**112%**	**127%**	**112%**	**112%**	**127%**
SDG&E							
Program Goals	3	1,500,000	30,000,000	150.0	1,200,000	24,000,000	120.0
Claimed Results	1	422,232	8,444,640	48.0	337,786	6,755,712	38.4
Claimed % of goal	**33%**	**28%**	**28%**	**32%**	**28%**	**28%**	**32%**
Total							
Program Goals	10	5,000,000	100,000,000	500.0	4,000,000	80,000,000	400.0
Claimed Results	8	4,336,924	86,738,480	493.6	3,469,539	69,390,784	394.9
Claimed % of goal	**80%**	**87%**	**87%**	**99%**	**87%**	**87%**	**99%**

* Program assumed a net-to-gross ratio of 0.8.

3.2 Facilities, EEMs and Evaluated Gross Savings

One or more EEMs were successfully implemented at 8 facilities. At 4 of the 8 facilities, 2 EEMs were implemented. EEMs were implemented at 7 facilities in the PG&E service territory and 1 facility in the SDG&E territory. A general discussion of each EEM for each facility is provided in this section of the report. Detailed calculations of the energy savings for each EEM are provided in Appendix 1. Initial information about the EEM measure(s) implemented at each facility is provided in Table 3.2.

Table 3.2: Facility and EEM Identification

UTILITY	FACILITY NAME	EEM	MONITORED/ METERED BY EVALUATOR
PG&E	Discovery Bay	SolarBees DO controls	N N
	East Bay Dischargers Authority	Reduced pumping	N
	Novato	DO controls	Y
	Planada	SolarBees	Y
	Soledad	SolarBees DO controls	Y Y
	Tiburon	Pumping efficiency DO controls	N N
	Wasco SP	Improved Oxygen Transfer	N
SDG&E	Olivenhain	Efficient blower Reduced pumping	Y N

3.2.1 Facilities, EEMs and Gross Savings in PG&E Territory

Discovery Bay

Two EEMs were implemented at Discovery Bay, SolarBees and dissolved oxygen (DO) control systems. In fact, the Discovery Bay project was conducted at two sites, the North Plant and the South Plant. The SolarBees were only installed at the South Plant, however a DO control system was installed at both the North and the South Plants. Although the energy savings for the DO controls were initially calculated for each plant, for the purposes of this report the resulting savings were reported as a single installation.

SolarBees EEM: At the time Evaluator conducted the pre-implementation inspection, the South Plant had 2 lagoons, each aerated by 2-15 hp surface aerators. According to plant staff and corroborated by Implementer's data, the 4 surface aerators were operated 24 hours/day, 365 days/year except for providing maintenance to the aerators. At the time of the post-implementation inspection, all 4 surface aerators had been removed and 1 SolarBee had been installed in each lagoon. No electric powered aeration equipment was installed at the lagoons. Evaluator reviewed Implementer's measurement of electrically powered aerators and concurred with Implementer's calculation of first year gross energy savings. Evaluator reviewed and concurred with Implementer's calculation of gross average peak demand savings.

DO Controls EEM: At both the North and South Plants, an oxidation ditch was used to provide secondary wastewater treatment. Aeration was provided to each ditch via 4 brush aerators. According to plant staff, all 4-30 hp aerators at each plant were operated 24 hours/day, 365 days/year, except to provide for maintenance. The EEM at both plants involved the installation of a dissolved oxygen sensor and additional equipment to enable a programmable logic controller (PLC) to turn off and on aerators as needed to maintain a DO concentration in the oxidation ditch between 1.5 to 2.0 mg/l. Evaluator reviewed Implementer's calculation of first year gross energy savings. Evaluated first year gross savings were approximately 86% of Implementer's savings due to 2 reasons: 1) Implementer assumed no downtime in their calculation of the baseline energy consumption and 2) Implementer's post-implementation data was collected during the cool, wet season – February. It is expected that during hot, dry weather conditions the reduction in aerator run time would not be as large as it was during Implementer's post-implementation data collection. Evaluated peak demand reduction was approximately 82% of Implementer's value. Evaluator's detailed calculations of the first year gross energy and demand savings for the SolarBees and the DO control EEMS are provided in Appendix 1.

East Bay Discharge Authority (EBDA)

The EBDA operates the Ora Loma Pump Station (OLPS). The OLPS receives treated wastewater from 3 wastewater treatment plants and pumps that wastewater to an outfall in San Francisco Bay. The operation of the OLPS is complicated by the fact that 2 other treatment facilities discharge into the same pipe as the OLPS. The OLPS has 2-350 hp electric motor-driven pumps that are used for 95% of the pumping. The OLPS has 2 diesel driven pumps that can be used during peak flow conditions. When Evaluator conducted the pre-installation site inspection, there was no capability for the flow to the OLPS to bypass the electric motor-driven pumps as was the situation prior to 1997. Therefore, at least 1 pump, and usually both 350 hp pumps had to be in operation. The EEM was to revise the control system (and install the associated hardware) to enable the flow to bypass the pumps and thus reduce the energy for operating the pumps during certain flow and tide conditions. During the post-implementation inspection the O&M manager (for over 12 years) indicated the modifications had been completed to enable the flow from the 3 wastewater treatment plants to bypass the pump station. The O&M manager estimated that approximately 10% of the time, the flow would bypass the pumps. In addition, the O&M manager indicated there would be substantial time when 1-350 hp pump would be sufficient to pump the incoming flow as a result of the 'draw-down' of the upstream collection system during the periods of bypassing. The O&M manager provided Evaluator with 3 years of monthly energy use data for the OLPS. Calculating 10% of the average of the 3 years energy use data exceeded Implementer's claim for energy savings. Evaluator concurred with Implementer's first year gross energy savings claim. Based on review of the monthly energy use data, the summer is usually a period of lower energy consumption. Using the average of the annual energy savings to calculate the annual peak demand savings appears reasonable and Evaluator concurred with Implementer's claim for gross first year demand savings. Evaluator's initial calculations of the first year gross energy and demand savings for this EEM are provided in Appendix 1.

When Implementer reviewed the draft EM&V report, Implementer re-assessed their prior calculation and subsequently recommended the actual energy savings from this EEM were substantially greater than their initial estimate of those savings. This is one of the two facilities Evaluator re-assessed in great detail. Evaluator obtained significantly more data and information from the O&M manager and prepared a revised calculation of the energy and demand savings for this EEM. The results of Evaluator's extensive and detailed investigation are that this EEM resulted in '0' first year gross energy savings. There are several factors that are crucial to the understanding of this evaluation. Of primary consideration is the fact that the pumps have VSD and OLPS manager operated the pumps in parallel at a low flow rate prior to the implementation of the EEM project. However, as a result of operational characteristic of the OLPS, the manager changed to running a single pump at nearly twice the flow rate after the EEM was installed. By the affinity laws for pumps we know the energy consumption will be dramatically increased as a result

of this change. (The affinity laws indicate the capacity varies directly as the speed of the impeller while the corresponding brake horsepower varies as the cube of the speed.) The Evaluator's revised analysis of energy savings is provided in Appendix 1 with Evaluator's initial analysis of the energy savings.

Novato

The Novato wastewater treatment plant operates 3 aeration basins for its secondary wastewater treatment. Two of the basins are operated 'in parallel' and both discharge into the 3rd aeration basin. The plant has 2-100 hp blowers and 3-50 hp blowers that can be used to provide air to the aeration basins. At the time of Evaluator's pre-installation site investigation the blowers were controlled by manually switching them on or off. The EEM for this facility was to install the additional equipment needed for automated control of the operation of the blowers to maintain a lower and more consistent DO concentration in the aeration basins. At the time of Evaluator's post-implementation inspection, the additional equipment needed to provide automated control of the aeration blowers had been installed and was operational. It appeared to Evaluator that Implementer had established one level of energy consumption based on the baseline data but used a higher baseline to calculate gross first year energy savings. Evaluator's monitored post-implementation data appeared inconsistent with Implementer's original baseline calculations. Evaluator subsequently obtained run-hour data for each of the 5 blowers for the previous 15 months. Utilizing that additional data Evaluator calculated first year evaluated gross energy savings that were approximately 39% of Implementer's calculated first year gross energy savings. Evaluator's initial calculations of the first year gross energy and demand savings for this EEM are provided in Appendix 1.

When Implementer reviewed the draft EM&V report, Implementer re-assessed their prior calculation and subsequently recommended the actual energy savings from this EEM were substantially greater than their initial estimate of those savings. This is the second of the two facilities Evaluator re-assessed in great detail. Evaluator obtained additional data from plant staff and prepared a revised calculation of the energy and demand savings resulting from implementation of this EEM. The results of the detailed re-evaluation yielded an increase in energy savings from Evaluator's initial findings. The refined analysis resulted in a first year energy savings of 77% of Implementer's initial estimate of energy savings. Evaluator's refined calculations are provided in Appendix 1.

Planada

The Planada wastewater treatment plant operates 6 ponds in series to provide secondary wastewater treatment. At the time of Evaluator's pre-installation site investigation, Ponds 1, 2 and 3 were each aerated with 4 aerators. [Although the plant manager indicated the aerators in Pond 1 were 15 hp and the aerators in ponds 2 & 3 were 7.5 hp, the demand measurements indicated they were 20 hp and 10 hp, respectively.] According to the plant manager, all 12 aerators were operated 24 hours per day, 365 days per year, except for maintenance. The EEM for this facility was to install 1 SolarBee in each of the first three ponds. At the time of Evaluator's post-implementation inspection, 1 SolarBee had been installed in each pond and the electrical driven aerators were still in-place. The electrically powered aerators were controlled by a time clock. The aerators in pond 1 were being operated approximately half time. The aerators in pond 2 were being operated approximately 1-quarter time and the aerators in pond 3 were not being operated. Evaluator's monitored data was consistent with Implementer's. Evaluator derated Implementer's first year gross energy savings calculations for a small amount for 2 factors: 1) Implementer assumed no 'down time' in the baseline calculation and 2) the post-installation measurements were taken in spring. Evaluator assumed the electrical aerators would need to be operated a small amount more than they were in the spring. Evaluator's first year gross energy savings were 95% of Implementer's savings. Evaluator's detailed calculations of the first year gross energy and demand savings for this EEM are provided in Appendix 1.

Soledad

The Soledad wastewater treatment plant operates 3 lagoons in parallel to provide secondary wastewater treatment. At the time of Evaluator's pre-installation site investigation each lagoon had 7-25 hp aerators installed. According to the plant manager, on average 6 aerators are in operation 24 hours/day, 365 days/year. The EEM for this facility was to install 2 SolarBees in each of the 3 lagoons and to install a DO sensor in each lagoon with supporting communications and control equipment to turn off an aerator when the DO reached 5.0 mg/l and to turn on an aerator if the DO reached 2.5 mg/l. At the time of Evaluator's post-implementation inspection, 2 SolarBees had been installed in each lagoon and a DO sensor installed in each lagoon. Also, the communications and equipment needed for controlling the electrical aerators was in service. Evaluator installed monitoring equipment on all aerators in the first lagoon. During the evaluation of the energy savings, the Evaluation Team learned from the Public Works Director that the City had decided to purchase the SolarBees prior to Implementer's involvement. For this reason Evaluator estimated the energy savings associated with each the installation of the SolarBees and the installation of the aerator control system. Implementer calculated its energy savings based on the combination of the SolarBees and the control system. Evaluator estimated that 3 additional aerators would have been in-service 24 hours/day, 365 days/year if the controls system was not in-service. Evaluator estimated that 30% of Implementer's first year gross energy savings were attributable to the control system and 66.5% of the Implementer's savings were attributable to the installation of the SolarBees. Evaluator's detailed calculations of the first year gross energy and demand savings for this EEM are provided in Appendix 1.

Tiburon

The Tiburon wastewater treatment plant had 2 EEMs implemented. At the time of Evaluator's pre-installation inspection a 20-hp (electric) motor that powered 2 pumps was used to provide sludge circulation to a dissolved air flotation tank (DAFT). The 2nd EEM was focused on the aeration blowers for the activated sludge process at the plant. The plant has 2-30 hp Sutorbilt blowers and 1-40 hp Lamson blower. At the time of Evaluator's post-implementation inspection, the motor and pumps for the DAFT had been replaced by a 10-hp motor that powered a single pump. Also, several improvements had been made to the aeration blowers, these improvements included:

- VFDs on the 2 Sutorbilt blowers had been replaced by inlet valves.
- The set-point for the DO control system had been reduced from 4.0 mg/l to 2.5 mg/l.
- Check valves had been installed on all 3 blowers.
- The control system had been changed so that when a blower (normally a Sutorbilt) was in operation and due to a low DO concentration a second blower was needed, the second Sutorbilt would start-up rather than the Lamson blower, which would have been the second blower to start prior to the control system change.

Evaluator calculated the first year gross energy savings from the motor and pump replacement to be 100% of energy savings calculated by Implementer. Evaluator calculated the first year gross energy savings from the aerator system improvements to be 100% of the energy savings calculated by Implementer. Evaluator's detailed calculations of the first year gross energy and demand savings for this EEM are provided in Appendix 1.

Wasco State Prison

The Wasco State Prison has 2 aeration ponds for treating the wastewater from the prison. Only 1 aeration pond is normally in-service. At the time of Evaluator's pre-installation site investigation the pond in-service had 7-20 hp Tornado aerators installed. According to the plant manager, 6 aerators are operated October through May and 7 aerators are operated June through September. The EEM was to install a more efficient aeration system (ASI system with 4-15 hp motors) and reduce the number of Tornado aerators in-service. At the time of Evaluator's post-implementation inspection, the ASI aeration system had been installed. In addition to the ASI aeration system, 4 Tornado aerators were also in-service. The plant manager estimated that 2 of the 4 Tornados were needed as a result of increased load to the plant but that 2 of the Tornados were needed due to reduced efficiency of the ASI system. Evaluator observed that 11 of the 40 aeration diffuser/distribution pipes were plugged. The plant manager indicated the system had worked satisfactorily for about the 1st year it had been in operation, but during the previous 6 months plugging problems had begun occurring. The plant manager indicated the ASI system had been installed while the pond was in-service and the piping was not supported. If the pond were drained, there would be no support for the piping on the surface of the pond. However, he was very concerned about having any personnel try to replace plugged piping by working from a boat if the repairs were undertaken while the pond was full. The plant manager also expressed substantial concerns about the durability of other components of the system. Evaluator calculated the first year gross energy savings from the aerator system improvements to be 100% of the energy savings calculated by Implementer. Evaluator's baseline gross energy consumption is 94% of Implementer's value. Evaluator's first year gross energy savings were calculated to be 73% of Implementer's savings. Evaluator's detailed calculations of the first year gross energy and demand savings for this EEM are provided in Appendix 1.

3.2.2 Facilities, EEMs and Gross Savings in SDG&E Territory

Olivenhain

The Olivenhain wastewater treatment plant had 2 EEMs implemented. At the time of Evaluator's pre-installation inspection the plant had 2-50 hp blowers providing aeration of its aerobic digester. The 2 blowers were operated 24 hours/day, 365 days/year. Also, 3-25 hp pumps were used as needed to supply pressurized In-Plant Non-potable Water (IPNPW) to the plant that was used for various purposes. At the time of Evaluator's post-installation inspection the 2-50 hp blowers had been replaced by 1-50 hp positive displacement blower. The use of the 25 hp pumps for supplying IPNPW had been discontinued. The needed IPNPW was being supplied via a storage reservoir. The non-potable water in the storage facility was treatment plant effluent that had been pumped there from the treatment plant using 3-75 hp pumps as

needed. Evaluator calculated the baseline energy consumption for pumping NPW to be 82% of Implementer's value. The reason for the reduction is that Evaluator used a weighted average of the 3 most recent months of IPNPW usage with the previous 12 months of IPNPW usage whereas Implementer used 2 months data. Regarding first year gross energy savings from this EEM, Evaluator calculated the post-implementation energy use to be greater than the baseline energy use. Implementer's energy savings appeared to be based on the assumption that no post-implementation energy was required. Evaluator's calculation of first year gross energy savings is 93% of Implementer's savings. The primary reason for the difference in energy savings resulted from Evaluator's monitored data was slightly larger than Implementer's monitored data. Evaluator's detailed calculations of the first year gross energy and demand savings for this EEM are provided in Appendix 1.

3.2.3 Summary of First Year Program and Evaluated Gross Savings and Realization Rates

Table 3.3 provides a summary of the first year gross savings by facility, utility and total program. Table 3.3 also contains Gross Realization Rates that were calculated by dividing the evaluated gross savings (first year gross energy savings and first year gross demand savings) by the comparable Program gross savings.

Table 3.3: Program and Evaluated Gross Savings and Realization Rates

			PROGRAM GROSS SAVINGS (first-year)		EVALUATED GROSS SAVINGS (first-year)		GROSS REALIZATION RATES	
Utility	Plant ID #		kWh	Average peak kW	kWh	Average peak kW	kWh	Average peak kW
PG&E	A	Tiburon	92,908	10.0	92,908	10.0	100%	100%
	B	Soledad	1,647,392	188.0	1,588,357	230.3	96%	123%
	C	Discovery Bay	749,856	85.6	704,186	78.8	94%	92%
	D	Novato	340,000	39.0	262,000	28.4	77%	73%
	E	Wasco	307,768	35.0	277,823	36.5	90%	104%
	F	Planada	649,116	74.0	618,474	70.6	95%	95%
	G	EBDA	127,000	14.0	-	-	0%	0%
SDG&E	H	Olivenhain	422,232	48.0	268,159	30.6	64%	64%
PG&E subtotal			3,914,040	445.6	3,543,748	454.6	91%	102%
SDG&E subtotal			422,232	48.0	268,159	30.6	64%	64%
Program total			**4,336,272**	**493.6**	**3,811,907**	**485.2**	**88%**	**98%**

3.2.4 Initial Evaluation of Effective Useful Life

Implementer utilized an effective useful life (EUL) of 20 years for all measures when calculating lifetime energy savings. For Evaluator's initial evaluation of the EUL of each measure, Evaluator compared the

types of EEMs implemented by this Program to the measures contained in the Energy Efficiency Policy Manual, Table 4.1 and their EUL. The information in the table below is an excerpt from the Manual.

Measure	Lifetime
High Efficiency Motors	15
Variable Frequency Drives	15
Pump Test	15
System Controls	15

Based on the above information, Evaluator established what it believes to be a more appropriate assessment of the EUL for each EEM as shown in Table 3.4.

Table 3.4: Initial EUL for Each Installed EEM

Plant ID	Facility Name	EEM	Measure type	Evaluated first-year gross kWh savings	Default measure-level EUL	Evaluated EUL
A	Tiburon	Pump Replacement/ Installation	Equip't change	45,908	15	15
		DO Controls	Equip't change	47,000	15	15
B	Soledad	SolarBees	Equip't change	1,094,877	15	15
		DO Controls	Process	493,480	20	20
C	Discovery Bay	SolarBees	Equip't change	427,488	15	15
		DO Controls	Process	276,698	20	20
D	Novato	DO Controls	Process	262,000	20	4
E	Wasco	Blowers and Diffusers (1)	Equip't change	277,823	15	7
F	Planada	SolarBees	Equip't change	618,474	15	15
G	EBDA	Bypass Controls	Process	-	20	20
H	Olivenhain	Blower	Equip't change	285,576	15	15
		Pumping improvement	Equip't change	(17,417)	15	15
Savings-weighted Program EUL					**16.4**	**14.7**

Evaluator concluded the EUL of two of the measures should be significantly reduced from the standard EUL of the Policy Manual. The air distribution and diffuser system at the Wasco facility have exhibited several problems including pipe breakage and plugging problems. As a result of these durability and operational/maintenance problems, plant staff is very concerned about continuing to use the equipment. The EUL of the Novato facility was reduced due to the scheduled demolition of the secondary wastewater treatment facilities on which the DO control system was installed. The plant is scheduled to have new secondary wastewater treatment facilities come on-line and demolish the existing secondary wastewater treatment system in 2009.

The above information is offered to provide the Utility Commission and the staff more insight as to Evaluator's assessment of expected EUL for these projects. However, Evaluator has completed Excel spreadsheets using the prescribed 20-year ex-ante EUL for calculating program savings and cost-effectiveness on a comparable basis with other 2004-2005 efficiency programs.

3.3 Process Evaluation and NTGR Results

This process evaluation task primarily relies upon the results of in-depth interviews with program participants. While these findings are drawn from participant interview results, the evaluation task relied heavily upon informal discussions with industry experts in understanding issues faced by program participants. This feedback was used in designing participant in-depth interview protocols. In addition to seeking industry expert input, the evaluation team conducted a literature search for applicable information. The primary goal of this secondary research task was to supplement the in-depth interview protocol design phase and to support resulting findings. Unfortunately, we were not able to secure secondary research to support NTGR findings given the custom nature of implemented measures and/or the relatively new technology installed.

An in-depth interview protocol containing both open-ended and close-ended questions was developed to gather information pertinent to the evaluation objectives (see Section 5.1 for a copy of the protocol). The protocol addressed program participant satisfaction, program training, implementation processes, and NTGR relevant questions. As respondents completed installation of program measures, each was interviewed. A total of nine respondents were interviewed beginning in April of 2006 and ending in October of 2006. The program implementer reported energy savings achievements for eight program participants (which implemented 12 measures), of which all eight participants were interviewed (only six of the eight were interviewed for process related information and all eight were interviewed for calculating the NTGR), a 100 percent response rate. The ninth interview took place with a facility that was initially listed as a program participant, but later the Implementer removed them for the participant list. Therefore, energy savings associated with that facility are not included in the NTGR or projected impacts. However, comments regarding program processes are included in these findings.

The following results are based on the qualitative findings from participant in-depth interviews. Given a lack of market data and applicable existing research, these findings are the ***best available*** for calculating a NTGR. The reader should consider these findings in the context of qualitative data and even though the all program participants were interviewed, qualitative research is best suited for exploring a **range** of attitudes and opinions. The fact that these results are based on data from 100 percent of the program participant population provides more credibility and reliability in these findings. See the table below for a list of respondents.

Wastewater Treatment Facility
Tiburon
Soledad
Discovery Bay
Rodney Strong Winery
Novato
Wasco SP
Planada
EBDA
Olivenhain

3.3.1 Process Evaluation

The Process Evaluation section begins with a discussion of program awareness, continues with a discussion of participant satisfaction with the program and concludes with findings on program provided training.

Program Awareness

Program participants initially heard about the program from a variety of sources.

- Two heard about it from a contractor or vendor.
- Two participants were approached by the program implementer.
- One participant had attended a seminar sponsored by an industry association.
- One participant heard about the program while attending a solar bee demonstration.
- One participant heard about the program through word of mouth.

Three of seven participants heard about the program early in 2004. Three participants heard about the program late in 2004 and one participant heard about the program in 2003.

Lead times between becoming aware of the program and participation range from zero months to 12 months, with the majority of participants making commitments to participate in two to six months (4 of 7 participants).

Participants were asked to provide a general description of the process they went through which lead to their participation in the program. Once aware of the program, the typical participation path included three steps.

1. Approach—The implementer or a contractor approached the plant manager and explained the program.
2. Analysis—The implementer conducted on-site testing to determine opportunities for energy efficiency improvement. Potential savings and payback periods were calculated.
3. Approval—Recommendations resulting for on-site monitoring and analysis were presented to authorizing committees. In most cases additional/independent analysis was not necessary.

In one case a vendor rather than the program implementer actively managed the sales process from approach through to project approval. In this case on-site monitoring was not conducted. Instead the vendor provided studies that helped convince the plant's authorizing committee to approve the project.

"The vendor sales person came in and presented to our board and convinced the board right away. The engineers had some doubts about her claims, but she gave them some studies that convinced them. The rebate and predicted energy savings helped the board approve the project pretty quickly."

Participant Satisfaction

Participants were asked to rate their satisfaction with a number of Program attributes using a scale of excellent, very good, average, fair, or poor.

Six of seven program participants rated their ***overall satisfaction*** with the Program excellent. The one remaining participant rate ***overall satisfaction*** with the Program fair.

Less than one-half of participants (3 of 7) rated the quality of ***workmanship*** received from the program contractor as excellent. Two participants rated workmanship very good, one participant rated workmanship average, and one participant rated workmanship fair.

Four participants rated their satisfaction with the program contractor's ***technical expertise*** excellent. One participant rated technical expertise very good, one rate technical expertise average, and one rated technical expertise fair.

Six of Seven participants rated the Implementer on being ***responsive to questions*** excellent. The remaining one participant rated the Implementer very good on being responsive to questions.

Six of Seven participants rated their satisfaction with the ***administrative process*** they went through in order to participate in the Program excellent. The remaining one participant rated their satisfaction with the administrative process average. Participants could not think of any away in which the administrative process could be improved.

"The folks we worked with kept things moving along. It is a very un-bureaucratic process…the least bureaucratic thing I have ever dealt with along the lines of grants."

"Other programs have been a pain the neck…there is no improvement needed. I liked the fact that Quantum handled everything."

"Everybody did a good job. They worked well as a team. I don't think it could have been improved…worked well with our team and they helped us out a lot."

Participants were asked to rate their satisfaction with the amount of time it took from initially entering the Program until the work at their facilities was complete. Three participants rated the amount of time it took to complete this process excellent, two said it was very good, one said it was average, and one rated it poor.

Although there appears to be room to improve the timeline for taking plants from entry into the Program through to completed installations, participants admit that most delays were internally generated rather than within the Program's control. In fact, they are quite complimentary on the "seamless process" managed by the Implementer.

"Some of that was caused by us doing some of the work ourselves…it would have gone better if we had used a contractor and someone more knowledgeable about what we were trying to do."

"It was really plant performance issues that stalled it. It is hard to say how it could be shortened…there are too many things going on in the plant."

"To the extent that it was slow, it was probably us, not them. We did not devote the staff time like we could have, but it was not a big priority for us."

When participants were asked to list things about the Program that are done particularly well, ease of participation is mentioned most often. Several participants seemed to be surprised that their expectations were exceeded by measure performance. One respondent indicated that they would not have been able to implement the changes without the assistance of the Program, especially the engineering assistance.

"For me…we are a small agency and having a contractor paid for by the PUC helps our budget. We would not have been able to pay for the engineering ourselves."

"It ran like a seamless program…a very easy program…no roadblocks. It was very easy to participate…no bureaucracy."

"The mechanical aspect of the program works very well…The SolarBees work well. The technical support we received…Quantum did a good job assisting us…everyone went the extra mile to make this happen."

In general, participants were not able to provide many suggestions for improving the program. The only suggestion offered on a consistence basis is to improve program marketing and communication to the industry. Marketing messages should include information about the program as well as the technology.

"Getting the info out to the masses could be done better…we were not even aware of the program until Quantum approached us."

"Getting the word out to the wastewater treatment community…educating us more about energy efficiency. We are always nervous about anything that might compromise treatment."

"Nothing off the top of my head. It is a very good program…best for small facilities that do not have the engineers on staff…provided energy savings and works well."

"No suggestions for improvement…the program is pretty good, but I would have liked to have known about it sooner. Quantum might be a little too busy to market the program."

Training

Only three of six participants received training as part of their participation in the program. These training sessions consisted of a one or two day on-site course on using and maintaining the installed systems.

In general, these three participants said they received adequate training, but also emphasized that the systems are fairly easy to use.

"It was pretty general…they are self contained units and pretty easy to operate. They have come out since then to check the programming."

While participants believe they have all the information they need to operate installed measures, participants couched their comments with the fact that it may be too early in the operating cycle to understand all the issues that may arise.

"*It is too early in the process to say exactly* [if we have received adequate training]*."*

3.3.2 Net Savings

The net savings analysis includes information about EEMs installed and what participants would have done (or would have likely done) in the absence of Program intervention. Plant managers were fairly familiar with the eight different technologies installed prior to becoming involved with the program. Below is a table that characterizes their response to questions on this topic.

Technologies Installed	Not at all Familiar	Somewhat Familiar	Very Familiar
DAFT		1	
SolarBees	1	2	
DO Control	1	1	1
Blower Controls	1		
ASI Diffuser System			1
Reduced Pumping		1	
Efficiency Blower		1	
Pumping Improvement		1	

Measure Performance

With few exceptions, measure performance has met or exceeded expectations. In several cases plant processes have improved and energy consumption has decreased.

"Yes, it is performing better than expected. DO is a lot better than we were previously getting and we didn't think that was possible."

[The measure] *has performed well. It keeps DO within level status…It has given us better affluent and reduced power demand…performed better than expected…we were pretty skeptical.*

Two respondents said it was too early to tell if the measures would perform as expected.

"It is too early to tell…it takes a long time to turn your pond around."

"Yes, it has so far met expectations, but a month is not enough time to tell if it works better or not."

There is one case in which measure performance at the time of the interview was meeting the high, and rather skeptical, expectations of the plant manager. The evaluation team has since discovered that this plant is experiencing difficulty with the program installed measure. At the time of the interview, the plant manager said, *"Yes, it has worked well. We are getting double aeration transfer and using less energy. I was always skeptical, but it is performing exactly the way it was intended."* Since then, the plant has experienced difficulty with the system, which has impacted performance, useful life expectations, and, potentially, energy savings.

Early Replacement

Installed measures were classified into two categories, system replacement measures and measures installed in addition to current systems. Those measures installed as additions to current systems are designed to minimize current system operating hours or load. Measures replacing current systems are design to accommodate plant processing needs at loads lower than the systems replaced. In order to understand program impacts relative to this second group of measures, it is necessary to understand "early replacement" issues—would the systems that were replaced have been replaced in the near future regardless of program intervention and would they have been replaced with an energy efficient option or the same or similar technology. In cases when these systems would have been replaced by an energy efficient option (technology similar to that install by the program) the program receives early replacement credit, but not full effective useful life credit.

Five of 12 measures installed by the program replaced systems and seven were installed as additions to current systems as shown in Table 3.6.

Table 3.5: Measure Classification Whole System Replacement or Addition

Wastewater Treatment Facility	Measure	Whole System Replacement	Addition to Current System
Tiburon	DAFT	y	
Tiburon	Blower Controls	y	
Soledad	SolarBees		y
Soledad	DO Controls		y
Discovery Bay	SolarBees	y	
Discovery Bay	DO Controls		y
Novato	DO Controls		y
Wasco SP	ASI Diffuser System		y
Planada	SolarBees		y
EBDA	Reduced Pumping		y
Olivenhain	Efficient Blower	y	
Olivenhain	Pumping Improvement	y	

Of the five measures installed through the Program to replace systems, two would have been replaced at some point in the future with systems similar to those that were in place prior to Program involvement had the Program not intervened. Table 3.7 provides information about those facilities and measures.

Table 3.6: Replacement Intention Prior to Program Intervention

		Replacement Intention Prior to Program Intervention	
Wastewater Treatment Facility	Measure	Energy Efficient System	Similar System
Tiburon	DAFT	y	
Tiburon	Blower Controls		y
Discovery Bay	SolarBees		y
Olivenhain	Efficient Blower	y	
Olivenhain	Pumping Improvement	y	

All respondents were specifically asked if they would have installed respective measures if they had never heard of or become involved with the Program. Four of the 12 measures would have been installed, regardless of Program intervention as shown in Table 3.8.

- Tiburon: DAFT would have been installed in 2008 (program intervention stimulated early replacement by 24 months).
- Olivehain: The plant had intended on implementing both measures in 2008 regardless of Program participation (Program intervention stimulated early replacement by 24 months).
- Soledad: Solar bees were ordered before the plant entered the program.[3]

"We had already ordered the Solar Bees…already bought the bees for another plant that serves the prison…We had already ordered the bees and then the vendor told us about the program, which helped us identify other energy savings."

Eight of the 12 measures installed through the Program would never have been installed without Program intervention.

"We would have probably replaced the old aerators with a like system [a system similar to the old, less efficient system]. *The Program really showed us the savings. I needed the motivation to take the steps to install the bees. The program made it easy…we have a very small staff and gathering info on technology like this is difficult."*

"Our skepticism and reluctance to spend money would have kept us from making the investment."

"Everyone is skeptical at first and it is hard to dedicate that kind of money when you are not sure it will work…hard to make changes unless you have seen it work in another plant first."

"It would have been tougher to convince the engineers without the Program. The Program showed us the energy savings and the rebate convinced the engineers to approve it."

[3] Given the potential impact on program induced energy savings that a free-rider participant can have, this fact was verified with a follow up conversation with the public works director for this facility.

Table 3.7: Program Influence on Installation

Wastewater Treatment Facility	Measure	Measure Would Have Been Installed Regardless of Program Intervention	Probable Timing
Tiburon	DAFT	Yes	2008
Tiburon	Blower Controls	No	
Soledad	SolarBees	Yes	2006
Soledad	DO Controls	No	
Discovery Bay	SolarBees	No	
Discovery Bay	DO Controls	No	
Novato	DO Controls	No	
Wasco SP	ASI Diffuser System	No	
Planada	SolarBees	Maybe	
EBDA	Reduced Pumping	Maybe	
Olivenhain	Efficient Blower	Yes	2008
Olivenhain	Pumping Improvement	Yes	2008

To calculate the net savings, each installed measure listed above was evaluated for whether or not it would have been installed with or without program intervention. If we determined that a measure would have been installed anyway at some point within the measure life, even without program intervention, then we assumed that the net savings from that point on would have been zero. As Table 3.7 summarizes, we found that the Tiburon DAFT/pumping improvement measure, the Olivenhain efficient blower measure and the Olivenhain pumping improvement measure would have occurred without the program in the year 2008. Soledad likely would have implemented the SolarBees in 2006 independent of the program intervention. The Novato plant has a reduced EUL because as described previously, the blower control system is scheduled for demolition in 2009. Also, the Wasco plant has a reduced EUL due to durability and reliability problems with the equipment installed under the Program.

Based on these findings, we calculated net-to-gross ratios for each plant and each utility, as shown in Table 3.8. These ratios consist of the cumulative savings over the life of the measure that occur because of the program, divided by the gross cumulative savings. As a result of the two out of seven plants in PG&E service territory where some of the measures would have occurred regardless, the PG&E net-to-gross ratio is 68%. The sole plant in SDG&E service territory intended to install their measures prior to participating in the Program. Because the Program impact was only to accelerate installation of their measures by two years, the SDG&E net-to-gross ratio is a low 13%.

Also shown in Table 3.8 are the program and evaluated net kWh and kW savings for each plant and utility. The ratio of evaluated net savings to program net savings yields the net realization rates displayed in the table. Table 3.9 shows the first year Program goals and claims, evaluated results and realization rates.

Table 3.8: Net Realization Rates and Net-to-Gross Ratios

Utility	Plant ID #		PROGRAM NET SAVINGS kWh	PROGRAM NET SAVINGS Average peak kW	PROGRAM NET SAVINGS Net-to-gross ratio	EVALUATED NET SAVINGS kWh	EVALUATED NET SAVINGS Average peak kW	EVALUATED NET SAVINGS Net-to-gross ratio	NET REALIZATION RATES kWh	NET REALIZATION RATES Average peak kW
PG&E	A	Tiburon	74,326	8.0	80%	53,121	5.7	57%	71%	71%
	B	Soledad	1,317,914	150.4	80%	401,278	58.2	25%	30%	39%
	C	Discovery Bay	599,885	68.5	80%	704,186	78.8	100%	117%	115%
	D	Novato	272,000	31.2	80%	262,000	28.4	100%	96%	91%
	E	Wasco	246,214	28.0	80%	277,823	36.5	100%	113%	130%
	F	Planada	519,293	59.2	80%	618,474	70.6	100%	119%	119%
	G	EBDA	101,600	11.2	80%	-	-	100%	0%	0%
SDG&E	H	Olivenhain	337,786	38.4	80%	35,755	4.1	13%	11%	11%
PG&E subtotal			3,131,232	356.5	80%	2,316,882	278.2	65%	74%	78%
SDG&E subtotal			337,786	38.4	80%	35,755	4.1	13%	11%	11%
Program total			**3,469,018**	**394.9**	**80%**	**2,352,636**	**282.3**	62%	**68%**	**71%**

Table 3.9: Evaluated Savings Compared to Program Goals

	PG&E		SDG&E		TOTAL	
	First-year kWh	First-year avg. peak kW	First-year kWh	First-year avg. peak kW	First-year kWh	First-year avg. peak kW
Program goals						
Gross savings	3,500,000	350.0	1,500,000	150.0	5,000,000	500.0
Net savings	2,800,000	280.0	1,200,000	120.0	4,000,000	400.0
NTGR	80%	80%	80%	80%	80%	80%
Program claims						
Gross savings	3,914,692	445.6	422,232	48.0	4,336,924	493.6
Net savings	3,131,754	356.5	337,786	38.4	3,469,539	394.9
Claimed as % of goal	112%	127%	28%	32%	87%	99%
Evaluated results						
Gross savings	3,543,748	454.6	268,159	30.6	3,811,907	485.2
Net savings	2,316,882	278.2	35,755	4.1	2,352,636	282.3
Net to gross ratio (NTGR)	65%	61%	13%	13%	62%	58%
Realization rates						
Gross realization rate	91%	102%	64%	64%	88%	98%
Net realization rate	74%	78%	11%	11%	68%	71%
Evaluated net as % of net goal	83%	99%	3%	3%	59%	71%

3.4 Program Savings and Cost-Effectiveness

3.4.1 Program Savings

Tables 3.10 and 3.11 show the Program impact over 20 years by utility. Table 3.11 shows the sum of the energy impact for the 2004-2005 CalPOP Program for PG&E and SDG&E.

Table 3.10: PG&E Program Energy Impact Reporting for 2004-2005 CalPOP Program

Program ID*:	1159-04							
Program Name:	CALIFORNIA WASTEWATER TREATMENT PLANT PROCESS OPTIMIZATION PROGRAM							
	Year	Calendar Year	Ex-ante Gross Program-Projected Program MWh Savings (1)	Ex-Post Net Evaluation Confirmed Program MWh Savings (2)	Ex-Ante Gross Program-Projected Peak Program MW Savings (1**)	Ex-Post Evaluation Projected Peak MW Savings (2**)	Ex-Ante Gross Program-Projected Program Therm Savings (1)	Ex-Post Net Evaluation Confirmed Program Therm Savings (2)
	1	2004	3,500	2,317	0.350	0.278	-	-
	2	2005	3,500	2,317	0.350	0.278	-	-
	3	2006	3,500	2,317	0.350	0.278	-	-
	4	2007	3,500	2,317	0.350	0.278	-	-
	5	2008	3,500	2,317	0.350	0.278	-	-
	6	2009	3,500	2,317	0.350	0.278	-	-
	7	2010	3,500	2,317	0.350	0.278	-	-
	8	2011	3,500	2,317	0.350	0.278	-	-
	9	2012	3,500	2,317	0.350	0.278	-	-
	10	2013	3,500	2,317	0.350	0.278	-	-
	11	2014	3,500	2,317	0.350	0.278	-	-
	12	2015	3,500	2,317	0.350	0.278	-	-
	13	2016	3,500	2,317	0.350	0.278	-	-
	14	2017	3,500	2,317	0.350	0.278	-	-
	15	2018	3,500	2,317	0.350	0.278	-	-
	16	2019	3,500	2,317	0.350	0.278	-	-
	17	2020	3,500	2,317	0.350	0.278	-	-
	18	2021	3,500	2,317	0.350	0.278	-	-
	19	2022	3,500	2,317	0.350	0.278	-	-
	20	2023	3,500	2,317	0.350	0.278	-	-
	TOTAL	2004-2023	70,000	46,338			-	-

*Form completed for the PG&E program ID included in the evaluation.
NOTE: EX ANTE EFFECTIVE USEFUL LIFE (FROM POLICY MANUAL) USED IN THIS TABLE.
**Definition of Peak MW as used in this evaluation: Average kW reduction during the period Monday-Friday 12 p.m. - 7 p.m., during the months of June through September (consistent with the CPUC Energy Efficiency Policy Manual, Version 2).
1. Gross Program-Projected savings are those savings projected by the program before NTG adjustments.
2. Net Evaluation Confirmed savings are those documented via the evaluation and include the evaluation contractor's NTG adjustments.

Table 3.11: SDG&E Program Energy Impact Reporting for 2004-2005 CalPOP Program

Program ID*:	1165-04							
Program Name:	CALIFORNIA WASTEWATER TREATMENT PLANT PROCESS OPTIMIZATION PROGRAM							
	Year	Calendar Year	Ex-ante Gross Program-Projected Program MWh Savings (1)	Ex-Post Net Evaluation Confirmed Program MWh Savings (2)	Ex-Ante Gross Program-Projected Peak Program MW Savings (1**)	Ex-Post Evaluation Projected Peak MW Savings (2**)	Ex-Ante Gross Program-Projected Program Therm Savings (1)	Ex-Post Net Evaluation Confirmed Program Therm Savings (2)
	1	2004	1,500	36	0.150	0.004		
	2	2005	1,500	36	0.150	0.004		
	3	2006	1,500	36	0.150	0.004		
	4	2007	1,500	36	0.150	0.004		
	5	2008	1,500	36	0.150	0.004		
	6	2009	1,500	36	0.150	0.004		
	7	2010	1,500	36	0.150	0.004		
	8	2011	1,500	36	0.150	0.004		
	9	2012	1,500	36	0.150	0.004		
	10	2013	1,500	36	0.150	0.004		
	11	2014	1,500	36	0.150	0.004		
	12	2015	1,500	36	0.150	0.004		
	13	2016	1,500	36	0.150	0.004		
	14	2017	1,500	36	0.150	0.004		
	15	2018	1,500	36	0.150	0.004		
	16	2019	1,500	36	0.150	0.004		
	17	2020	1,500	36	0.150	0.004		
	18	2021	1,500	36	0.150	0.004		
	19	2022	1,500	36	0.150	0.004		
	20	2023	1,500	36	0.150	0.004		
	TOTAL	2004-2023	30,000	715			-	-

* Form completed for the SCE program ID included in the evaluation.
NOTE: EX ANTE EFFECTIVE USEFUL LIFE (FROM POLICY MANUAL) USED IN THIS TABLE.
**Definition of Peak MW as used in this evaluation: Average kW reduction during the period Monday-Friday 12 p.m. - 7 p.m., during the months of June through September (consistent with the CPUC Energy Efficiency Policy Manual, Version 2).
1. Gross Program-Projected savings are those savings projected by the program before NTG adjustments.
2. Net Evaluation Confirmed savings are those documented via the evaluation and include the evaluation contractor's NTG adjustments.

Table 3.12 Sum of Energy Impacts for the 2004-2005 CalPOP Program Over 20 Years

Program IDs*:	1165-04 & 1159-04							
Program Name:	CALIFORNIA WASTEWATER TREATMENT PLANT PROCESS OPTIMIZATION PROGRAM							
	Year	Calendar Year	Ex-ante Gross Program-Projected Program MWh Savings (1)	Ex-Post Net Evaluation Confirmed Program MWh Savings (2)	Ex-Ante Gross Program-Projected Peak Program MW Savings (1**)	Ex-Post Evaluation Projected Peak MW Savings (2**)	Ex-Ante Gross Program-Projected Program Therm Savings (1)	Ex-Post Net Evaluation Confirmed Program Therm Savings (2)
	1	2004	5,000	2,353	0.500	0.282	-	-
	2	2005	5,000	2,353	0.500	0.282	-	-
	3	2006	5,000	2,353	0.500	0.282	-	-
	4	2007	5,000	2,353	0.500	0.282	-	-
	5	2008	5,000	2,353	0.500	0.282	-	-
	6	2009	5,000	2,353	0.500	0.282	-	-
	7	2010	5,000	2,353	0.500	0.282	-	-
	8	2011	5,000	2,353	0.500	0.282	-	-
	9	2012	5,000	2,353	0.500	0.282	-	-
	10	2013	5,000	2,353	0.500	0.282	-	-
	11	2014	5,000	2,353	0.500	0.282	-	-
	12	2015	5,000	2,353	0.500	0.282	-	-
	13	2016	5,000	2,353	0.500	0.282	-	-
	14	2017	5,000	2,353	0.500	0.282	-	-
	15	2018	5,000	2,353	0.500	0.282	-	-
	16	2019	5,000	2,353	0.500	0.282	-	-
	17	2020	5,000	2,353	0.500	0.282	-	-
	18	2021	5,000	2,353	0.500	0.282	-	-
	19	2022	5,000	2,353	0.500	0.282	-	-
	20	2023	5,000	2,353	0.500	0.282	-	-
	TOTAL	2004-2023	100,000	47,053			-	-

*This form is for the total energy impacts for the program across all IOU territories in which the program was implemented.
May be multiple ID numbers if implemented in more than one territory.
**Please include the definition of Peak MW used in the evaluation.
NOTE: EX ANTE EFFECTIVE USEFUL LIFE (FROM POLICY MANUAL) USED IN THIS TABLE.
**Definition of Peak MW as used in this evaluation: Average kW reduction during the period Monday-Friday 12 p.m. - 7 p.m., during the months of June through September (consistent with the CPUC Energy Efficiency Policy Manual, Version 2).
1. Gross Program-Projected savings are those savings projected by the program before NTG adjustments.
2. Net Evaluation Confirmed savings are those documented via the evaluation and include the evaluation contractor's NTG adjustments.

3.4.2 Cost Effectiveness

To re-estimate the cost-effectiveness of the CalPOP Program, the final PIP workbooks for PG&E and SDG&E provided by the Program Implementer were revised with the evaluated savings and the 20-year effective useful life as discussed in this report. In addition, we used the claimed number of projects shown in Table 3.1 and the evaluated gross savings and net-to-gross ratios shown in Table 3.8. Table 3.12 compares the benefit-cost ratios and net benefits originally proposed by the Program Implementer with the final evaluated results. These indicate that the CalPOP Program was cost-effective in the PG&E service area, but not in the SDG&E service area. This is consistent with the fact that Implementer was successful in implementing EEMs at its target number of treatment plants, 7, and achieved close to its calculated level of energy savings at the majority of those plants. By contrast, however, Implementer was successful at implementing EEMs at only 1 plant in the SDG&E service area and was not highly accurate in its calculation of the energy savings at that facility.

Table 3.13: Benefit-Cost Ratios

	TRC Parameter	Projected (from PIP)	Evaluated
PG&E			
	Costs	$966,626	$899,058
	Benefits	$2,353,638	$1,938,387
	Net Benefits*	$1,387,012	$1,039,329
	TRC Ratio*	2.43	2.16
SDG&E			
	Costs	$424,917	$227,496
	Benefits	$1,008,051	$33,705
	Net Benefits*	$583,134	($193,791)
	TRC Ratio*	2.37	0.13
Overall Program			
	Costs	$1,391,543	$1,126,554
	Benefits	$3,361,689	$1,972,091
	Net Benefits*	$1,970,146	$845,537
	TRC Ratio*	2.42	1.75

* Note: in some cases, PIP values are inconsistent, so we assumed Costs and Benefits were correct and recalculated Net Benefits and Ratio.

4. Conclusions

The Program had a definitive positive impact on creating energy savings among the targeted wastewater treatment plants. There is a need for a program of this nature to stimulate energy efficiency improvements in small, resource-limited plants and Implementer effectively delivered a useful program to nearly all of the facilities. Most participants required some program assistance in order to effectively implement the energy efficiency measures. The Program provided two primary functions which had direct influence on successfully implementing efficiency measures: the Program removed the project planning and execution burden from plant staff and/or the Program provided the analysis and financial stimulation needed in getting projects of this nature approved by authorizing bodies.

The key conclusion from the impact portion of the evaluation is that the CalPOP Program was cost-effective in the PG&E service area. However, the Program was not cost-effective in the SDG&E service area. Had there been more than one project completed in the SDG&E service area the Program might also have been cost-effective in that area.

The Program realized 83% of its evaluated first-year net energy savings as compared to its net goal in the PG&E service area. The Program realized 99% of its evaluated first-year net average peak demand reduction as compared to its net goal in the PG&E service area. However, the low savings achievement in the SDG&E service area 3% and 3%, respectively, reduced the overall Program values to 59% and 71%, respectively.

Additional plants in both the PG&E and the SDG&E service areas had expressed interest in participating in the Program. A key factor that reduced the number of participants was inability to obtain final budget approval from the ultimate decision-making body in timely fashion. At other facilities, staffing changes inhibited timely consideration of participating in the Program. These issues are examples of the difficulties in successful recruitment and implementation of efficiency measures over a relatively short period of time.

Overall, program administration and delivery was found to be effective. Customers for the most part responded well to the program and were satisfied with the results. Several participants reported that the Program exceeded their expectations. The Program was found to have a strong influence on customers implementing energy saving measures with only one case of free-ridership reported by the participants.

One of the programs most obvious strengths is ease of participation. The target market for the Program is small wastewater treatment plants. These plants are often understaffed or do not have staff resources that can be dedicated to improving energy efficiency. Maintaining a Program that retains a focus on ease of participation is critical. Burdensome administrative processes present significant barriers to participation.

Program Implementers should work with vendors or contractors cautiously for promoting the program. A Program whose goal has a small number of participants can limit the risk associated with free-ridership by maintaining strict control over recruiting participants. This procedure will help ensure the Program only facilitates the implementation of those EEMs that truly would not have otherwise been implemented.

Wastewater treatment plants, especially small resource-limited plants, are reluctant to execute process changes. Barriers to implementing energy efficiency measures are not limited to staff and financial resources. Risk aversion and technological skepticism are barriers that need to be addressed. In several cases plant managers found that measures installed performed at or better than pre-program levels. However, there was one case in which the installed equipment is beginning to fail. Program Implementers should prudently install equipment that is proven to perform. Using equipment that has been successfully demonstrated at other facilities will help Implementers overcome this type of issue.

5. Attachments

5.1 Participant Interview Protocol

California Wastewater Treatment Plant Process Optimization Program
Program Participant In-Depth Interview Protocol

Introduction

Hello, my name is _____. I am calling from Glacier Consulting Group on behalf of the California Wastewater Treatment Plant Optimization Program, sometimes referred to as CalPOP that was offered by Quantum Consulting for improving energy efficiency. The Utility Commission requires that a study be conducted to assess the effectiveness the program. Glacier Consulting has been commissioned to conduct the study. Your feedback about the program is particularly important to determining whether the program should be offered in future years and if so, to help identify improvements. This interview will take about 15 minutes to complete. (If not a convenient time to conduct the interview, schedule a call back.)

Screener

S1. Are you the person at your plant that is most knowledgeable about the program?
1. Yes
2. No →Transition to the person that is most knowledgeable about the program.

Process Evaluation

Q1. When did you first become aware of CalPOP?
ENTER YEAR AND MONTH _____
98. (Not sure)

Q2. How long have you been involved with CalPOP?
ENTER YEAR AND MONTH _____
98. (Not sure)

Q3. How did you first hear about the program?

Program Satisfaction

Q4. Using a scale of excellent, very good, average, fair, or poor, how would you rate your overall satisfaction with CalPoP?
1. Excellent
2. Very good
3. Average
4. Fair
5. Poor
98. (Not sure)
99. (refused)

Q5. Using the same scale, how would you rate your satisfaction with the administrative process you went through in order to participate in the program?
1. Excellent
2. Very good
3. Average
4. Fair
5. Poor
98. (Not sure)
99. (refused)

Q6. How could the administrative process be improved?

Q7. How would you rate the quality of workmanship you received from the program contractor?
1. Excellent
2. Very good
3. Average
4. Fair
5. Poor
98. (Not sure)
99. (refused)

Q8. Using a scale of excellent, very good, average, fair, or poor, how would you rate your satisfaction with the program contractor's technical expertise?
1. Excellent
2. Very good
3. Average
4. Fair
5. Poor
98. (Not sure)
99. (refused)

Q9. Using the same scale, how would you rate the program implementers on being responsive to your questions?
1. Excellent
2. Very good
3. Average
4. Fair
5. Poor
98. (Not sure)
99. (refused)

Q10. When you think about the amount of time it took from initially entering the program until the work at your facility was complete, how would you rate your satisfaction with the amount of time it took to complete this process?
1. Excellent
2. Very good
3. Average
4. Fair
5. Poor
98. (Not sure)
99. (refused)

Q11. How could the amount of time it took to complete this process be shortened?

Q12. What two or three things could be changed that would dramatically improve the CalPop program?

Q13. What two or three things about the CalPop program work particularly well?

Q14. Please describe the process you went through regarding your involvement and participation in CalPop.

Training

Q15. Did you or your staff attend or receive any training as part of your involvement with CalPOP?
1. Yes
2. No →Skip to Q21

Q16. Please describe the training that you received.

Q17. Using a scale of excellent, very good, average, fair, or poor, how would you rate your satisfaction with the training your staff received as part of your involvement with CalPoP?
1. Excellent
2. Very good
3. Average
4. Fair
5. Poor
98. (Not sure)
99. (Refused)

Q18. Did you and your staff receive enough training to make you feel comfortable operating and maintaining the installed equipment? Please explain.

Q19. From the training you received through CalPoP, what did you find most beneficial?

Q20. How could the training have been improved?

Net-to-Gross

Q21. I need to verify which energy efficiency measures where installed at your location. According to our records you implemented the following measures:
1. MEASURE1
2. MEASURE2

Q22. Is this correct?
1. Yes →Skip to Q24
2. No

Q23. What changes to this list do I need to make?
1. MEASURE1
2. MEASURE2
3. MEASURE3

[INTERVIEWER NOTE: Ask Q24 – Q32 for each MEASURE listed above.]

I would like to ask you a few questions about each measure installed. Let's start with MEASURE1.

Q24. Prior to becoming involved with CalPOP, were you aware that MEASURE technology was available?
1. Yes
2. No →Skip to Q26

Q25. How familiar were you with the technology? Would you say you were…?
1. Very familiar
2. Somewhat familiar

3. Not very familiar
4. Not at all familiar

Q26. Did MEASURE replace an existing system or function in whole or in part or was MEASURE installed as an addition to an existing system?
1. Whole
2. In part
3. In addition to →Skip to Q30
4. (Other _____) →Skip to Q30

Early Replacement
Q27. How much longer before you would have replaced the old system?
ENTER YEARS AND MONTHS _____
98. (Not sure)

Q28. Before your involvement with CalPoP, would you have replaced the old system with MEASURE or the same or a similar system?
1. Energy efficient system
2. Same/similar system
98. (Not sure)

Q29. After installation of MEASURE, does this system perform…
1. Much better
2. Somewhat better
3. About the same
4. Somewhat worse
5. Much worse
98. (Not sure)

Q30. Has MEASURE performed as you expected? Please explain.

Q31. If you had never heard of or gotten involved with CalPop, would you have installed MEASURE?
1. Yes
2. No
98. (Not sure)

Q32. Please explain. Why or why not?

Final Comments
Q33. What final suggestions do you have for improving CalPop?

Q34. Is there anything else that you would like to add?