Final Report: Evaluation of the California Statewide Emerging Technologies Program

Prepared by

Summit Blue Consulting, LLC

ADM Associates, Inc.
California Technology International, Inc.
E SOURCE
Energy Market Innovations
Opinion Dynamics Corporation

For the

California Public Utilities Commission
Energy Division

February 3, 2010

Submitted to:

Ayat Osman
505 Van Ness Avenue
California Public Utilities Commission
Energy Division
San Francisco, CA 94102

Submitted by:

Brent Barkett, Principal
Summit Blue Consulting (now a part of Navigant Consulting)
1722 14th Street, Ste, 230
Boulder, CO 80302
720.564.1130

ABBREVIATIONS

CEC	California Energy Commission
CEE	Center for Energy Efficiency
CIEE	California Institute for Energy Efficiency
CPUC	California Public Utilities Commission
DEER	Database for Energy Efficiency Resources
DOE	Department of Energy
DSM	Demand-Side Management
ED	Energy Division (of the California Public Utilities Commission)
EE	Energy Efficiency
EM&V	Evaluation, Measurement, and Verification
ETCC	Emerging Technologies Coordinating Council
ETP	Emerging Technologies Program
IOU	Investor-Owned Utility
MECT	Master Evaluation Contractor Team
PG&E	Pacific Gas and Electric
PGC	Public Goods Charge
PIER	Public Interest Energy Research
PIP	Program Implementation Plan
R&D	Research and Development
SCE	Southern California Edison
SCG	Southern California Gas
SDG&E	San Diego Gas and Electric
TTC	Technology Test Center
VC	Venture Capital

EVALUATOR CONTACT INFORMATION

Contact information for key members of the evaluation team is as follows:

Table ES-1. Key Evaluator Contact Information, by Firm

	Name	Address	Email	Phone
Summit Blue Consulting	Brent Barkett	1722 14th St. Suite 230 Boulder, CO 80302	bbarkett@summitblue.com	(720) 564-1130
ADM Associates	Don Dohrmann	3239 Ramos Circle Sacramento, CA 95827	dohrmann@adm-energy.com	(916) 363-8383
California Technology International	Andrew Isaacs	P.O. Box 12005 Berkeley, CA 94712	isaacs@haas.berkeley.edu	(408) 306-2469
E Source	Dan Greenberg	1965 N 57th Ct Boulder, CO 80301	dan_greenberg@esource.com	(303) 345-9118
EMI	Robert Bordner	83 Columbia Street, Suite 303 Seattle, WA 98104	rbordner@emi1.com	(206) 621-1160
Opinion Dynamics Corporation	Mary Sutter	2415 Roosevelt Drive Alameda, CA 94501	msutter@opiniondynamics.com	(510) 864-8507
SDV/ACCI	Alex Norton	21144 Mission Blvd Hayward, CA 94541	anorton@sdvacci.com	(510) 538- 4280

Contact information for the Energy Division and Master Evaluation Contractor Team is as follows:

	Name	Address	Email	Phone
CPUC: Energy Division	Ayat Osman	CPUC Energy Division 505 Van Ness Avenue San Francisco, CA 94102	aeo@cpuc.ca.gov	(415) 703-5953
MECT: Ridge and Associates	Richard S. Ridge	3022 Thompson Avenue Alameda, CA 94501	rsridge@comcast.net	(510) 865-6011

ETP Final Report Public Information

Document access information and public comment and meeting period information:

Website: http://www.energydataweb.com/cpuc/

Emerging Technologies Program:

- November 17, 2009: Draft report posted for public comments
- December 11, 2009: Public comment period closed
- November 20, 2009: Public webinar to address questions and comments on the report

TABLE OF CONTENTS

APPENDICES

Executive Summary

This report represents the final major reporting deliverable prepared by the Summit Blue Consulting team (evaluation team) as part of the evaluation of the 2006-2008 California Statewide Emerging Technologies Program (ETP or Program) as designed and implemented by the four investor-owned utilities – Pacific Gas and Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas and Electric (SDG&E) – collectively referred to as the IOUs or the utilities.[1] The report is the last of three major reporting deliverables prepared by the evaluation team and it builds upon the observations and findings presented in the first and second interim reports. In addition, the report presents final findings and recommendations generated by the evaluation team based on all completed research tasks including integration of findings across tasks as well as within the evolving programmatic and regulatory landscape in California.

It is important to note that this evaluation was focused on assessing the ETP as implemented during the 2006-2008 program cycle.

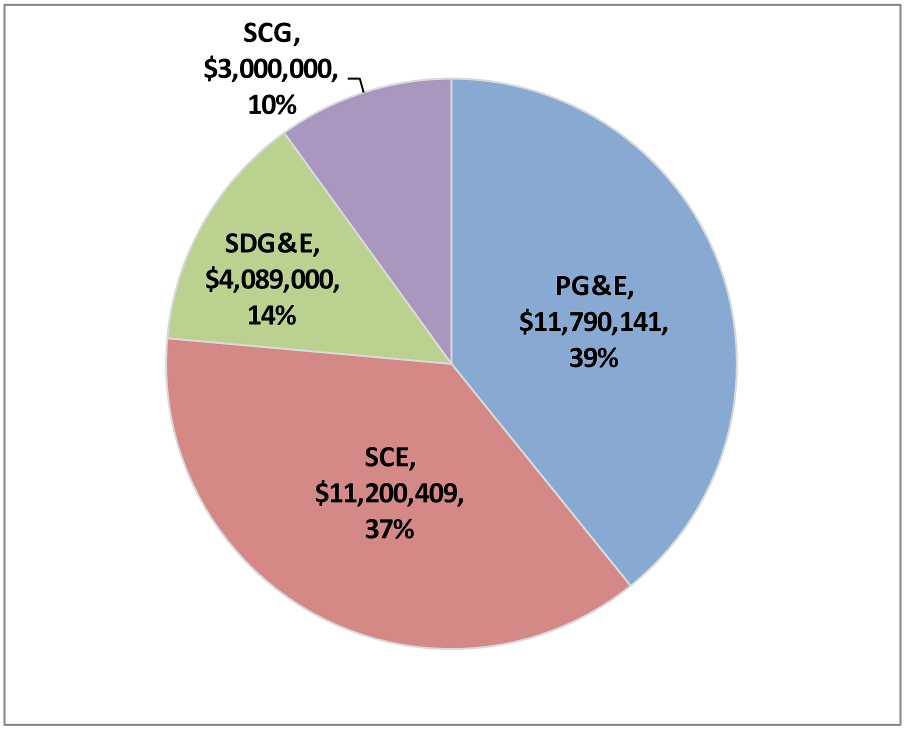
E.1 The Emerging Technologies Program (2006 – 2008 Program Cycle)

The ETP as implemented during the 2006-2008 program cycle sought to accelerate the introduction of innovative energy efficiency technologies, applications, and analytical tools that are not widely adopted in California. The ETP was classified as an information-only program and relied primarily on technology assessments, case studies, and information dissemination to accomplish its goals. Information generated by the ETP was primarily disseminated to IOU EE program managers to assist in preparing the workpapers necessary to support the inclusion of emerging technologies in IOU EE programs. The ETP managers employed various tactics to identify promising technologies, design tools, strategies, and services. Some were identified by working closely with Public Interest Energy Research (PIER), while others were identified through discussions with other entities, such as national laboratories, universities, inventors, trade groups, and energy efficiency advocates. An important medium of information exchange between the ETP and other entities was the Emerging Technologies Coordinating Council (ETCC), a statewide coordination effort comprised of quarterly meetings of interested stakeholders, a bi-annual ETP summit, and a dedicated website and database, all of which were intended to provide a forum for interested stakeholders to remain apprised of ETP activities.

While the IOUs shared the same overarching program goals during the 2006-2008 program cycle, levels of funding differed by IOU, and, as a result, staff sizes, the number of technology assessments that could be initiated, and the size of program marketing efforts also differed by IOU. The budget for the ETP during the 2006-2008 program cycle was approximately $30 million allocated across IOUs as shown in Figure E-1.

[1] Sempra Energy was created in 1998 by a merger of SCG and SDG&E and this report uses the title "Sempra" to refer to the resulting utility organization. Where relevant, results are disaggregated to highlight differences between SCG and SDG&E.

Figure E-1. ETP Budget Allocation across IOUs, 2006-2008 Program Cycle

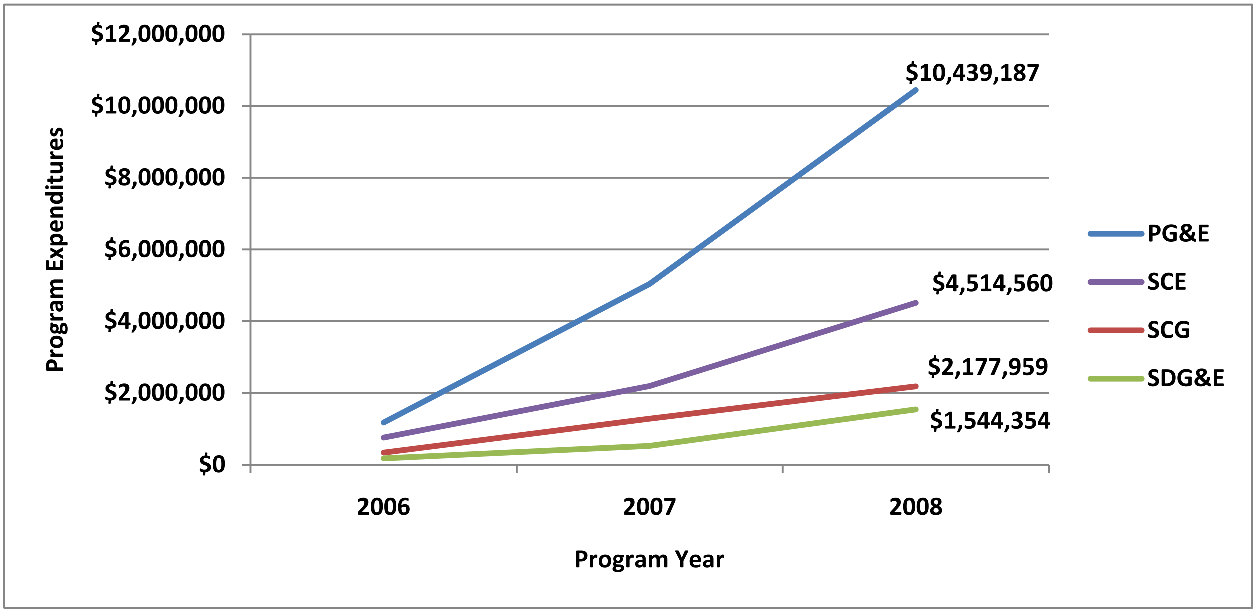


Source: PG&E, SCE, SDG&E, SCG 2006-2008 Energy Efficiency Programs Statewide Emerging Technologies Program Summaries (2006).

Through December 31, 2008, statewide program expenditures were approximately 62 percent of the budgeted $30 million according to data presented on the CPUC's Energy Efficiency Groupware Application (EEGA) website (see Figure E-2).[2] The evaluation team does not know the reason for the observed level of expenditure but notes that it could be due to a variety of factors including non-current program data on the EEGA website, accounting methods that do not consider expenditures firm until assessment projects are completed, and/or the program's ability to meet its stated goals at a reduced level of spending, among others.

[2] http://eega2006.cpuc.ca.gov. The EEGA website did not present adequate data to disaggregate total expenditures by program operation (e.g., administration, assessment, etc.).

Figure E-2. ETP Expenditures through December 31, 2008



Source: EEGA, Program Expenditures Report (accessed January 15, 2010).

E.2 Overarching Evaluation Goals

The evaluation of the ETP was focused on four overarching goals:

1. To conduct an ***Evaluability Assessment***: The essence of this goal was to determine the extent to which the data necessary to address each of the remaining three evaluation goals were available and, if not, whether they could be collected in a cost-effective manner.

2. To conduct a ***Program Design Assessment***: The essence of this goal was to review, document, and assess the design of each IOU ETP. The intent of the goal was to gauge the extent to which each IOU ETP, as designed during the 2006-2008 program cycle, was capable of meeting the needs of California for future energy efficiency technologies and, if not, how the programs should be restructured.

3. To conduct a ***Program Implementation Assessment***: The essence of this goal was to assess how effectively and efficiently each IOU ETP was being implemented during the 2006-2008 program cycle, including any synergies that emerged from statewide collaboration.

4. To conduct an ***Impact Assessment***: The essence of this goal was to document the extent to which short-, mid-, and long-term objectives were being achieved by each IOU ETP during the 2006-2008 program cycle, including the extent to which ETP technologies have been transferred to utility EE programs.

These four primary goals informed the development of a research agenda that comprehensively assessed the ETP as implemented during the 2006-2008 program cycle. The agenda, which included multiple data collection efforts and analysis methods, was implemented by the evaluation team over a multi-year timeframe beginning in fall 2007.

E.3 Approach

The approach used by the evaluation team relied upon the Emerging Technologies and Process Evaluation Protocols specified in the *California Energy Efficiency Evaluation Protocols*.[3] Following the evaluability assessment, the team undertook a number of activities linked to the elements of the Protocols to achieve the remaining three goals of this evaluation. These Protocol elements included the following:

- Program theory and logic model;
- Development of key performance indicators;
- Business Risk Assessment[4] framework development;
- Aggregate analysis;
- Verification of basic achievements;
- Program implementation and delivery;
- Measure tracking;
- Peer review; and
- Literature review.

The development of a Business Risk Assessment framework was proposed by the evaluation team. Rather than replacing elements of the Protocols, the Business Risk Assessment effort seeks to complement the Protocol elements by providing a broader business perspective to more fully understand the process of technology commercialization. In other words, the Business Risk Assessment, focused on the screening phase, is simply another tool by which to conduct the Program Implementation Analysis required by the Protocols.

The evaluation team used a combination of primary and secondary data sources to conduct the assessment of the ETP. Most primary research tasks (i.e., Aggregate Analysis, Case Studies, Business Risk Assessment, Peer Reviews, and impact assessment) involved primary data collection with ETP staff. The evaluation team carefully planned the implementation of these primary data collection efforts in order to increase the efficiency of the data collection and minimize the burdens placed on ETP staff while responding to the multiple efforts. The evaluation team used overlapping samples and a staggered data collection schedule to meet these objectives.

It is important to note that ETP staff across the IOUs was instrumental in assisting the evaluation team in developing a better understanding of the ETP. Program staff responded to data requests made by the evaluation team; participated in numerous in-person meetings, workshops, and webinars to discuss project activities; worked with the evaluation team to resolve questions and gaps in existing program tracking data; and participated in the various data

[3] TecMarket Works Team. June 2006. *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. Prepared for the California Public Utilities Commission.

[4] This task was originally titled "Portfolio Evaluation" in previous deliverables prepared by the evaluation team. It has been renamed "Business Risk Assessment" after consultation with the IOUs and the CPUC to better reflect the nature of the work. The title "Business Risk Assessment" is used throughout this final report.

collection efforts initiated by the evaluation team. This collaboration helped clarify discussion points as they arose and ensured that the evaluation team developed accurate interpretations of program processes and the associated impacts. The evaluation team appreciates the input provided by ETP staff and their active engagement throughout the project.

E.4 Summary of Findings and Recommendations

Based on the work conducted over the course of this evaluation, the evaluation team concluded that the design of the ETP as implemented during the 2006-2008 program cycle was plausible and that the implementation processes developed by the utilities were consistent with the broad program intentions outlined within the corresponding Program Implementation Plans (PIPs). In addition, the team found that ETP staff had acted on recommendations made in prior program evaluations and had met their goals in terms of the following three metrics documented in the 2006-2008 PIPs to be used to measure the progress of the Statewide ETP:

1. Number of technology assessments initiated:

Utility	Technology Assessments Specified in 2006-2008 PIP	Technology Assessments Actually Initiated (2006-2008 Program Cycle)
PG&E	45	67
SCE	45	54
SDG&E	20	20
SCG	18	25

Source: ETP tracking data compiled into master evaluation database.

2. Annual updates to the Emerging Technology Database
3. Quarterly meetings of the Emerging Technologies Coordinating Council

A high level synopsis of additional ETP activities during the 2006 – 2008 program years includes the following:

- PG&E focused primarily on lighting and HVAC projects while SCE focused primarily on lighting and industrial process projects and Sempra focused primarily on lighting and water projects;
- The majority of projects surveyed for PG&E (88%) and SCE (77%) were expected to obtain both electrical energy (kWh) and demand (kW) savings while the majority of Sempra's projects (69%) were expected to generate gas (therm) savings;
- Analysis of utility ETP and EE program tracking systems revealed that PG&E's transferred ETP technologies had generated approximately 59 GWh of ex ante expected first year gross savings and that that SCE's transferred ETP technologies had generated approximately 196 GWh of ex ante expected first year gross savings. Although some technologies identified by Sempra ETP projects were recommended for consideration as EE program measures, no activity for transferred ETP technologies was recorded in Sempra EE program tracking system data for the period 2006 –2008.

As discussed in Section 6.2, a variety of ETP technologies have generated the observed ex ante expected first year gross savings impacts. The majority of impacts can be attributed to lighting technologies (e.g., evaluations of commercial lighting technologies and residential LED downlights), HVAC technologies (e.g., residential air conditioner charge and air flow verification study and evaluations of commercial air conditioning equipment), and information technologies (e.g., computer network power save software and 80+ personal computers).

The evaluation team also observed inconsistencies in program operations across the utilities and numerous opportunities to improve program performance. The following needs were most notable:

- Improved quality and consistency of documentation of program processes, procedures, and corresponding decision-making (e.g., technology selection and transfer decisions, technology migration through the ETP);
- Expanded use of interdisciplinary project teams, one of the hallmarks of successful product development efforts, to improve technology selection processes and increase the likelihood that candidate technologies will succeed in EE programs as well as in the broader market;
- Development of more robust technical and market potential estimates, as well as enhanced market research, for technologies being considered for inclusion in the Program to help prioritize ETP investment decisions;
- Expansion of the technology selection process to include a broader array of stakeholder interests and perspectives, to increase the transparency and rigor with which the process is undertaken, and to ensure that technology selection priorities align with the ultimate goals of the ETP as specified by ETP staff and the CPUC;
- Increased collaboration with EE program staff and the CPUC to create consistent project naming and numbering conventions, decision documentation, and feedback loops between the ETP and the EE programs to which technologies were recommended for transfer;
- Enhanced data tracking systems and activities (e.g., assigning unchanging master ID numbers to ETP projects, archiving data in a standard format as it is collected) to facilitate informative review of and provide insights into the ETP;
- Increased collaboration with the CPUC and other program stakeholders to establish standards for the design, execution, and documentation of technology assessments to promote consistently high-quality assessment projects, and thereby the value of the ETP; and
- Continued dialogue with the CPUC to ensure a smooth transition to the 2010-2012 program cycle by reaching agreement on the indicators that will be used to assess program progress during the 2010-2012 evaluation cycle, the success criteria associated with these indicators, and the requisite data collection and documentation processes to be incorporated into program implementation.

The remainder of this report provides additional detail regarding these topics and other aspects of the ETP as implemented during the 2006-2008 program cycle. The successes and challenges of the program are noted as are the evaluation team's recommendations for improving the program performance. The results are timely given the ongoing transition to the modified and enhanced design of the ETP as it will be implemented during the 2010-2012 program cycle as well as stakeholder perceptions of the ETP's role within the existing regulatory framework.

1 INTRODUCTION

This report represents the final major reporting deliverable prepared by the Summit Blue Consulting team (evaluation team) as part of the evaluation of the 2006-2008 California Statewide Emerging Technologies Program (ETP or Program) as designed and implemented by the four investor-owned utilities – Pacific Gas and Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas and Electric (SDG&E) – collectively referred to as the IOUs or the utilities.[5] The report is the last of three major reporting deliverables prepared by the evaluation team and is referred to as the final report. The report builds upon the observations and findings presented in the first and second interim reports prepared by the evaluation team[6] by providing updated information regarding the research tasks undertaken by the team over the course of the project and describing additional research activities implemented by the team after completion of the first two reports. In addition, the report presents final findings and recommendations generated by the evaluation team based on all completed research tasks including integration of findings across tasks as well as within the evolving programmatic and regulatory landscape in California. The evaluation team considers this report to be summative in nature; therefore, the results of initial evaluation tasks completed by the evaluation team and reported in the first and second interim reports (e.g., program process mapping, final program theory and logic models) are repeated herein to create a cumulative body of knowledge regarding the Program.[7]

It is important to note that this evaluation was focused on assessing the ETP as implemented during the 2006-2008 program cycle. As the evaluation was being conducted, the IOUs were working with the Energy Division (ED) of the California Public Utilities Commission (CPUC) and other stakeholders to finalize the program plans and associated budgets for the ETP to be implemented during the 2010-2012 program cycle.[8] The IOUs appear to have considered many of the interim findings generated during the course of this evaluation while developing the modified and enhanced design of the ETP as it will be implemented during the 2010-2012 program cycle; however, the evaluation team is not certain of this as an assessment of the revised (i.e., 2010-2012) program design is outside the scope of this evaluation.

[5] Sempra Energy was created in 1998 by a merger of SCG and SDG&E and this report uses the title "Sempra" to refer to the resulting utility organization. Where relevant, results are disaggregated to highlight differences between SCG and SDG&E.

[6] Summit Blue Team, July 2008. *Interim Report #1 for the PY 2006-08 California Statewide Emerging Technologies Program*. Prepared for the California Public Utilities Commission and Summit Blue Team, July 2009. *Interim Report #2 for the PY 2006-08 California Statewide Emerging Technologies Program*. Prepared for the California Public Utilities Commission.

[7] The Literature Review completed as an initial task by the evaluation team is presented in Appendix A.

[8] As noted in the Proposed *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets* (CPUC, August 25, 2009), the CPUC changed the timeframe for implementing the subsequent program portfolio from 2009-2011 to 2010-2012 in response to the lengthy development and review process associated with finalizing the program plans.

1.1 Overarching Evaluation Goals and Schedule

The evaluation of the ETP sought to assess the impacts of the Program on statewide energy efficiency (EE) efforts in order to ensure that public goods charge (PGC) funds are prudently spent. It also sought to provide feedback from an independent source on program implementation effectiveness that is aimed at helping program staff improve the design and delivery of the ETP to better meet program objectives, as well evolving strategic objectives. The evaluation was directed by the CPUC ED with the assistance of the Master Evaluation Contractor Team (MECT), which provided guidance on evaluation methods and interpretation of the *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals* (Protocols).[9] As described in the first interim report, this evaluation was the first evaluation of the ETP to be guided by the Protocols, and the evaluation team was careful to apply the requirements specified in the Protocols while also considering findings and lessons learned from previous evaluations of the Program.[10]

As outlined in the evaluation plan[11] and guided by the Protocols, the evaluation of the ETP was focused on four overarching goals:

1. To conduct an *Evaluability Assessment*: The essence of this goal was to determine the extent to which the data necessary to address each of the remaining three evaluation goals were available and, if not, whether they could be collected in a cost-effective manner.

2. To conduct a *Program Design Assessment*: The essence of this goal was to review, document, and assess the design of each IOU ETP.[12] The intent of the goal was to gauge the extent to which each IOU ETP, as designed during the 2006-2008 program cycle, was capable of meeting the needs of California for future energy efficiency technologies and, if not, how the programs should be restructured.

3. To conduct a *Program Implementation Assessment*: The essence of this goal was to assess how effectively and efficiently each IOU ETP was being implemented during the 2006-2008 program cycle, including any synergies that emerged from statewide collaboration.

4. To conduct an *Impact Assessment*: The essence of this goal was to document the extent to which short-, mid-, and long-term objectives were being achieved by each IOU ETP during the 2006-2008 program cycle, including the extent to which ETP technologies have been transferred to utility EE programs.

---

[9] TecMarket Works Team, June 2006. *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. Prepared for the California Public Utilities Commission.

[10] The ETP has been formally evaluated four times prior to this effort. A synopsis of these previous evaluations is presented in Section 2.1.1 of the first interim report.

[11] Summit Blue Team, February 2008. *Evaluation Plan for the PY 2006-08 California Statewide Emerging Technologies Program*. Prepared for the California Public Utilities Commission.

[12] The statewide ETP is administered by the four IOUs: Pacific Gas and Electric (PG&E), Southern California Edison (SCE), San Diego Gas and Electric (SDG&E), and Southern California Gas (SCG).

These four primary goals informed the development of a research agenda that comprehensively assessed the ETP as implemented during the 2006-2008 program cycle. The agenda, which included multiple data collection efforts and analysis methods, as described in subsequent chapters of this report, was implemented by the evaluation team over a multi-year timeframe beginning in fall 2007 with an expected completion date on or before February 2010.

1.2 Purpose and Objectives of the Final Report

This report is the last of three major reporting deliverables prepared by the evaluation team as part of the evaluation of the ETP. The CPUC ED requested a three phase reporting cycle to create opportunities for the evaluation team to generate interim results that could be used to inform utility program implementation and planning decisions during the 2006-2008 program cycle as well as during the transition to the 2010-2012 program cycle.[13]

This final report builds upon observations and findings presented in the first and second interim reports by providing updated information regarding initial research tasks undertaken by the evaluation team and describing additional research activities implemented by the evaluation team after completing the first two reports. More specifically, the primary research objectives of this phase of the evaluation and the related contents of this report, as outlined in the evaluation plan, are summarized in Table 1-1.[14]

[13] The transition from the 2006-2008 program cycle to the 2010-2012 program cycle is currently underway, with the CPUC recently issuing a proposed decision approving the IOUs' 2010-2012 program plan and budgets. See the Proposed *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets* (CPUC, August 25, 2009).

[14] Given the evolution of ETP implementation processes during the 2006-2008 program cycle, initial findings generated during the evaluation showing that ETP information dissemination activities were focused more on internal IOU audiences (e.g., energy efficiency program managers, account representatives, etc.) than external stakeholders, and IOU comments received in response to the first interim report, it was decided that the target audience surveys described in the evaluation plan were no longer a necessary component of the current evaluation. Therefore, the reference to target audience surveys that was shown in the evaluation plan has been removed from Table 1-1.

Table 1-1. Research Objectives Linked to Final Report

Research Objective	Anticipated Deliverable
Assess the availability of data for both process and impact evaluations.	Summary of content with additional synthesis as appropriate from Interim Reports 1 and 2 (Full Report)
Describe the ETP that each utility states that it is currently implementing.	Summary of content with additional synthesis as appropriate from Interim Reports 1 and 2 (Full Report)
Assess the plausibility of each ETP design.	Characterization of each IOU ETP portfolio according to best practices and Business Risk Assessment[15] framework (Chapter 4) Final list of key performance indicators, based on best practices and Business Risk Assessment framework (Chapter 4) Recommendations as appropriate for changes to design of ETP based on knowledge of program, portfolio, and best practices (Chapter 7) Summary of content with additional synthesis as appropriate from Interim Reports 1 and 2 (Full Report)
Determine the extent to which the intended ETP design is being faithfully implemented	Final findings on barriers to implementation (Chapter 5) Summary of content with additional synthesis as appropriate from Interim Reports 1 and 2 (Full Report)
Assess the performance of each *activity & output* linkage in the ETP logic model.	Final Case Studies (Chapter 5) Complete process map for technology identification, screening, selection, and assessment processes (Chapter 5) Assessment of program performance relative to key performance indicators (Chapters 4 – 6) Assessment of resource deployment (Chapters 4 – 6) Summary of content with additional synthesis as appropriate from Interim Reports 1 and 2 (Full Report)
Assess the extent to which the statewide approach to ETP creates synergies.	Recommendations for more effective use of ETCC meetings (Chapters 5 & 7) Recommendations for improving the ETCC database to further program goals (Chapters 5 & 7) Summary of content with additional synthesis as appropriate from Interim Reports 1 and 2 (Full Report)
Assess the performance of each impact *outcome* linkage in each IOU's ETP logic model.	Technology trail profiles of selected technologies (Chapter 6) Final recommendations for tracking progress of ETP technologies. (Chapters 6 & 7) Summary of content with additional synthesis as appropriate from Interim Reports 1 and 2 (Full Report)
Assess overall technology assessment project performance for sampled projects.	Results of the Peer Reviews (Chapter 6) Evaluation of the Peer Review teams (Chapter 6)

[15] This task was originally titled “Portfolio Evaluation” in previous deliverables prepared by the evaluation team. It has been renamed “Business Risk Assessment” after consultation with the IOUs and the CPUC to better reflect the nature of the work. The title “Business Risk Assessment” is used throughout this final report.

This final report represents the culmination of a series of interactions among the CPUC ED and MECT project management team, the evaluation team, ETP staff, and project stakeholders that was designed to provide ongoing feedback regarding program design, implementation processes, and associated impacts. The interactions, which included workshops, meetings, memoranda, and webinars, in addition to the interim and final reports, were intended to establish a dialogue regarding the various methods employed by the evaluation team as well as the findings generated during the evaluation. Such a dialogue helped enhance the evaluation team's ability to conduct a credible and transparent evaluation of the ETP as implemented during the 2006-2008 program cycle in a manner that provided timely and unbiased results to the CPUC ED, ETP staff, and other project stakeholders.

1.3 Organization of Report

The remainder of this final report is organized in the following manner:

- Chapter 2 provides a brief overview of the evaluation of the ETP including a synopsis of select observations and findings presented in the first and second interim reports.
- Chapter 3 summarizes the methods employed to gather and analyze the information and data needed to support this evaluation and documents the multiple activities used to conduct the evaluation.
- Chapter 4 presents findings related to the program design assessment, including presentation of the final ETP theory and logic models and associated key performance indicators, as well as discussion of the Business Risk Assessment and Aggregate Analysis components of the evaluation.
- Chapter 5 presents findings related to the program implementation assessment including discussion regarding the process mapping exercise conducted by the evaluation team and the nature of interactions among participants at the Emerging Technologies Coordinating Council (ETCC) meetings, as well as discussion of the Stakeholder Interviews and Case Studies conducted as part of the current evaluation.
- Chapter 6 presents findings related to the impact assessment including discussions of data organization and synchronization tasks, efforts by the evaluation team to develop a database to support program tracking, management and evaluation efforts, an assessment of the technologies that have been transferred from the ETP to IOU EE programs, and the Peer Review evaluation component.
- Chapter 7 presents findings and recommendations generated by the evaluation team during the course of the evaluation, including integration of results across evaluation components.

2 BACKGROUND

This chapter provides background information regarding the evaluation of the 2006-2008 ETP including:

- A brief discussion of program implementation processes (Section 2.1)
- A summary of select observations and findings presented in the first and second interim reports prepared by the evaluation team (Section 2.2).

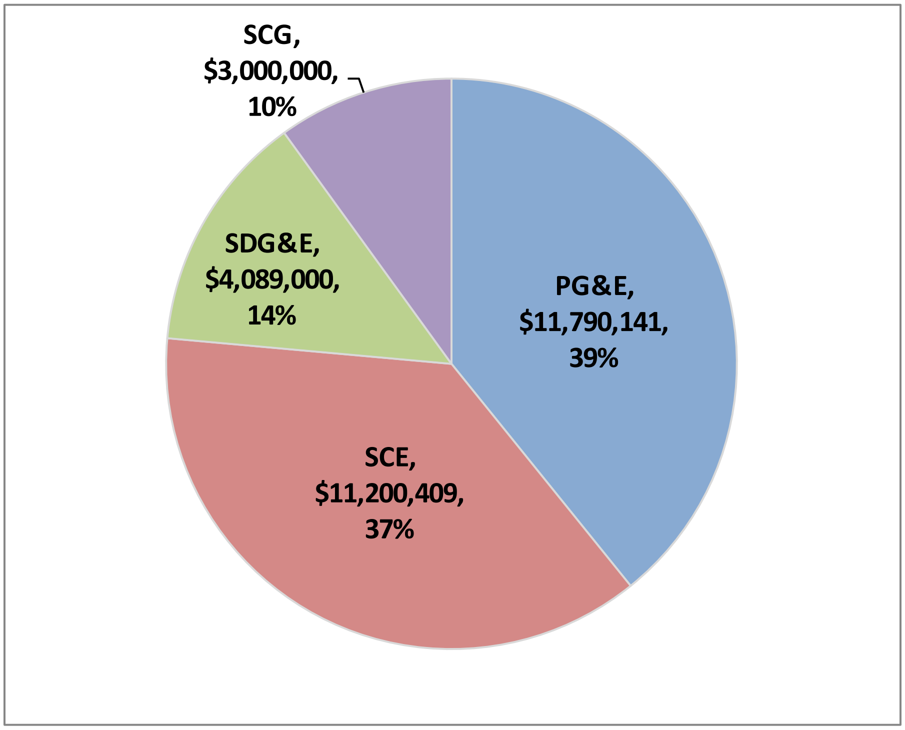
The first interim report presented a comprehensive historical overview of the ETP including detailed discussions of how the Program has evolved over time in response to numerous factors including the evolving nature of California energy policy, results of the four previous evaluations of the ETP as implemented during prior program cycles, and ETP objectives and activities as specified in the Program Implementation Plans (PIPs) developed for the 2006-2008 program cycle. This chapter is not intended to restate that information; rather, the chapter is intended to briefly provide context for ongoing evaluation activities.

2.1 The Emerging Technologies Program (2006 – 2008 Program Cycle)

The ETP as implemented during the 2006-2008 program cycle sought to accelerate the introduction of innovative energy efficiency technologies, applications, and analytical tools that are not widely adopted in California. The ETP was classified as an information-only program and relied primarily on technology assessments, case studies, and information dissemination to accomplish its goals. Information generated by the ETP was primarily disseminated to IOU EE program managers to assist in preparing the workpapers necessary to support the inclusion of emerging technologies in IOU EE programs. The ETP managers employed various tactics to identify promising technologies, design tools, strategies, and services. Some were identified by working closely with Public Interest Energy Research (PIER), while others were identified through discussions with other entities, such as national laboratories, universities, inventors, trade groups, and energy efficiency advocates. An important medium of information exchange between the ETP and other entities was the Emerging Technologies Coordinating Council (ETCC), a statewide coordination effort comprised of quarterly meetings of interested stakeholders, a bi-annual ETP summit, and a dedicated website and database, all of which were intended to provide a forum for interested stakeholders to remain apprised of ETP activities.

While the IOUs shared the same overarching program goals during the 2006-2008 program cycle, levels of funding differed by IOU, and, as a result, staff sizes, the number of technology assessments that could be initiated, and the size of program marketing efforts also differed by IOU. The budget for the ETP during the 2006-2008 program cycle was approximately $30 million allocated across IOUs as shown in Figure 2-1.

Figure 2-1. ETP Budget Allocation across IOUs, 2006-2008 Program Cycle

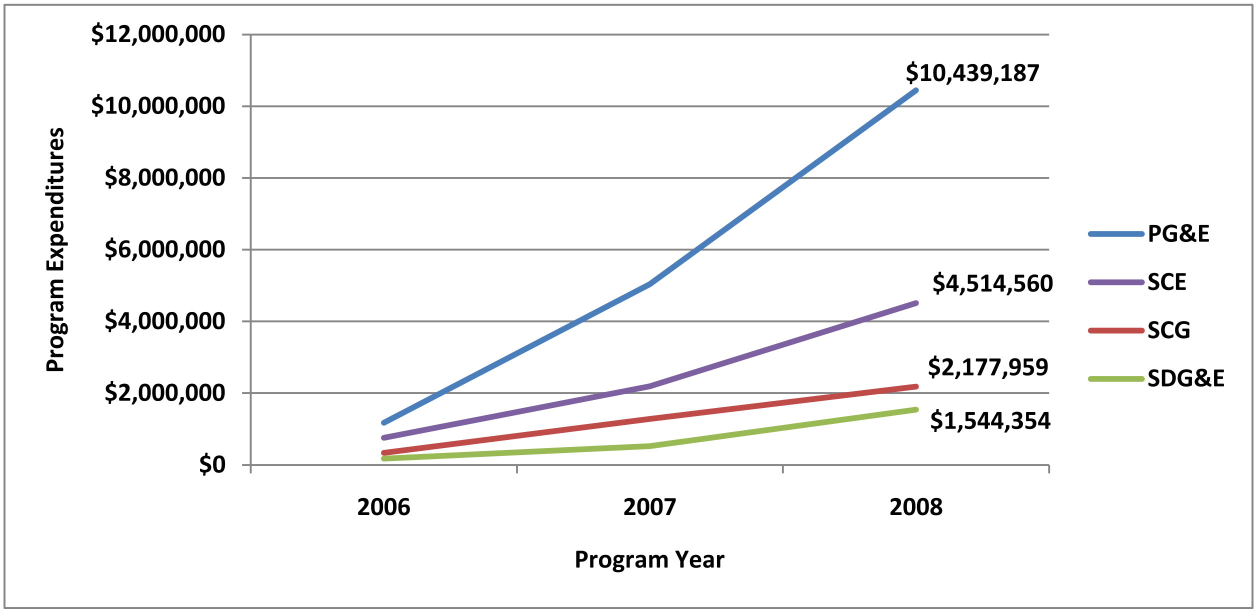


Source: PG&E, SCE, SDG&E, SCG 2006-2008 Energy Efficiency Programs Statewide Emerging Technologies Program Summaries (2006).

Through December 31, 2008, statewide program expenditures were approximately 62 percent of the budgeted $30 million according to data presented on the CPUC's Energy Efficiency Groupware Application (EEGA) website (see Figure 2-2).[16] The evaluation team does not know the reason for the observed level of expenditure but notes that it could be due to a variety of factors including non-current program data on the EEGA website, accounting methods that do not consider expenditures firm until assessment projects are completed, and/or the program's ability to meet its stated goals at a reduced level of spending, among others.

[16] http://eega2006.cpuc.ca.gov. The EEGA website did not present adequate data to disaggregate total expenditures by program operation (e.g., administration, assessment, etc.).

Figure 2-2. ETP Expenditures through December 31, 2008.



Source: EEGA, Program Expenditures Report (accessed January 15, 2010).

2.2 Synopsis of the First and Second Interim Reports

The first and second interim reports were finalized in July, 2008 and July, 2009 respectively.[17] These reports described initial research activities conducted by the evaluation team and presented preliminary observations and findings based on these initial activities. The intent in this section is not to repeat the content presented in the two interim reports; rather, the intent is to summarize high level themes developed from the preliminary observations and findings presented in the reports to provide context for the information presented in this document. Readers interested in more detail regarding initial evaluation activities and results are encouraged to review the first and second interim reports.

The discussion that follows is organized by overarching evaluation goal (i.e., evaluability assessment, program design assessment, program implementation assessment, and impact assessment) as well as reported date (i.e., whether the material was presented in the first or second interim report).

2.2.1 Evaluability Assessment

The evaluability assessment, conducted as part of the first interim report, considered the goals and objectives of the evaluation in light of the information available about the ETP from ETP staff and stakeholders. The evaluation team worked collaboratively with the CPUC ED and

[17] These reports and their supporting appendices and summary presentations were posted at the Public Document Area for CPUC Energy Division Contracts (http://www.energydataweb.com/cpuc).

MECT project management team to prioritize research tasks and determine which data would be required to successfully complete the selected research tasks. This process informed subsequent data requests made by the evaluation team to the IOUs. Over the course of the project, the evaluation team made numerous formal data requests to the IOUs via the CPUC's Energy Efficiency Groupware Application (EEGA) website.[18] In addition, the evaluation team used informal means (e.g., telephone conversations, meeting follow-up, etc.) to work collaboratively with the IOUs to resolve questions and gaps in program tracking data.

The IOUs responded to the data requests with a great deal of information regarding the ETP. The data provided by the IOUs was extracted from multiple ETP tracking systems, provided in various formats, and presented in various levels of completion. Upon receiving the data, the evaluation team began the process of organizing and synthesizing the data, working with the IOUs to resolve questions about and gaps within the data provided. Based on this exercise, which occurred for the duration of the project, the evaluation team determined that adequate information was available or could be cost-effectively collected to evaluate the Program in conformance with the Protocols. The evaluation team noted, however, that its data collection and organization efforts highlighted the lack of thorough, standardized project tracking efforts at the IOUs and that ETP tracking of technology assessments should be improved to provide a more comprehensive picture of program activity and evolution over time. Such improvements would facilitate program management and subsequent evaluations of the Program.

2.2.2 Program Design Assessment

The program design assessment conducted as part of the first interim report provided detailed descriptions of the ETP being implemented by each IOU including visual representations of the logic and the theory underlying each program as well as an overall assessment of the plausibility of the program theory. This information was presented in the form of updated program theory and logic models (PTLM) that were developed by the evaluation team based on information in the IOUs' 2006-2008 PIPs, previous evaluations of the ETP, and information provided by the IOUs. The updated PTLMs were used by the evaluation team to develop performance indicators to be used to conduct a theory-based evaluation of the ETP as specified in the Protocols. These indicators, which are associated with specific links in the IOU-specific logic models, were prioritized by the evaluation team to determine those most important to measuring the success of the ETP given limited evaluation resources.

The evaluation team also assessed the plausibility of the ETP design based on the activities performed by the Program, the available program funding, and the planned outputs and outcomes from program activities. Based on these criteria, the team concluded that the program design is plausible; however, the team noted that the ability of the ETP to help EE programs achieve energy and demand impacts may have been compromised by lack of feedback between the ETP and the EE programs to which technologies had been transferred. For example, in many

[18] http://eega2006.cpuc.ca.gov. The CPUC specified that all formal data requests be submitted through the EEGA website in order to create a clear accounting of the nature of each request, the parties responsible for responding to the requests, the dates the requests were submitted, and the dates the requested data were posted.

instances, ETP staff was unclear whether ETP technologies transferred to EE programs had actually been incorporated into the EE programs or what the market adoption rates were for ETP technologies that were known with certainty to have been incorporated into EE programs.

The second interim report presented expanded information regarding the program design assessment component of the evaluation. The primary research tasks undertaken as part of the program design assessment during the second phase of the evaluation included the development of the final program logic models and associated performance indicators for the 2006-2008 ETP[19] as well as the collection of data to support the Business Risk Assessment and Aggregate Analysis.

Based on the preliminary data received as part of the Business Risk Assessment task, there were a number of areas in which the ETP could better assess the business case for the technologies already included in the ETP portfolio. The evaluation team noted that this was an expected finding given that market-facing issues (e.g., conducting market research to develop technology-specific market potential estimates and customer acquisition plans) were not a high priority of the ETP during the 2006-2008 program cycle.

Preliminary findings from the Aggregate Analysis task revealed that ETP projects covered a wide variety of end-uses, with lighting, HVAC, and industrial processes representing a large percentage of projects across the statewide portfolio. The findings also revealed that most ETP projects were hardware assessment efforts conducted within the individual IOUs using primary data. Based on survey responses from the ETP project managers, almost half of the 70 ETP projects completed for inclusion in the second interim report had been recommended for transfer into an IOU EE program, and almost all of these recommended projects had either already been transferred or had plans to be transferred in the near future.

2.2.3 Program Implementation Assessment

The program implementation assessment conducted as part of the first interim report developed a series of process maps to characterize the details of program implementation and compare and contrast the various implementation models developed by each IOU.[20] Based on this exercise, the evaluation team concluded that program implementation processes were consistent with the broad intentions outlined within the respective PIPs. However, the team observed several departures from original program designs, most notably the level of importance placed on internal vs. external audiences for information dissemination efforts. The team also noted that differences in program implementation processes across IOUs could complicate comparisons of program performance and the ability of the programs to coordinate and optimize research and communication efforts. In addition, the process mapping exercise revealed the importance of developing workpapers to substantiate the IOUs' claims of savings estimates

[19] The final program logic models and associated performance indicators for the 2006-2008 ETP are reproduced in Section 4.1 of this final report as they did not change over the remainder of the project.
[20] The process maps are reproduced in Section 5.1 of this final report as they did not change over the remainder of the project.

associated with specific technologies and the influence this requirement has had on each stage of the ETP implementation process.

As part of the program implementation assessment, the evaluation team also determined that ETP managers had actively responded to recommendations made in previous program evaluation efforts, with half of the recommendations already fully implemented and the other half already initiated.[21] The only recommendation not fully addressed regarded the timely completion of final technology assessment reports, a process that has been hampered by utility concerns over potential liabilities related to disseminating information that may present a technology in an unfavorable light. ETP staff at each utility has been working with their respective regulatory affairs staffs to streamline internal review processes.

The team was also able to verify the basic achievements of the Program in terms of performing technology assessments, updating the Emerging Technologies Coordinating Council (ETCC) Database, and conducting periodic meetings of the ETCC. This verification process again highlighted limitations of existing program tracking systems including inconsistencies between the IOUs' internal tracking databases and the ETCC Database. The verification process also revealed that the ETCC meetings were appropriately structured to share information on program activities and opportunities, to provide opportunities for informed discussions of proposed or active projects, and to contemplate opportunities for collaboration among program stakeholders.

The second interim report presented expanded information regarding the program implementation assessment component of the evaluation. The primary research tasks undertaken as part of the program implementation assessment during the second phase of the evaluation included assessing the nature and frequency of interactions among ETCC stakeholders as well as the implementation of the ETP Stakeholder Interviews and Phase I Case Studies.

Preliminary findings from these efforts revealed that ETCC meetings appeared to serve the purpose of allowing formal opportunities for utilities and other stakeholders to share experiences on projects, learn about non-IOU emerging technology activities, provide updates on other relevant events, and discuss broader emerging technology issues. However, the ETCC meetings did not appear to focus on coordinating the planning of assessments and/or the transfer of technologies into EE programs. The evaluation team also noted that the biannual Emerging Technology (ET) Summit was well organized, informative, and well attended by a diverse set of organizations; however, showcasing of the ETP was limited during the event.

The Stakeholder Interviews identified strong consensus among ETP stakeholders that programmatic efforts are needed to promote the commercialization of new energy-efficient technologies and that the ETP plays a key role in achieving the state's zero net energy goals as

[21] The complete list of recommendations made in previous program evaluation efforts is shown in Section 5.2 of this report.

well as the goals set out in the state strategic plan (Big Bold Strategies).[22] However, the evaluation team noted that surprisingly little in-depth understanding of the ETP existed among these individuals. Stakeholders made suggestions to ensure success in the ETP initiatives, the most consistent of which involved the creation of a broader process for deciding where ETP investments are made, a reflection perhaps of stakeholder uncertainty as to how the current ETP efforts are coordinated.

Initial observations developed by the evaluation team based on the sixteen case studies completed for inclusion in the second interim report included:

- Program implementation processes are in flux at each utility, generally moving in the direction of becoming more formalized.
- Technologies are identified for program inclusion through various channels including utility staff and customers.
- Assessments are conducted in the field and in the laboratory and primarily serve to test or verify energy savings as well as meet other secondary objectives.
- Following an assessment, the path to integrate a technology into an efficiency program was largely undefined (however this is changing at some utilities). Organizational factors affecting the transfer process may include unclear definition or mapping of the transfer process and unclear roles for key staff in the transfer process.

2.2.4 Impact Assessment

The impact assessment conducted as part of the first interim report was primarily focused on identifying the technologies transferred from the ETP into the IOUs' EE programs during the 2006-2008 program cycle. The effort was complicated by differences in the IOUs' ETP designs and implementation processes which in turn created different definitions of the term "transfer" across IOUs. The evaluation team reviewed the programmatic information provided by the IOUs to develop a better understanding of each utility's transfer phase and to facilitate cross-utility comparisons of the transferred technologies. Based on this exercise, the evaluation team identified 21 technologies that had been transferred by PG&E, seven technologies that had been transferred by SCE, and six technologies that had been transferred by Sempra.

The second interim report presented expanded information regarding the impact assessment component of the evaluation. The primary research tasks undertaken as part of the impact assessment during the second phase of the evaluation included ongoing data tracking and database development initiatives, efforts to identify ETP technologies that had been transferred to the IOUs' 2006-2008 EE programs, and implementation of the Peer Review data collection efforts.

[22] The stakeholder interviews results are reproduced in Section 5.4 of this final report as they did not change over the remainder of the project.

The evaluation team noted in the second interim report that data collection and organization efforts have highlighted the lack of thorough, standardized project tracking efforts at the IOUs. These limitations have hindered the team's ability to develop a comprehensive database of projects that had participated in the ETP during the 2006-2008 program cycle. The evaluation team worked with ETP staff to align technologies/projects across the various data sources provided by the IOUs, to clean the available datasets and resolve existing data gaps, and to develop unique, unchanging master project ID# and master project titles for each participating project. In response to the difficulties the evaluation team has experienced in developing a Master Database, the CPUC requested that the evaluation team develop a standardized database for the IOUs to populate and routinely update during the 2010-2012 program cycle.

The evaluation team examined measure-level EE program tracking data provided by the IOUs that covered rebates paid through EE programs over the period 1/1/2006 through 6/30/2008 to assess the extent to which transferred ETP technologies had been adopted by participants in EE programs. Expected annual savings accounted for by ETP technologies transferred into EE programs during this timeframe ranged from 0 GWh for Sempra (across both SCG and SDG&E) to approximately 30 GWh for PG&E. The team noted, however, that lack of standardized naming conventions and transfer protocols across IOUs hindered the team's ability to undertake this exercise; thus, additional ETP technologies may have been transferred but the evaluation team could not identify them.

At the time of the second interim report, the Peer Review task leaders were working to identify, recruit, and gain approval for peers for the 16 projects included in the Peer Review sample. The task leaders had sought and received approval by the Peer Review Steering Committee (PRSC) for the project selection, peer selection, and project evaluation criteria and had completed three Peer Review sessions.

In conclusion, the activities undertaken by the evaluation team since completing the first and second interim reports sought to build upon the initial observations and findings presented above to explore key programmatic concepts in more depth and expand the scope of the evaluation to provide a broader assessment of ETP processes. The remainder of this final report summarizes progress made by the evaluation team toward achieving the overarching evaluation goals.

3 METHODS

This chapter describes the methods employed to gather and analyze the information and data needed to support this evaluation including:

- An overview of the Protocol-driven evaluation approach (Section 3.1)
- A description of the evaluation activities completed over the course of the project (Section 3.2).

Additional details regarding task-specific evaluation approaches including data collection and analysis methods are presented in subsequent chapters of this report.

3.1 Protocol-driven Approach

This evaluation was focused on assessing the design, implementation, and impacts of the ETP. The components of the evaluation followed the approach specified in the *Evaluation Plan for the 2006-2008 California Statewide Emerging Technologies Program,*[23] which was prepared by the evaluation team and delivered to the CPUC ED in February 2008. The approach outlined in the evaluation plan relied upon the Emerging Technologies Protocol specified in the *California Energy Efficiency Evaluation Protocols*.[24] The process evaluation, sample designs, and reporting for this evaluation relied on the following three Protocol chapters, respectively:

- Process Evaluation Protocol;
- Sampling and Uncertainty Protocol; and
- Evaluation Reporting Protocol.

The evaluation team also consulted the *California Evaluation Framework*[25] throughout the evaluation as well as the U.S. DOE‘s *Peer Review Guide,*[26] which informed the Peer Review activity conducted as part of the evaluation.

Following the evaluability assessment, the team undertook a number of activities linked to the elements of the Emerging Technologies and Process Evaluation Protocols to achieve the remaining three goals of this evaluation. These protocol elements include the following:

- Program theory and logic model;

[23] The Evaluation Plan for this program can be found at http://www.energydataweb.com/cpuc/.
[24] TecMarket Works Team. June 2006. *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. Prepared for the California Public Utilities Commission.
[25] TecMarket Works. June 2004. *The California Evaluation Framework*. Prepared for the California Public Utilities Commission and the Project Advisory Group.
[26] Energy Efficiency and Renewable Energy Task Force. 2004. *EERE Peer Review Guide*. Washington DC: US Department of Energy.

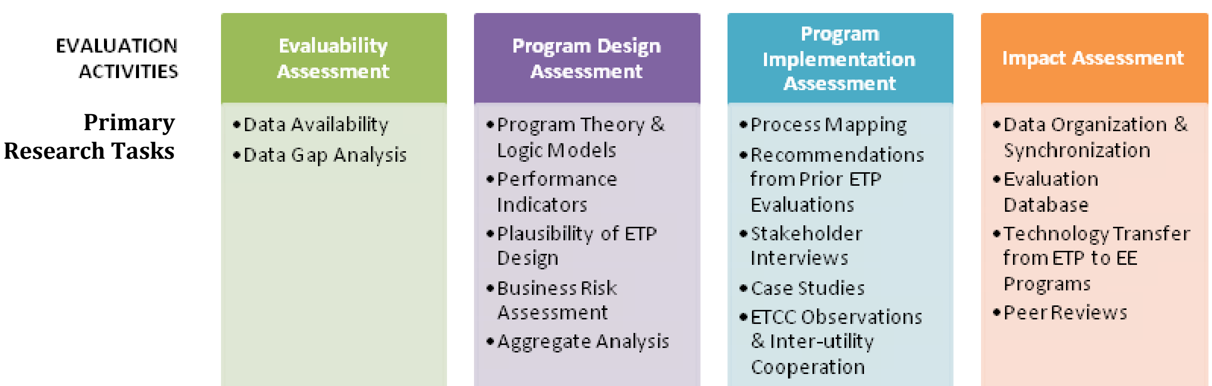
- Development of key performance indicators;
- Business Risk Assessment framework development;
- Aggregate analysis;
- Verification of basic achievements;
- Program implementation and delivery;
- Measure tracking;
- Peer review;
- Target audience surveys;[27] and
- Literature review.

The development of a Business Risk Assessment framework was proposed by the evaluation team. Rather than replacing elements of the Protocols, the Business Risk Assessment effort seeks to complement the Protocol elements by providing a broader business perspective to the evaluation in order to more fully understand the process of technology commercialization.

3.2 Evaluation Activities

The current evaluation was designed to comprehensively assess the ETP across multiple dimensions. As such, the evaluation was comprised of a diverse set of research tasks scheduled for completion at different points during the evaluation cycle. This section presents a high-level overview of the various evaluation activities and primary research tasks (summarized in Figure 3-1); additional details regarding task-specific evaluation approaches including data collection and analysis methods are presented in subsequent chapters of this report.

Figure 3-1. Overview of Evaluation Activities and Primary Research Tasks



[27] Given the evolution of ETP implementation processes during the 2006-2008 program cycle, initial findings generated during the evaluation showing that ETP information dissemination activities were focused more on internal IOU audiences (e.g., energy efficiency program managers, account representatives, etc.) than external stakeholders, and IOU comments received in response to the first interim report, it was decided that the target audience surveys described in the evaluation plan were no longer a necessary component of the current evaluation.

Research tasks were scheduled in a staggered manner that allowed the results of initial tasks to inform the development and focus of subsequent tasks. For example, initial evaluation activities identified the transfer phase of program implementation as being most in flux at the time the research was conducted. Given the importance of the transfer process in generating subsequent EE program impacts, the evaluation team determined it would be prudent to focus increased attention on this aspect of the program implementation process. Other similar decisions were made by the evaluation team in close consultation with the CPUC ED and MECT project management team and the research agenda was adjusted accordingly to accommodate the prioritized research agenda. This approach also assisted the evaluation team and the CPUC ED and MECT project management team in determining the relative priorities of multiple research options to ensure that evaluation resources were deployed effectively.

The following research tasks were completed by the evaluation team over the course of the project:[28]

- Evaluability assessment;
- Onsite meetings and workshops with the IOUs to discuss specific evaluation activities;
- Data requests to the IOUs and follow-up correspondence as needed for clarification;
- Analysis of program tracking data and preparation of summary metrics;
- Alignment of technologies/projects across the various data sources provided by the IOUs to ensure consistent presentation of program accomplishments;
- Literature review targeting information needed by customers for successful use of new products;
- Analysis of policy directives influential to the evolution of the ETP;
- Preparation of draft and final program theory and logic models;
- Development of draft and final ETP performance indicators and suggested data collection approaches;
- Program implementation process mapping;
- Review of the status of recommendations made during the evaluation of the 2004-2005 ETP;
- Observation of quarterly ETCC meetings and the bi-annual ETCC Summit;
- Preparation of final Aggregate Analysis evaluation plan, sampling strategy, and data collection tool ;
- Preparation of final Case Study evaluation plan, sampling strategy, and interview guides;
- Recruitment of members into the Peer Review steering committee and preparation of final project selection criteria, evaluation criteria, and sampling strategy incorporating committee feedback;
- Preparation of final white paper summarizing the essential components of the Business Risk Assessment research task, the methodology used to evaluate the ETP's performance in this area, and the associated sampling strategy;

[28] Readers interested in additional detail regarding the initial activities completed by the evaluation team are encouraged to review the first and second interim reports.

- Preparation of final stakeholder interview guide and list of interviewees;
- Coordination of data collection and analysis efforts across the multiple research tasks – Business Risk Assessment, Aggregate Analysis, Stakeholder Interviews, Case Studies, and Peer Reviews;
- Development of a final ETP tracking database structure and content incorporating feedback from the CPUC IT liaison[29] and ETP staff;
- Development of an online ETP tracking database for use by the CPUC ED and ETP staff for program management purposes;[30]
- Review of IOU EE program databases to determine the extent to which technologies transferred from the ETP to EE programs have been adopted by EE program participants; and
- Interim and final project reporting including integration of findings across evaluation activities.

The evaluation team remained in regular communication with the CPUC ED and MECT project management team throughout the course of the evaluation using monthly meetings, ad hoc meetings, monthly progress reports, and other email and telephone communications as needed to keep the ED and MECT team apprised of project progress and to efficiently resolve evaluation issues as they arose. This close communication facilitated the development of an iterative review process for key elements of the research tasks (e.g., data collection instruments, sampling strategies, etc.) whereby the evaluation team submitted draft documents to the ED and MECT project management team for review and comment then addressed feedback until the elements were deemed final by the ED.

This comprehensive approach enabled the evaluation team to thoroughly assess the design, implementation, and impacts of the ETP as implemented during the 2006-2008 program cycle. In addition, the regular communications between the evaluation team and the CPUC ED and MECT project management team, ETP staff, and other project stakeholders helped to ensure that the evaluation was conducted in a credible and transparent manner that provided timely and unbiased results.

3.3 Approach to Analysis

The evaluation team used a combination of primary and secondary data sources to conduct the assessment of the ETP. As described in detail in subsequent chapters of this report, most primary research tasks (i.e., Business Risk Assessment, Aggregate Analysis, Case Studies, and Peer Reviews) involved primary data collection with ETP staff. The evaluation team carefully planned the implementation of these primary data collection efforts in order to increase the efficiency of the data collection and minimize the burdens placed on ETP staff while responding

[29] Conversations with CPUC ED staff revealed that Intergy Corporation would serve as the CPUC's IT liaison. Intergy designed, developed, and maintains the Energy Efficiency Groupware Application (EEGA) website that allows public access to CPUC Energy Efficiency program reports for the 2006-2008 program cycle.

[30] This task includes backfilling the database to include project activity during the 2006-2008 program cycle and working with the CPUC IT liaison to transfer the database structure and content to the EEGA website.

to the multiple efforts. The evaluation team used overlapping samples and a staggered data collection schedule to meet these objectives.

As shown in Table 3-1, separate samples were drawn for each primary research task. Sample designs and sizes were determined by several factors including ETP project population at the time the samples were drawn, data availability for each ETP project in the population, degree of sample overlap across research tasks, and level of evaluation resources assigned to each respective task. Given that the majority of evaluation activity was qualitative in nature, the samples were not designed to meet rigid confidence and precision thresholds. Rather, the samples were purposefully drawn with input from IOU staff and the CPUC ED and MECT project management team according to established protocols that ensured representativeness with the ETP project population. This approach enabled the results of the evaluation to be generalized across the project population, as well as broader ETP activities, using triangulation and preponderance of evidence methods. Additional details regarding the sample designs used for the various research tasks are presented in the corresponding sections of this report.

Table 3-1. Overview of Sample Sizes and Designs

Research Task	Sample Size	Notes
Business Risk Assessment	70	• Sample was segmented by utility based on ETP budgets • 31 projects selected through the Case Study and Peer Review evaluation components were included in the sample (the Case Study sample included the 16 projects in the Peer Review sample) • 39 additional projects were randomly selected that 1) were initiated in the 2006 – 2008 ETP cycle, 2) had a completed screening form (i.e., ETPA, ETOS, Long Form) available for review, and 3) a diversity of project managers • Utilities were given the option to add projects to the sample as long as the projects met the above criteria; however, none of the utilities opted to do so
Aggregate Analysis	149	• Census of eligible projects at time of survey fielding (12/08) • Projects in the scanning and screening phases were not eligible for inclusion in the sample • ETP tracking data provided by the IOUs were not finalized at the time the Aggregate Analysis was initiated (Final ETP tracking data was made available in Q1 2009).
Case Studies	45	• Sample was segmented by utility based on ETP budgets • Each utility agreed on a variety of representative projects • Projects were segmented using a number of "pathways" indicative of how technologies moved through the ETP process • Sample included a variety of ETP project managers, end-use categories and market sectors to ensure a wide range of project experiences
Peer Review	16	• Peer Review Steering Committee (which included representatives from each utility) established project selection criteria • Eligible projects included those that 1) were funded by 2006 – 2008 ETP cycle, 2) had a final report completed by March 31, 2009, and 3) the associated ETP project manager was still employed by the utility • Diversity criteria including assessment project budget, estimated energy impact, and diversification of project managers were also employed to ensure representativeness
Note: The ETP project population was 230 at the time these samples were drawn (Q3 2008); 149 of the 230 projects had progressed beyond the scanning and screening phases.		

A fundamental requirement for conducting the evaluation of the ETP was the development of a comprehensive understanding of project activity during the 2006-2008 program cycle. The evaluation team needed to determine the total population of projects that participated in the ETP during this timeframe, segmented by the number of projects within each of the four phases of the program participation cycle (i.e., scanning phase, screening phase, assessment phase, or transfer phase).[31] In order to develop this knowledge, the evaluation team requested from the IOUs their

[31] The size of the ETP project population continued to increase over the course of the evaluation (through December 31, 2008). Thus, sample sizes were determined based upon the project population at the points in time the samples

relevant program tracking systems and all supporting project documentation. The team then worked with the IOUs to resolve gaps in these datasets and combine the data with information presented in the ETCC database to create a master evaluation database that presented consistent information across the statewide population of projects. This master evaluation database, which is described in more detail in Chapter 6 of this report, represents an essential element of the evaluation, serving as a central repository for information about ETP projects as well as the definitive source of project populations from which the evaluation team drew samples for the various research tasks.

It is important to note that ETP staff across the IOUs was instrumental in assisting the evaluation team in developing a better understanding of the ETP. Program staff responded to data requests made by the evaluation team; participated in numerous in-person meetings, workshops, and webinars to discuss project activities; worked with the evaluation team to resolve questions and gaps in existing program tracking data; and participated in the various data collection efforts initiated by the evaluation team. This collaboration helped clarify discussion points as they arose and ensured that the evaluation team developed accurate interpretations of program processes and the associated impacts. The evaluation team appreciates the input provided by ETP staff and their active engagement throughout the project.

were drawn. The master evaluation database being constructed by the evaluation team will contain data regarding the total ETP project population as of December 31, 2008.

4 PROGRAM DESIGN ASSESSMENT

This chapter summarizes findings related to the program design assessment aspect of the evaluation including:

- Presentation of the final program theory and logic models and associated performance indicators for the 2006-2008 ETP (Section 4.1)
- Discussion of the Business Risk Assessment research task (Section 4.2)
    - Approach used to conduct the Business Risk Assessment (Section 4.2.1)
    - Data collection methods, focused on the three major evaluation components: Value Propositions, Value of ETP Assessments to California Ratepayers, and Data Sources (Section 4.2.2)
    - Data collection approach including sample selection, workshops with ETP staff, and data collection tools (Section 4.2.3)
    - Approach used by the evaluation team to evaluate the ETP value statements in terms of robustness of the value propositions, extent to which due diligence was conducted, and value of the assessments to California ratepayers (Section 4.2.4)
    - Results of the Business Risk Assessment (Section 4.2.5)
    - Recommendations generated during the Business Risk Assessment (Section 4.2.6)
- Discussion of the Aggregate Analysis research task (Section 4.3)
    - Data collection methods including sample selection and development of an internet-based survey instrument (Section 4.3.1)
    - Evaluation methods including descriptive statistics (Section 4.3.2)
    - Results organized by program implementation phase: Scanning, Screening, Assessment, and Transfer/Dissemination (Section 4.3.3)
    - Technical potential estimates developed by the evaluation team and the team's assessment of the reasonableness of the estimates (Section 4.3.4).

4.1 Final Program Theory and Logic Models (PTLMs) and Key Performance Indicators

As noted in the Protocols, program theory and logic models (PTLMs) document program activities and how these activities interrelate to produce immediate, intermediate, and long-term outputs and outcomes. PTLMs are typically structured such that the program theory is presented as a textual description while the logic model is presented as a graphical representation of the program theory showing the flow between program activities and their anticipated outputs and outcomes. PTLMs also identify key performance indicators associated with the program theory that can be used to assess program progress toward specified goals. An initial task in the evaluation was the development of PTLMs for each utility's ETP.

The evaluation team developed draft PTLMs for the 2006-2008 ETP based on the 2006-2008 ETP PIPs, the results of ECONorthwest's evaluation of the ETP during the 2004-2005 program cycle, and information made available by the utilities. The draft PTLMs served as the basis for discussions about program logic with the utilities and the models were considered current as of April 2008. A matrix containing potential performance indicators associated with each link in the logic models and the corresponding success criteria for each indicator was created based on these models. This matrix was discussed with the utilities in late July 2008 and the evaluation team continued to refine the program logic models in collaboration with the utilities, arriving at completed models for the 2006-2008 program cycle in August 2008.[32] A meeting was held at the CPUC where these updated logic models and the associated performance indicators and success criteria were finalized in conjunction with the utilities. Figure 4-1 through Figure 4-3 in this section contain the final program logic models for the 2006-2008 program cycle and the completed performance matrix is provided in Appendix B. An assessment of which indicators are considered high priority is provided in the matrix, as is information regarding how the utilities are supporting the data collection through their record keeping.

As noted previously, the final PTLMs documenting the activities performed by the Program and the anticipated outputs and outcomes from these activities were used to assess the plausibility of the ETP design. The evaluation team concluded that the program design is plausible; however, the team noted that the ability of the ETP to help EE programs achieve energy and demand impacts may have been compromised by lack of feedback between the ETP and the EE programs to which technologies had been transferred. It is important to note that the ETP has undergone modifications for the 2010-2012 program cycle which will necessitate the development of a PTLMs. The development of these new models is outside the scope of the current evaluation; however, much of the work done by the evaluation team for the 2006-2008 program cycle can be incorporated into the next PTLM effort for the 2010-2012 program cycle.

[32] The completed logic models were not substantially different from those provided in the first interim report.

Figure 4-1. Final PG&E Logic Model

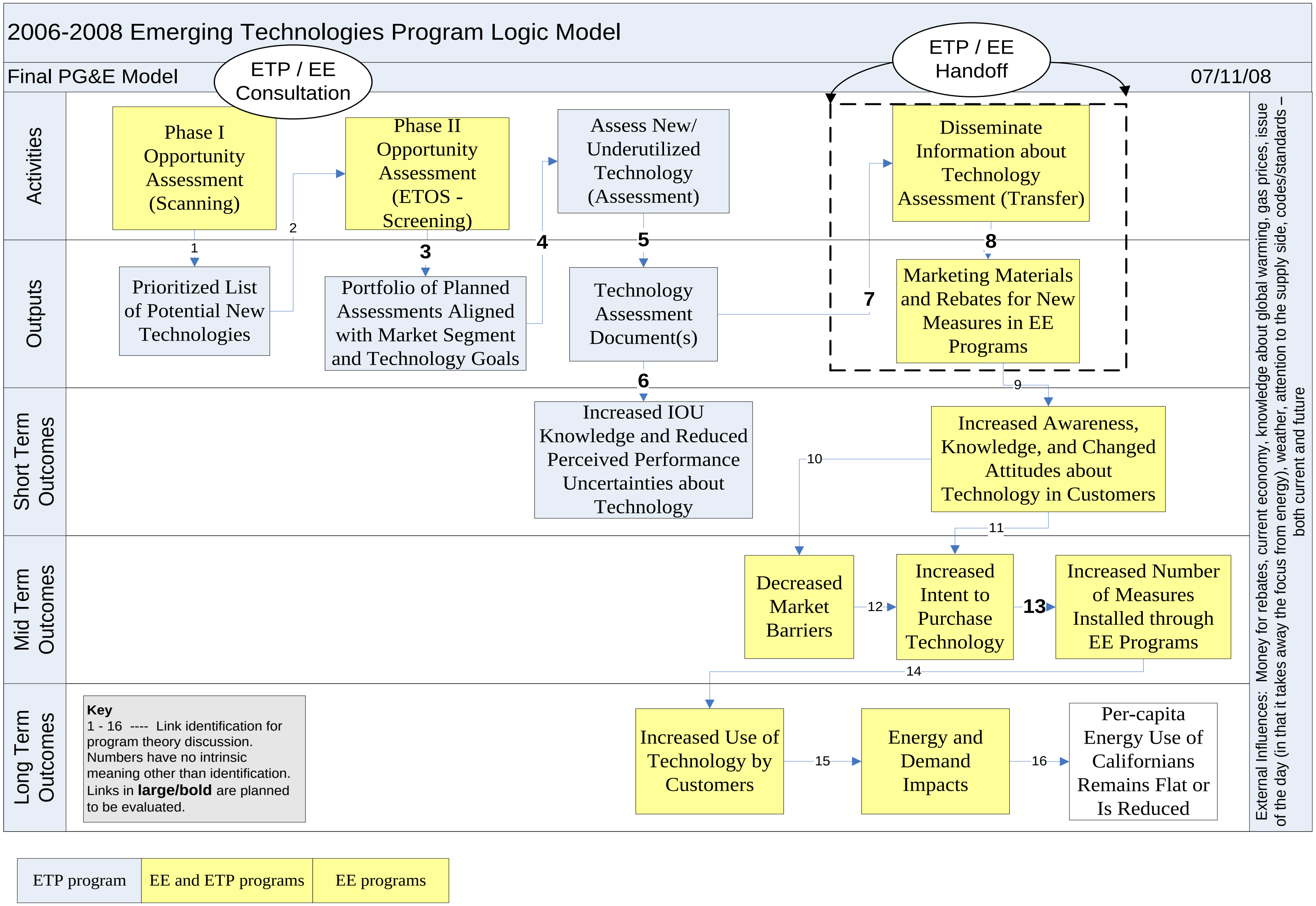


Figure 4-2. Final SCE Logic Model

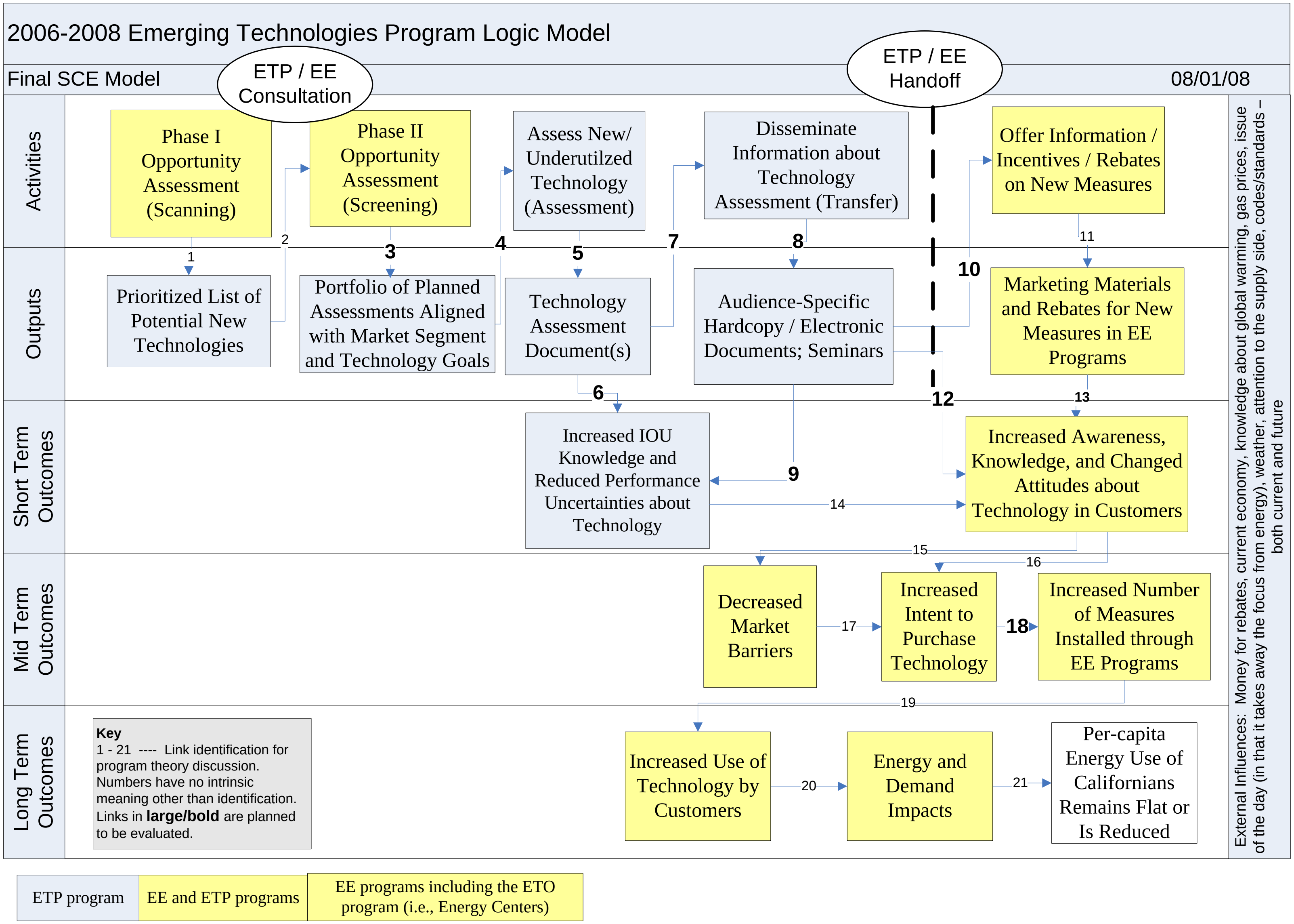
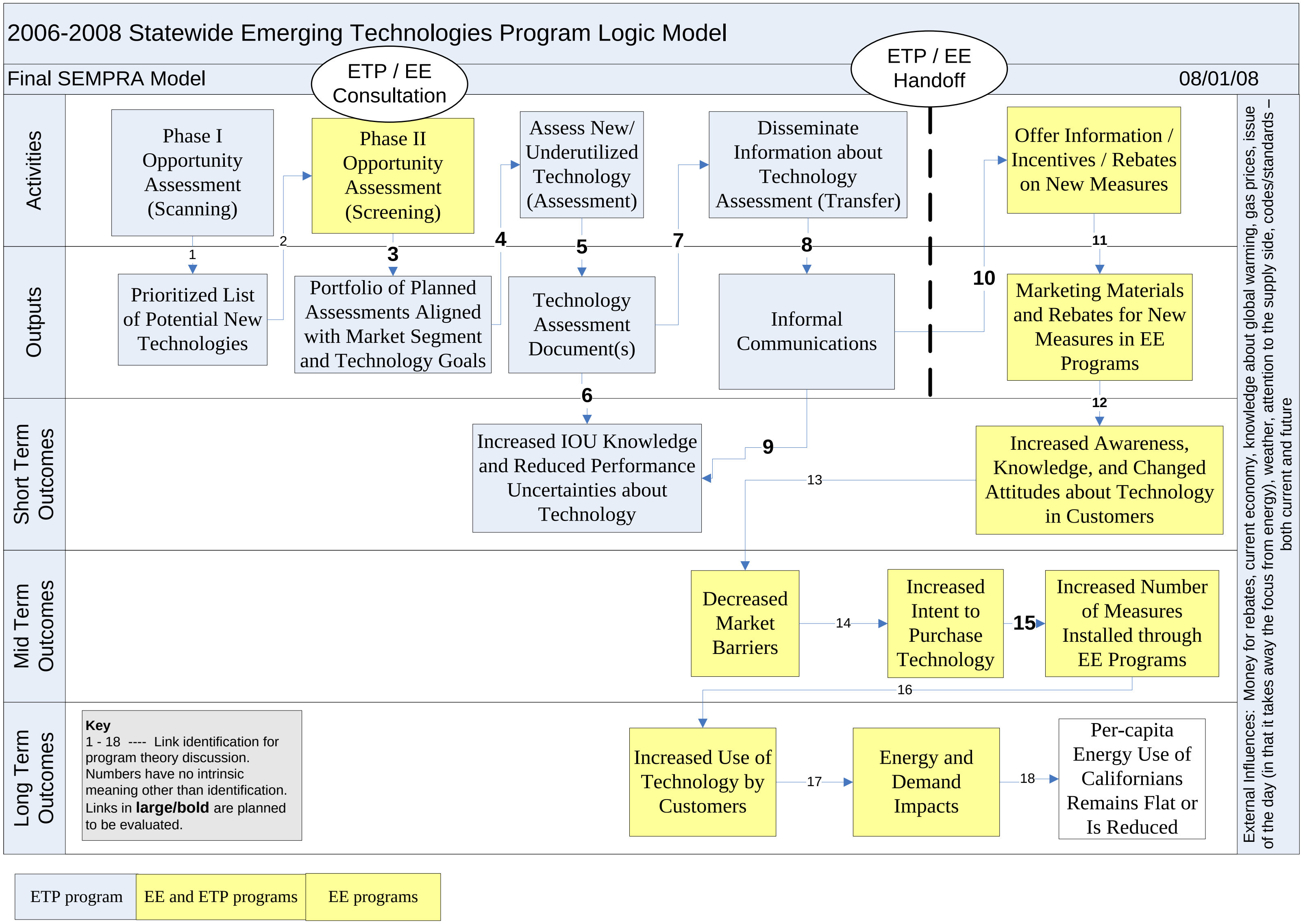


Figure 4-3. Final SEMPRA Logic Model



The logic models presented above are graphic representations of the theory behind each utility's ETP. The theory statements that follow were agreed to by ETP staff early in the evaluation (before the first interim report) and have not been changed. Use of program theory is generally based on a "means-ends" type of thinking. An intervention is put in place to create a change (the ends) through specific activities (the means). The policy-relevant ends for the ETP (adoption of a given technology by customers) are distal to the actual program and not under the full control of ETP managers or staff. However, achieving those outcomes that are closer to the program (i.e., the proximal outcomes) provides the necessary but not sufficient conditions for meeting the resource acquisition goals that are the ultimate reason for the existence of the 2006-2008 ETP.

<u>Theory Statement</u>

The short version:

New measures are needed by the resource acquisition programs to enable the IOUs to meet energy efficiency goals set by the CPUC. The ETP produces/acquires knowledge about measures that are new to the marketplace or have not gained widespread market use. The knowledge is transferred to the EE program managers and causes the resource acquisition programs to include the ETP measures in their portfolios.

The longer version:

*(Evaluator's note: much of the longer version of theory is implementation type information. The **bolded** sections in the write up show more of a theory behind why the activities occur.)*

The ETP is constantly looking for possible energy savings measures[33] to include in the IOU resource acquisition portfolios (i.e., EE portfolio). The ETP needs to be forward looking to assure that the energy efficiency goals set by the CPUC can be met. As such, ETP staff looks to measures that are new to the marketplace or have not gained widespread market use. Within the IOUs, a first cut at potential measures for inclusion in ETP (i.e., the scanning phase) is a low-data situation. ETP managers make choices here based on knowledge of technologies or a market segment for a technology and an initial assessment of the level of interest among EE program partners (i.e., EE program managers). Promising measures emerging from this first phase of program activity undergo more detailed review, specifically a more detailed assessment of the possible energy savings, the needs of the EE portfolio, the market potentials, and market barriers. Choices made during the opportunity screening phase are based on an expanded data set and a subset of promising technologies is eventually selected for formal assessment.

Assessment of candidate measures can occur through testing at a customer site, benchmarking in a laboratory setting, or through a paper review. The choice of location for customer site assessments is based on the specific measure and access to host sites. In some cases, a single site is expected to yield sufficient data for the assessment. If the results of a demonstration project (i.e., in-situ testing) are inconclusive, a decision is made by ETP staff

[33] A measure can be a widget (technology) or a process that leads to energy impacts.

regarding the appropriate next step, which could include additional in-situ testing at a different location to collect sufficient data. In some cases, the output of the assessment is a calculation tool.

The assessment of a given measure provides ETP staff with additional information that is used to determine how, or whether, to include the measure in the EE portfolio. The assessments also reduce the uncertainty regarding energy and demand impacts. Once this information is known, ETP staff share their knowledge with the IOU EE program managers.

The way that information is disseminated varies by IOU. For SEMPRA, this is generally through informal face-to-face interactions. SCE creates fact sheets and reports that can be shared with EE program managers as well as having formal face-to-face interactions. PG&E has reports, fact sheets, and other communications on each project as well as informal and formal face-to-face interactions.

What occurs *after* information is disseminated from the ETP to EE program managers also differs by IOU.

ETP staff at PG&E may continue to work with others in the company in a supportive role while the project moves through an energy efficiency program process (developing incentives, rebates, workpapers, and marketing to deliver the product to its customers). Playing this supportive role increases the chances that the measure is appropriately understood by others in the EE programs and helps to answer questions as marketing materials are generated. While most projects go through this process, not all do. If the information gained through the ETP assessment is sufficient to easily include the measure into the EE portfolio without further interaction with ETP staff, then this is done. Generally projects that do not go through the longer process are based on calculator-derived assessment information. PG&E also communicates the information to its EE program partners and throughout the company so all possible channels for energy savings are informed.

SCE disseminates information to both internal clients and external customers with a majority of effort focused on internal clients. Work with internal clients provides useful information about new technologies so that they can accurately describe the new measure to SCE customers. In a small subset of cases, the SCE ETP staff also creates data for workpapers in support of EE programs for measures outside of those in the ETP (e.g., those referred by the EE staff). While a small effort, **each seminar targeted at external customers attempts to persuade them to adopt a new technology**. Additionally, SCE creates reports and fact sheets, which are made available to SCE account managers and representatives to help them sell the new measures to customers. **The information provided directly to the customer by the SCE representatives increases the customer's confidence that adoption of the measure will save energy and perform as expected.**

By working directly with EE program managers, **SEMPRA increases the awareness of managers about the savings potential of assessed measures. This increased awareness persuades EE managers to include these measures in their programs**.[34]

The IOUs interact collaboratively with the California Energy Commission (CEC) through quarterly meetings of the Emerging Technology Coordinating Council. These meetings provide another avenue for dissemination of information among the IOUs and with the CEC.

The above paragraphs addressed only the ETP components in the logic model. The theory behind the EE program portion of the model is addressed only briefly below.

Once technologies are transferred from the ETP to the EE programs, multiple opportunities arise for adoption of those measures. How each EE program chooses to design the market intervention and approach their customers can be different. The models represent the social psychology approach that aligns with the theory of planned behavior as well as components of market transformation. In the planned behavior model, people become aware of an option, then learn more about it, with resulting attitudinal changes probable. This increase in knowledge and change in attitude, combined with the ability to affect change and social norms, increases a person's intent to purchase or change a behavior. Once a person's intent to change behavior occurs, it is followed by the actual behavior. However, the timeline of when the actual behavior occurs can vary. Market transformation views the market as imperfect with barriers that must be overcome. A program's intervention is designed to reduce those barriers. Multiple barriers such as asymmetric information (where an individual purchasing an item is at a disadvantage because they know less than the person selling an item) or performance uncertainty (where the individual does not trust that a product will perform as expected) are two such market barriers that EE programs may try to overcome.

4.2 Business Risk Assessment

This section of the report outlines the essential components of the Business Risk Assessment and the method used to evaluate the ETP's performance in this area. Section 4.2.1 discusses the approach used to conduct the assessment; Section 4.2.2 describes the data collection methods, focusing on the two major components of the Business Risk Assessment; Section 4.2.3 summarizes the evaluation method applied to the Program's performance during the 2006-2008 program cycle; and Section 4.2.4 presents the results of the Business Risk Assessment effort based on the final data collection tools submitted by ETP staff.

4.2.1 Business Risk Assessment: Approach

The Business Risk Assessment is designed to provide feedback on the likelihood that technologies in the ETP portfolio will make a tangible net contribution to California's energy efficiency goals. Many of the technologies assessed by ETP are still in the development stage or in the early stages of commercialization, making it difficult to determine how well they will be

[34] The process of working with internal clients is under revision at SCE and SEMPRA, but this is the current theory underlying the logic model at this point.

adopted by the market and, as a result, how much they will contribute to California's energy efficiency goals. The Business Risk Assessment enabled the evaluation team to address this challenge by examining how well the program considered fundamental market characteristics in the selection of technologies for assessment.

The risk that a technology fails to achieve widespread market adoption (i.e., gain "market traction") is one of three major risks faced by new technologies. The other two (technology risk and leadership team risk) can be managed through concrete actions. Laboratory tests, demonstrations, and the placement of executives with entrepreneurial experience minimize these risks. Market traction has a higher level of risk associated with it because it relies on a factor external to an organization: the target market's response to a product or service. Of these three types of risk, the market traction risk poses the most significant barrier to a successful venture.

The ETP's efforts to manage market traction risk were at issue in the Business Risk Assessment. This aspect of the evaluation provides insight into ETP's due diligence on the business value of the technologies in which it has invested – essentially, the program's assessment of the anticipated market traction risk. Business Risk Assessment required that ETP staff consider the viability of a technology from the target market's perspective, ensuring that investments favor technologies with positive market perceptions and/or significant market potential.

The Business Risk Assessment approach drew on the experience of the private sector in identifying promising technologies. Venture capital firms, private equity investors, and corporate product development teams use the core method of the Business Risk Assessment, the development of a well-researched value proposition, when selecting technologies and services in which to invest. The Business Risk Assessment team adapted this private-sector approach to fit the utility context.

The evaluation team understands that the consideration of the market for a given technology is one of several factors considered when determining whether or not to assess a technology in the ETP. In addition to the market issues elucidated by the value proposition approach, ETP staff must consider the technology's viability from a technical perspective, the value that the ETP adds by assessing the technology, the strength of partner relationships, and other utility- and technology-specific issues (e.g., the types of technologies in the existing EE program portfolios). These other factors were considered through other parts of the evaluation (e.g., the Peer Review and the process evaluation). The evaluation team coordinated its assessment of these factors, and the recommendations that result from the evaluation consider the context created by the combination of these factors.

4.2.2 Business Risk Assessment: Data Collection Methods

Data collection for the Business Risk Assessment relied on ETP staff to complete a short questionnaire (i.e., data collection tool) about the business case for a subset of technologies in the

ETP Database.[35] The content of this questionnaire and the data collection approach are discussed below.

4.2.2.1 Value Proposition

A value proposition provides a vehicle for summarizing the most compelling market data that support an investment decision.[36] A value proposition is a statement that defines the benefit for a specific innovation in a specific framework of use. A well-developed value proposition includes the most important factors in assessing a product's market viability. By examining the value proposition associated with a specific technology, ETP staff (and the evaluation team) can determine the likelihood that the product will achieve market adoption sufficient to warrant ETP's investment of staff time and financial resources (i.e., program budget) in assessing the technology.

Value propositions developed as part of the Business Risk Assessment examine the benefits created by a specific innovation from the perspective of the target market. The target market is the specific individual(s) who makes the decision to purchase the innovation and who has budget authority to make the purchase. Examples of the target market include the following:

- Purchasing agent at a winery;
- Office supplies store manager; and
- Operations manager at a manufacturing plant.

Considering the value of the innovation to these individuals is critical, because these individuals make the decision about whether or not to purchase the technology. This purchasing decision is the ultimate determinant of an innovation's ability to create energy savings. Value propositions can be developed from other perspectives as well (e.g., utility EE program managers or utility shareholders), but these individuals do not determine market adoption rates. Thus, it is critical that the value proposition be prepared with a focus on the motivations of the target market.

For the purposes of the Business Risk Assessment, the value proposition took the following form:

For ___________________ (target customer)

who ___________________ (statement of customer need)

the ____________ (product) is a ____________________ (recognized product category)

---

[35] A list of the projects included in this subset is included in Appendix G.

[36] The discussion of the value proposition integrates fundamental marketing concepts in leading marketing resources:

Moore, Geoffrey. 1991. *Crossing the Chasm: Marketing and Selling High Tech Products to Mainstream Customers.* Harper Business Essentials.

Kotler, Philip and Kevin Lane Keller. 2008. *Marketing Management (13th Edition).* Prentice Hall.

that ______________________ (statement of key benefit).

Unlike ________________(primary competitive alternative),

this product _____________________ (statement of primary differentiation).

Table 4-1 describes the information needed to complete each of the blanks in the value proposition.

Table 4-1. Description of Value Proposition Components

Value Proposition Component	Definition	Examples	Questions to Answer
Target Customer	The **individual(s)** making the purchase decision who has/have budget responsibility and go/no-go authority on the actual purchase decision. The individual(s) may be a consumer or represent a business.	• *Dairy farm owners* • IT purchasing manager at a manufacturing company • Residential occupant focused on reducing energy bills	Who would be the individual(s) that would purchase this item?
Statement of Customer Need	An expression of a perceived gap between the current state of affairs or the current system of use and what would be desirable. The gap falls somewhere along a spectrum of mild (not much of a gap) to acute (a significant difference that demands attention).	• *Desire to reduce operation cost and maintain the standards for a healthy cow milking system* • Ability for IT manager to remotely access work stations when powered down to update software	What is the gap in performance of the current system that is perceived by the target customer?
Product	Any physical good or intangible service (or a combination of goods and services) that serves as a solution to the customer need.	• *Pulsation stop control* • Tankless water heaters • Window shading	What is the good or service with which you are proposing to meet this customer need?
Recognized Product Category	A set of goods and services that are widely recognized in society as being appropriate for a particular type of need.	• *Enhancement to the milking system* • Software • Home insulation • Power storage batteries	What is the broader category of commonly used goods and services to which this product belongs?

Value Proposition Component	Definition	Examples	Questions to Answer
Statement of Key Benefit	The way in which the features of that product are appropriate to satisfy a stated customer need.	• *Extends the useful life of pulsation units and milking unit shell rubber liners, reducing the frequency of replacing these parts and therefore reducing maintenance costs, reduced vacuum pump noise level in milking barn, and lowering vacuum pump energy operation costs* • Increased foot traffic and number of repeat customers lead to higher sales • Broader customer base • Reduced energy bills (if this is a purchase motivation for the target market)	How do the features of the product serve to meet the customer need?
Primary Competitive Alternative	The system that the target customer would use to meet their need in the absence of this product. This can appear in several different forms: • Pre-existing system of use • A competitive alternative that is in the market today • An alternative, which is believed to be coming on the market relatively soon • A drastic change in the way things are done; a shift to some other method	• *Milking systems without pulsation stop control* Consider the example of an individual who owns a gas-guzzling SUV in a market with elevated gasoline prices: • Keep the gas guzzler and keep paying for the gas • Buy a Prius • Wait until next year's (improved) model of the Prius is released • Keep the gas guzzler, but drive less. Take the bus two days per week.	What are the principal options available to the target customer that would provide the same or similar benefits?

Value Proposition Component	Definition	Examples	Questions to Answer
Statement of Primary Differentiation	The ways in which a given product can be readily distinguished from the primary competitive alternatives.	• *Doubles life of pulsation units, reduces vacuum pump energy consumption by 50%, and reduced noise inside the milking barn* • Reduces production time by 30% • Adjusts classroom lighting based on real-time lighting needs	How does this product uniquely meet the needs of its target customers in a way that its competitors do not?
Note: The first bulleted item in each category is taken from the highest scoring data set provided by the utilities for the Business Risk Assessment; it is the Dairy Milking Vacuum System prepared by Southern California Edison. This bullet appears in italics to differentiate it from the other examples.			

4.2.2.2 Value of the Assessment to California Ratepayers

A second component of the Business Risk Assessment considered the ETP's view of the assessment's net value to California ratepayers. This component of the evaluation was suggested by an ETP staff and honed through discussions among ETP staff and the evaluation team, including the CPUC. This component of the evaluation enabled ETP staff to explain the value added by ETP's assessment of the technology. By communicating ETP's perception of its value added, this statement creates a picture of how the ETP assessment is helping the technology achieve traction in the marketplace, traction that would be reduced or delayed in the absence of ETP's intervention. While the value proposition to the target market captures the benefits of the technology in the marketplace, this statement captures the net benefit (value added) of the ETP's activities.

The statement of value is based on the updated ETP logic models. Each utility's logic model links the technology assessments to uptake of the technologies in the EE programs and eventually to increased market adoption by end users, which ultimately contributes to California's energy efficiency goals (see links 6 through 21 in Figure 4-2; similar links appear in the PG&E and Sempra logic models). The evaluation team recognizes that the ETP's direct influence is expected to take place mostly within the utility (e.g., information dissemination from ETP to EE staff; links 6 through 11 in Figure 4-2). The net benefit of the assessment may be limited to that influence, or it may be broader, depending on the circumstances surrounding a given assessment. The evaluation team sought to discover the scope of the influence, as well as the level of variation from one project to another.

The evaluation team used a two-pronged approach to determine the value of the assessment to California ratepayers. First, the evaluation team relied on information provided by ETP staff. Some data collected from project managers using the Aggregate Analysis Data Collection Tool (as discussed in Section 4.3) was useful in this regard, including the estimated current level of market penetration, rationale behind selecting the technology, annual energy savings, and technical potential. In addition, two questions were asked of ETP staff through the Business Risk Assessment effort:

1. Please describe the incremental benefits of ETP's activities related to this technology. That is, what value has the ETP added that would not exist otherwise?
2. Was the incremental cost of this technology (when compared to the nearest baseline) considered when selecting the technology? If it was, what was the approximate incremental cost? Please provide any data used to arrive at this conclusion.

Table 4-2 describes the type of data expected in response to each of these questions. The evaluation team acknowledges that self-reporting bias may arise through this reporting method, and the next step in the data collection activities was designed to validate the responses.

Table 4-2. Description of Components of Value to California Ratepayers

Statement Component	Definition	Examples	Questions to Answer
Statement of Incremental Effect	The value added to the technology's commercialization by ETP's assessment efforts (e.g., accelerating the diffusion of a given innovation)	• Produce EE data that will help the distributor market the technology • Reduce risk that the technology will be introduced into EE program and fail to deliver savings • Produce work paper data to support inclusion into EE program • Demonstrate a technology's applicability in a new sector	How will ETP's assessment of the innovation enhance the likelihood that the diffusion of the technology will increase or be accelerated, thus contributing to California's energy efficiency goals?
Calculation of Incremental Cost	Up-front costs associated with this technology that are above and beyond the up-front costs associated with baseline (less efficient) technology	Varies widely by technology. A quantitative response is preferred, but a qualitative description will also be accepted.	How much more does this technology cost at the time of installation when compared with the baseline (less efficient) technology?

The second prong of the approach included interviews with a subset of the partner companies (e.g., vendors or manufacturers) that participated in the ETP assessment process. The goal of such interviews was to understand the value of the ETP as it is perceived by parties that could potentially benefit from program activities and, in doing so, validate the perceptions of ETP staff. Such interviews focused on the vendors' expectations of their participation in the ETP, any changes in market adoption (speed, degree of penetration, etc.) that occurred because of ETP's involvement, and critique of the incremental effect anticipated by ETP staff in the Business Risk Assessment Data Collection Tool. Interview questions included the following:

- Why did your company bring this technology to the ETP? What did your company hope to gain from the assessment?
- Did the assessment achieve the hoped-for outcome?
- Were there any impacts on the technology's progress to market – or in its market adoption – as a result of the ETP assessment?
- Is your company trying to move the technology into the EE incentive programs? If so, did the assessment help in achieving that goal?
- ETP staff stated that a key benefit of this Program was __________________ [use information from the Business Risk Assessment Data Collection Tool]. Did the assessment by/involvement of ETP in fact help to achieve that?

Ten such interviews were conducted, allocated in the same proportion as the technologies selected for the Business Risk Assessment: four from SCE, four from PG&E, and two from Sempra.[37] Four of these projects were selected to leverage data collection efforts undertaken by the Case Study evaluation team; this approach minimized the number of times that vendors were contacted since the Case Study evaluation team was also conducting vendor interviews. The remaining six were randomly selected from the remaining projects examined through the Business Risk Assessment to create the proper balance of projects among the four utilities. The evaluation team received the vendor contact information from ETP staff.

4.2.2.3 Data Sources

The Business Risk Assessment also entailed documentation of the sources used to complete statements about the innovation's value proposition to market actors and about its value to the ratepayers of California. This enabled the evaluation team to accomplish two goals:

- Verify the claims made in the value statements; and
- Assess the quality of data used to create the value statements.

The Business Risk Assessment team requested that ETP staff provide the information in an easily verifiable format, either through bibliography-style notation and/or through a list of contacts involved in developing the information.

The information included in the Business Risk Assessment used some of the information collected in the utilities' existing technology selection documentation (e.g., SCE's Long Form), but it also required that ETP staff be more explicit about their understanding of the market's need for a given technology. Sources for market information included both primary and secondary data sources. Primary data are the result of original research performed by ETP staff. Secondary sources are the result of research efforts by entities outside of ETP staff. Some potential sources of information used to arrive at the value statements are shown in Table 4-3.

[37] Results from these interviews are qualitative in nature with no pre-determined confidence/precision levels established.

Table 4-3. Examples of Primary and Secondary Data Sources

Primary Data Sources	Secondary Data Sources
Interviews with EE program managers	Trade journals
Surveys	Technical literature
Focus groups	Popular literature
Interviews with relevant market actors[#]	EE program manager research
Original analysis of pre-existing data	Utility-sponsored market research (e.g., Commercial Energy Use Survey, Residential Appliance Saturation Survey, Residential Market Share Tracking System, completed EE program evaluations, market characterization studies, market transformation studies, etc.)
	Papers completed for or by Public Interest Energy Research (PIER)
	Conference proceedings

[#] Relevant market actors may include representatives of competing companies, independent third-party market research firms, end users, academic or government researchers or agency representatives, and others.

4.2.3 Business Risk Assessment: Data Collection Approach

The evaluation team determined that the ETP has not historically documented much of the information needed for the Business Risk Assessment. In part, this was due to the introduction of the Business Risk Assessment mid-way through the program cycle. ETP was expected to collect some of the information needed for the Business Risk Assessment as part of its technology selection process. It was not clear to ETP staff, however, that this information would need to be organized along the lines of the Business Risk Assessment data collection tool (Appendix C) until early 2008.

In order to mitigate the work load for ETP staff, the evaluation team selected a subset of technologies in the ETP database about which to collect the information for the Business Risk Assessment. The method for selecting these technologies is discussed below. The evaluation team planned workshops with ETP staff to train them on the approach to preparing the technology's value proposition and the statement about the assessment's value to California ratepayers. Finally, the data collection tool that ETP staff used to submit the information to the evaluation team is discussed.

4.2.3.1 Approach to Technology Selection

The Business Risk Assessment team collected data on 70 (~30 percent) of the 230 technologies from the 2006-2008 program cycle included in the ETP Database dated September 2008; selecting the subset prior to the completion of the program cycle was deemed necessary due to the evaluation timeline. These were then allocated among the utilities according to their portion of the three-year Statewide ETP budget. Accordingly, PG&E and SCE were each responsible for roughly 40 percent of the technologies in the subset (i.e., 28 technologies each), and the two Sempra utilities combined for 20% (i.e., 14 technologies total, including 8 from SCG and 6 from SDG&E).

The evaluation team employed a three-part selection process to identify projects for consideration in the Business Risk Assessment:

1. **Include projects selected independently through the Peer Review and Case Study evaluation components.** This enabled the Business Risk Assessment team to leverage the efforts of other evaluation team members and to gather a richer compilation of information about a small set of projects. The Case Study sample also included some technologies that were *not* selected for assessment through the ETP. In the future, this approach can enable the Business Risk Assessment team to identify any "false negatives" in the portfolio. In order to be included in the Business Risk Assessment, the projects that were selected for Peer Review or for the Case Studies had to meet two criteria:

    - Project was initiated during the 2006-2008 program cycle; and
    - A screening form (i.e., ETPA, ETOS, Long Form) was available for review.

    The evaluation team selected 31 projects in this way, which included all of the projects in the September 2008 database that met these criteria.

2. **Select a sub-set of additional projects to include that achieved the targeted subset size.** Projects had to meet the following criteria to be considered for the Business Risk Assessment:

    - Project was initiated during the 2006-2008 program cycle;
    - A screening form (i.e., ETPA, ETOS, Long Form) was available for review; and
    - Diversity of project managers.

    From the set of technologies that met these criteria, the Business Risk Assessment team drew a random selection of projects.

    An additional 39 projects were selected in this manner.

3. **If the utilities wanted to add technologies to the list beyond the above two sets selected by the evaluation team, they were included in the evaluation, provided that they met the practical considerations described previously.** The Business Risk Assessment team was willing to work with the utilities on these value propositions and review the results as part of the evaluation.

    The utilities did not add any technologies to the sample in this way.

While the subset of projects reviewed in the Business Risk Assessment was not strictly random, the evaluation team believes that this subset of projects was reasonably representative of ETP's portfolio of technologies. The Business Risk Assessment focused on the quality and documentation of ETP's due diligence effort and the ETP's articulation of the business case for each technology. Collecting data that satisfy the criteria of Table 4-4 and providing it in a form that meets the criteria of Table 4-5 flows directly from the current practices within ETP. It is also important to note that proficiency at these tasks is not dependent on the industry sector, end use, recipient of information about the technology, or other characteristics analyzed in the Aggregate Analysis.

The utilities provided input on the projects selected for the Peer Review and Case Study process, and a subset of these projects was included in the Business Risk Assessment. A random sample of the remaining projects was then selected to meet the quota; this random sample made up more than half of the group of projects examined through the Business Risk Assessment. In addition, in order to increase the representativeness, the Business Risk Assessment team also specifically asked the utilities for their recommendations on which projects to include in the Business Risk Assessment. However, none of the four utilities provided recommendations regarding additional projects.

4.2.3.2 Workshops with ETP Staff

The Business Risk Assessment team conducted workshops with ETP staff to demonstrate the approach to developing value propositions and statements about the value of the assessment to California ratepayers. All ETP project managers and other relevant ETP staff (as determined by ETP managers) were invited to these half-day workshops, which occurred in early January 2009.[38]

The goal of these workshops was to describe the mechanics of preparing value propositions to ETP staff. To meet this goal, the workshops had three main objectives:

- To review the value proposition approach, its importance, and the methods;
- To work through the preparation of value propositions for several technologies in which the project managers were involved in the 2006-08 program cycle; and
- To explain the methods that will be used to evaluate the value propositions prepared by program staff for the evaluation team.

4.2.3.3 Data Collection Tool

The evaluation team requested that ETP staff submit the information needed for the Business Risk Assessment using a data collection tool similar to that provided in Appendix C. The evaluation team provided an electronic copy of the data collection tool to ETP staff and requested that completed tools be submitted electronically as well.[39] The data collection tool provides a mechanism for consistent record keeping as well as a format that clearly delineates the information needed from ETP staff.

[38] The meeting with PG&E staff was held on January 6, 2009, at PG&E's facility. The meeting with SCE was held on January 7, 2009, at SCE's Irwindale facility. The meeting with SCG and SDG&E staff was held on January 9, 2009, at the Gas Tower in Los Angeles.
[39] The form was provided to all utilities on February 13, 2009.

4.2.4 Business Risk Assessment: Approach to Evaluating Value Propositions

This section discusses the approach to evaluating the value propositions prepared by ETP staff. The evaluation process involved four steps. First, the evaluation team assessed the robustness of the value proposition; next, the evaluation team assessed the extent to which due diligence was conducted; then, the evaluation team assessed the value of the assessment to the ratepayers of California; and finally, combining the results of these steps, the evaluation team characterized the subset of projects examined As discussed in Section 4.2.3.1, the evaluation team does believe that these projects are representative of the larger ETP portfolio of projects.

4.2.4.1 Assess the Robustness of the Value Proposition

The robustness of the value proposition indicates the extent to which it demonstrates the product's potential to achieve market success. In this context, "robust" is intended to mean that the value propositions are not easily contradicted or disproved. Robust value propositions overcome doubt in the reader's mind that the product can achieve market traction by presenting a compelling case for the technology. The compelling case convinces the reader that the product is well positioned to attract sufficient interest from the target market to warrant investment by the manufacturer/marketer.

The evaluation of the robustness of the value propositions included two metrics:

1. The extent to which the value proposition resembles one associated with a technology that has demonstrated commercial success (i.e., adoption, growth, and profit); and
2. The extent to which each of the seven components of the value proposition (see Table 4-1) is described to a reasonable level of specificity. These seven components are repeated here for convenience:
    - Target Customer,
    - Statement of Customer Need,
    - Product,
    - Recognized Product Category,
    - Statement of Key Benefit,
    - Primary Competitive Alternative, and
    - Statement of Primary Differentiation.

Table 4-4 summarizes the approach to scoring these two aspects of the value proposition.

Table 4-4. Scoring Matrix for Robustness of Value Proposition

Evaluation Metric	**Scoring (Points)**				
	0	**5**	**10**	**15**	**20**
Resemblance of successful technology value proposition (20 points max.)	None of the value proposition components resemble value proposition for a successfully commercialized technology.	At least one of the components resembles that of a value proposition for a successfully commercialized technology.	Half of the components resemble those of a value proposition for a successfully commercialized technology.	At least four of the components closely resemble those of a value proposition for a successfully commercialized technology.	All value proposition components strongly resemble those of a value proposition for a successfully commercialized technology.
Level of specificity (10 points max.)	The statement lacks any clarity and could be used for multiple technologies.	At least four of the seven components are explicitly detailed or all of the components are partially detailed; it is possible to determine what the product is, who would buy it, or why this product would be preferred over the competitors, but the full case is not clear.	All of the components are explicitly detailed, clearly answering all of the questions outlined in Table 4-1.	N/A	N/A

Decades of experience from the private investment community demonstrate that robust value propositions possess certain characteristics. Decision makers use the value proposition to determine the viability of investments, to create business plans around the product, to build marketing plans and to make a variety of other business decisions. Successful value propositions lay the foundation for a investment decisions by defining the critical elements associated with product as succinctly as possible. When a product is in the early stages of commercialization, this narrow definition of the market and of the technology's benefits to that market are critical in determining the proper point of entry. The initial point of entry, if successfully defined, creates the momentum needed to expand either the market for this product or the product offerings of the firm.

Robust value propositions withstand the test of questions about the validity of the value proposition components. The evaluation team asked questions including, "Will this target market really pay for the benefit described in the value proposition? Is there an established product category in which this technology could better compete? To what extent is this technology really different from its competitors? Does the placement in the established product category subject the technology to so much competition that it will never achieve the needed market share?" Robust value propositions address these types of questions by making a solid case for why the technology is well positioned to excel in the marketplace.

4.2.4.2 Assess the Extent to Which Due Diligence Has Been Conducted to Support Value Propositions

As the evaluation team reviewed the value proposition, it also examined the quality of the due diligence underlying the value proposition (see Table 4-5 for metrics used to assess due diligence). The value proposition requires that market research support the business case outlined for the product. The value proposition should represent the results of the analysis of primary and/or secondary research. This portion of the evaluation assessed the quality of that research (or "due diligence").

This portion of the evaluation is weighted more heavily than the robustness of the value proposition. In total, the quality of due diligence conducted is worth 70 points, while the robustness of the value proposition is worth 30 points. This weighting scheme reflects the evaluation team's acknowledgement that the preparation of value propositions is a new exercise for ETP staff at this stage in the Program's evolution; it is a skill that requires practice. ETP technology selection forms used by ETP staff, however, already request information about many of the components of the value proposition. The Business Risk Assessment team assessed the due diligence underlying those responses as it relates to the value proposition.

Table 4-5 presents the seven metrics for evaluating "due diligence" and the criteria that must be met to earn certain levels of points for each metric. As shown in Table 4-5, the maximum value for each metric varies according to its importance relative to the other metrics, in effect weighting the importance. For example, the metric "Captures enduring, lasting market effects" has a maximum value of five points, while "Relevant to the product at hand" has a maximum value of 15 points.

Table 4-5. Scoring Matrix for Assessing the Extent to Which Due Diligence Has Been Conducted to Support Value Proposition

Evaluation Metric	**Scoring (Points)**			
	0	**5**	**10**	**15**
From a trusted source (10 points max)	Sources rely heavily on speculation or unknown market actors.	Some sources are speculative or rely on unknown market actors; some of the sources are well known and respected.	Sources rely heavily on relevant peer-reviewed publications, trade journals, primary research, and conference proceedings.	N/A
Verifiable (10 points max)	No sources are listed.	Some sources are not well documented, or the cited information is not included.	Sources are well documented, and cited information is available.	N/A
Captures enduring, lasting market trends (5 points max)	Market trends cited are whimsical; they will be short-lived and will not support the product's growth.	Market trends cited represent a real change in the marketplace that will last for the product's market life cycle.	N/A	N/A
Relevant to the product at hand (15 points max)	The data are irrelevant for the product at hand. They are based on the state of knowledge about another product or end market.	Most data are not related to the product at hand or its potential market.	Most data are related to the product at hand and its potential market.	The data presented represent information known about the product at hand and its potential market.
Support the claims made in the value proposition (15 points max)	The data bear no relation to the information in the value proposition.	Most of the components of the value proposition lack supporting evidence in the data provided.	Most of the components of the value proposition are documented in the data provided.	The data are clearly linked to all of the components of the value proposition.

Evaluation Metric	Scoring (Points)			
	0	5	10	15
Statistical significance (if relevant)[40] (5 points max)	If the data are in a form that can be processed statistically, they are not statistically significant.	If the data are in a form that can be processed statistically, all data are statistically significant.	N/A	N/A
Degree to which market readiness has been assessed (See Appendix D for more detail.) (10 points max)	The data do not consider the market's receptivity to the product at all.	Some data exist to support a claim that the market is open to new products, but most of the categories in Appendix D are left unanswered.	The data support the fact that the target market is open to new products; all of the categories in Appendix D are addressed.	N/A

[40] In the event that statistical significance is not relevant, the evaluation team will adjust the Due Diligence point scale to 65 instead of 70 points.

4.2.4.3 Assess the Value of the Assessment to the Ratepayers of California

This component of the evaluation is qualitative. The ETP is intervening in the market for these technologies so early that it is difficult to determine what would have happened in the absence of the Program with any reasonable precision. As a result, the evaluation looked for qualitative statements that demonstrate the effect on the market that ETP intended to have when it made the funding decision. Accordingly, the team did not assign a "score" to this part of the Business Risk Assessment; instead, it relied on a qualitative analysis of the statements that were made.

To evaluate the net benefit of the assessment to the ratepayers of California, the evaluation team used the two-pronged approach discussed previously. Vendor comments regarding the Program's influence were characterized both independently, as well as alongside the statements made by ETP staff. The goal of the stand-alone analysis was to understand the vendors' motivation for participating in the ETP, as well as their perception of the benefits of the Program as they experienced it. The goal of the comparative analysis was to assess the level of communication about the Program benefits between ETP staff and vendors. In the end, ETP staff's understanding of the vendors' interest in participating in the Program will enable them to adjust the Program in order to attract the most appropriate vendors to the Program in the future.

4.2.4.4 Characterize the Portfolio: Categorize the Technologies According to the Robustness of the Value Proposition and the Quality of Underlying Data

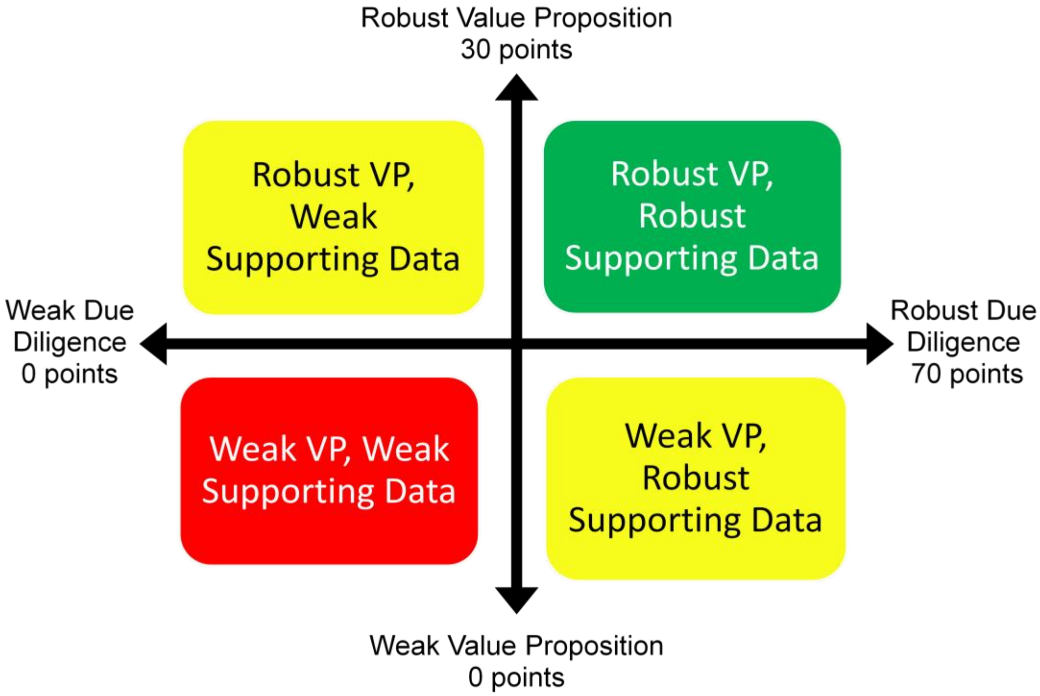
Relying on the data collected using the scoring matrices in Table 4-4 and Table 4-5, the evaluation team assigned each technology to one of four categories:

1. Robust value proposition, weak supporting data
2. Robust value proposition, robust supporting data
3. Weak value proposition, weak supporting data
4. Weak value proposition, robust supporting data

Assigning the technologies to one of these categories enabled the evaluation team to identify trends in ETP staff's approach to developing value propositions and conducting due diligence.

Figure 4-4 depicts the matrix used to characterize the results of the scoring completed in the first two stages of this evaluation. The score for each technology is plotted on this x-y axis, where the x-coordinate is the score that represents the quality of due diligence performed, and the y-coordinate is the score that represents the robustness of the value proposition. The four quadrants depicted in the matrix correspond to the four categories discussed previously; for example the upper-right quadrant corresponds to technologies that have robust value propositions and robust supporting data.

Figure 4-4. Categories Used to Characterize ETP's Value Propositions and Due Diligence



The evaluation team performed the scoring for the value proposition and the underlying due diligence only after the ETP staff submitted final versions of the Data Collection Tool; all such final versions were to be submitted by July 15, 2009.[41] The evaluation team took a collaborative approach to the evaluation and provided preliminary feedback on draft data collection tools as requested by ETP staff.[42] If ETP staff were able to improve on an individual draft data collection tool based on the evaluation team's feedback, they were able to re-submit the revised data collection tool as a final version. These final data collection tools were used for scoring and placement into the categories described in Figure 4-4.

4.2.5 Business Risk Assessment Results

The two-member evaluation team used a two-step procedure for scoring the data collection tools. This approach was designed to increase inter-rater reliability and reduce reviewer biases. In the first step, the team reviewed a subset (9 of 70) of the data collection tools together to develop a scoring benchmark, which served as the foundation for scoring the remaining data collection tools. The second step entailed scoring the remaining (61 of 70) data collection tools and involved individual scoring of the data collection tools by each team member; periodic discussion of differences in scoring enabled the reviewers to maintain consistency in the methodology and to protect the validity of the scoring. This process is captured graphically in Figure 4-5. The remainder of this section describes this process in more detail.

[41] Final versions of some data collection tools were not delivered to the evaluation team until mid-August, 2009.
[42] A summary of the issues identified in the series of preliminary feedback memos is included in Appendix E.

The first step established a common benchmark for scoring. To initiate this process, one member of the team began by conducting a high-level review of all 70 data collection tools.[43] From these data collection tools, this team member selected a representative subset, which was scored jointly by both team members. The representative subset had the following composition:

- Three high-quality data collection tools drawn from the full set of 70 data collection tools. A high quality data collection tool is one in which the technology is unambiguously backed up by clear data, and the value proposition is articulated in a clear manner;
- Three low-quality data collection tools drawn from the full set of 70 data collection tools. A low-quality data collection tool is one in which the technology lacks supporting data, and the value proposition fails to communicate a business case for the technology;
- Three data collection tools selected at random from the remaining 64 data collection tools.

The two team members jointly scored the representative sample in real time. This real-time analysis enabled the team to establish benchmarks for the scoring criteria, so as to develop a common approach to evaluating the data and to ensure that both team members properly followed the scoring instructions. The team then scored the remaining data collection tools using the common benchmark developed through this joint scoring exercise.

The second step involved scoring the remainder of the data collection tools. The two team members individually scored four groups with each group consisting of 15 data collection tools. Each group of 15 was selected at random from the remaining data collection tools. The team members worked in parallel, scoring these data collection tools individually. After each group of 15 was scored, the team members compared scores for the two major categories identified in the scoring tool (included in Appendix F). In cases where either of the major category scores was not identical, one of two actions was taken:

1. If the team members' scores in either of the major categories differed by 15% of the possible points in that major category *or less* (e.g., 15% of 30 points in the Robustness of Value Proposition category), the two team members' scores were averaged together.
2. If the team members' scores in either of the major categories differed by *more than* 15% of the possible points in that major category (e.g., more than 15% of 30 points in the Robustness of Value Proposition category), the difference was noted, and the two team members analyzed the basis for the difference in their scores. In addition, the team members identified the sources of the differences[44] and developed strategies to minimize such differences in future rounds of scoring.

[43] Please see Appendix C for an example of the data collection tool that ETP staff completed.

44 Differences in scoring between the reviewers may result from several causes, including different interpretations of words like "trusted", "relevant", "verifiable", "enduring", and "lasting," or different interpretations of the evidence associated with a given metric.

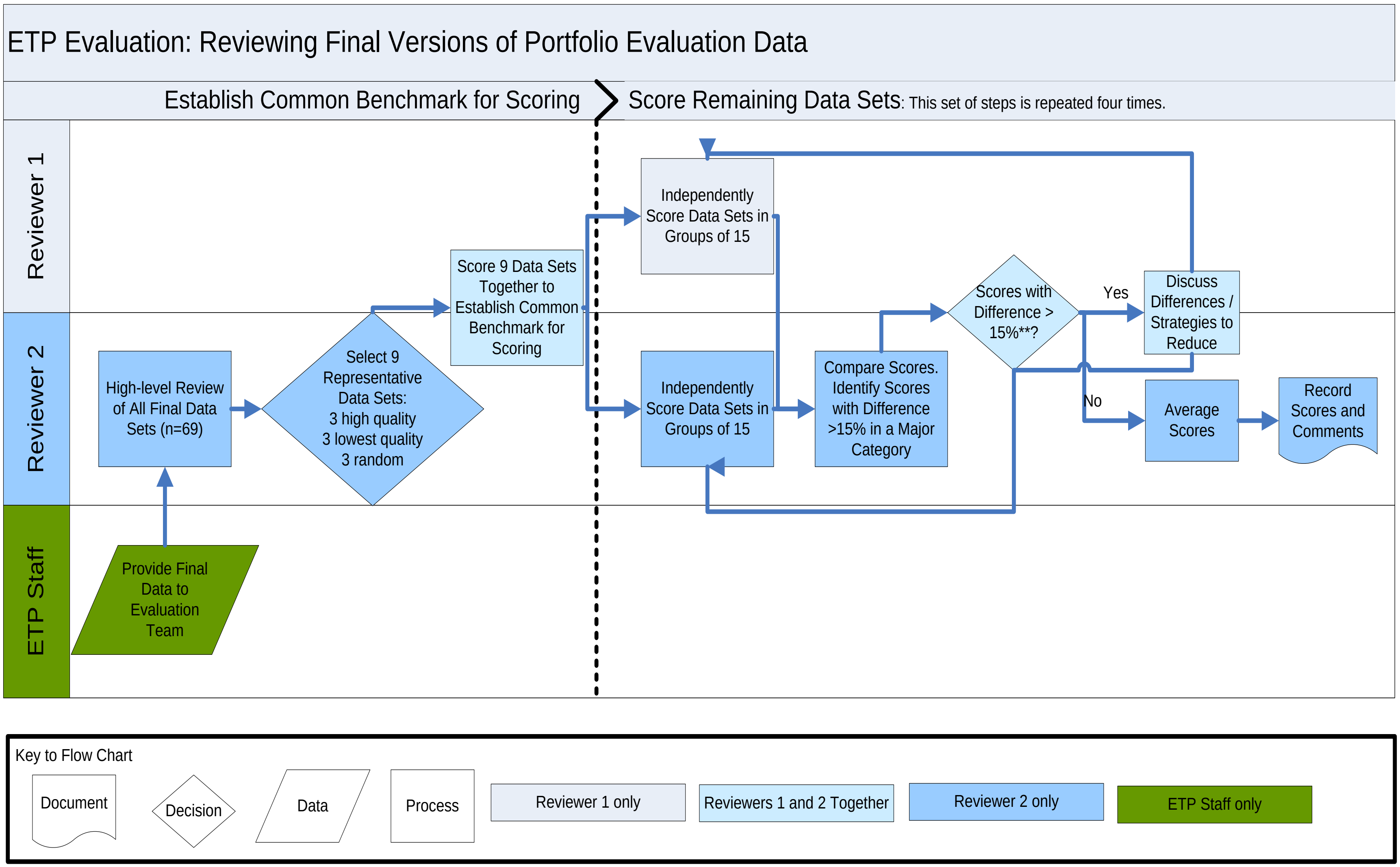
Following this analysis, the team members again individually scored the data and repeated the process in this second step until the difference was 15% percent of the total possible points in each major category *or less*. Any remaining differences are the result of remaining differences in the interpretation of the data.

A final score was recorded in the master data file. A list of final scores for each major scoring category is included in Appendix G.

It should be noted that the evaluation team considered only information about the technologies that was provided by ETP staff. Some of the completed data collection tools included web links or references to publicly available documents, which were reviewed if available. PG&E provided additional documentation in the form of attachments to the data collection tools, and these were reviewed when provided. The team did not conduct its own independent research about the market for these technologies.

In addition to these documents provided by ETP staff with the specific intent of inclusion in the Business Risk Assessment review, the evaluation team reviewed additional data that had been provided by the utilities earlier in the evaluation cycle. For example, all three utilities had provided completed technology selection forms (i.e., Long Form, ETOS, ETPA) for some technologies. Where these were made available, the evaluation team reviewed them as part of the Business Risk Assessment; in general, the forms used by SCE and PG&E provided more information than those provided by Sempra. In some cases, PG&E and SCE had provided additional documentation, such as presentations and other product information used or produced by project managers; the evaluation team also included this information in the review since it was viewed as being made available to the team by ETP staff, even if it was not directly referenced in the Business Risk Assessment documentation.

Figure 4-5. Process Used to Review and Score Final Business Risk Assessment Data Collection Tools



4.2.5.1 Business Risk Assessment Scoring: Value Proposition and Due Diligence

Summary results of the scoring of the value propositions and supporting due diligence are provided in Figure 4-6. The first scatter plot summarizes all of the scores for all of the IOUs, while the following four plots disaggregate the scores by utility. The data in the scatter plots are presented as follows:

- X-axis represents the due diligence score, typically out of 65 points;[45] Table 4-5 describes relevant components of this score.
- Y-axis represents the score for the Robustness of the Value Proposition, out of a possible 30 points; Table 4-4 describes relevant components of this score.
- Each marker on the chart represents the score for a unique ETP project, with each utility represented by a different shape.
- The "X" marker in each plot represents the average of the data in that chart.
- The ovals in each plot represent one standard deviation of the data in the chart (i.e., 68.2% of the projects in each chart are included in these ovals).

Scores for each individual project are included in Appendix G, sorted by the ETP database number.

Descriptive statistics can provide additional insights into the data presented in the scatter plots. As discussed earlier, the sample of projects was selected to build on data collection efforts and project vetting processes used in other parts of the evaluation and is therefore not a strict probability sample. Thus, technically, the evaluation team could not extrapolate any averages to the larger population of 230 projects or estimate standard errors and construct confidence intervals. Nevertheless, the results are reasonably representative of the project population.

While the subset of projects reviewed in the Business Risk Assessment was not strictly random, the evaluation team believes that this subset of projects was reasonably representative of ETP's portfolio of technologies. The Business Risk Assessment focused on the quality and documentation of ETP's due diligence effort and the ETP's articulation of the business case for each technology. Collecting data that satisfy the criteria of Table 4-5 and providing it in a form that meets the criteria of Table 4-4 flows directly from the current practices within ETP. It is also important to note that proficiency at these tasks is not dependent on the industry sector, end use, recipient of information about the technology, or other characteristics analyzed in the Aggregate Analysis.

The utilities provided input on the projects selected for the Peer Review and Case Study process, and a subset of these projects was included in the Business Risk Assessment. A random sample of the remaining projects was then selected to meet the quota; this random sample made

[45] Only two projects were scored out of 70 points due to the fact that only those two projects provided statistical data in support of the claims made in the value proposition. The five points associated with Statistical Significance were only counted towards the total if the supporting data included statistical analysis of any kind.

up more than half of the group of projects examined through the Business Risk Assessment. In addition, in order to increase the representativeness, the Business Risk Assessment team also specifically asked the utilities for their recommendations on which projects to include in the Business Risk Assessment. However, none of the four utilities provided recommendations regarding additional projects.

The remainder of this discussion focuses on the characteristics of the sample, but the conclusions to which they lead are applicable to the portfolio as a whole. The scatter plot and descriptive statistics lead to similar conclusions; thus, the conclusions are discussed following the scatter plots and summary statistics.

Figure 4-6. Summary of Business Risk Assessment Scores for All IOUs

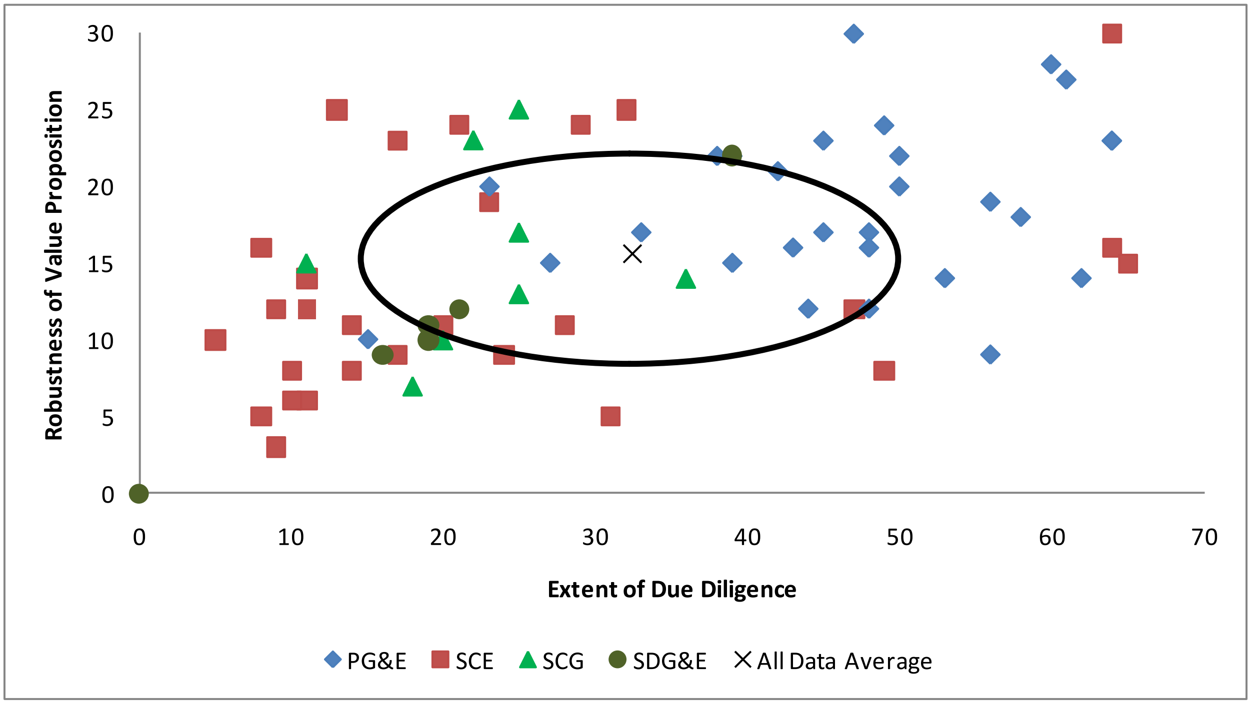


Table 4-6. Summary of Descriptive Statistics for All Utilities' Projects

	Robustness		**Due Diligence**		**Total Points Earned**	
	Absolute	**Normalized to 100%**	**Absolute**	**Normalized to 100%**	**Absolute**	**Normalized to 100%**
Average	16	52%	32	50%	48.0	50%
Median	15	50%	29	44%	47.5	50%
Mode	12	40%	64	98%	25	26%
Standard Deviation	6.9		18.5		22.8	

The scatter plot and descriptive statistics identify several useful conclusions about the information included in the Business Risk Assessment data collection tools.[46] Again, while the subset of projects reviewed in the Business Risk Assessment was not strictly random, the evaluation team believes that this subset of projects was reasonably representative of ETP's portfolio of technologies and allows, therefore, the evaluation team to arrive at some useful insights regarding the larger population of projects. The main findings are summarized as follows:

The main findings are summarized as follows:

1. ***Performance varies within ETP as a whole.*** From one project to another, ETP varies widely in its ability to develop a solid value proposition and document the evidence to support it. Every combination of scores is present: high Robustness and high Due Diligence, high Robustness and low Due Diligence, low Robustness and low Due Diligence, and low Robustness and high Due Diligence. The variation, as demonstrated by standard deviation, is noteworthy: each component of the score varied by 20-25% of the total possible points in that category.

   This variability points to an inconsistency in the methods for collecting, reporting, and/or tracking information across the ETP. In some cases, a wealth of data was available to support the claims made in the value propositions; in other cases, very little data were available. At times, this may have been because data were not collected at the time of project selection. For other projects, the data were available (or had been at some point) but were not well documented. Some solid methods do exist within the ETP for collecting and documenting the information, but they are not used consistently throughout the Program.

2. ***There are differences in performance from one utility to the next.*** As the different colors and shapes in Figure 4-6 demonstrate, some utilities performed better than others in the Business Risk Assessment. The reasons for these differences are beyond the scope of this evaluation task. It is important, however, that the utilities take advantage of this opportunity to discuss the strengths and weaknesses of each of their approaches to business risk assessment. Given the importance placed on this activity in the 2010-12 PIPs, developing an approach that builds on the strengths of each program will result in a set of technologies that are more likely to gain traction in the marketplace and thereby contribute to meeting California's ambitious energy efficiency goals.

3. ***Three of the four utilities had at least one project in the "upper right quadrant" part of the scatter plot.*** PG&E had the greatest number of projects (19) in the part of the grid where Robustness scores were greater than or equal to 16 and the Due Diligence scores were greater than or equal to 32. SCE had three projects and SDG&E had one project in that plot area. SCG had two projects that had upper-

[46] As noted earlier, the projects were distributed among the utilities as follows: 28 projects from PG&E, 28 projects from SCE, 8 projects from SCG, 6 projects from SDG&E.

quadrant results in one of the two categories, but neither of these projects had upper-quadrant scores in both categories.

It should be pointed out that the documentation provided for some projects at each utility was outstanding. For those projects, the evaluation team was impressed with the use of a wide variety of sources, including widely-known experts, peer-reviewed publications, statewide market studies, and conversations with potential customers. The individuals who prepared these projects did an outstanding job of building a case for their claims. It was not clear if these individuals were better organized or if they simply spent more time preparing the data collection tools, but the differentiation between these and other projects was notable.

Additional information about the characteristics of these high-scoring projects can be found in two places in this report. First, the scoring matrices in Table 4-4 and Table 4-5 explain the characteristics of the value propositions and due diligence that would earn high scores. Additionally, Appendix E describes the best practices for overcoming the issues identified in the draft data collection instruments prepared by ETP staff. Together, these resources should provide guidance about how to construct a robust value proposition and perform and document robust due diligence.

4. ***There are several common types of fundamental errors in the value propositions and due diligence.*** There were many types of errors made in the development of the Business Risk Assessment data preparation. For example, these issues were found in many of the data sets: providing only the project manager's opinion in support of the value proposition, identifying a type of company (rather than an individual decision maker) as the target customer, and citing technical features of the product as the benefits of the technology that would convince a buyer to purchase the product. In these examples, these errors stem from a lack of understanding of the importance of the Business Risk Assessment and a lack of understanding of the fundamental concepts presented in the *White Paper*.

   Appendix E includes a classification of many of the errors seen in the data sets. These were prepared in response to the draft data, but many of these were still present to some degree in the final data. (This is especially true for SCE's final data, for which SCE chose to re-submit the draft data, unchanged.) This appendix provides a starting point for understanding ways in which ETP can improve its performance in the area of Business Risk Assessment.

Table 4-8 includes examples of a strong and a weak data set. These are examples taken directly from the data provided by ETP for the evaluation.

Table 4-7. Comparison of Strong and Weak Value Propositions and Supporting Data

Value Proposition Component	Definition of Value Proposition Component	Robust Example	Weak Example
Target Customer	The **individual(s)** making the purchase decision who has/have budget responsibility and go/no-go authority on the actual purchase decision. The individual(s) may be a consumer or represent a business.	Lettuce field owners and facility managers of lettuce packaging plants	Retail customer interested in reducing energy bills
Statement of Customer Need	An expression of a perceived gap between the current state of affairs or the current system of use and what would be desirable. The gap falls somewhere along a spectrum of mild (not much of a gap) to acute (a significant difference that demands attention).	Must cool their product quickly after harvest to lengthen its shelf life while maintaining food product safety	Needs energy efficient OPEN signs
Product	Any physical good or intangible service (or a combination of goods and services) that serves as a solution to the customer need.	New build Field Vacuum Pre-cooling system with VFDs	LED OPEN sign
Recognized Product Category	A set of goods and services that are widely recognized in society as being appropriate for a particular type of need.	Refrigeration system	Sign
Statement of Key Benefit	The way in which the features of that product are appropriate to satisfy a stated customer need.	Cools lettuce within 30 minutes more efficiently by reducing the energy used in the refrigeration cycle	Provides energy efficient sign lighting

Value Proposition Component	Definition of Value Proposition Component	Robust Example	Weak Example
Primary Competitive Alternative	The system that the target customer would use to meet their need in the absence of this product. This can appear in several different forms: • Pre-existing system of use • A competitive alternative that is in the market today • An alternative, which is believed to be coming on the market relatively soon A drastic change in the way things are done; a shift to some other method	Older vacuum pre-coolers and forced air coolers without VFDs	The existing neon OPEN signs
Statement of Primary Differentiation	The ways in which a given product can be readily distinguished from the primary competitive alternatives.	Improves food safety by using stainless steel, reduces maintenance costs, improves productivity through better controls (Improved control allows the needed refrigeration and vacuum capacity to operate only when needed), and reduces energy consumption by 30% through the use of VFDs on all major drives	Product is more energy efficient

Value Proposition Component	Definition of Value Proposition Component	Robust Example	Weak Example
Examples of supporting data provided		Names, phone numbers and email addresses for the following primary sources: ▪ End users ▪ UC-Davis Extension contact ▪ Account Executive at the utility ▪ Vendor Citations (title, author, publication) for the following secondary sources (which included directly relevant information): - Article published by UC-Davis extension - Article published by Kansas State University - Article published by Maryland Cooperative Extension	List of these primary sources without individual names or contact information: - "Various manufacturers and vendors" - Industry association (a contact name was provided) - "Basic lighting industry knowledge" Links to the following secondary sources, which were to home pages rather than to specific articles: - Lighting Resource Center, Rensselaer Polytechnic University - LEDs magazine - LED Journal - Vendor websites (including GE and Neon Design a Sign)

Source: The first two columns of this table are repeated from Table 4-1. The "strong example" is from the second-highest scoring data set among those submitted by ETP; the components of the highest scoring are included in Table 4-1. The "weak example" is from the second-lowest scoring data set among those submitted by ETP; the lowest scoring data set was blank.

4.2.5.2 Business Risk Assessment: Value of ETP Assessments to California Ratepayers

The final component of the Business Risk Assessment examined the value of ETP's involvement in the technology assessments. The evaluation team asked ETP staff associated with the sample of 70 projects to describe how ETP's role in the assessments made a difference in the technologies' commercialization and market penetration. For a sample of nine of these 70 projects, vendors whose technologies were assessed as part of the program were also asked to describe how ETP's role in the assessments made a difference in the technologies' commercialization and market penetration.. This part of the evaluation sought to examine the skills, resources, and other benefits that ETP brought to the assessments that would not have been available in the program's absence. While other steps in the assessment asked how well ETP was performing at certain tasks, this step asked ETP staff to define how each ETP project made a net contribution (a contribution that would not have existed absent the ETP) to the value of the technology in the marketplace. Once the data were collected, the evaluation team compared the responses of the two groups. This approach was intended to determine if it was worthwhile to pursue this methodology in the future. The responses of ETP staff are presented first followed by the responses of the vendors.

The evaluation team identified categories of benefits based on the narratives developed by ETP staff. In the narratives, ETP staff identified a wide variety of benefits associated with ETP involvement, giving rise to several themes.[47] Table 4-8 connects these themes with some examples of specific benefits of ETP's involvement that ETP staff identified in the narratives.

[47] This evaluation relied in large part on the self-report of ETP project managers to identify benefits of the Program. In future evaluations, these or other higher level themes may be addressed in the Aggregate Analysis or Case Study efforts so that data can be collected for larger subset of technology assessments. As in this evaluation, the vendors involved in projects considered in future evaluations may be asked about their perceptions of ETP's value in order to validate ETP staff's consideration of the program's value and to identify other values of ETP of which ETP staff may not be aware. In addition, EE program managers may also be interviewed to better understand the values created within the utilities by the ETP assessments.

Table 4-8. Specific Examples of Descriptions of the Value that ETP Added by Involvement in a Given Assessment

Theme	Examples of Stated Values
Verify/Assess Energy / Environmental Performance	-Quantify / verify energy efficiency savings -Quantify / verify emissions reductions -Quantify / verify water savings
Address Cost-Effectiveness Issues	-Calculate incremental cost -Assess installed cost
Provide Neutral Third-Party Assessment	-Provide credible source of information in the market from a neutral third party
Support Program / Incentive Design	-Develop total resource cost information, workpapers, etc. -Develop specifications for technology in EE program design -Enable informed decisions by EE program managers -Establish / improve methods for calculating energy savings -Determine marketing, education, and training needs
Conduct Outreach / Increase Awareness	-Increase awareness about the technology in the utility sector and the broader market -Provide information for outreach to customers
Direct Effect on Market	-Influence manufacturer design -Influence installation / operation decisions
Address Market Concerns / Needs	-Identify and understand market needs -Validate claims about non-energy benefits -Test for specific product characteristics -Assess customer satisfaction -Understand product installation / operation -Explore alternative applications
Contribute to a Broader Effort	-Trigger research by other organizations (e.g., PIER) -Leverage funds from other organizations -Feed codes and standards enhancement efforts -Allow ETP to establish priorities for future projects
Determine that Technology Not Ready for Incentive Program	-Result of testing revealed that product was not ready for EE programs, enabling utility to avoid going any further with the technology
Describe the Value of the Technology, Not ETP's Role in the Assessment	-Some forms described the technical potential for energy savings, which could represent the benefit of the technology to the ratepayers of California rather than the benefit of ETP's involvement in the assessment.

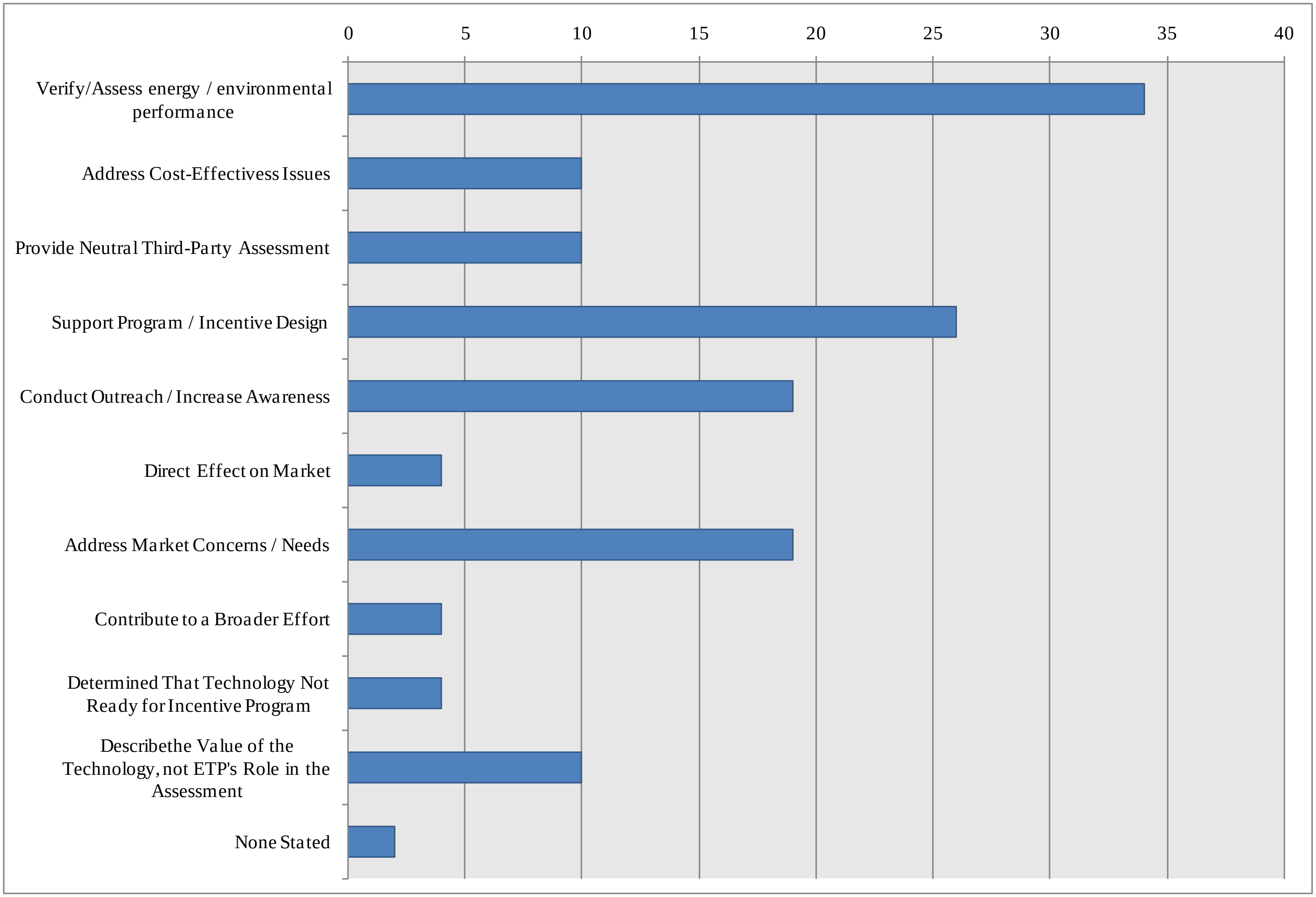
Note: These benefits are based on self-report by ETP staff.

The narratives varied widely in the level of detail and documentation provided by ETP staff to support claims about the benefits created by the ETP. The narratives were sometimes rich with detail about the project's influence on manufacturers, customers, or EE program staff. In these instances, it appeared that the project had a tangible effect on the technology's adoption into EE programs or by customers. In other cases, the statements were forward looking, anticipating benefits of an assessment that was not yet completed. In still other cases, the statements were overly bold, claiming, for example, that the ETP assessment increased market penetration without documenting how the project influenced market actors or the amount by which the market penetration increased. This variation was analogous to that seen in other components of the Business Risk Assessment.

The evaluation team documented how many times each theme appeared in a narrative. In doing so, the evaluation team did not make judgments about the validity of these claims. The evaluation team used the language in the second column of Table 4-8 as a guideline for categorizing the values stated in the narratives into the higher level themes.

A summary of the frequency with which each theme appeared in the narratives is included as Figure 4-7. A more detailed examination of the value associated with each project is included as Appendix G. It should be noted that multiple values were identified for several projects such that the sum of all responses is greater than 70, the number of projects for which these narratives were requested.

Figure 4-7. Frequency with which ETP Staff Mentioned Each Major Theme of ETP Value



Vendors involved in the ETP assessments identified similar values, though the value of ETP's involvement in a given project was different than that identified by ETP staff. On the whole, ETP staff and vendors identified consistent categories of value for the Program. Like ETP staff, vendors most frequently identified verifying energy savings claims as a value. However, on any individual project, the vendor identified a different set of values for that specific project than did ETP staff.

Table 4-9 compares the values of the program identified by ETP staff with those identified by vendors involved in the technology assessments. Recall that the vendor interviews regarding the value of ETP's involvement were conducted for a very small sample of 9 ETP projects. Given that the sample of vendors is not a strict probability sample, the findings from these few projects might not be representative of the ETP as a whole. This small sample was investigated further to determine if further examination of this area in future evaluations would be worthwhile. Given the disparity at the project level between ETP staff's assessment of the program's value and the vendors' assessment of that value, it does appear worthwhile to pursue this further in future evaluations. Doing so would provide ETP staff with a better sense of the ETP partners' perceptions of the Program's value and enables stakeholders to assess how ETP's resources are being spent.

Table 4-9. Comparison of Self-Report Values to Values Reported by Vendors

Master - ID (Primary Key)	Project Name	Verify/Assess energy / environmental performance	Address Cost-Effectiveness Issues	Provide Neutral Third-Party Assessment	Support Program / Incentive Design	Conduct Outreach / Increase Awareness	Direct Effect on Market	Address Market Concerns / Needs	Contribute to a Broader Effort	Determined That Technology Not Ready for Incentive Program	Describe the Value of the Technology, not ETP's Role in the Assessment	None Stated
SBC00001	Ozone Laundries for Hotel	α	•		*	α	α					
SBC00007	Green Plug Charger	Ө				*						
SBC00026	Industrial Battery Charger	*						α				
SBC00174	Air Source Heat Pump for Emergency Back Up Diesel Generators	*									•	
SBC00209	Demand Ventilation for Commercial Kitchens	*		*	*	*		*			•	
SBC00219	Electrodialysis for wine industry	*				*		*			•	
SBC00259	LED for Covered Parking Lots			*	*			*			•	
SBC00484	HeatSaver - Liquid Pool Cover	•	•	*	α			•				
SBC00569	Ice Bear TES Evaluation	•	•		Ө	*	*	•				

Key: • = Benefits Reported by ETP Staff Only, * = Benefits Reported Only by Vendor, α = Benefits Reported by Both Vendor and ETP Staff, Ө = Benefits Reported by ETP That Vendor Discounted

Findings about the value of ETP activities are as follows:

1. ***The following four themes were mentioned most frequently and are related to activities and outcomes illustrated in ETP logic models*** (Figure 4-1 to Figure 4-3):

    1. Documenting energy savings is not explicit in the logic models, but it is implied in the assessment activities and short-term outcomes.

    2. Supporting EE program and incentive design is at the heart of transfer activity between the ETP and EE programs as demonstrated in the logic models.

    3. Addressing market concerns and needs is related to reducing market uncertainties about technology performance, a short-term outcome in the logic models. This is important for reducing risk from the end users' perspectives.

    4. Conducting outreach and increasing awareness encompasses audiences within and outside of the utilities. The logic models include these as both activities (outreach) and short-term outcomes (awareness).

    This indicates that many ETP projects are striving to achieve the intended short-term outcomes of the Program.

2. ***Vendors value the relationships that they form with utility staff and the verification of energy savings and non-energy performance most highly.*** Vendors view the relationships with utility staff and the documentation of energy savings by ETP assessments as keys to getting their products into the EE programs. In addition, the ability to share the findings of an independent and highly credible entity with potential customers strengthens the business case for their technology. These values are similar to those expressed by ETP staff.

3. ***In a small subset of cases, the ETP assessment resulted directly in changes in the marketplace.*** In one case, the results of an assessment caused a manufacturer to change the design of a product. In another case, customers who had installed the product in facilities in California as part of an ETP assessment purchased and installed the product at their other facilities around the country. These types of market effects are significant and could be pursued in more assessments.

4. ***ETP's involvement gives credibility to the results of the study within the utility.*** This is an important factor in getting the technologies into the EE programs. In the absence of the ETP, it is likely that the utilities' engineers would attempt to assume the responsibility for testing the technologies and vetting the results. However, it is unclear if the engineering teams would have the bandwidth to accommodate the increase in testing required in the absence of the ETP.

5. ***There is value in conducting an assessment and determining that the technology is technically not prepared for EE programs.*** Doing so reduces risk for the EE programs, which have limited budgets to allocate for incentives. It also reduces reputation risk for the utility, which implicitly endorses a product by offering an incentive for it. Cost-effectiveness and market readiness should be evaluated *prior* to

conducting ETP assessments. However, testing the energy and non-energy performance of a technology that is known to have a market ready for acceptance is also important, however.

6. **In some cases, there was confusion between the value of the technology and the value of ETP's role in the technology's progress to market**. Some respondents indicated that the value of the assessment was in the technical energy savings potential that the product could achieve. It is true that, in the long run, the technology may bring value to the ratepayers of California by generating energy savings. That may have occurred with or without the help of the ETP, however. Responses like these need to be re-configured to demonstrate how ETP will help a technology achieve its full potential.

4.2.6 Business Risk Assessment: Recommendations

This section builds on the recommendations developed as part of the review of draft data collection tools as documented in Appendix E. Both the process of conducting the evaluation and the results of the analysis were informative in developing conclusions to assist in improving the quality of data collected and prepared for the Business Risk Assessment. This section shares some of these results.

1. **All of the utilities are capable of producing robust value propositions and solid documentation to support the claims made in the value propositions.** Three of the four utilities had at least one project in the "upper right quadrant," (the green quadrant in Figure 4-4), and the remaining utility had at least one project in each of the yellow quadrants. These results indicate that the approach within each utility provided the necessary, though not sufficient, conditions for a performing well on the Business Risk Assessment: performing and documenting solid due diligence and crafting a robust value proposition for the technologies in their portfolio.

2. **Drawing on the expertise of individuals with training in a variety of disciplines would strengthen the process.** Currently, ETP focuses on the technical aspects of new technologies while placing less emphasis on the risks associated with market traction and team. Examining these other aspects of the business case for a given technology requires interdisciplinary discussion and analysis. Interdisciplinary teams are one of the hallmarks of product development teams, and that approach could help ETP select and assess more technologies thus increasing the likelihood that the technology would succeed in EE programs and in the broader market.

3. **Taking calculated risks on market traction requires knowledge about the marketplace.** ETP staff will need to take calculated risks in order to meet the ambitious EE goals of the State of California. The high risk/high reward paradigm is one that is familiar to the evaluation team and ETP staff alike. However, understanding which risks are big and are likely to pay off will require more market research. The evaluation team assumes that the ETP is taking risks. The challenge is that it is difficult to determine the magnitude of these risks owing to poor documentation of important information, such as the savings potential, the competitive advantage of the technology and market barriers.

Better information about the size and needs of target markets should be included in the technology selection process; some such information is already available through statewide market studies (e.g., the *Residential Appliance Saturation Survey*, the *California Energy Efficiency Potential Study,* and the *Commercial Energy Use Survey*), but these sources were rarely cited.

Only two of the projects analyzed in the Business Risk Assessment sample included any statistical analysis of the market for a given technology, even though this approach is considered best practice across many industries. While it is true that these technologies are in the early stages of their development, market studies can be conducted to identify specific needs of a target market and to determine how a certain type of product could meet those needs. While it is sometimes true that "customers don't know what they really need," it is more often the case that they do know. Products that are wildly successful often start by fulfilling a specific need and then (sometimes unintentionally) end up serving several other needs of the target customer (e.g., the iPhone). The fact is that these technologies start by serving a primary need *perceived by the customer* in a unique way; market research can help to uncover those primary needs and others that can add to the success of a product in the long term.

4. **Improvement is possible for each of the IOUs.** When ETP staff at PG&E, SCG, and SDG&E revised the draft data collection tools or the documentation of their due diligence efforts, the result was generally positive and sometimes substantially so.48 Following the guidance provided in this report and any clear guidance provided about a specific project can help to improve the quality of data prepared.

   The best evidence of this is the higher scores earned by PG&E projects. PG&E provided revised versions of all of their Business Risk Assessment data collection tools. They involved staff who had been involved in the projects at their inception, many of whom had moved onto other parts of the company. The commitment to improving the data collection tools was clear. Project SBC00006 Demand-Based Building Controls was one of the projects that benefited from the revision process; the value proposition shifted to focus more on the non-energy benefits of the product (which are typically the benefits that convince customers to purchase the product). In addition, the Due Diligence section was enhanced with additional contact information for relevant stakeholders.

   Sempra's improvements were also noted after the revision process; although their scores are generally lower than the other utilities, they did make the effort to improve their data collection tools. For example, project SBC00474 Deutz Lean-Burn High Efficiency Engine showed improvement after the revision process. The revised value proposition included a shadow cost as the customer need (the need to meet compliance requirements), rather than the straight energy-saving benefits of the

[48] As mentioned earlier, SCE chose not to revise its data collection tools and used the same data for final scoring as they had submitted as draft for comment.

technology. In addition, contact information provided for the primary sources listed helped this project to score well on the Due Diligence component.

5. **Beginning the documentation process at the time of technology selection would ease the burden on ETP staff.** The Business Risk Assessment process provides a venue for ETP staff to document the work that they do to select technologies for assessment. In addition to their professional judgment, ETP staff may talk to representatives of several key stakeholder groups, including potential customers, competitors of a specific vendor, industry experts, former colleagues, and distributors. Using existing market research from credible, independent sources is another potential source of valuable information. In some cases, it might be worthwhile to conduct new market research. Maintaining better records of these various sources of information would greatly reduce the amount of time required to prepare Business Risk Assessment data. ETP staff advised the evaluation team that it had been several years since the inception of many assessments and that trying to re-create the information used to make the technology selection would be difficult. This situation can be avoided in the future by beginning the documentation process at the time of technology selection.

4.3 Aggregate Analysis

As defined in the Protocols, the Aggregate Analysis involves the analysis of a variety of data collected for all of the projects in each utility's ETP portfolio to provide a statistical overview of the ETP portfolio. In conjunction with the literature review and program design assessment, it supports the comparison of the ETP designs to best practices and makes recommendations, as appropriate, for changes to ETP designs. Additionally, in conjunction with the implementation analysis and impact assessment, the Aggregate Analysis examines the extent to which ETP technologies have been transferred to EE programs and are effectively tracked after having been transferred.

4.3.1 Aggregate Analysis: Data Collection Methods

Because of the desire to fully characterize the ETP portfolio for each utility and the unique aspects of the projects, the choice was made to collect data on a census of projects (as opposed to a sample). At the time of fielding the survey (December 2008), the eligible population consisted of 149 projects that were either under assessment (103), completed (43), on hold (2), or terminated (1).[49] Projects in this analysis were funded using PY2006-2008 dollars only. While an additional 102 projects were ultimately included in other evaluation activities during the 2006-2008 program cycle,[50] this analysis was kept static and covers only these 149 projects. The final Aggregate Analysis survey instrument is provided in Appendix H.

[49] Source: ETP program tracking data. No other type of project was eligible for inclusion in the Aggregate Analysis.
[50] ETP tracking data provided by the IOUs were not finalized by the time the Aggregate Analysis was initiated; ultimately 251 projects participated in the Program during the 2006-2008 program cycle. The tracking data indicate that of these 251 projects, 55 projects were classified as completed, 95 projects were classified as being in the assessment phase, 72 projects were classified as being in the screening phase, 1 project was classified as being

Table 4-10. Number of Projects by IOU Included in the Aggregate Analysis

IOU	Number of Projects
PG&E	65
SCE	40
SCG	24
SDG&E	20
Total	149

An internet-based survey was chosen as the most expeditious data collection approach for the Aggregate Analysis. The instrument was drafted with input from the utilities. After review by the evaluation team, the final instrument was provided to the team's online survey programmer. When posted online, each survey was project specific and linked to the relevant project manager.[51] The number of ETP projects per manager ranged from one to 21 with an average of five projects per manager. Thus, the data collection burden varied depending on the number of projects managed by each person. The project managers received an email on December 11, 2008 requesting them to please complete surveys for the projects assigned to them. A follow up email to the ETP managers at each utility regarding the status of all surveys was sent in January, February, and March 2009. An official data request was submitted to Sempra on March 10, 2009 for completion of the surveys. The evaluation team notes that there were difficulties with this on-line survey due to incompatibility with the older internet browsers at SCE and Sempra (i.e., computers with Internet Explorer 6.0 had extreme difficulty entering data into the on-line survey).[52] The team commends the utilities for their perseverance in working through this issue and thanks the project managers at each utility for their time and effort in completing the surveys.

The Aggregate Analysis achieved a 100% response rate and the data collection effort was terminated on July 29, 2009. The analysis presented in this section includes data from all projects surveyed in the Aggregate Analysis.

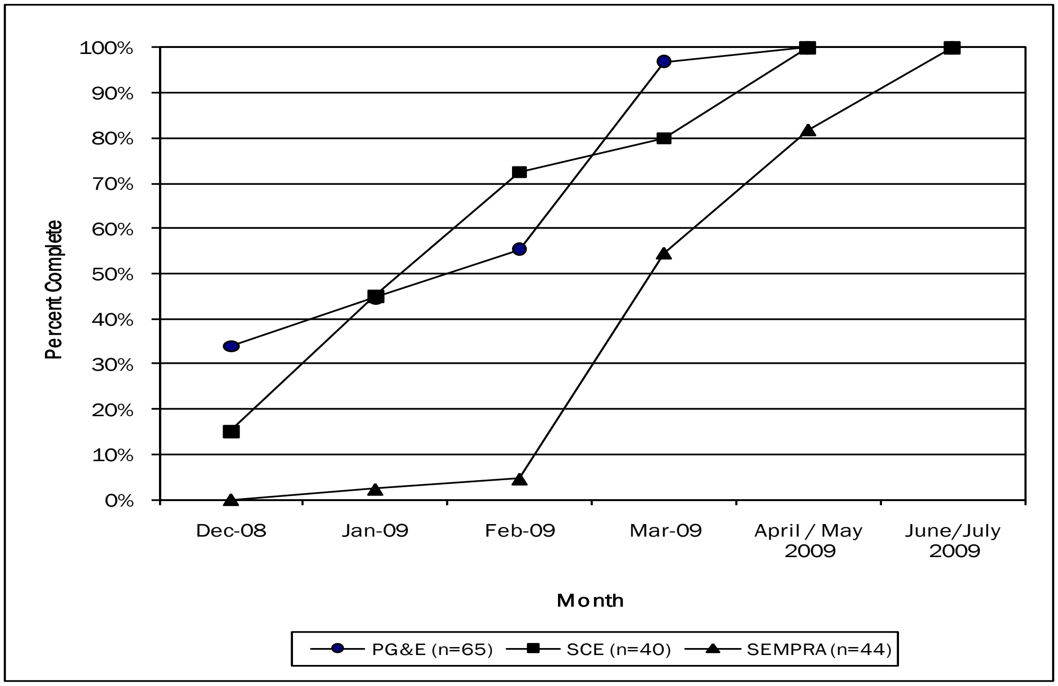
Figure 4-12 shows the utility-specific rates of survey completion between the start of the survey and July 31, 2009.

in the scanning phase, 16 projects were classified as terminated, 1 project was classified as being on hold, and 11 projects were classified as no status available.

[51] With assistance from ETP staff, the evaluation team updated the list of project managers for each project to be surveyed.

[52] The team allowed data to be sent by the IOUs via email for certain difficult to enter items.

Figure 4-8. Aggregate Analysis Survey Completion Rate



4.3.2 Aggregate Analysis: Evaluation Methods

Descriptive statistics were used to characterize information generated by the Aggregate Analysis surveys. The program theory and logic models separate program activities into four distinct implementation phases: scanning, screening, assessment, and transfer/dissemination. The Aggregate Analysis survey was structured to reflect these different implementation phases, and the results that follow are organized in that manner.

4.3.3 Aggregate Analysis: Results

Differences in ETP staffing levels exist across the utilities. PG&E has an average of six projects per project manager, SCE has an average of three projects per manager[53], SDG&E has an average of ten projects per manager, and SCG has two project managers, one with 21 projects and the other with three. Because SDG&E and SCG are both SEMPRA utilities, data for these two utilities are aggregated under for presentation in the remainder of this section.

4.3.3.1 Aggregate Analysis: Scanning Phase

Scanning takes place prior to any specific activity on the part of ETP project managers. During the scanning phase, ETP project managers are alert to new opportunities and meeting with companies and other outside parties regarding technologies for possible inclusion in the

[53] SCE ETP project managers have additional responsibilities including codes and standards projects and demand response projects.

program. Both the Aggregate Analysis and the Case Study analysis found that project managers learned about technologies from a variety of sources.

Table 4-11. Utility Information Sources for Emerging Technologies

Information Source	PG&E	SCE	Sempra
Company approached ETP	48%	61%	58%
Internal IOU staff	33%	18%	37%
Experience/past work with technology	24%	11%	5%
Conference	16%	37%	0%
PIER	11%	8%	5%
Professional organization (ASHRAE, etc)	7%	5%	0%
Article in a professional journal/newsletter	5%	5%	5%
Customer approached ETP	3%	24%	14%
Other	2%	8%	9%

Note: Percents sum to greater than 100% due to multiple responses

An interesting note about these figures is the differences in relative values when compared to the Case Study results. For instance, the Aggregate Analysis data indicate that ETP staff learned about technologies from companies/customers more often than from internal IOU staff while the Case Study analysis shows the opposite. This inconsistency is in part explained by the fact that the Aggregate Analysis considers a census of ETP projects while the Case Studies consider a purposive sample of projects. However, the finding could also relate to staff difficulties remembering early project experiences, which would indicate a need for improved project documentation regarding program scanning activity.

4.3.3.2 Aggregate Analysis: Screening Phase

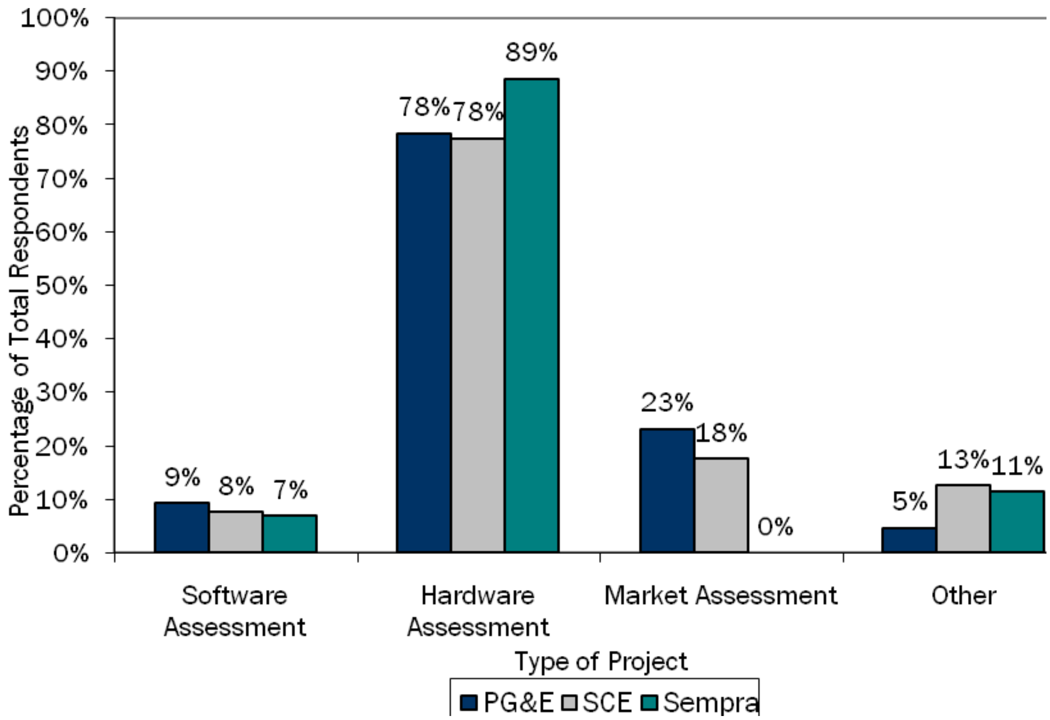
Once a technology comes to the attention of an ETP project manager through the scanning phase and it appears to hold promise for subsequent program activity, a more structured screening phase with documentation generally occurs. Results indicate that PG&E has documentation at the time of screening for 86% of the projects surveyed; SCE has documentation for 71%, and Sempra for 38%. The impetus for screening documentation took place during the 2006-2008 program cycle, along with implementation of different screening documents across the IOUs. As such, the evaluation team realizes that not all projects within the current program cycle have screening documentation in place and, as noted previously in the Business Risk Assessment discussion, the team observed that the quality of documentation produced by ETP staff varied across projects and utilities. However, given the push for improved documentation of programmatic decision-making, subsequent ETP evaluations should expect 100% completion of screening documents across the utilities.

4.3.3.3 Aggregate Analysis: Assessment Phase

The majority of the ETP effort occurs during the assessment phase. The following information provides an overarching look at the portfolio of projects within the ETP. While the

ETP devotes some effort to conducting market assessments and evaluating software, each of the IOU ETPs devotes more than 75% of its effort to examining specific hardware (see Figure 4-9). The "other" types of projects shown in Figure 4-9 include creating specifications for technologies (e.g., power supplies for data centers) and creating technology summaries to be used for information dissemination.

Figure 4-9. Types of Projects under Assessment (multiple responses allowed)



As expected, close to 90% of the research conducted during the assessment phase is based on primary data (i.e., data collected from the original source[54], see Figure 4-14) with most of the data being collected at customer sites, in laboratories, or through customer surveys (see Figure 4-11). This is consistent with the Case Study analysis which revealed that different settings were used to conduct the technology assessments.

[54] The Aggregate Analysis survey asked respondents to indicate whether the research used in their assessment was primary, secondary, or both. The survey instrument included information about what was considered primary data collection (i.e., gathering data from the original source) or secondary data collection (i.e., gathering data from other sources such as reports). In the Case Study analysis, the assessment processes were described as involving the collection of primary data, which is consistent with the Aggregate Analysis finding that the majority of projects involved primary data collection. However, the Portfolio Evaluation found that there was some confusion among ETP staff about what constitutes a primary source and what constitutes a secondary source. Therefore, the results to this question may be somewhat inaccurate, although the data appear to be internally consistent.

Figure 4-10. Types of Research by Utility

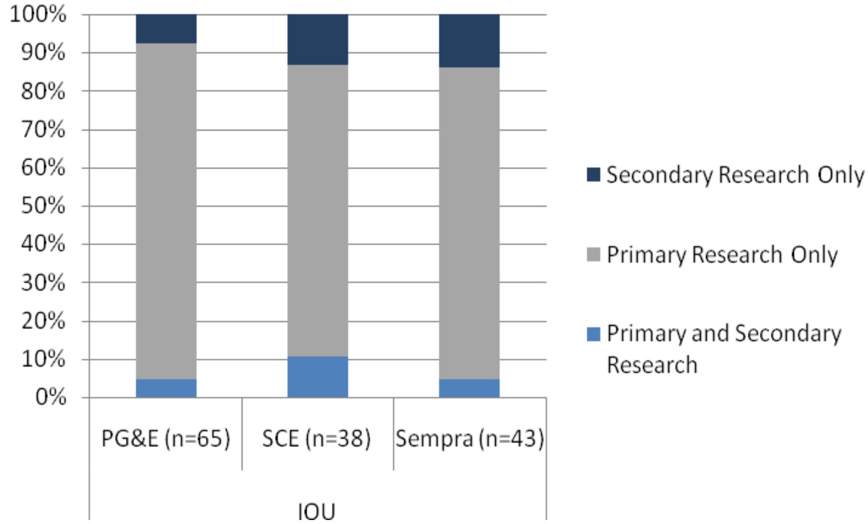
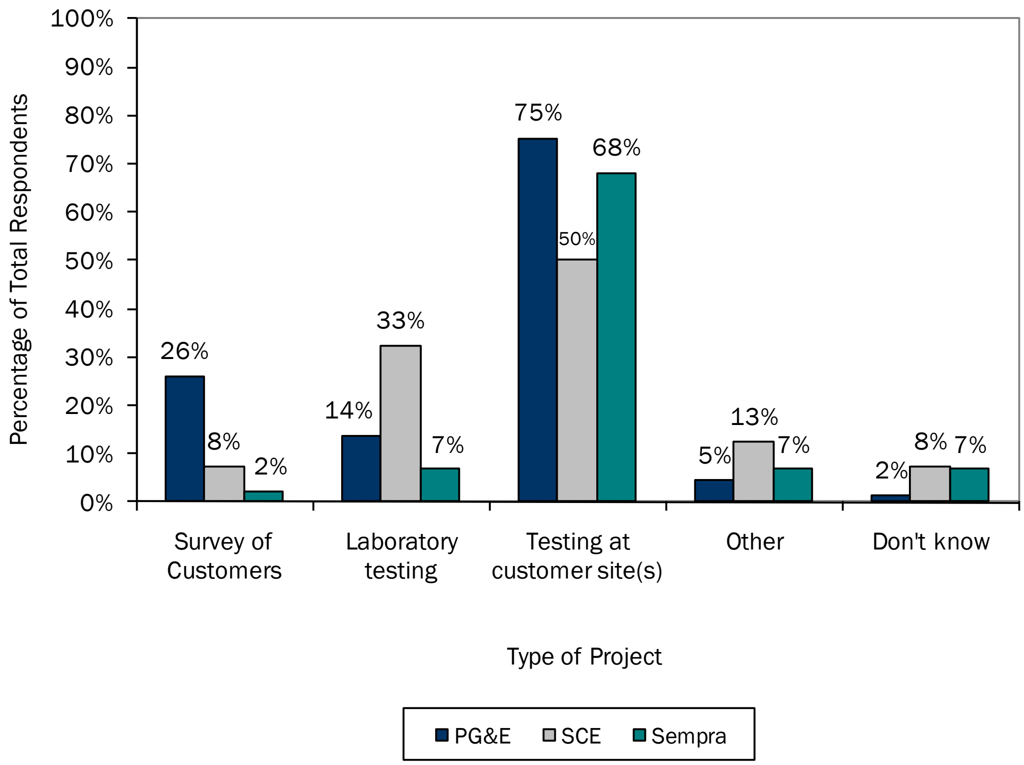
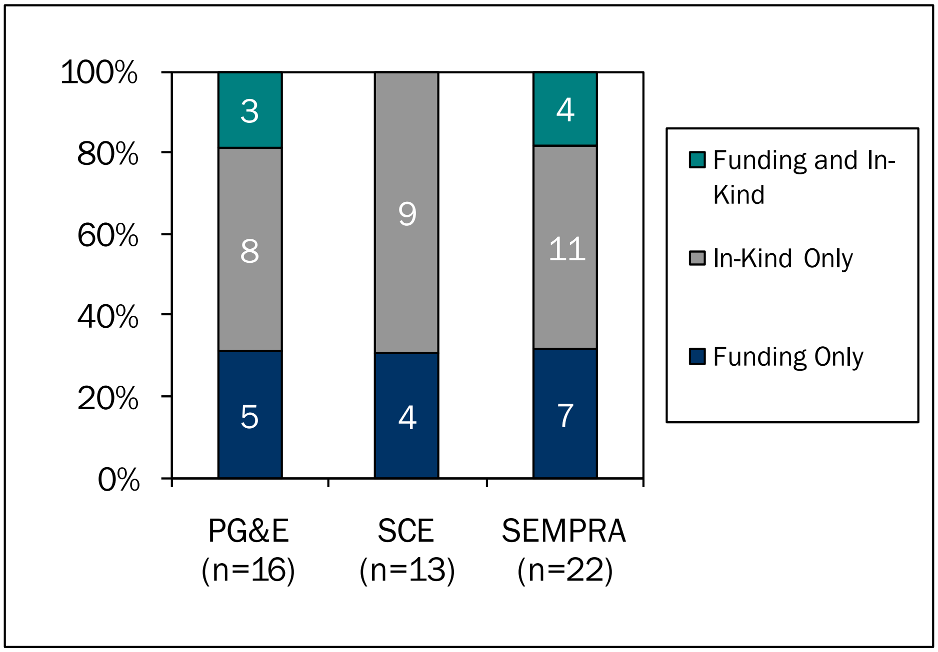


Figure 4-11. Primary Research Data Collection (multiple responses allowed)



For the most part, the Aggregate Analysis and Case Study results indicate that the utilities work independently on assessing ETP projects and then use the ETCC meetings and other forums to share information regarding the results of the assessments as well as to discuss potential new projects. This approach, while relatively informal as explained in subsequent sections of this report, helps to mitigate the potential for duplication of effort across utilities. For the approximately one-third of the total ETP projects where the utilities worked collaboratively or involved other entities, funding and/or in-kind services were shared among the participating entities (see Figure 4-12). In such collaborative projects, the contributions of these other entities represented only a small percentage of the individual IOU ETP total expenses for the projects (15% for PG&E; 4% for SCE; and 1% for Sempra).

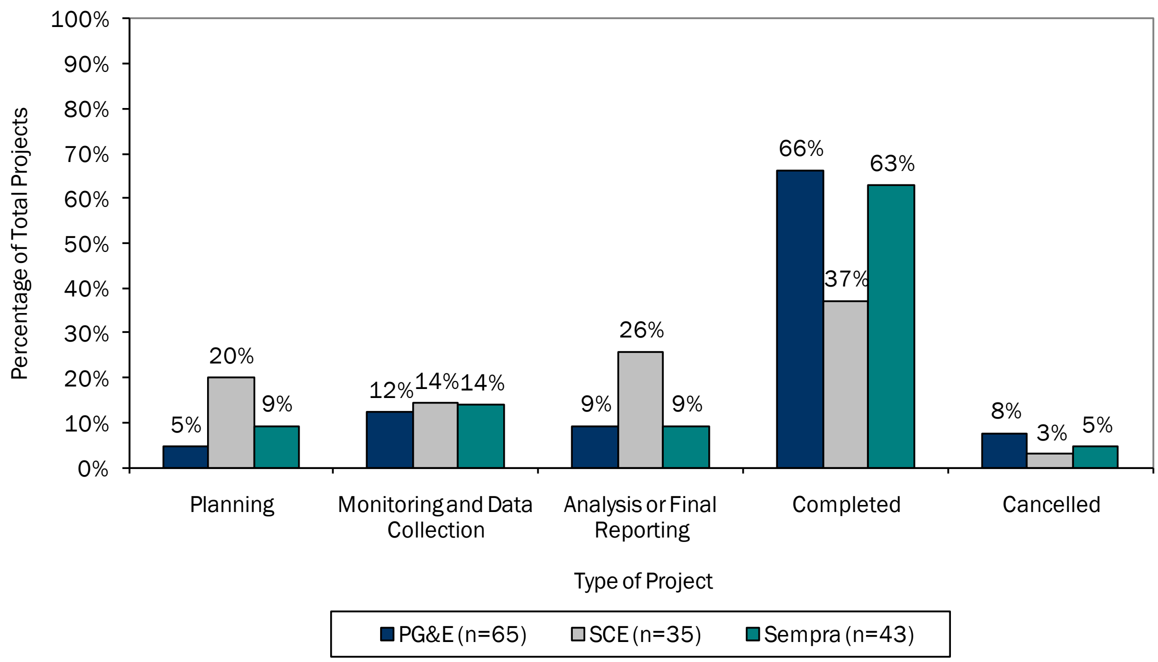
Figure 4-12. ETP Projects that Shared Funding and/or In-kind Services



While most ETP projects across the IOUs were completed or nearing completion at the time of survey fielding (see Figure 4-13), eight projects representing less than 10% of each utility's portfolio were classified as cancelled.[55] Respondents indicated that the cancelled projects were due to high incremental costs (n=1), contracting difficulties (n=1) under-performing technologies (n=4), and in two cases, customer decisions to terminate the projects. In addition, respondents noted that the technology manufacturers associated with four of the cancelled projects were still pursuing the technologies; respondents did not know the current status of the other four cancelled projects. Beyond the information provided in the surveys, no additional documentation was available for six of the cancelled projects; it is unknown if documentation exists for the remaining two cancelled projects.

[55] However, no status data were provided for three projects in the population and project managers indicated that status was non-applicable (N/A) for an additional three projects in the population.

Figure 4-13. Project Status when Aggregate Analysis Survey Completed[56]

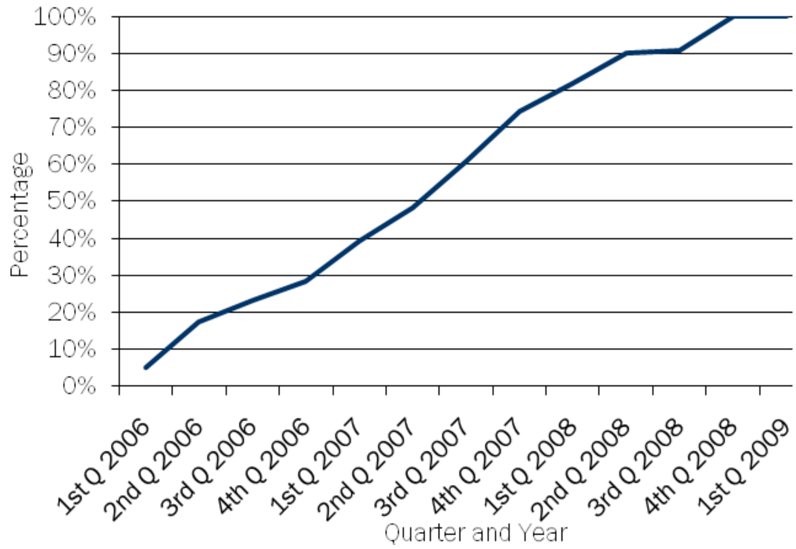


Projects were initiated at a fairly steady rate during the 2006-2008 program cycle (see Figure 4-14) and, for completed projects, averaged 10.5 months (standard deviation of 6.7 months) in duration. For those projects not yet completed at the time of the survey, ETP staff estimated that the projects would take an average of 24.0 months (standard deviation of 9.4 months) to complete. The evaluation team does not know why the anticipated duration of ongoing projects is substantially greater than that realized for completed projects but hypothesizes that staff may lengthen anticipated project timeframes to account for potential project difficulties.

The relatively short timeline of the completed projects seem to indicate that the portfolio is skewed towards shorter-term versus longer-term projects. Whether this adequately balances a need for the type of projects to meet current and future savings in California is unknown.

[56] Surveys were completed by the respective project managers between December 2008 and July 2009; the information in this table is meant to provide an idea of the variation possible across projects. The total is less than the 149 because 3 projects had N/A as a response to this question and 3 did not answer the question.

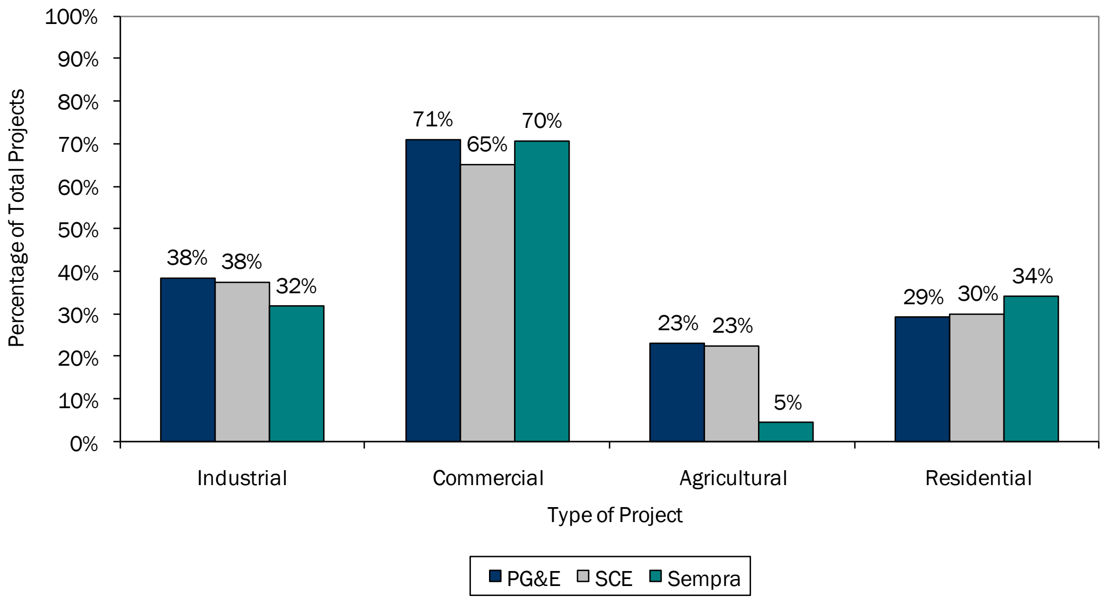
Figure 4-14. Cumulative ETP Project Starts[57]



ETP projects covered all market sectors, with the commercial sector explored through the largest number of projects (Figure 4-15).

[57] The shape of this curve is similar for each utility.

Figure 4-15. Projects by Market Sector



Note: A single project can have multiple market sectors.

The characteristics of non-cancelled projects within the statewide ETP portfolio during the 2006-2008 program cycle are shown in Figure 4-16. The projects marked as “Other” are heterogeneous in nature and include technologies such as heat recovery systems, power supplies, and optical sensors. PG&E focused primarily on lighting and HVAC projects while SCE focused primarily on lighting and industrial process projects and Sempra focused primarily on lighting and water projects.

Figure 4-16. Non-Cancelled Project Type within the Statewide ETP Portfolio

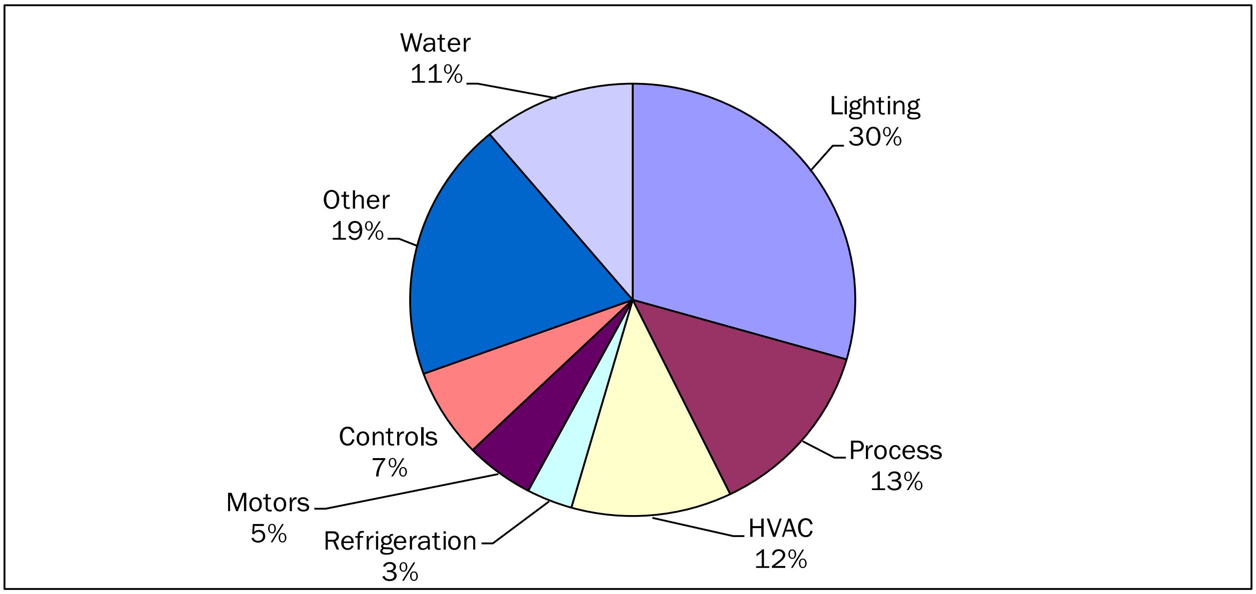
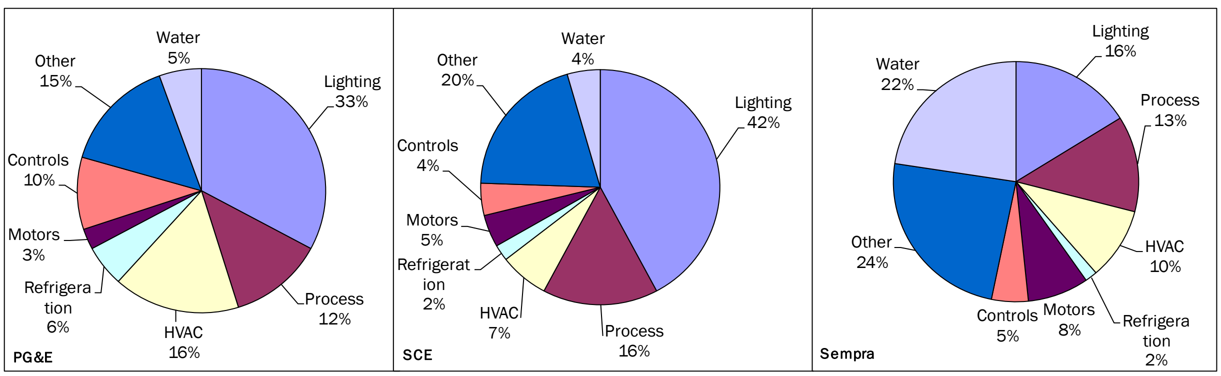


Figure 4-17. Non-Cancelled ETP Project Type by Utility



Any given project can have energy impacts (kWh and/or therms) and demand impacts (kW). For each project, ETP staff was asked to report the types of impacts they expected. Responses are summarized below:

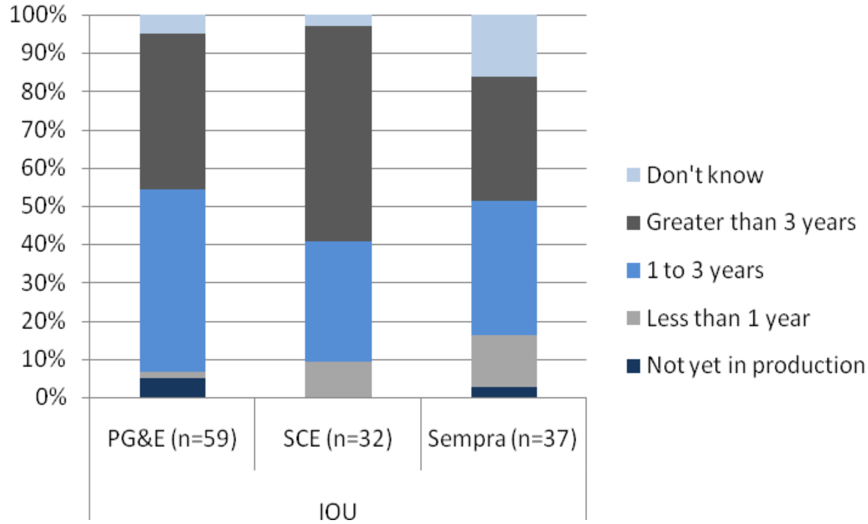
- The majority of projects surveyed for both PG&E (88%) and SCE (77%) were expected to obtain both electrical energy (kWh) and demand (kW) savings
- A small portion of PG&E's projects were expecting kWh or therm savings only (6% and 4% respectively)[58] while 23% of SCE's projects were expecting kWh savings only
- Therm savings were expected for 69% of Sempra's projects with kWh and kW savings expected for the remaining projects (31%).

[58] Two percent of PG&E's projects are expecting demand savings only.

- Gas technologies were a primary focus of 69% of Sempra's projects, 20% of PG&E's projects, and 13% of SCE's projects.

The majority of technologies in the ETP have been on the market for more than one year, with only a very few technologies not yet in production (Figure 4-21). For those few technologies, the expected time until production and marketing by the manufacturer varies from one to four years.

Figure 4-18. Time in Market for ETP Technologies



ETP staff stated that several projects were either software or market assessments. However, of the 12 projects classified as software assessments, only three appeared to be purely software. These three projects include:

- Software that will help EE program design by improving savings calculations for energy management systems;
- Software that will assist commercial customers in uploading data into the ENERGY STAR Portfolio Manager (AB1103 requires this data by January 1, 2010 during the sale, lease, or financing of whole non-residential buildings); and
- Software that will be used as compliance software at the state level for specific technologies (i.e., ductless air conditioner).

A review of the descriptions of the 22 projects classified by ETP staff as market assessment projects indicated that only seven could be considered true market assessments.[59] These seven projects examined the following aspects associated with the technology included in the ETP:

[59] The Barron's Business Guide Dictionary of Marketing Terms for market research was used to group the descriptions. If the assessment covered information about the marketplace, information about the desires for a product, or information about the needs and motivations of a consumer, it was considered a market assessment.

- Current use of the technology in the market;
- Feasibility of the technology based on discussions with manufacturers;
- Best market channels for moving the technology;
- Markets currently using the technology;
- Customer acceptance of a technology (2 assessments); and
- Other similar technologies in the market and whether or not these other technologies were already included in utility EE programs such as in-home displays.

In general, the ETP portfolio assesses new technologies within the end use measure categories that have typically generated the largest impacts in EE programs (e.g., lighting, process). Additionally, the fact that a large number of technologies in the statewide portfolio can affect both energy consumption and peak demand is positive. However, the evaluation team notes that Sempra, with the smallest program budget, is assessing the majority of projects statewide that are expected to generate gas savings. In the future, it may be prudent for ETP designs to purposefully determine a proper (as defined by existing regulatory constructs) split of projects by fuel type and strive to meet that allocation across the project portfolio. In addition, while currently few in number, the importance of non-hardware assessments (i.e., software assessments and market assessments) is expected to increase since they can inform EE program decision-making in terms of existing and expected market opportunities for specific technologies. One area of particular concern is that the ETP typically estimates the *technical* potential for candidate technologies rather that the equally important market potential. Increasing the number of market assessments that include both technical and *market* potential estimates will assist ETP staff in screening candidate technologies. In the future, the question of whether or not market assessments should count as technology assessments or simply important components of technology assessments should be addressed by the CPUC and ETP staff to ensure program goals and performance metrics are clearly defined.

4.3.3.4 Aggregate Analysis: Transfer Phase

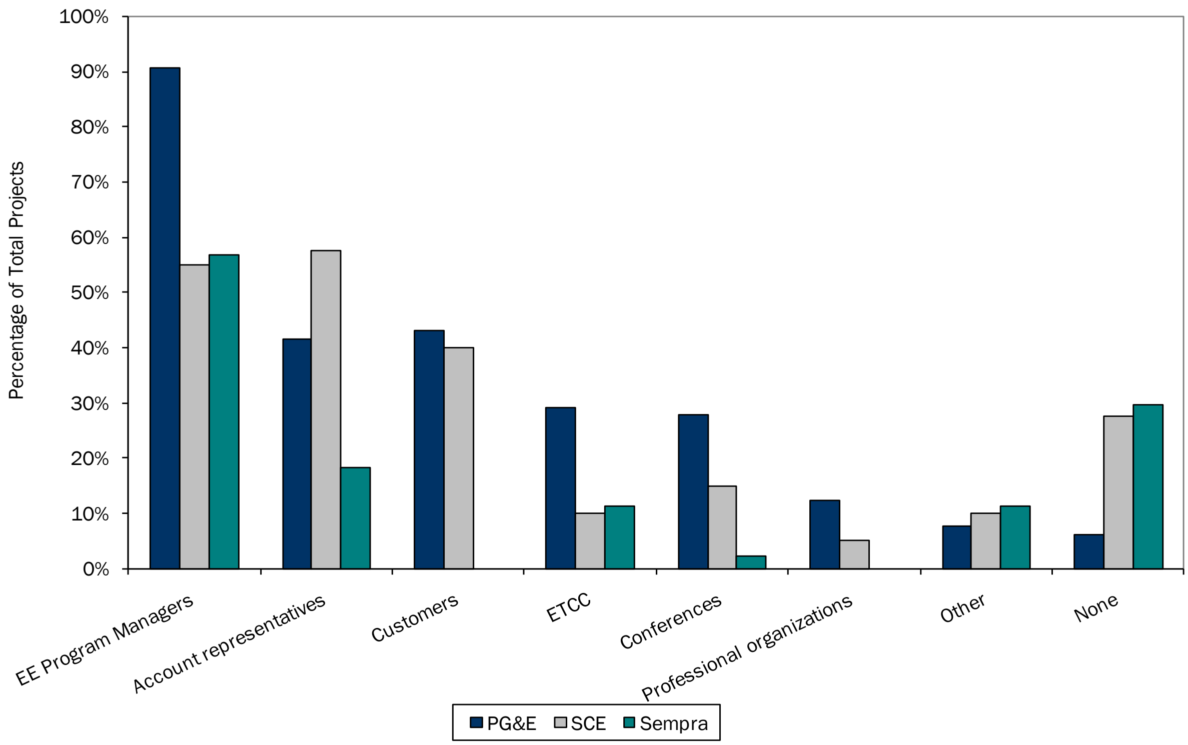
The transfer phase of the ETP implementation process begins when a technology assessment is completed.[60] The vast majority of the 83 completed assessments (93% of 43 for PG&E, 100% of 13 for SCE, and 81% of 27 for Sempra) have a final report documenting the results of the assessment. Of the eight projects without a final report, a summary document of some sort (such as a fact sheet) was created for three of them while the other five had no documentation indicated.

Examples of dropped projects included tankless water heater testing in commercial facilities, verification of system efficiencies, photometric testing, and assessment of incremental energy and demand.

[60] As noted in other sections of the report, some project managers are discussing transfer issues at the beginning of ETP projects. Additionally, PG&E has a technology transfer group with whom ETP works to deploy assessed technologies into the EE program portfolios.

Project managers present information about completed projects to multiple audiences. Internal utility audiences including EE program mangers and customer account representatives are the main focus, followed by utility customers (see Figure 4-19). This finding, along with the Stakeholder Interviews (which revealed incomplete knowledge of the ETP among influential stakeholder groups), suggests the need for more frequent communication of results to external audiences using a wider variety of strategies, if the program design is to educate external audiences about the results of ETP assessments. It should be noted, however, that Figure 4-19 does not reflect the posting of final reports to the ETCC website, which also serves as a means of sharing ETP assessment results with external audiences.

Figure 4-19. Information Dissemination Audiences (multiple responses allowed)



A different question was asked regarding the use of the statewide IOU-affiliated energy centers as information dissemination tools for the ETP. SCE staff used affiliated energy centers to inform external audiences about ETP projects with 35% of their projects having presentations at the Customer Technology Application Center (CTAC) and 30% at either the Agricultural Technology Application Center (AgTAC) and/or the Technology Test Center. PG&E staff most often used the California Lighting Technology Center (22% of projects), which was also used by Sempra staff for 2% of their projects. Additionally, Sempra staff used the Food Service Technology Center for 5% of their projects.

The percentage of ETP projects recommended for transfer into utility EE programs varies by IOU (see Figure 4-20). Of those technologies recommended for transfer, their incorporation into EE programs varies widely from 0% to 57% based on self-reported data from ETP project managers. Of those 2006-2008 ETP projects reported to have been transferred into EE programs, the majority reside in large custom EE programs according to the project manager. However, inconsistent measure names and limited feedback loops between the EE programs and the ETP hindered the evaluation team's ability to track the status of transferred technologies (see discussion in Chapter 6).

Figure 4-20. ETP Projects Traced from Assessment Phase to Transfer into EE Programs

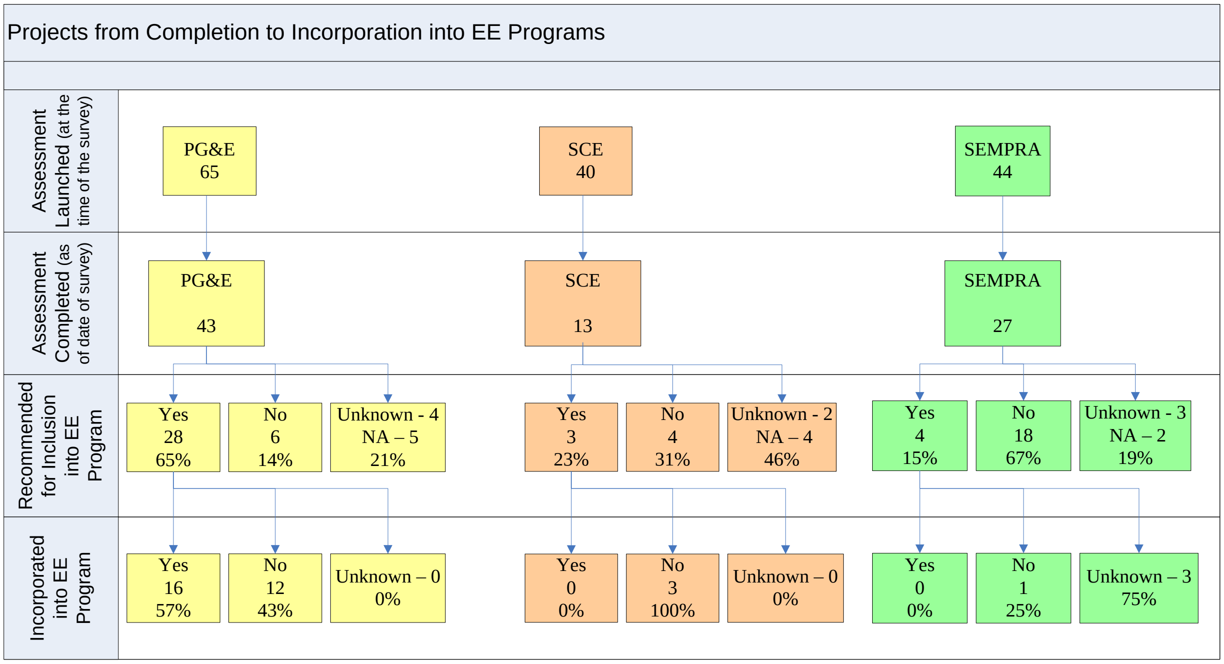


Figure 4-20 presents a useful overview of 2006-2008 ETP assessments from initiation to incorporation into an EE program. As one can see, there are 11 projects for which it is not known whether they were ever recommended for inclusion into an EE program. This appears to be a program documentation issue. It is known that some ETP project managers moved to different jobs prior to the survey and that the new project managers were not always able to answer all of the survey questions. The "NA" values listed for those projects recommended for inclusion in EE programs are indicative of the fact that not all ETP projects are actually planned for direct incorporation into the EE programs. Survey responses indicate that these could be projects for which information is gathered to inform program design/strategy decision-making[61] or projects where information regarding technologies is collected for possible future inclusion into an EE program.

The disposition of the 28 ETP projects that were not recommended for inclusion into an EE program is as follows (the percentages do not sum to 100% because multiple responses were allowed):

- 32% expect future recommendations, discussions, or presentations to be generated

[61] For example, one of the projects investigated the best program format for obtaining energy savings from the consumer electronics segment.

- 14% had inadequate technologies
- 14% had no response to the survey question
- 11% were deemed not cost effective
- 11% were not recommended for some other reason
- 7% were focused on gathering information only
- 4% had impacts that were not able to be quantified
- 4% needed more research
- 4% had unverified claims

The disposition of the 16[62] ETP projects that were recommended for inclusion into an EE program and reported to have not been deployed into an EE program is as follows (the percentages do not sum to 100% because multiple responses were allowed):

- 57%: ETP staff had plans for its future incorporation into an EE program
    - 44%: ETP staff are working on a program design/program delivery system
    - 13%: ETP staff are working on its incorporation
- 25%: ETP staff were completing work papers on the projects
- 13%: ETP staff decided it required more research

As a maximum, if one assumes that the 82% of projects not yet ready for inclusion into an EE program (i.e., the 57% with plans and the 25% with work papers under construction) are eventually transferred into an EE program, then 35% of completed ETP projects would have transferred into EE programs.

4.3.4 Aggregate Analysis: Technical Potential Estimates

Project managers were asked to provide data related to the technical potential of their respective ETP projects. Technical potential refers to the savings potential that would be captured if ***all*** energy efficiency measures were installed in ***all*** applicable and feasible applications. That is, the population of customers who had facilities and technologies in which the ETP technologies or behaviors *could* be used. Economic potential indicates the savings potential that would be achieved if measures were installed in all applicable, feasible cost-effective applications. Market potential denotes the energy savings that can be expected to result from specific scenarios relating to program designs and market conditions. As noted in the 2008 *California Energy Efficiency Potential Study*, "Technical and economic potential estimates should be viewed as theoretical constructs. These estimates do not attempt to incorporate the

[62] This does not include the three Sempra projects labeled as Unknown in the last row of Figure 4-20.

willingness of customers to adopt these technologies or the market barriers associated with these products, and they do not reflect the budget constraints faced by utilities as they implement demand side management programs." While technical potential is not an easy value to estimate with any precision, it is a useful metric for comparing technologies.

Technical potential is calculated as shown in Equation 1.

Equation 1. Technical Potential Algorithms

$$Technical\ Potential = N\ Sites * \%\ Sites\ where\ Technically\ Feasible * \frac{Savings}{Site}$$

$$Lifetime\ Technical\ Potential = N\ Sites * \%\ Sites\ where\ Technically\ Feasible * \frac{Savings}{Site} * EUL$$

Where EUL = Effective Useful Life of the measure garnering savings at the site

To determine which projects should be included in the technical potential analysis, the evaluation team assumed that ETP project managers would be able to provide data for a given ETP project if it met two criteria; first, the project should be a hardware assessment, and second, project reporting should be completed or in the final stage. Eighty-one (54%) of the 149 projects included in the Aggregate Analysis met these criteria and project managers provided useable data to the evaluation team for 29 (36%) of these 81 projects.[63] However, it was later determined that project managers could provide useable data for projects even if the two criteria were not met. Including these additional projects in the analysis increased the set of useable data to 49 projects (60%) from which technical potential could be calculated by the evaluation team. Differences were observed across the utilities in terms of the percentages of projects for which usable data were provided, no matter which criteria they met (Table 4-12). Notably, PG&E and SCE provided useable data for almost half of their respective projects, while Sempra provided no useable data for any projects.

[63] Useable data was defined as reliable information about all components in the algorithm that enabled technical potential to be calculated. The evaluation team has no knowledge of the accuracy of information provided by ETP project managers.

Table 4-12. Projects with Useable Technical Potential Data

IOU	Number of Projects Meeting Original Two Criteria	Number of Projects Meeting Original Two Criteria with Useable Data	Percent of Projects Meeting Original Two Criteria with Useable Data	Number of Additional Projects for which Useable Data Were Provided	Total Number of Projects for which Useable Data Were Provided
PG&E	37	18	49%	13	31
SCE	19	11	58%	7	18
SEMPRA	25	0	0%	0	0
Total	81	29	36%	20	49

For the projects without useable data, 30% have no data of any kind available and 17% were missing only an energy savings estimate. The remaining projects were missing various components of the technical potential algorithm.

The small set of usable data hampered the evaluation team's ability to develop technical potential estimates for the ETP portfolio. Nonetheless, the team was able to develop rough technical potential estimates in terms of electrical energy savings (GWh/yr), peak demand reduction (MW), and gas savings (Mth/yr) using the algorithms in Equation 1 and the data from the project managers. Additionally, for these same projects, lifetime savings estimates were able to be developed based on the estimated effective useful lives of the technologies.[64] Table 4-13 provides the total annual and lifetime technical potential estimates for the 49 projects with useable data. Notably, not all projects generated estimates in all energy savings categories.

Table 4-13. Technical Potential Estimates for ETP Projects with Usable Data

IOU	Number of Projects	Total First-Year Annual Technical Potential (GWh/yr) 43 projects	Total Technical Potential (MW) 25 projects	Total First-Year Annual Technical Potential (Mth/yr) 8 projects	Total Lifetime Technical Potential (GWh)	Total Lifetime Technical Potential (Mth)
PG&E	31	9,007	1,569	132	21,539	871
SCE	18	4,479	425	0	58,858	0
Total	49	13,486	1,994	132	80,397	871

Table 4-14 shows the distribution of annual technical potential estimates across market sector and unit type for the 49 projects with useable data.

[64] The average expected useful life of the 49 projects with usable data was 11.3 years.

Table 4-14. Distribution of Annual Technical Potential Estimates for ETP Projects with Usable Data

Unit Type	GWh/yr	MW	Mth/yr
Lighting	5,973	439	0
Laboratory	2,365	225	20
Residential	1,558	20	50
Consumer	504	1	-
Business Monitors	500	-	-
Grocery	478	78	-
Data Center	423	53	-
Restaurant	390	60	-
Hotel	310	39	3
Wastewater Treatment	256	30	-
Business Desktop PC	250	-	-
Food Processor	171	53	26
Forklift Charger	117	-	-
Winery	87	53	-
Retail	68	920	-
Covered Parking	34	4	-
Hotel Room	3	-	32
Industrial	1	0	-
Warehouse	-	19	-
Dairy Processor	-	-	1
Total	13,486	1,994	132

4.3.4.1 Evaluation Judgment of Technical Potential Estimates

The evaluation team identified several methods for assessing whether the technical potential estimates calculated from the ETP projects with useable data were reasonable. One was to consider the annual technical potential estimates in comparison to the electrical use of the entire state for one year. The other was to compare the aggregate technical potential estimates to the estimated savings associated with the entire portfolio of EE projects in the 2006-2008 program cycle. When this is done, the ETP annual technical potential estimate (13,486 GWh) equates to approximately 4% of the total statewide energy use in 2008 (306,577 GWh).[65] However, if the ETP annual technical potential estimate is reduced by 70% for GWh, 72% for MW, and 82% for Mth to be consistent with the 2008 potential study,[66] to reflect a corresponding market adoption rate, the ETP annual technical potential estimate is reduced to approximately 1% of the total statewide energy use in 2008, a value that is likely somewhat understated given the relatively small number of ETP projects (with useable data) considered in the analysis.

[65] http://www.energyalmanac.ca.gov/electricity/total_system_power.html
[66] This is reasonably consistent with the Base Restricted (measures with TRC > 0.85) which found that gross market GWh potential was approximately 30% of the technical potential.

Given the uncertainties in developing the comparison presented above, the evaluation team felt it may be more useful to consider the aggregate ETP technical potential estimate in relation to the total CPUC-reported energy impacts generated by the portfolio of 2006-2008 EE Programs.[67] Table 4-15 shows the results of this analysis. Since the CPUC-reported EE savings values represent savings claimed by the IOUs as having been achieved (i.e., the customers actually installed these measures), the evaluation team chose to discount the estimated technical potential for ETP projects with useable data by 70% for GWh, 72% for MW, and 82% for Mth to be consistent with the 2008 potential study and reflect an achievable potential adjustment factor and create a more direct comparison between the two values. The team acknowledges that the achievable potential adjustment factor is arbitrary, but felt that it was a needed and reasonable adjustment.[68] In addition, the evaluation team distributed the installation of ETP projects over a ten-year period to create a more reasonable relationship between the technical potential estimates and the CPUC-reported EE savings values. Once spread over ten years, a consistent comparison would have three years of ETP values summed to compare to the 2006-2008 EE values. The results of this analysis indicate that the annual market potential estimates calculated from the ETP projects with useable data range from 5% - 12% of the CPUC-reported EE savings values (last column in Table 4-15).

These values, while imperfect, are informative in two regards. First, the arbitrary reduction to market potential does not account for any risk associated with market traction. It is assumed that the market responds perfectly to these new products – an acknowledged poor assumption, but with no good value to use to account for market traction of these newer products, it remains as is. If market traction risk were able to be included in the analysis, the true percentage of the EE portfolio that could be met by these ETP projects would be reduced. Second, if the calculated values are close to a true market response, they support the vital nature of the ETP as a feeder for new measures into the utility EE portfolio.

[67] http://eega2006.cpuc.ca.gov/

[68] Since the ETP technical potential estimate assumes that all ETP projects with useable data are installed in a single year, no multiplication of the technical potential estimate is needed to compare to the three year period of the energy efficiency programs.

Table 4-15. Comparison ETP Potential Estimates and CPUC-reported Energy Impacts from the 2006-2008 EE Program Portfolio

Impact Type	Technical Potential for ETP Projects with Useable Data	ETP Market Potential	2006-2008 CPUC-Reported EE Savings (Installed to Date)	ETP Market Potential as a Percent of CPUC-Reported EE Savings	Three Years of Potential if ETP Installations Distributed over Ten Years
GWh	13,486	4,046	10,341	39%	12%
MW	1,994	558	1,776	31%	9%
Mth	132	24	138	17%	5%

Going forward, the evaluation team suggests that ETP staff develop more robust technical potential estimates for technologies being considered for inclusion in the Program. In addition, if resources permit, staff should endeavor to translate these technical potential estimates into market potential estimates based on the results of market research conducted by ETP, other utility staff or stakeholder groups (e.g., PIER). Doing so will provide ETP staff and other stakeholders additional information regarding the magnitude of savings possible from ETP activities. It should be noted, however, that this would not be a trivial exercise for ETP staff to undertake. In addition to understanding existing market opportunities for emerging technologies, staff would also need to have a solid understanding of baseline market conditions and how the conditions differ by market sector and geography. Nonetheless, the evaluation team believes that robust technical and market potential estimates for candidate ETP technologies would help program staff and other stakeholders prioritize ETP investment decisions. The team also believes that the issue of assessing a technology’s potential for the purpose of prioritizing ETP investment decisions should be the subject of targeted conversations between ETP management and staff, the CPUC ED, and other relevant stakeholders.

5 PROGRAM IMPLEMENTATION ASSESSMENT

This chapter outlines the program implementation assessment component of the ETP evaluation and is designed to illustrate how the Program was implemented in the 2006-2008 program cycle, including any synergies that might emerge from statewide collaboration. The chapter includes:

- Presentation of results from the process mapping exercise conducted by the evaluation team as an initial task in the project (Section 5.1)
  - Comparative analysis of actual program implementation to PIPs (Section 5.1.1)
  - Mapping results organized by program implementation phase: Scanning, Screening, Assessment, and Transfer/Dissemination (Section 5.1.2)
  - Summary of observed ETP design differences across the utilities (Section 5.1.3)
- Discussion of the evaluation team's findings on the status of recommendations from the evaluation of the 2004-2005 ETP program cycle (Section 5.2)
- The team's assessment of the nature and frequency of interactions among ETCC stakeholders (Section 5.3)
- Results of the Stakeholder Interviews conducted by the evaluation team including the stakeholders' perceptions of the mission of the ETP, issues affecting the long-term success of the Program, and suggested roles for the ETP in future program cycles (Section 5.4)
- Objectives and methods used by the evaluation team to conduct the Case Study analysis including observations organized by program implementation phase: Scanning, Screening, Assessment, and Transfer/Dissemination (Section 5.5).

5.1 ETP Process Mapping

This section provides a detailed discussion and assessment of the program implementation process as it has evolved for the ETP. To facilitate the discussion, the evaluation team developed a series of process maps to characterize the details of program implementation and to compare and contrast the various implementation models developed by the IOUs. It is important to note that the process maps presented in this section were developed relatively early in the evaluation cycle, and may not necessarily reflect the current state of each utility's Program, especially as the Programs have evolved in relation to planning efforts associated with the 2010-2012 program cycle.

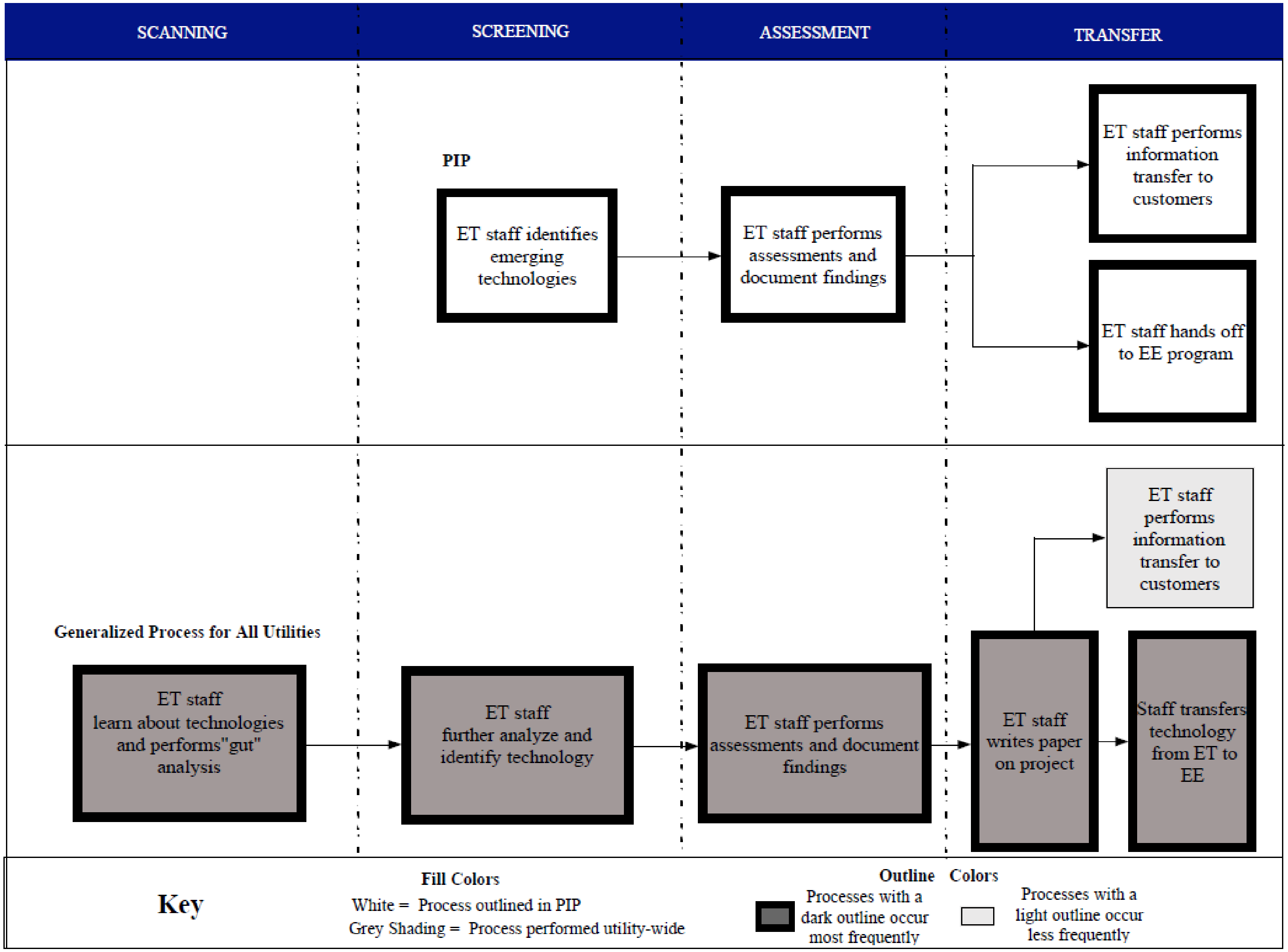
5.1.1 Process Mapping: Comparison of PIPs and High-Level Program Implementation

At its most basic level, the implementation of the ETP corresponds with the four phases identified in the program theory and logic model: scanning, screening, assessment, and transfer. As a first step, the evaluation team developed a high-level program implementation process map, based upon its understanding of the program implementation process across the IOUs, and compared this with the implementation process outlined in the 2006-2008 PIPs filed by each of the utilities (see Figure 5-1 - Figure 5-5).

The high-level process map provides more detail than the information provided in the PIPs. As characterized by the IOUs, the PIPs are viewed as *enabling* documents, from which the utilities can then develop more detailed program plans. Based upon this assessment, the program implementation processes developed by the utilities are consistent with the broad intentions outlined within the PIPs. The most significant difference is noted in the transfer phase, where the majority of program efforts are concentrated upon the transfer of information to internal utility staff. This divergence is depicted within the transfer stage of Figure 5-1 by a difference in shade, with the darker shade representing the process that occurs most frequently and the lighter shade representing the process that occurs less frequently.

Figure 5-2 through Figure 5-5 provide high-level process maps for each of the utilities. Within these maps, the evaluation team endeavored to vertically align tasks that are similar to each other throughout the four phases of program implementation. Darker shades are meant to denote the primary process through the Program; lighter shades are those activities that occur but with less prevalence. Different shapes are utilized to denote the various actors (or combinations of actors) involved with each step.

Figure 5-1. High-Level Comparison of ET Programs



An overview of each phase of program implementation, as implemented, is provided below along with highlights of how these phases vary by utility.

5.1.2 Process Mapping: Scanning Phase

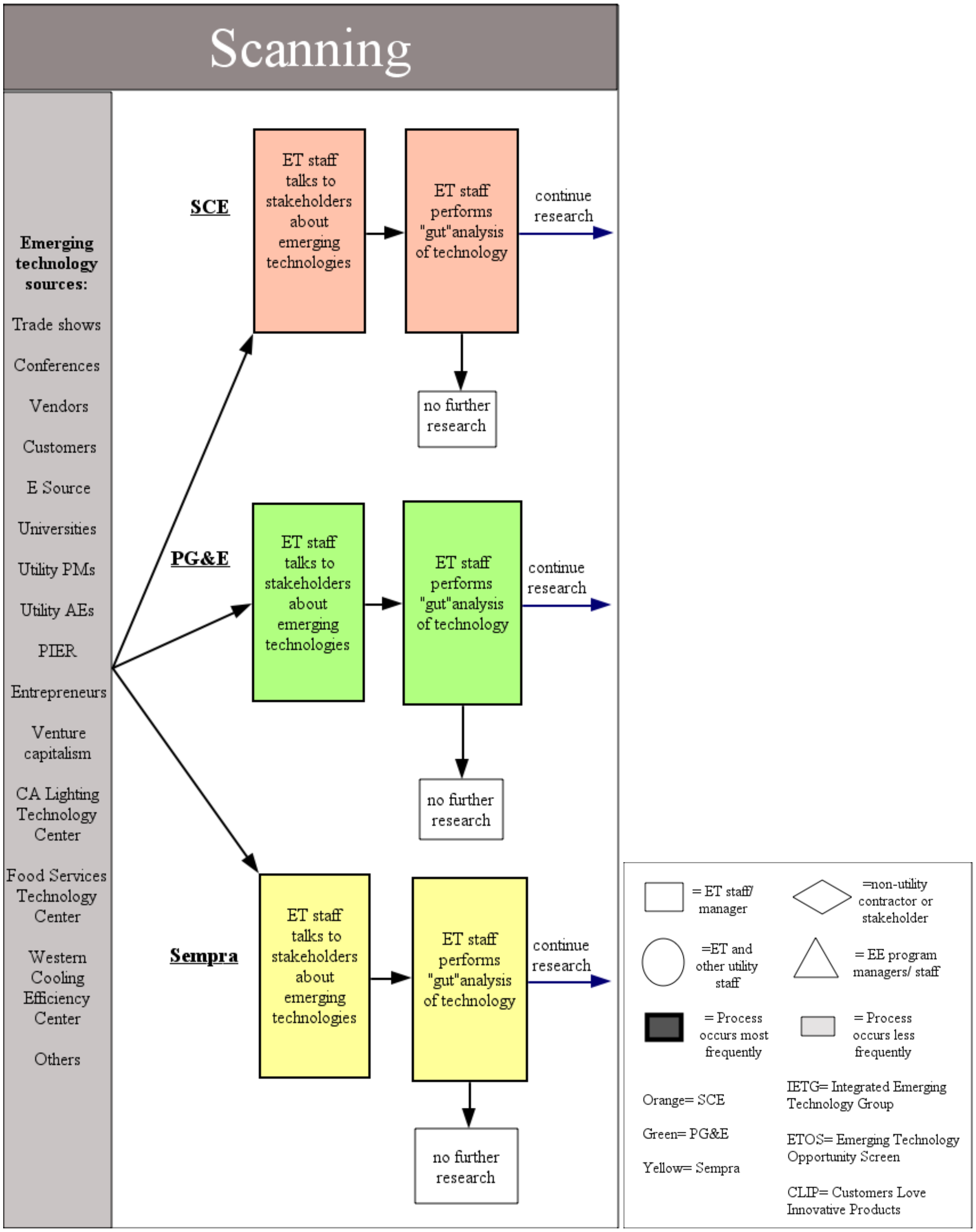
Scanning refers to the process by which each of the utilities identifies potential new energy efficiency technologies for inclusion in the ETP. Importantly, from the perspective of the utilities, an "emerging" technology may actually be one that is not new, but one for which there is a new application or niche within an existing market that may be developed. This scanning process is not a formalized process per se and a variety of potential information sources were identified by the utilities. These include (but are not limited to):

- Trade shows
- Conferences
- Vendors
- Customers
- E Source
- Utility program managers
- Utility account managers
- PIER
- Entrepreneurs
- Venture capitalists
- Universities
- CA Lighting Technology Center
- Food Services Technology Center
- Western Cooling Efficiency Center

While utility staff may first hear of an idea from a conference or vendor, ETP staff most often describe that informal interactions among themselves, account managers, and program managers enable a technology to become integrated into the screening phase of the ETP.

Each of the utilities underscored the difficulty in identifying potential residential technologies during this scanning process. ETP staff felt that commercial and industrial technologies were more plentiful, with the caveat that industrial applications often faced a potentially limited market due to the unique nature of some industrial processes. ETP staff viewed gas efficiency technologies as being more difficult to identify than electric technologies, and noted that existing air quality regulations affect the feasibility of many potential new gas measures. All of the utilities reported to scan technologies in a similar fashion and so are depicted similarly in Figure 5-2.

Figure 5-2. Scanning Phase of SCE, PG&E, Sempra ETPs



5.1.3 Process Mapping: Screening Phase

Screening refers to the process by which the utilities identify technologies in which they wish to invest programmatic resources to conduct technology assessments. The process by which technologies are screened is evolving rapidly, with each of the utilities taking a different approach at the time the process maps were developed. In spite of the differences, two common elements were evolving: (1) the use of quantitative metrics; and (2) involvement of non-ETP staff in the screening process. These processes are described for each utility and shown in detail in Figure 5-3.

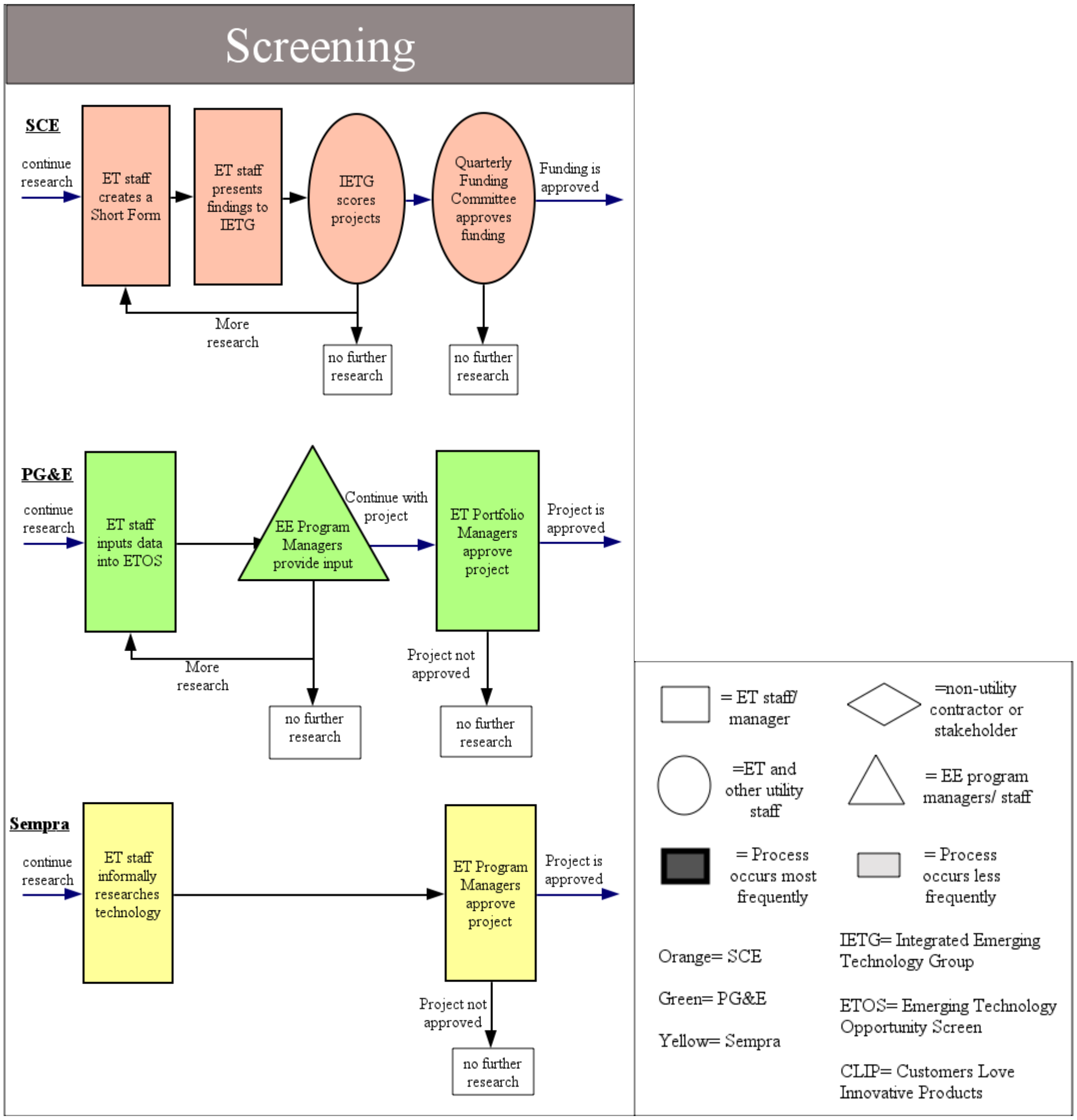
- **SCE:** SCE had developed the most formalized process for including EE program staff in the review process. This change in program design was undertaken to ensure that ETP efforts were aligned with the needs of EE program implementation staff, and to ensure that these implementation staff were more fully invested in the ETP. After completing a quick analysis of a technology, summarized in a "Short Form," ETP staff present the information to EE staff and other utility staff via the Integrated Emerging Technology Group (IETG). Together, they are able to evaluate the Short Form and score projects to recommend one of the following strategies: (1) to go forward, (2) to return for more work, or (3) not to pursue. ETP staff performs more detailed background research on those technologies that pass the Short Form review process and present these secondary findings, summarized in a "Long Form", to a funding committee that approves an up-to four-year budget for the technology assessment process.[69]
- **PG&E:** PG&E had utilized a relatively informal internal process at the time the process maps were developed, but was in the process of developing a risk-based assessment tool to help screen technologies in a more systematic and quantitative manner.[70] This tool, called Emerging Technology Opportunity Screen (ETOS), is similar to the SCE Long Form, in that it summarizes technology and project-related information. The information is weighted by various forms of risk, including: market, channel/distribution, technology, regulatory, and execution in order to help determine if PG&E should pursue the project. Based upon input from ETOS and EE program managers, ETP Portfolio Managers meet to formally approve an ETP project.
- **Sempra:** Sempra also developed a process to screen potential technologies for inclusion in the ETP during the 2006-2008 program cycle. The approach was not fully adopted at the time the process maps were developed,[71] as the utility was working to resolve issues associated with developing subjective screening criteria; thus, the process is not depicted in Figure 5-3. As the program developed, ETP staff began completing an Emerging Technology Potential Assessment (ETPA), which summarizes technology and project-related information and quantifies the risk associated with pursuing a technology. ETP managers review the information and are charged with deciding whether or not to approve an ETP project.

Each of the utilities underscored the reality that screening is not a once-a-year process where the staff sit down with a long list of technologies and run them through a screening process simultaneously. Rather, it is an ongoing process, and a process that is continuously evolving as

[69] This could effectively limit research to that which takes no more than four years to complete.
[70] The Emerging Technology Opportunity Screen (ETOS) was subsequently finalized and used by PG&E staff to screen technologies into the ETP during the 2006-2008 program cycle.
[71] The Emerging Technology Potential Assessment (ETPA) was subsequently finalized and used by Sempra staff to screen technologies into the ETP during the 2006-2008 program cycle.

the utilities seek to meet the needs of their internal, as well as those of their external, stakeholders.

Figure 5-3. Screening Phase of SCE, PG&E, and Sempra ETPs

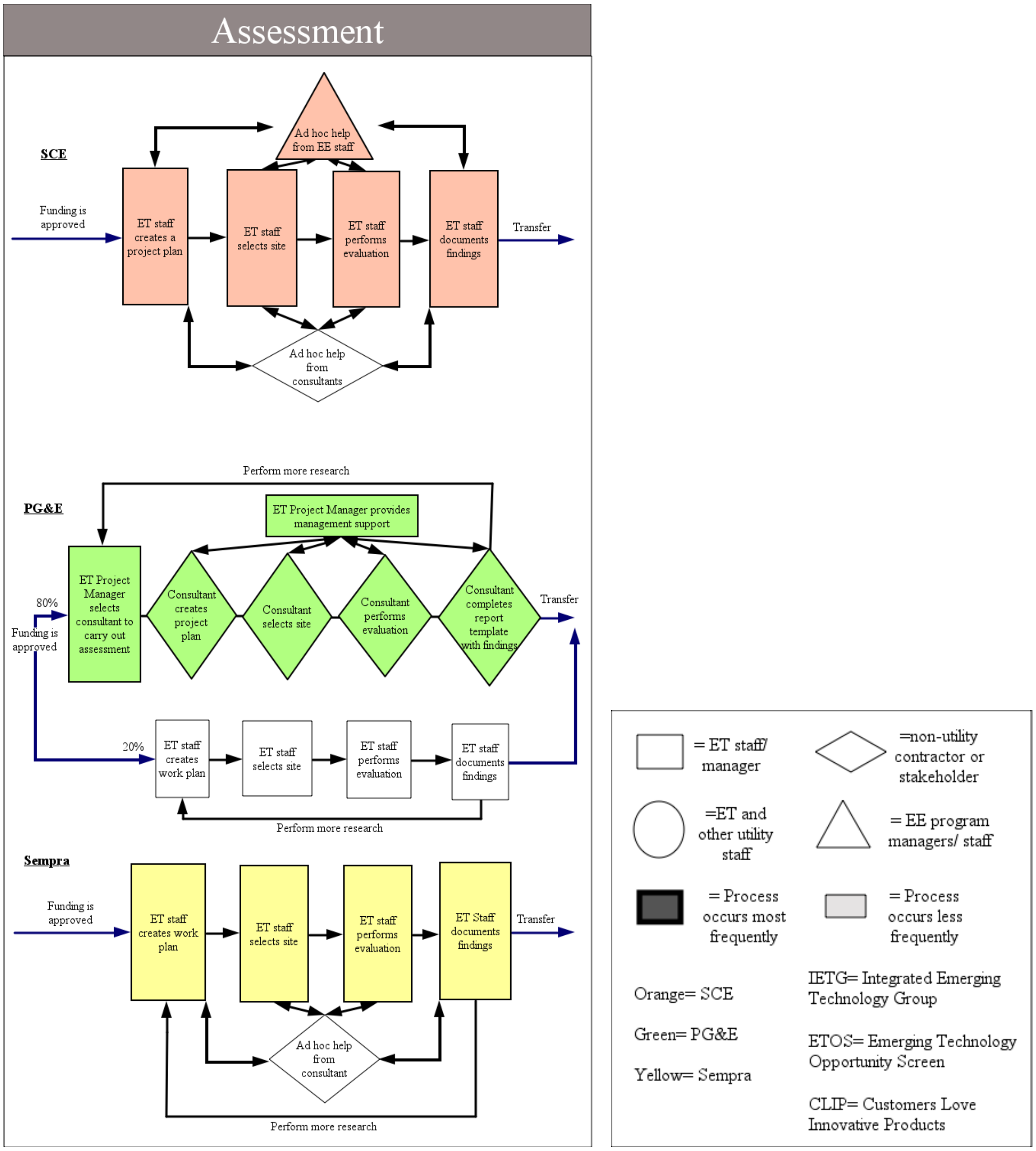


5.1.4 Process Mapping: Assessment Phase

Assessment refers to the process by which each of the utilities goes about its work to ascertain the technical viability of a particular technology. This step is viewed as necessary for the utility to support a technology, include the technology in one of its EE program offerings, and to take any additional steps that may serve to reduce performance uncertainty within the market. Each assessment project is unique, designed to address specific technologies, and often with specific applications. In general, all of the utilities develop some type of project plan, select a test site, evaluate findings, and ultimately document the study. A key challenge faced by the utilities during the assessment phase is the recruitment of host customer sites. Often, this process takes many months, thereby becoming a key driver in project timelines. While the utilities generally follow the same steps to carry out assessments, their means of assessment vary widely. The assessment phase of the ETP process is shown in Figure 5-4.

- **SCE:** SCE utilizes a combination of engineering analyses, laboratory tests, and on-site testing to assess technologies. Consultants are employed ad hoc to assist SCE project managers in various components of these assessments. SCE staff members, including EE staff, are very involved throughout the process. Work products resulting from the assessments vary, but often include some sort of final report and/or data which SCE uses to substantiate savings claims associated with a technology.
- **PG&E:** In contrast with the other utilities, much of PG&E's assessment work is outsourced to consultants. Using its Consultant Work Agreement (CWA) process, the utility solicits bids from a short list of consultants to conduct technology assessments. Consultants are required to submit a proposed methodology and, at the conclusion of the study, are required to submit a final report documenting findings using a standard report template. The majority of PG&E's assessment activity includes the installation of equipment at host customer sites. PG&E staff may play a role in selecting customer host sites, but assessments are largely designed and conducted by the consultants. Whereas SCE will often pay for the entire cost of equipment installed for the purposes of assessment, PG&E expects customers to share in the cost of the installed equipment.
- **Sempra:** While not detailed in Figure 5-4, Sempra uses three terms to describe its activities during the assessment phase: demonstration, showcase, and assessment. While these terms are used interchangeably, the connotation may vary depending upon the context. Sempra asks vendors to share in the costs associated with in-situ testing. Staff at Sempra also noted the need to document savings that are achieved through the installation of equipment, and the inclusion of these savings (kWh or therms) toward the utility's resource acquisition goals. Similar to SCE, Sempra typically performs assessments in house with only ad hoc assistance from consultants.

Figure 5-4. Assessment Phase of SCE, PG&E, and Sempra ETPs



5.1.5 Process Mapping: Transfer Phase

Transfer refers to the phase of the ETP following the assessment work, during which the results of the assessment work are communicated (or *transferred*) to other market actors. As with the screening phase of the Program, this transfer phase was evolving rapidly at each of the utilities, and each utility was handling it differently at the time the process maps were developed. As noted in the discussion of program theory above, each of the utilities has evolved their program design to focus the information dissemination activities at internal clients, predominantly EE program staff. This is not to say that there is not information flowing from this Program that also benefits external stakeholders; rather, the primary focus at this juncture is providing EE program managers with reliable information regarding promising technologies that will help the utility in achieving its resource acquisition goals. The transfer phase of the ETP process is shown in Figure 5-5.

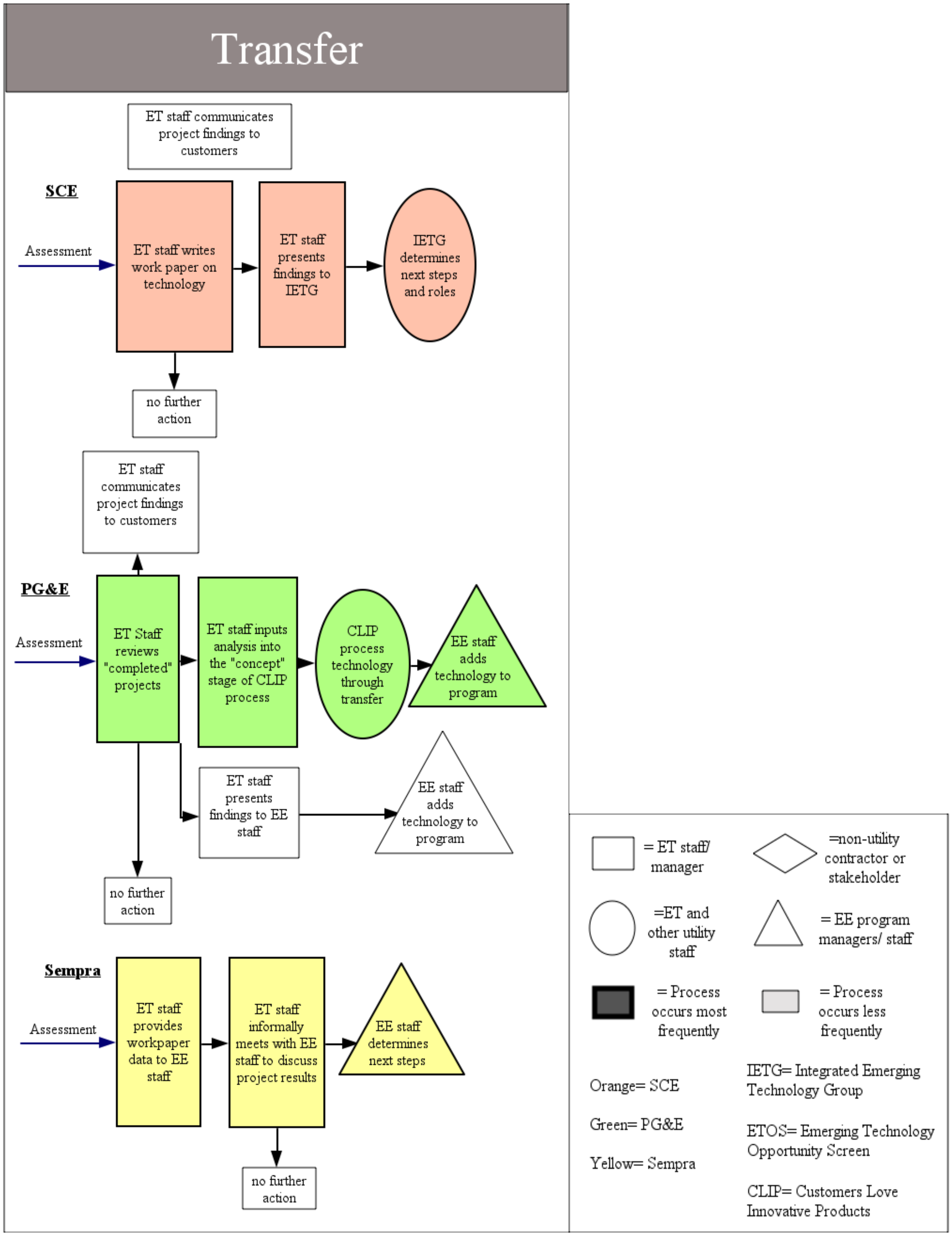
- **SCE:** SCE has formed an Integrated Emerging Technology Group (IETG), which meets every eight weeks to review findings from ETP assessments and to determine next steps following the assessments. The IETG is comprised of the ETP project manager and also members from other functions within the EE department. There is typically a presentation from ETP staff, followed by a discussion of further action to be taken and an identification of roles for moving forward. The IETG determines next steps, although this step is not formalized at this point.
- **PG&E:** The majority of technologies that pass through the assessment process successfully are funneled into an internal product development process that is used throughout PG&E, known as Customers Love Innovative Products (CLIP). This proprietary process draws upon cross-functional teams and is utilized to move potential new products from concept to deployment in EE programs. Once the technology is handed off, the ETP project manager becomes a member of the team, but no longer has lead responsibility for that product development.
- **Sempra:** The transfer process at Sempra was still evolving at the time the process maps were developed, and was not as formalized as that being developed by either PG&E or SCE. During the transfer phase, the ETP assessment manager continues to be involved with the technology, promoting it internally as much as possible and working with EE program managers to address ongoing information needs.

One issue that was highlighted during discussions with utility ETP staff is that of workpapers that are developed to substantiate the IOUs' claims of deemed savings. At a minimum, each workpaper is supposed to contain the first-year energy and demand impacts, the effective useful life, the incremental cost, and the load shape associated with the evaluated technology. Such workpapers are now required for measures included within the EE resource acquisition programs.[72] Since an objective of the ETP is to feed the resource acquisition programs with new measures, one of the criteria for this transfer is the ability to complete a workpaper for a technology. These workpapers are characterized as being very detailed and time consuming to construct. In the case of an HVAC measure that is to be offered in a statewide program, for example, the workpaper must document savings estimates for each of the sixteen climate zones within the state. The need for rigorous workpapers has had ripple effects back into each stage of the ETP. Assessments must be conducted with a much more conservative focus than had previously been used, and technologies screened into the Program must have a high likelihood of substantiating the development of a workpaper. Given this, it may be worth reconsidering the

[72] Commissioner M. Gottstein. December 21, 2006. "Administrative Law Judge's Ruling Addressing Compliance Filings Pursuant to Decision 06-06-063," Order Instituting Rulemaking to Examine the Commission's post-2005 Energy Efficiency Policies, Programs, Evaluation Measurement and Verification, and Related Issues, Page 17.

role of ETP staff in this process, a decision that should be made jointly between the CPUC and ETP staff as well as other relevant stakeholders.

Figure 5-5. Transfer Phase of SCE, PG&E, and Sempra ETPs



5.1.6 Process Mapping: Summary of Differences from ETP Design

The 2006-2008 IOU ETPs were implemented to a large extent in accordance with the ETP design as articulated in the corresponding PIPs. The 2006-2008 PIPs were fairly broad and provided a great deal of latitude for the individual utilities to refine the specifics of the implementation process in ways that suited the needs of their organizations. Perhaps the most significant departure from the original design was in the level of importance placed upon internal vs. external audiences for the information dissemination efforts. As discussed previously, this focus was largely an outgrowth of the increased importance of meeting resource acquisition goals and the role that ETP plays in ensuring that the utilities have adequate technologies offered through EE programs to meet these goals. The ways in which the 2006-2008 ETP designs were similar and dissimilar in actual program execution are summarized below.

In many ways, the program implementation processes that evolved at each utility during the 2006-2008 program cycle are relatively similar. Each utility began to develop a more formalized way of screening potential technologies for inclusion within the ETP. Each utility also began, with varying levels of formality, to include EE program staff within this screening process as a way of ensuring that the outputs from the ETP will be useful to program staff, and to obtain broader utility support for the assessment process. The manner in which the assessments were carried out varied by utility, with PG&E appearing to have the most structured process, using outside contractors for the majority of its assessments. Both SCE and Sempra used a mix of in-house staff and outside contractors to complete assessments. SCE included laboratory assessment and paper analyses, whereas the assessments made by Sempra and PG&E more typically involved in-situ testing, measurement, and assessment. A great deal of evolution was also occurring during the transfer phase within each of the utilities, with both SCE and PG&E developing more formalized hand-off processes and Sempra not yet developing this step.

While the differences in program processes provide room for each utility to develop innovative processes that work best within its particular organizational structure and culture, the differences also present challenges in being able to compare program performance across the utilities. As one example, program databases are unique, with each utility using a data structure with unique variable names. These differences in program processes may also complicate the ability of the Programs to coordinate and optimize efforts across the research and communication efforts they are undertaking.

5.2 Findings on the Status of Recommendations from the Evaluation of the 2004/05 Program Cycle

The evaluation of the 2004-2005 Statewide Emerging Technologies Program, undertaken by ECONorthwest, identified a number of recommendations for the program (see Table 5-1).[73] One goal of the current evaluation was to assess the extent to which ETP managers and staff had acted upon those recommendations. The evaluation team used the various evaluation components to conduct this assessment and found that ETP managers and staff had actively responded to the

[73] ECONorthwest, *2004-2005 Statewide Emerging Technologies Program Evaluation Report*, July 2007.

recommendations made in previous program evaluation efforts; however, in most instances, the programmatic responses remained ongoing exercises that could benefit from more formalized procedures and improved documentation of program activities. The status of each recommendation and the evaluation team's notes regarding actions taken by ETP managers and staff in response to the recommendations are presented in Table 5-1.

Table 5-1. Status of Recommendations from the Evaluation of the 2004-2005 Program Cycle

Recommendation	Addressed by ETP	Evaluation Team Notes
Coordination between the ETP and other entities (EE programs and those who deliver the EE programs to customers) should be considered essential - need to budget sufficient time and resources for coordination activities.	Yes	The utilities have notably increased coordination between ETP and EE program managers and formalization of processes in this regard (e.g., involving EE managers in early stage ETP activities). However, room for improvement exists, especially in terms of generating feedback loops between the ETP and EE programs to assess the success of transferred technologies and identify and mitigate barriers to anticipated levels of market adoption.
Write and complete final reports for all assessments in a timely manner - includes those assessments that find that the technology is not yet ready for inclusion in the EE programs.	Yes	The utilities have improved the efficiency of report preparation in terms of preparing timely documentation for each completed assessment. However, utility affiliate rules require careful legal review and approval of reports before public posting, a situation that can delay the reporting process at each utility. ETP staff at each utility has been working with their respective regulatory affairs staffs to streamline internal review processes.
Refine ETCC website to meet the needs of a target audience.	Yes	The ETCC website was redesigned during the 2006-2008 program cycle to improve its appearance and functionality. However, the utilities do not consistently update the website to reflect ongoing program accomplishments and do not actively "market" the website to relevant stakeholder groups for use as an information dissemination outlet.
The ETP should continue to develop a strong relationship with PIER (Public Interest Energy Research).	Yes	ETP staff has been working to align more closely with PIER through quarterly ETCC meetings and other outreach activities. However, interactions at ETCC meetings tend to be relatively informal and the level of collaboration between the ETP and PIER would likely benefit from a more structured approach to cultivating this relationship (e.g., documenting the ETP role in setting PIER research agenda or the anticipated technology transfer pathways from lab to PIER to the ETP).
Continue developing a formalized technology selection process.	Yes	Each utility has made varying levels of progress in this area and processes continued to evolve over the course of the 2006-2008 program cycle. However, the scanning and screening phases of program implementation appeared to include project-related selection criteria that is somewhat disconnected from the overarching regulatory goals.

The ETP should continue to look for opportunities to incorporate EE Program Managers and account executives into the technology identification and selection process.	Yes	As noted previously, the utilities have notably increased coordination between ETP and EE program managers and formalization of processes in this regard. This is especially apparent in early stage ETP activities (i.e., the scanning and screening phases of program implementation).
Case studies of individual technology assessments can be a useful exercise for demonstrating the program logic; however, project tracking systems need to be improved.	NA	The current evaluation used Case Studies and Peer Reviews to assess program logic and implementation processes; the results of these efforts are presented in other sections of this report. The ability to track the success of technologies that have been transferred from the ETP to EE programs has been limited by multiple and inconsistent data tracking systems and project naming conventions as well as a lack of feedback loops between the ETP and EE programs. The evaluation team has been working with ETP staff and the CPUC to develop an improved program tracking system including consistent and more useful project naming conventions.
Common metrics should be tracked and clearly documented for every assessment.	Yes	The utilities have made progress in this area by working toward consistency across utility data tracking systems and the ETCC database. However, numerous inconsistencies and data gaps remained during the 2006-2008 program cycle. The utilities have been working with the evaluation team to remedy these deficiencies and develop common reporting metrics based on the final program logic models and recognized program management and evaluation needs.

A variety of factors likely contributed to the evaluation team's observation that most programmatic responses to these recommendations remained works in progress during the 2006-2008 program cycle, including continued evolution of the ETP during the 2006-2008 program cycle and a lack of formal documentation of program procedures and decision-making regarding many of these items. Additional insights regarding the items, including expanded discussions of program implementation processes and suggested areas of improvement, are presented throughout this report. In addition, it should be noted that the 2010-2012 ETP Program Implementation Plans reflect continued progress made by ETP managers and staff to address these and other recommendations generated during program evaluation efforts.

5.3 Assessment of the Nature and Frequency of Interactions among ETCC Stakeholders

The Emerging Technologies Coordinating Council (ETCC) has held a meeting in every quarter during the 2006-2008 program cycle. In addition, the ETCC organized and presented the 2008 Summit on Emerging Technologies in Energy Efficiency (ET Summit) in October 2008. Members of the evaluation team attended these events in order to observe the effectiveness of the ETCC and its corresponding impact on ETP operations. The evaluation team's feedback based on the events attended is summarized in the remainder of this section.

The team's observation of the ETCC meetings revealed that the meetings are run in a formal but relaxed manner that encourages broad, often informal, discussion among meeting attendees. The IOUs and related organizations (e.g., CEC, PIER) are well represented at these meetings.

However, the meetings are not open to the public, unless someone was invited to speak on a specific technology or issue. In addition, the meetings appear to serve the purpose of allowing formal opportunities for utilities and other stakeholders to share experiences on projects, learn about non-IOU ETP activities, provide updates on other relevant events (e.g., ET Summit planning), and discuss broader ETP issues (e.g., PIP planning, evaluation activities). However, meeting objectives do not appear to focus on coordinating the planning of assessments (e.g., have other utilities performed a similar assessment that can be leveraged to improve the proposed assessment design or offer other lessons learned?) or coordinating the transfer of technologies into other IOUs (e.g., how can other IOUs use the results of a completed assessment for their own needs?). The evaluation team often observed informal discussions of collaboration opportunities, but limited instances of formal decision-making regarding such opportunities. While this type of decision-making may typically occur outside the confines of the ETCC, a formal setting such as the ETCC meetings would seem to be an appropriate venue to formally discuss collaboration opportunities. Doing so would facilitate efforts to keep the broader group of ETCC stakeholders aware of ongoing program activities.

In addition, while the meetings themselves functioned smoothly and stimulated much informal conversation, the evaluation team had difficulty tracking follow-up on specific discussion topics given lack of discussion of action items from previous meetings and limited attendee review of previous meeting minutes. Given the prevailing meeting structure – formal presentations of projects coupled with mostly informal means of coordinating joint work on an assessment – it would be prudent to better document action items to ensure owners of tasks complete the tasks in a timely manner. Best practice experience from other organizations would be to clearly document action items in the minutes recorded for each meeting, to distribute the meeting minutes within several days of meeting completion, and then devote some portion of the next meeting to report on progress made toward completing the specified action items.

Regarding the ET Summit, the evaluation team observed that the Summit was well organized, informative (i.e., consisted of high quality presentations and on-point topics), and well attended by a diverse set of organizations including representatives of industry, investment, IOUs, state agencies, and non-profits. The Summit presented good networking opportunities; however, showcasing of the ETP was limited. As examples, staff from each of the IOU ETPs chaired sessions and gave presentations, yet there was little to no direct reference to the ETP. The plenary session speakers gave only passing reference to the ETP, and exhibitors queried by evaluation team members (even those with products being assessed by the Program) had limited knowledge of the ETP. Undoubtedly, networking among Summit attendees helped broaden awareness of the ETP; however, given the significance of the event and the diversity of Summit attendees, the team senses a missed opportunity in terms of generating interest and awareness of the ETP.

In summary, the evaluation team believes that the ETCC meetings serve the purpose of bringing ETP staff together to informally discuss technologies being considered for each utility's ETP, providing networking opportunities regarding specific technologies, and presenting possible collaboration opportunities across the utility ETPs. However, the team notes that this lack of formality hinders the ability to document decisions made during the meetings and track subsequent actions taken on specific discussion topics. In addition, attendance at the meetings appears to be limited to utility staff and a select group of program stakeholders, a factor contributing to limited awareness of the ETP among a broader stakeholder group. As noted in later sections of this report, uncertainty exists among many stakeholders as to the mission and effectiveness of the ETCC, especially in terms of facilitating networking and collaboration focused on technology commercialization. The evaluation team recommends that the ETCC bear this in mind as it positions itself for the 2010-2012 program cycle.

5.4 Stakeholder Interviews

This section provides a summary of interviews conducted with policymakers and stakeholders working in the realm of emerging technologies for energy efficiency. The objective of the interviews was to develop a better understanding of the perceived role of emerging technologies within the broader energy efficiency policy context, both in California and elsewhere, as a means of providing greater understanding and guidance for the development of the ETP.

A series of in-depth interviews was conducted with professionals who are either working within the realm of emerging energy technologies or otherwise have an interest in the mission of the ETP. An interview guide[74] was developed for these conversations and the following 13 individuals participated in this effort:

- Jeanne Clinton, California Public Utilities Commission (CPUC);
- Cathy Fogel, California Public Utilities Commission (CPUC);
- Andrew Hargadon Energy Efficiency Center, UC Davis;
- Benjamin Finkelor, Energy Efficiency Center, UC Davis;
- David Goldstein, Natural Resources Defense Council (NRDC);
- Ed Vine, California Institute for Energy Efficiency (CIEE);
- Francis Rubenstein, Lawrence Berkeley National Laboratory (LBNL);
- Jim Lutz, Lawrence Berkeley National Laboratory (LBNL);
- Harvey Sachs, American Council For and Energy Efficiency Economy (ACEEE);
- Norman Bourassa, Public Interest Energy Research (PIER);
- Rohit Sakhuja, Massachusetts Institute of Technology (MIT);
- Ted Jones, Consortium for Energy Efficiency (CEE); and
- Tom Roberts, Division of Ratepayer Advocate (DRA).

The evaluation team would like to thank all of these individuals, each of whom provided valuable insights related to energy efficiency and the important role of the ETP in these efforts. Findings from these interviews are provided below and include the following:

- Public Sector Involvement in Emerging Technologies;
- Perceived Mission of the ETP;
- Broad Perceptions of the Current ET Programmatic Effort; and
- Issues Affecting the Long-term Success of the ETP.

[74] The in-depth interview guide used in this task is included as Appendix I to this report.

5.4.1 Stakeholder Interviews: Public Sector Involvement in Emerging Technologies

Perhaps the most consistent point of agreement across all of the interviewees was the notion that new technologies, beyond what exists today, will be needed to meet increasingly aggressive energy efficiency and climate change mitigation goals. Concurrent with this identified need, there was similar agreement that the goals are important enough to warrant public sector involvement through research and development (R&D) efforts *and* publicly-funded initiatives such as the ETP that serve to move technologies from R&D into commercialization. While only one person cited market failures as a rationale for public sector involvement, the more consistent point of justification was the central role that energy efficiency will play in addressing climate change and the sense of urgency in meeting these needs as soon as possible. Below are comments from interviewees relating to this subject:

- *Climate change goals require a "well-stocked shelf" ready for deployment.*
- *We can do a lot with what we have BUT we also will need more.*
- *To meet climate change mitigation goals, 70-80% reductions in energy use are needed; we have technologies at this point that may achieve 50% reductions.*

This connection between the ETP and climate change is one that will likely resonate well with the broader range of industry actors and can be leveraged to promote awareness of the Program and its initiatives. At the same time, a fuller development of the economic rationale for the ETP as a means of addressing perceived market failures could provide a more robust and deeper understanding of the need for public investment in emerging technologies through this Program.

5.4.2 Stakeholder Interviews: Perceived Mission of the Statewide ETP

Each interviewee was asked to characterize their understanding of the mission of the ETP and provide their insights as to whether or not they perceived that this mission is well understood. Among these people there was a general consensus that the mission is not well understood. Below highlights two comments by interviewees that speak specifically to this point:

- *The mission of the ETP is very poorly understood.*
- *I don't think many people know about the Program; people have different ideas about what it should be.*

This is further reflected in the articulations of the ETP mission statement as provided by these individuals:

- *Identify and deploy potential technologies that, with some support, could become viable for programs or usable by the utilities.*
- *Conduct performance evaluations of emerging technologies and perform demonstrations in a way so that the utilities can develop the technology into a program.*
- *"Fill the shelf" of technologies that can be in the market.*
- *"Press out" new technologies, which are not currently commercialized. To do this, the ETP performs lab or field demonstrations for these types of technologies, and in so doing collects data on energy savings and cost*
- *They don't develop new seed varieties, but they evaluate better technologies, cull out, filter, and push them towards implementation.*

- *Collect the documentation to run through their programs the technologies that are not well known or distributed.*
- *Identify promising technologies that are in R&D or have a small market share and identify priority technologies to devote support and field testing; and further move these technologies into rebate programs.*
- *Grab technologies that might normally die and then help businesses with final stage demonstrations to demonstrate that this is a technology that ought to be incentivized to help utilities meet their goals.*
- *Help bring promising technologies into a promising environment to attract technology development in the marketplace.*
- *Focus on identifying promising technologies that offer substantial gains/ benefits in EE. Once identified, the program advances those technologies in a variety of ways that are possible.*
- *Identify good candidates for proving a technology concept, perform pilot demonstration projects, provide data to assesses the technology, and develop materials to help spread success stories…not R&D.*
- *Testing and bringing new technologies to the market.*
- *ETP does field tests and demonstrations on specific technologies*

While all of these statements are more or less within the current definition of the Program, the range of responses indicates that, even among those who are very active in energy policy and/or working within the realm of emerging energy technologies (but who are admittedly outside the utility organizations), the specific mission of the ETP is not well understood.

5.4.3 Stakeholder Interviews: Broad Perceptions of the Current ET Programmatic Effort

When asked about how successful they believe the ETP has been in achieving its mission, very few interviewees were able to state whether or not they believed the Program had been successful. More often than not, interviewees began asking the interviewers if there were examples of technologies that had moved through the Program and into the marketplace. This reflects a general lack of understanding among stakeholders about the successes of this Program and suggests a need for more aggressive promotion of success stories tied to the Program.

As noted by one individual, utilities are viewed as being a potentially important distribution channel for new technologies and, as such, venture capitalists (VCs) and other entrepreneurs would be very interested in knowing more about the ETP since this program is effectively a gateway into the utility incentive programs.

Several interviewees shared their perspective, based upon their interactions with the Program, that each utility's implementation of the Program is very different. Some utilities are perceived as being easier to interact with than others; some are seen as being more actively involved and visible in the emerging technologies community. While the specific differences across the programs are not important at this juncture, the interviewees had questions regarding why these differences exist.

5.4.4 Stakeholder Interviews: Issues Affecting the Long-term Success of the ETP

These discussions provided an opportunity for thoughtful consideration of the issues that are perceived to affect the long-term success of the ETP. These include the following, each of which is discussed in more detail below:

- *Regulatory Treatment of Investments in Emerging Technologies*
- *Technology Selection Process*
- *Link Between PIER, ETP, EE Programs, and Related Efforts*
- *Suggested Roles for the ETP*
- *Alternative models*

5.4.5 Stakeholder Interviews: Regulatory Treatment of Investments in Emerging Technologies

Several stakeholders questioned broadly whether or not the current regulatory framework was designed in a way to foster success within this type of a program. These comments typically centered on two dimensions: (1) acceptance of risk within the current structure of the shareholder incentive mechanism, and (2) the current focus upon, and uncertainty surrounding, program attribution (including net-to-gross ratios and free ridership).

Each interviewee recognized that investing in emerging technologies is very uncertain. The stakes are high; while the potential rewards are great, the risk of investing in technologies that do not come to fruition is also quite high. And yet, as was also underscored in several of the interviews, accepting the potential of failure is a necessary part of this investment. Absent such a willingness to accept failure, the necessary risks are unlikely to be taken. Several individuals wondered aloud about whether or not the current regulatory incentive structure provides adequate “space” for accepting risk and the potential attendant financial implications. As characterized by these comments:

- *It is hard to be nimble and risk taking with the level of regulatory scrutiny that is placed on these programs.*
- *Our culture is one where we would rather be precisely wrong rather than approximately accurate.*
- *The regulatory incentives need to be thought through carefully in order to provide the right kind of signals to the utilities for risk.*
- *The risk/reward structure needs to give more credit to emerging technologies initiatives.*

It was also noted that, since technology developments occur not within the confines of state political boundaries, but instead on national and international levels, the ETP needs to be allowed to reach beyond California and allow for time and expenses that may be required to interact with peers on the national and international levels. This, in turn, may have implications for how these costs are treated within the regulatory framework.

As currently designed, the ETP is closely linked with, and is intended to feed, the utility EE programs. The financial pressures placed upon the organization to link ETP efforts closely with the near-term success of the EE programs, is perceived by some as limiting the ability of the ETP to make investments that are potentially more long-term and risky in nature. These observations are potentially important and suggest that the CPUC and the utilities engage in discussions to ensure that the near-term performance incentives do not detract inadvertently from the long-term mission set out for the ETP and, ultimately, the state's climate change mitigation goals.[75]

Observers also noted that attribution was another potentially contentious area for the Program. One person questioned whether or not the question of attribution was relevant to ETP noting, *"I don't care about attribution, we should remain focused on the end result. It's like asking which player on the football team caused the team to win."* This perspective was shared, by others as well, citing the fact that the "*IOUs are a major driver, but not the only driver*."

5.4.6 Stakeholder Interviews: Technology Selection Process

Another area that each of the interviewees commented upon was how technologies are selected for assessment within the Program. Again, this was most often framed as a question to the interviewers, but inevitably the interviewees had their own perspectives on what would be important in this realm for the success of the Program. Specifically, more than one person suggested that external parties could be more involved in selecting the technologies that are then pushed through ETP to the utility EE programs. It was cited that there could be merit to broadening this process, opening it up to provide broader representation of interests from industry, researchers, investors, and policymakers. One person suggested that, in the future, the utilities should work more closely with the CPUC to determine which technologies to promote: *"There is a great divide between the utilities and the CPUC, and this current planning process is the first time the CPUC has taken an activist approach in terms of program planning."* In a parallel manner, it was also noted that the utilities are not involved in setting the research agenda for the PIER programs and that a closer linkage in this area might also be very beneficial.

5.4.7 *Stakeholder Interviews: Link between PIER, ETP, EE Programs, and Related Efforts*

The links among the various entities involved in technology development (e.g., PIER, National Labs, and industry), the ETP, and utility EE programs is another area that is not clear among the interviewees. Although this sentiment was communicated in several of the interviews, it was characterized most aptly in this instance: *"There is no linear progression from Lab to PIER to ETP to IOU programs. Ideally, there would be a flow-through plan for a technology that links the PIER and ETP efforts for that technology."*

On a related note, there was consistent uncertainty expressed regarding the Emerging Technologies Coordinating Council (ETCC) – *How do they coordinate with other efforts? What does the ETCC do? How effective is it? Who is involved and how do decisions get made?* While the purpose of our interview was not to assess the effectiveness of the ETCC, the fact that this uncertainty exists among these stakeholders indicates that the process is not transparent and that, with the observed need for coordination, such transparency is viewed as being important.

[75] This also relates to the market transformation goals established in the *California Long Term Energy Efficiency Strategic Plan* (CPUC, September, 2008). As noted in the Plan, "There has been little incentive for utilities to engage in measures with a longer-term orientation – those very measures which produce meaningful market transformation."

Other emerging technology efforts cited during these discussions, which may factor into overall emerging technologies coordination, included:

- American Council for and Energy Efficient Economy (ACEEE);
- US Department of Energy (DOE);
- New York State Energy Research and Development Authority (NYSERDA);
- National Labs (e.g., LBNL, PNNL, characterized as "idea foundries");
- The Center for the Built Environment; and
- PIER Energy Innovations Small Grant Program.

5.4.8 Stakeholder Interviews: Suggested Roles for the ETP

The technology assessment work undertaken by the ETP is recognized as playing a vital role in the commercialization process. Additional roles that the Program could play were also identified. They included:

- **Working upstream** – distribution channels are vital to the success of a product in the long term. "*There is a need to focus on upstream variables and downstream variables.*"
- **Business and Market Dimensions** – interviewees highlighted the need for successful business enterprises that can scale-up their manufacturing processes to meet market demand and achieve economies of scale. Several emphasized the concept of scalability as being essential to the ultimate success of a technology, wondering how the ETP takes this into account when staff decide where to invest and what type of role is needed to accelerate the adoption of a particular technology.
    - *ETP is focused on evaluating the technology, but not the business. These are very different questions.*
    - *If we are trying to get emerging technologies into the marketplace, then there are lots of other questions that need to be addressed in addition to technical assessment.*
    - *What is less clear is which entity is tasked with paying attention to the market dimensions.*
- **Standards Development** – Standards development was cited as an area in which utility involvement will become increasingly important. Standards are instrumental in providing the metrics against which efficiency is measured and communicated and, as such, utility leadership in this area is essential. Two areas in particular were cited where this is likely to have long-term impact: consumer electronics and lighting. Interestingly, this discussion led to another potential issue: since standards development often takes place on an international level rather than a state or national level, such involvement may require substantial international travel, something that is costly and is perceived as often being frowned upon in public circles. While potentially a small detail, this is another example of how the regulatory framework and treatment of program costs can influence the success of ETP efforts.

- **Technology Focus** – While the evaluation team did not solicit suggested technology areas for the Program to focus upon, several recommendations were offered. Specific areas of technology focus that were offered by one individual included:
    - Control systems, and the compatibility of these systems with equipment that is being developed.
    - Home energy management systems and the linkage of these systems with evolving Smartgrid infrastructures.
    - Accelerating the development of high efficiency lighting and HVAC technologies, including improved performance and dimmable ballasts.

5.4.9 Stakeholder Interviews: Other Models

During these discussions, several other organizations were suggested as "models" from which the ETP might draw "lessons learned." A primary role that each of these models plays is that of facilitating networking and collaboration focused on technology commercialization.

- **Consortium for Energy Efficiency (CEE)** – CEE was cited as another model for ETP. Subsequent conversations with CEE staff, however, underscored the fact that CEE is predominantly focused on technologies that are viewed as being scalable to serve a mass market. ETP, in contrast, does not necessarily prioritize its efforts to focus on mass markets.
- **Building Commissioning Collaborative** – This organization has a leadership Board that includes broad representation from key stakeholders including utilities and other entities. The Collaborative provides coordinating functions utilizing paid staff that is separate from the various building commissioning initiatives in the state.
- **Western Area Cooling Center** – This model was cited (not just by the UC staff who were interviewed) as an example of an organization that has been successful in the coordination of initiatives surrounding a particular end-use (in this case, cooling-centered technology initiatives).
- **Golden Carrot Refrigerator Program** – Rather than the utilities focusing on technology assessment, another way to potentially impact the market would be to establish stretch goals and put incentives in place to reward the marketplace for reaching these goals.

5.4.10 Stakeholder Interviews: Summary of Findings

As noted above, there is strong consensus among the interviewed stakeholders that programmatic efforts are needed to promote the commercialization of new technologies. The ETP is viewed as playing a key role in achieving the state's Zero Net Energy goals and achieving the goals set out in the state strategic plan (Big Bold Strategies). And yet, surprisingly little in-depth understanding of the ETP exists among these individuals. There is significant uncertainty regarding the successes of the Program, details of implementation, and uncertainty about the coordination of emerging technology research and commercialization agendas.

Questions were raised regarding the regulatory treatment of the ETP, an issue that will need to be addressed openly by the CPUC and the utilities. Suggestions to ensure success in the ETP initiatives were offered, the most consistent of which involved the creation of a broader process for deciding upon where ETP investments are made. Finally, several other organizations were cited as potential models for the ETP, with a clear emphasis on the coordinative and facilitative nature of this work and reflection of stakeholder uncertainty as to how the current efforts are in fact being coordinated.

5.5 Case Studies

This section discusses the analysis of 45 ETP project case studies. These case studies provide an in-depth understanding of the processes used to identify, select, and assess technologies through the ETP, and also portrays the methods used to disseminate the knowledge gained from these processes. In addition, the analysis identifies common program processes and trends across different utilities and technologies. The detailed Case Study summaries are provided in Appendix J, and observations from the Case Study analysis are summarized in this section and organized as follows:

- **Objectives and Methodology** – a discussion of the primary objectives for the Case Study research and an overview of the methods used to prepare and analyze the case studies.
- **Overview of Case Study Technologies** – a descriptive analysis of the projects selected for Case Study analysis.
- **Process Observations** – a summary of observations, including trends, successes, and challenges, for each of the key phases in the ETP process. These observations are presented in the following subsections:
    - Observations from the Scanning Phase
    - Observations from the Screening Phase
    - Observations from the Assessment Phase
    - Observations from the Transfer Phase
- **Case Study Conclusions** – observations and feedback on program implementation based on the results of the Case Study analysis.

5.5.1 Case Studies: Objectives and Methodology

This subsection describes the objectives of the Case Study analysis and provides insights into the methodology used to select and analyze the projects included in the Case Study sample. The subsection is organized as follows:

- Objectives of the Case Study Analysis
- Sample Selection
- Case Study Preparation and Analysis

- Limitations

5.5.1.1 Objectives of the Case Study Analysis

The Case Study analysis serves three objectives. The primary objective is to provide the CPUC and other ETP stakeholders with a tangible understanding of *how* the ETP operates. A secondary objective is to identify some of the specific successes and challenges encountered in ETP projects and how the Program has addressed such challenges. The third objective is to identify trends and provide feedback to increase the effectiveness of future program implementation activities.

The case studies document how individual technologies were included in and moved through the ETP. The analysis focuses on the processes involved for the four key phases in the ETP process:

- **Scanning** – how technologies were identified by ETP staff.
- **Screening** – how technologies were selected or rejected for an ETP assessment.
- **Assessment** – how and why technologies were tested and evaluated.
- **Transfer** – how information collected in the assessment was shared, including efforts to integrate the technology into EE programs.

5.5.1.2 Sample Selection

A number of factors guided the selection of Case Study sample. First, the total number of case studies was segmented by utility based on their associated budgets; PG&E and SCE each utilized approximately 40% of the overall ETP budget. As such, 18 of the 45 case studies (40%) were allocated for each of these two utilities. Sempra, with 20% of the overall ETP budget, received the remaining nine case studies (20%).

Each utility was then asked to agree on a variety of representative projects to include in the Case Study analysis. Projects were identified using a number of "pathways" which indicated how technologies moved through the ETP process (the pathways are described later in this section). Since preliminary evaluation work identified a number of key process questions related to the screening and transfer phases, an emphasis was placed on projects that were not selected during the screening process and those still in the transfer phase. Greater weight was also given to projects that were previously selected to be Peer Reviewed (see Section 6.3). Finally, the evaluation team included a variety of utility project managers, end-use categories and market sectors to ensure a wide range of project experiences. Table 5-2 lists the ETP projects selected for Case Study analysis.

Table 5-2. ETP Projects Reviewed for Case Studies

Project ID #[1]	ETP Cases Studies	Utility	Phase[2]
SBC00013	Auto-Demand Response, for Critical Peak Pricing	PG&E	Phase 1
SBC00027	Variable Frequency Drives (VFD) for Dairy Pumps	PG&E	Phase 2
SBC00029	Field Vacuum Pre-Cooling	PG&E	Phase 2
SBC00030	Microbubble Circulation and Stratification Lagoon Wastewater Treatment Technology	PG&E	Phase 2
SBC00033	Mechanical Vapor Recompression (MVR) – Tomato	PG&E	Phase 1
SBC00036	Thermosorber Food Processing	PG&E	Phase 2
SBC00041	Data Center Air Flow Management	PG&E	Phase 1
SBC00081	Demand Response - Wireless Lighting Controls	PG&E	Phase 2
SBC00085	High Intensity Discharge (HID) Electronic Ballasts	PG&E	Phase 1
SBC00092	Ceramic Metal Halide (CMH) Lighting	PG&E	Phase 2
SBC00099	Residential Compact Fluorescent (CFL) Recessed Downlights	PG&E	Phase 2
SBC00103	Light Emitting Diode (LED) - Streetlighting	PG&E	Phase 1
SBC00116	Water-Cooled Condenser	PG&E	Phase 1
SBC00124	Effect of a Variable Speed Drive (VSD) on the Indoor Fan of a Commercial Roof Top Unit (RTU)	PG&E	Phase 2
SBC00125	Evaporative Cooler Field Monitoring	PG&E	Phase 2
SBC00153	Hot and Dry Air Conditioner Field Test	PG&E	Phase 1
SBC00163	LED Niche Applications	PG&E	Phase 2
SBC00174	Air Source Heat Pump for Emergency Back Up Diesel Generators	SCE	Phase 2
SBC00183	Auto Sash Positioning System	SCE	Phase 1
SBC00187	Case Index Testing for Single Compressor System	SCE	Phase 2
SBC00219	Electrodialysis for the Wine Industry	SCE	Phase 2
SBC00223	Packaged Unit - Energy Storage Module	SCE	Phase 2
SBC00226	Evaporative Cooling Technologies Assessment	SCE	Phase 2
SBC00242	Induction Lighting Systems	SCE	Phase 1
SBC00259	LED for Covered Parking Lots	SCE	Phase 2
SBC00262	LED Open Signs	SCE	Phase 1
SBC00295	Optimization of Wastewater Aeration	SCE	Phase 2

SBC00320	LED Downlights	SCE	Phase 2
SBC00336	Efficient Power Supplies for Data Center and Enterprise Servers	SCE	Phase 1
SBC00348	Variable Dust/Make-up Air System	SCE	Phase 1
SBC00353	Variable Speed Die Casting Machine	SCE	Phase 2
SBC00368	Compressed Air No Loss Drain	SCE	Phase 2
SBC00370/ SBC00586	Solar Vending Machines	SCE	Phase 2
SBC00404	Wet Cleaning for Dry Cleaners	Sempra	Phase 1
SBC00430	Sharp Hospital - Exterior Lighting	Sempra	Phase 2
SBC00435	UCSD Data Center Evaluation	Sempra	Phase 1
SBC00442	CEC PIER Project with SMUD	Sempra	Phase 2
SBC00470	Evaluation of Condensing Boilers for Laundry Segments	Sempra	Phase 2
SBC00479	85 kW Combined Heat and Power (CHP) System	Sempra	Phase 1
SBC00493/ SBC00542	OSCOM Valve Prime Wheel - Assessment 1&2	Sempra	Phase 1
SBC00552/ SBC00553/ SBC00589	Advanced Engine Controls	Sempra	Phase 2
SBC00585	Oil Well Pump Controllers	PG&E	Phase 2
SBC00587	Barn Lighting	SCE	Phase 2
SBC00590	Boiler Combustion Damper	Sempra	Phase 2
SBC00591	Step Control Magna Drive	SCE	Phase 2

[1] The Project ID # is the unique identifier assigned by the evaluation team to each ETP technology as part of the Master Database created by the evaluation team (see discussion in Chapter 6).
[2] Indicates whether the Case Study was completed during Phase 1 or Phase 2 of the evaluation.

5.5.1.3 Case Study Preparation and Analysis

Several steps were taken in the preparation and analysis of the individual case studies, as described below:

- **Document review** – The project documentation available for each selected ETP project was reviewed by the evaluation team. Documents that were typically available for review included screening documents, contract documents, and final reports. This review provided context for what the project involved, how it was planned, and how the assessment occurred.
- **ETP staff interviews** – Telephone interviews were conducted with ETP staff that managed the individual projects. Any additional utility staff members that played a key role during the process were also contacted, when applicable. These interviews

were the main source of primary information and supplemented the document review with the history and context of the documents.

- **Other project stakeholder interviews** – Following these initial conversations, the evaluation team conducted supplementary telephone interviews with key stakeholders in the projects including consultants who worked on the projects, technology manufacturers and distributors who may have actively participated in the projects, and property managers or others representing the facilities that served as host sites for the projects. Stakeholders for these interviews were identified through both the document review and ETP staff interviews. These interviews provided other perspectives on program processes.

- **Preparation of Case Study summaries** – A Case Study summary was written to describe each of the above steps, provide a clear story of how the technology moved through the ETP process, and describe how the results of the projects were disseminated.

- **Analysis** – Finally, information from the case studies was synthesized to generate an overall summary of findings and to identify crosscutting issues and patterns from these projects.

This section describes both program-level and phase-specific observations collected from the preparation of the case studies.

5.5.1.4 Limitations

Throughout this process, certain limitations on the evaluation team's ability to perform the Case Study development and analysis were recognized, including the following:

- **Limited scope** - Case studies summarized in this report only represent roughly 20% of the approximately 250 projects conducted by the ETP in 2006-2008. In addition, some of the projects had limited available documentation; therefore, much of the information for these projects was generated through interviews.

- **Skewed sample** – The Case Study selection process was not random and over-sampled projects in certain phases of the ETP process in order to better understand implementation challenges. Results therefore may reflect a skewed representation of project experiences.

- **Staff turnover** – Some project managers had moved onto different positions within or outside of the utility. Some others were not available to be interviewed for other reasons. Consequently, in some instances, key project staff could not be interviewed for the Case Study preparation.

- **Changing processes** – Program processes evolved over the 2006-2008 program cycle and continue to evolve. Therefore, processes vary across utilities and across projects in the Case Study sample, and the processes these case studies describe may no longer be current.

- **Case study timing** – All Case Study analysis occurred after the 2006-2008 program cycle ended. As a result, some case studies describe ETP activities that occurred in 2009 even though funding was committed during the 2006-2008 program cycle. In addition, the case studies were conducted in two phases, and the evaluation team did not update information from the phase one case studies during phase two activities.

5.5.2 Case Studies: Overview of Technologies

This subsection provides an overview of the 45 cases studies selected for this analysis, and is organized as follows:

- Market Sectors and End-Uses of ETP Technologies
- Identified Market Barriers of ETP Technologies
- Classification of Emerging Technologies
- Case Study Pathways

5.5.2.1 Market Sectors and End-Uses of ETP Technologies

The projects selected for the Case Study analysis covered a wide variety of market sectors and end-uses. Table 5-3 shows the distribution of projects by market sector and reveals that the four major market sectors (commercial, industrial, residential and agricultural) are broadly represented by the sample. However, the results do indicate a concentration of projects in the commercial sector, with over a third of the projects reviewed representing that sector.

Table 5-3. Case Study Technology Market Sectors

Utility	PG&E	SCE	Sempra	All	Percent
Commercial	5	6	5	16	35%
Industrial	1	4	2	7	16%
Residential	5	1	1	7	16%
Agricultural	3	2	1	6	13%
Multiple*	4	5	0	9	20%
Total	**18**	**18**	**9**	**45**	**100%**

*****Applicable to any combination of the referenced sectors

Table 5-4 illustrates that lighting and HVAC represent the most common end-uses for the technologies, with almost 50% of the Case Study projects falling within those two measure categories. Table 5-4 also reveals a number of “other” end-uses for more niche applications, which were only represented by a single Case Study technology (e.g., Cogeneration, Demand Response).

Table 5-4. Case Study Technology End-Uses

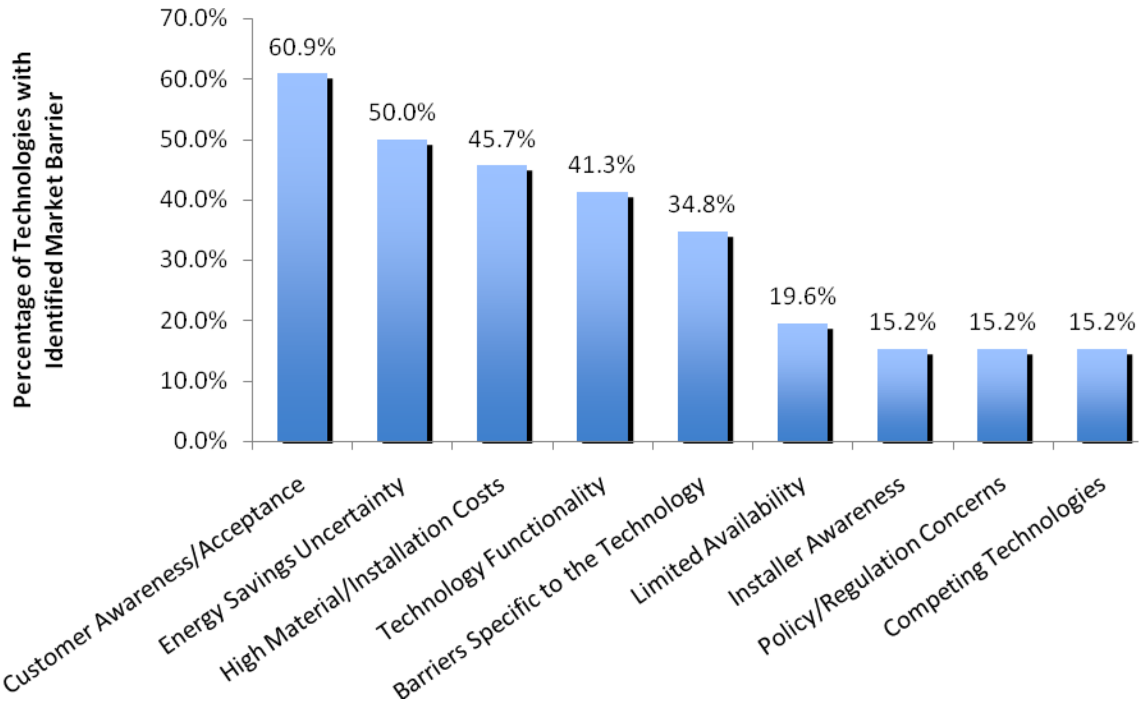
Utility	PG&E	SCE	Sempra	All	Percent
Lighting	6	5	1	12	28%
HVAC	5	5	0	10	23%
Controls	2	2	2	6	13%
Data Center	0	1	1	2	4%
Food Processing	1	1	0	2	4%
Pumps & Motors	0	2	0	2	4%
Wastewater Treatment	1	1	0	2	4%
Water Heater/Chiller	1	0	1	2	4%
Other*	2	1	4	7	16%
Total	**18**	**18**	**9**	**45**	**100%**

*Projects indicated as "other" studied the following end-uses: Cogeneration, Demand Response, Dry Cleaners, Home Design, Industrial Manufacturing Process, Refrigeration, and Vending Machines.

5.5.2.2 Identified Market Barriers of ETP Technologies

An analysis of the market barriers associated with each of the ETP technologies is shown in Figure 5-6. The analysis reveals that project stakeholders identified customer awareness/acceptance and uncertainty of energy savings as market barriers for 50% or more of the Case Study technologies. Project stakeholders identified the following market barriers for over a third of the technologies: high material/installation costs, technology functionality, and technology specific barriers. As discussed further below, these identified market barriers help reveal the importance of the project assessment objectives.

Figure 5-6. Market Barriers Identified for Case Study Technologies



5.5.2.3 Classification of Emerging Technologies

During the Case Study analysis, the evaluation team analyzed available data to determine why technologies were considered emerging, and therefore why these technologies were deemed appropriate for the ETP. The evaluation team identified three types of emerging technologies through this analysis:

- **Recently developed technologies** – In these cases, the fundamental energy saving technology was newly developed and relatively untried in the market. Examples of recently developed technologies include the microbubble stratification for wastewater aeration and the advanced demand response (DR) wireless lighting controls.
- **Established technologies used in a new application** – For these cases, the fundamental energy savings technology is not new but is being used in a different and relatively untested application. In such cases, minor modifications may have been made to adapt the technology to the new application. Examples of established technologies used in new applications include variable speed drives (VSDs) for both battery manufacturers and for commercial roof top HVAC units, air source heat pumps for backup diesel generators, and ceramic metal halide lights for the retail sector.
- **Established technologies with limited market acceptance** – These cases include well-established technologies that have never gained significant traction in the

market. Some technologies in this category may be established in other markets, but have very low acceptance in the local (i.e., California) market. Examples of established technologies with limited market acceptance include electrodialysis for winemaking and boiler combustion dampers.

The evaluation team found that these three categories of emerging technologies were present at each utility, as shown in Table 5-5. It is important to note that many technologies can reasonably fit into more than one of the three categories. However, the evaluation team reasoned that one of these three categories often stood out as the main justification for considering a technology emerging and so each technology was placed in the one primary category.

Table 5-5. Identified Categories of Emerging Technologies

Utility	PG&E	SCE	Sempra	All	Percent
Recently Developed Technology	10	5	4	19	42%
New Market or Application	6	7	1	14	31%
Limited Acceptance	2	6	4	12	27%
Total	**18**	**18**	**9**	**45**	**100%**

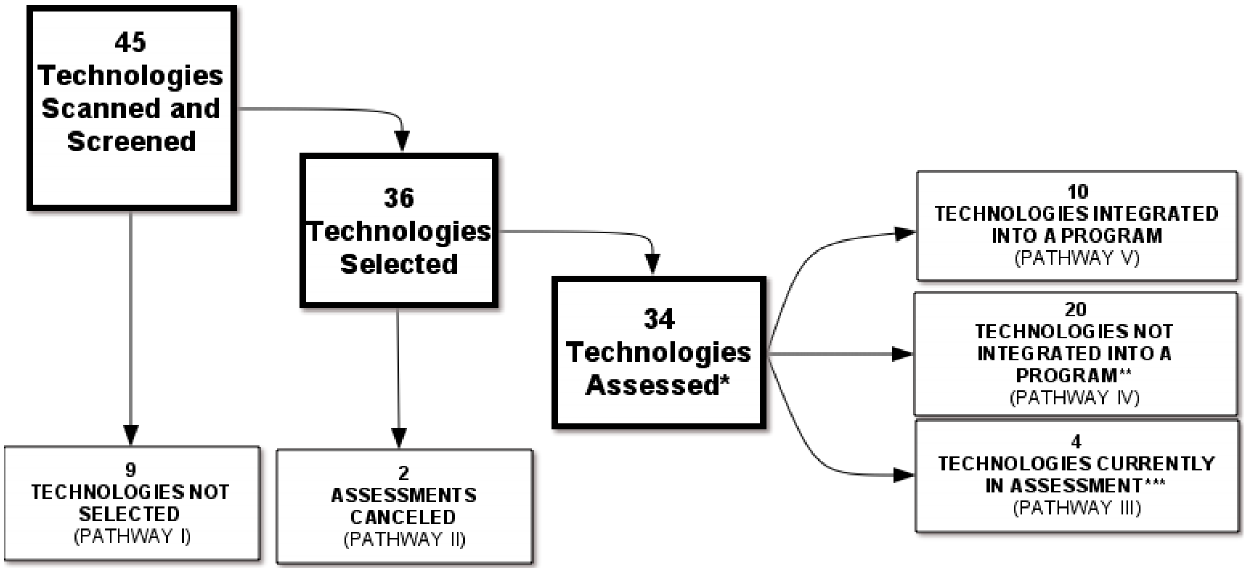
5.5.2.4 Case Study Pathways

As mentioned previously, Case Study projects were selected, in part, by the pathway the technology took through the ETP process. These pathways describe the five main ways that technologies moved through the process, and are described as follows:

- **Pathway I: Technologies Not Selected** – These technologies were screened, but not selected for an assessment during the 2006-2008 program cycle.
- **Pathway II: Assessments Canceled** – These technologies were screened and selected for an assessment, but the assessments were not completed and the projects were ultimately canceled.
- **Pathway III: Technologies Currently in Assessment** – These technologies were screened and selected for an assessment, but the assessments were still underway when the case studies were prepared.
- **Pathway IV: Assessed Technologies Not Integrated into an EE Program** – These technologies were screened, assessed, but ultimately not integrated into an EE program.
- **Pathway V: Assessed Technologies Integrated Into an EE Program** – These technologies were screened, assessed, and integrated into an EE program.

A breakdown of the pathways associated with the 45 Case Study technologies is shown in Figure 5-7, which presents a visual representation of the different pathways in which technologies move through, and out of, the ETP program processes. This illustration shows the different steps a technology must take to move fully through the ETP and be integrated into an EE program, and also notes the number of Case Study projects that clear each step. The transfer process, though not directly identified in the figure, consists of activities occurring after the assessment including the integration of technologies into EE programs and information dissemination activities for those technologies not integrated into EE programs.

Figure 5-7. Flow Diagram of Case Study Technologies Moving Through the ETP



5.6

*Any project that has reached the assessment phase is included in this box. It is important to note that the Case Study sample purposefully included several projects that did not reach the assessment phase.
**These 20 projects have had different outcomes after the assessment phase as shown in Table 5-7.
***For one of these projects, which was in the assessment phase at the time of Case Study preparation, an EE program was already under development. Once completed, the information collected from this assessment may lead to further transfer activities as well.

5.6.1 Case Studies: Observations from the Scanning Phase

In most cases, the scanning process was not well defined by the utilities; however, this section describes several trends regarding how emerging technologies were identified for inclusion in the ETP.

5.6.1.1 Identification of Emerging Technologies

ETP project managers learned about candidate technologies from a variety of sources, as indicated in Table 5-6. These information sources are explained in greater detail below.

Table 5-6. How ETP Staff Learned of Candidate Technologies

	PG&E	SCE	Sempra	Total
General Market Awareness	8	10	3	21
Manufacturer/Distributor	2	3	5	10
PIER	3	1	- -	4
Consultant	3	1	- -	4
Utility Customer	2	2	- -	4
Research Institution (not PIER)	- -	1	1	2
Total	18	18	9	45

- **General market awareness** – ETP staff often knew about technologies through their own knowledge of the market. ETP staff indicated they originally heard about these technologies through other utility staff, had known about them for some time, or had heard about them through "various sources". For example, the SCE project manager who studied LED open signs had been investigating various LED technologies for a number of years. While he learned of several specific LED products at a lighting trade show, he also saw retail storefronts using LED open signs and had been following related developments via the Internet.

- **Manufacturers / distributors** – In other cases, manufacturers and distributors brought technologies to the attention of ETP staff. For example, the PG&E LED street lighting project was first considered when the technology manufacturer brought the specific product to the attention of the project manager at a trade show meeting. After this conversation, the project manager decided to conduct an assessment on the technology.

- **PIER** – Some projects were identified based on research and development activities conducted by PIER. For example, in the hot dry air conditioning project, PG&E provided a laboratory facility for the PIER study. When the PIER project was completed, PG&E was already familiar with the project findings and decided to perform field-testing to verify the laboratory results generated by the PIER project.

- **Utility customers** – In other cases, utility customers brought the technology or the project idea to ETP staff. The automatic sash positioning technology, assessed by SCE, is an example of a technology where the customer asked SCE about the energy savings capabilities of the technology. Given the level of uncertainty, SCE also became interested in performing an assessment to determine the potential energy savings of the technology.

- **Consultant** – In some cases, a consultant looking to carry out an assessment on a particular technology approached ETP staff, such as with the oil well pump controllers project. In this instance, a consultant who was familiar with advanced controls for oil well pumps thought the technology was a good candidate for an ETP assessment and proposed to conduct an assessment for PG&E.

- **Research institutions, other than PIER** – In some cases, projects came to the attention of ETP staff through research institutions such as the Lawrence Berkley National Laboratory (LBNL), the Electrical Power Research Institute (EPRI), or a college or university such as Occidental College or the UC system. The efficient server power supplies project is one example of an ETP project that originated because EPRI had previously performed research to establish guidelines for efficient power supplies in desktop servers. EPRI submitted their report to SCE ETP staff (and others), which eventually led to the corresponding ETP project.

Despite the general lack of a defined process during the scanning phase, the evaluation team identified several examples where utility staff used brainstorming activities to identify project ideas that warranted consideration for the ETP. These brainstorming sessions occurred with both external and internal stakeholders:

- **External brainstorming** – In this example, PG&E held a brainstorming session with experts in energy efficiency in the agricultural sector. These experts identified a number of different emerging technologies and then prioritized projects based on whether they were perceived to be ready for an ETP assessment.
- **Internal brainstorming** – In another example from PG&E, an ETP staff member was asked to develop a portfolio of potential projects for the ETP. The staff member provided a list of ideas, and when the opportunity presented itself to study one of these technologies, the ETP staff member pursued it. In a similar example, an SCE staff member indicated that his research group frequently pulls ideas from a hat and then prioritizes them before taking the best ones forward to the ETP staff.

5.6.1.2 Successes and Challenges in the Scanning Phase

Since the scanning phase is rarely documented, lines between what constitutes the scanning phase versus the screening phase are vague. Therefore, the successes and challenges associated with the scanning phase are discussed below along with the successes and challenges in the screening phase.

5.6.2 Case Studies: Observations from the Screening Phase

During the screening phase, the utilities selected or rejected technologies identified in the scanning phase for assessment under the ETP. The screening process was different at each utility and continually evolved at each utility throughout the 2006-2008 program cycle. The remainder of this subsection explores the following topic areas as they relate to the screening phase:

- Screening Processes
- Reasons Technologies Were Selected for Assessment
- Reasons Technologies Were Not Selected for Assessment
- Successes and Challenges in the Screening Phase

5.6.2.1 Screening Processes

ETP staff often first held informal discussions with energy efficiency program staff in order to gauge initial interest in performing an assessment on a given technology. However SCE developed a formalized approach for this activity, using a special form called the Emerging Technology Preliminary Project Proposal, or "Short Form." This form typically included brief descriptions of the technology, market assessment and energy savings estimates, and basic information on the scope of a proposed assessment project. Although other utilities did not have a formalized process at this stage, they typically performed similar research to gauge whether the technology was appropriate for an ETP project.

If the technology was still of interest after this initial screening phase, the next step was to seek formal management approval for performing an assessment. This approval was sought either independently by the ETP or in conjunction with energy efficiency program staff. The process usually required a formal screening form to determine whether the ETP program would fund a project. These screening documents included the following:

- The Emerging Technology Project Proposal Guidelines form, or "Long Form," (SCE)
- The Emerging Technology Opportunity Study or ETOS (PG&E)
- The Emerging Technology Potential Assessment (Sempra)

These forms contained similar information regarding the proposed assessments including information on the potential market for the technology, estimated potential savings in the service area, estimated budget for the project, as well as other project details. This information helped key utility staff understand the nature of the proposed assessment and the potential for the integration of the technology into an EE program. In addition, the screening process not only determined the ability of the technology to produce energy savings, it also studied the ability of the ETP to conduct the assessment for that particular technology.

The PG&E and Sempra forms often included a scoring system to help determine how appropriate the technology was for an assessment. The energy efficiency program staff then reviewed these completed forms and decided whether to approve funding for an ETP assessment. At SCE, the Funding Committee scored the technologies after the program staff reviewed them (without scoring), in order to approve a project.

5.6.2.2 Reasons Technologies Were Selected for Assessment

While the information analyzed during the screening phase varied across the utilities, certain factors drove the selection of a technology for an assessment. Below is a list of the primary driving factors identified during the Case Study analysis:

- **Customer interest / available host site** – In some cases, the customer was on a quick timeline and the technology was moved quickly through the screening process in order to take advantage of the opportunity. This was particularly important in industrial projects, which included large capital expenditures. For example, the PG&E MVR project required major capital investment to install an evaporator at a food processing facility. When PG&E learned that a customer was interested in serving as a host site for an assessment of the technology, the utility decided to conduct an assessment to capitalize on the opportunity.

- **Previous research** – In some cases, previous technology studies identified specific knowledge gaps for a promising technology. In these cases, the screening process was simplified because significant information was already available for the technology, and an assessment was initiated specifically to collect the previously identified missing information. For example, SCE conducted the variable dust/make-up air system project following a previous project, which assessed the same technology in a different facility type. SCE was able to use results from both assessments to understand the energy efficiency potential of the technology across different environmental conditions.

- **On-going research** – On occasion, a large-scale assessment of a technology was underway by another research group and ETP staff was asked to assist in the research. In order to play a role in these projects, the utility streamlined the ETP approval process. For example, the ongoing work with EPRI on the power supplies for desktop servers project streamlined the selection of that technology into the ETP.

5.6.2.3 Reasons Technologies Were Not Selected for Assessment

Many reasons were provided for why ETP staff chose not to conduct assessments on specific technologies. These reasons can generally be broken into the following categories:

- **Not applicable to an EE program** – Some technologies were not assessed because it was apparent early on that the technologies were not applicable to an energy efficiency program. Project managers gave several reasons technologies were not applicable to an EE program including: 1) the technology had a small market, 2) the market had already adopted the technology, 3) the technology could not meet the definition of an energy-efficient product,[76] 4) the technology was not cost effective, and 5) the technology was not market ready.

- **Not a priority** – Some projects were not assessed because they were not a priority for the utility; thus, small challenges were enough to keep the assessment from being conducted. The PG&E variable speed drive for a roof top unit project is an example of a project that was not a clear priority for the ETP staff. This project was intended to use a RTU unit installed for another project. When the other project was canceled and the potential test unit removed, PG&E lost interest in pursuing an assessment. Another example is the compressed air, no-loss drain project, which was not prioritized for the 2006-2008 budget cycle. Therefore, an assessment was deferred to the next budget cycle.

[76] The SCE solar vending machine project idea, which would have taken energy completely off the grid, did not meet the required energy efficiency definitions.

- **External factors** – One project, the SDG&E zero emissions new home project, was not assessed because it was dependent on external funding for the assessment. When the external funding was canceled, the utility did not pursue the assessment further.

5.6.2.4 Successes and Challenges in the Screening Phase

Several aspects of the screening process were found to be particularly successful, such as the following:

- **Formal screening processes** – Formal screening procedures and documents guaranteed a level of research and due diligence for selected technologies. They also offered a means of knowledge transfer when staff turnover occurs.
- **Screening technologies out** – In a number of cases the formal screening process was able to identify projects that ETP staff concluded were not appropriate for an assessment. As a result, the project was not approved for the ETP, which saved the ETP the effort and cost of having to perform the assessment.

In addition, several aspects of the screening process were found to be particularly challenging, including:

- **Information from self-interested parties** – In some circumstances, ETP staff may have relied heavily on information provided by self-interested parties, such as consultants that would ultimately perform the work or vendors of the technologies under consideration. This sometimes led to projects that did not achieve the stated goals of the assessment and which may have been avoided with a more rigorous screening process. An example of this was the SCE optimization of wastewater aeration project, which was pursued by a consultant and the end result did not meet the expectations of utility staff. Other projects, such as the packaged unit energy storage module paper study conducted by SCE and a third party technical consultant, purposefully avoided this challenge by deciding not to involve the manufacturer.
- **Screening for the ability to carry out an assessment** – The screening process did not always eliminate projects where a successful assessment could not be completed, leading to canceled assessments. Examples include the SCE variable speed die casting machine project and the SDG&E boiler combustion damper project, both of which were canceled due to the lack of a customer site for field-testing.

5.6.3 Case Studies: Observations from the Assessment Phase

This section describes the assessment processes as identified through the Case Study analysis. The assessment process typically involved collecting and analyzing primary data of various types to evaluate the technical potential of a technology. For many cases, this information was used to determine whether a technology could be integrated into an EE program. However, in other instances, the results have not been used to date or were used simply to provide an information resource for other organizations or utilities interested in pursuing the technologies.[77] Further discussion of project outcomes is presented later in this section.

The remainder of this subsection explores the following topic areas relating to the assessment phase:

- Assessment Objectives
- Roles and Responsibilities of Assessment Stakeholders
- Assessment Implementation Steps
- Canceled Assessments
- Successes and Challenges in the Assessment Phase

5.6.3.1 Assessment Objectives

The evaluation team found that the ETP assessments shared a number of common objectives. This reveals the intention of performing the assessment and how ETP staff sought to use the assessment to further the goals of the ETP. Some of the objectives were common for many projects, but in other cases, were more specific to a particular technology. Assessment objectives were often outlined in contractual documents with engineering consultants, assessment reports, and at times, screening documentation. Figure 5-8 shows the objectives for the assessments identified through the Case Study analysis.

[77] Although evaluation of the specific technical methods involved in an assessment is outside the scope of work of the Case Study research, such technical methods are detailed in the Peer Review research effort.

Figure 5-8. Identified ETP Assessment Objectives

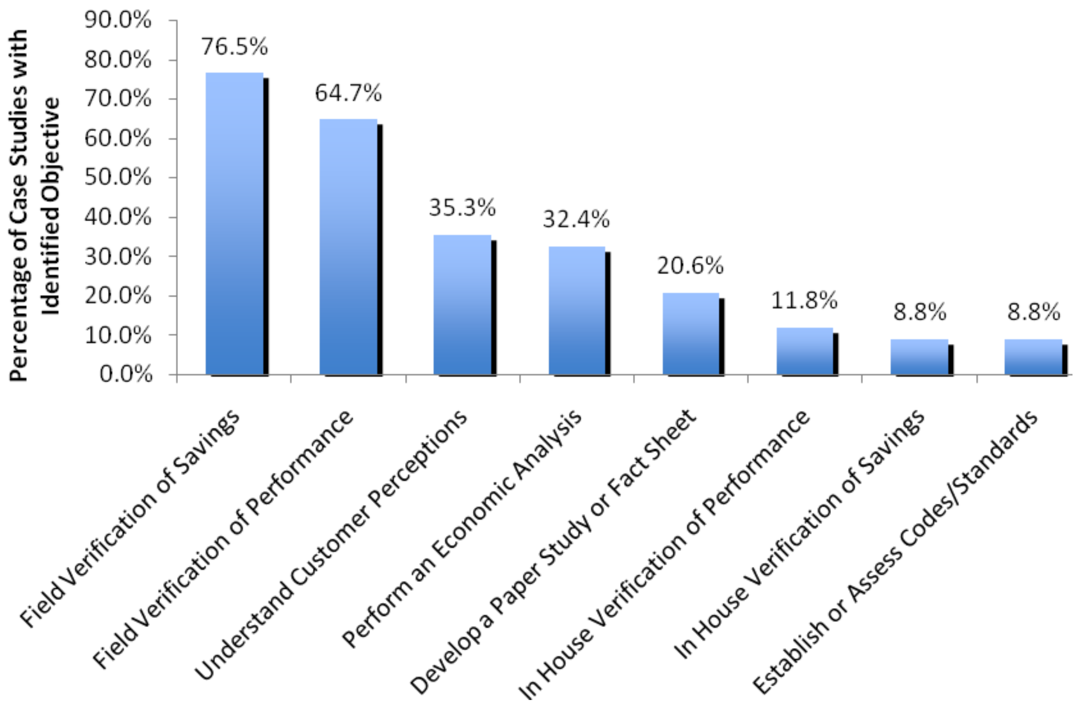


Figure 5-8 illustrates that the most common objective of the ETP teams was fieldwork to verify energy savings and performance. Many ETP project assessments included a combination of objectives. One of the clearest cases of blending several objectives into a single assessment was the LED streetlighting project. The primary objectives of this PG&E project included verifying energy savings, verifying performance (illumination and reliability), and assessing the customer perception of the technology. The final report also included the evaluation of economic performance through calculating payback period and lamp life expectancies as well as other measurements of lighting performance and temperature.

Although many of the assessments focused on verifying energy savings, other assessments focused on technologies with previously determined energy impacts. The major market barrier for these projects often involved insufficient knowledge of the performance (i.e., assessment of non-energy performance metrics) of the unit in the field, often in new applications. Therefore, though many projects indicated savings verification as an assessment objective, sometimes the primary need from the assessment was to verify performance in the field. An example of this was the microbubble circulation and stratification lagoon wastewater treatment project. Since the energy savings capabilities of this product were well known from previous installations, the primary interest from the ETP perspective was technology performance treating wastewater in wineries.

5.6.3.2 Assessment Implementation Steps

The implementation steps of technical assessments were often outlined in the contract documents with hired consultants and in documents associated with the screening phase. The project reports also often highlighted the various steps of the assessment process to some degree.

Although an assortment of methods were applicable to different project types, a number of steps were generally applicable to most assessments:

- **Hiring consultants** – Engineering firms or specialized consultants were often hired to perform the technical aspects of the assessments such as the installation of monitoring equipment, market research, or other primary data collection.
- **Retaining a customer site** – For the large number of assessments involving a field study of savings and/or performance, it was necessary to identify and retain a customer host site where the testing could take place. Host sites were identified through a variety of methods such as through utility account representatives, vendors/manufacturers, previous research sites (e.g., PIER), or the customers themselves. Once host sites were approached, they were often retained through informal agreements or formalized signed contracts.
- **Developing a scope of work (SOW)** – Project managers typically defined the SOW in the contract document between the consultant and the ETP. The SOW outlined the various tasks that would be performed during the assessment and formalized roles and responsibilities.
- **Conducting testing and research** – Once all elements of the assessment plan were finalized, work would begin on the assessment itself. Typical activities included market research, installation of the technology and requisite monitoring equipment, collection of primary energy and performance data, and analysis of collected data.
- **Finalizing the project report** – Once the assessment was completed, the consultant was often responsible for writing a final report to summarize the results for ETP staff. At other times, a separate consultant with technical writing experience was hired to write the final project report.

5.6.3.3 Roles and Responsibilities of Assessment Stakeholders

A variety of stakeholders (e.g., project managers, consultants, customer site staff, and technology vendors/manufacturers) participate in ETP assessments and contribute to successful assessments. A successful project was often able to leverage the interest and work of all stakeholders that made up the assessment team. The ETP project manager's role, therefore, often involved coordinating stakeholder activities to ensure that the implementation steps relevant to that assessment were completed. Over the course of the project, these key stakeholders would interact through site visits and collaborate with the project team as needed. The evaluation team identified the following general project roles and responsibilities from the Case Study analysis:

- **Project managers** – The project manager was a utility staff member who oversaw and implemented the ETP projects. At PG&E and Sempra, the project managers were part of the ETP, while at SCE the project managers were typically engineers that worked on a variety of programs including the ETP. Project managers typically identified the technology, developed the screening documents, set up the necessary contract documents, and managed the work of other stakeholders. For some projects, they also conducted the fieldwork with assistance from other utility staff. Importantly, they typically coordinated the dissemination of results within the utility as well.

- **Consultants** – Consultants were often hired to work with the project managers to help define the scope of work, identify and retain a customer site, implement aspects of the assessment plan, and draft the assessment results.
- **Customer site staff** –Typically, field assessments were performed at customer sites that provided their facilities as host sites for an assessment. Sometimes the customer would sign an agreement with the utility and would help manage site visits. The customer site would sometimes receive demonstration funding from the ETP for their participation in the project.
- **Technology vendors/manufacturers** – The vendor or manufacturer of a technology being assessed would often be involved with the assessment by providing equipment, assisting with the installation, and/or helping troubleshoot installation problems. Vendors and manufacturers were typically motivated to help an assessment succeed with the expectation that a successful assessment could help increase unit sales within the utility service territory.

Outside of coordination of the four key stakeholder groups involved in a typical assessment, the ETP staff often collaborated with one or more outside institutions to complete an assessment. These collaborative relationships helped the utilities leverage the work and knowledge of outside parties to complete more thorough assessments of particular projects. The most commonly identified forms of collaboration involved research institutions, universities or other utilities, as explained below.

- **Research institutions or universities** – In certain instances, the utilities collaborated with research institutions or universities. For example, in the SCE electrodialysis for the wine industry project, the utility, consultant and winery performed the energy data collection and analysis for three different wine stabilization methods, while a university helped collect data on the perceived quality of the wine resulting from the three stabilization methods. While the collaboration in this case involved an institution with specific, useful knowledge, the wine quality testing was not driven or controlled by the utility.
- **Collaboration between utilities** – In some select instances, the managing utility collaborated with another utility or utilities to complete an assessment. One such collaborative effort was the wet cleaning projects performed by Sempra and SCE. In this case, staff from the IOUs performed assessments of the technology. However, Sempra did not have the capacity for metering the technology, so they partnered with SCE, who installed the necessary meters in the Sempra service territory. Once all of the assessments were completed, results from the utilities were compiled and presented jointly in the final report. This resulted in a larger dataset for analysis. For this project, in addition to collaboration between utilities, a research institute at Occidental College played a key role in driving and developing the assessment.

Collaboration efforts on some of the other projects were less defined. For example, an automatic controller for laboratory fume hoods was examined separately at SCE and at PG&E at a similar time. When talking to staff about this project, it was not apparent whether any formal means to collaborate on the two assessments existed. While it is possible that some communication about the projects occurred between the two utilities, the assessments themselves were conducted individually.

5.6.3.4 Canceled Assessments

Some projects selected for an assessment were never completed due to challenges encountered during the assessment phase. Of the 36 case studies selected by the utilities for an assessment, two projects were canceled due to the lack of a customer site for field-testing. For example, the SCE variable speed die casting machine project was canceled because the production levels of the customer changed and the die casting machine was no longer needed. SCE could not find another customer with a machine to test, so the assessment was canceled. This further illustrates the importance of retaining test sites for field evaluation, as this is the only identified reason assessments were canceled for the ETP.

5.6.3.5 Successes and Challenges in the Assessment Phase

A number of aspects of the assessment phase were found to be particularly successful including the following:

- **Achieving multiple objectives** – In a number of cases, the assessment team was able to accomplish multiple objectives through a single assessment. In some of these cases the multiple objectives were accomplished through collaboration with other stakeholders. One example is the SCE electrodialysis for the wine industry project for which the utility collaborated with a university to assess not only the power savings potential of the technology, but also the quality of the wine processed using the technology.
- **Having a technology champion** – Assessments were often able to sustain the momentum when a clear champion within the utility pushed the project. Utilities prioritized such projects, which helped navigate the inevitable challenges that arose. A technology champion impacted both the quality and prioritization of the project.

In addition, a number of aspects of the assessment phase were found to be particularly challenging including the following:

- **Identifying a customer site** – One of the largest challenges identified during the Case Study analysis was identifying a willing customer site to install the emerging technology for a field assessment. Field assessments could not be completed without a host site for installation, and two of the Case Study projects had their assessments canceled because of a lack of host sites.
- **Installation issues** – A variety of issues arose with some of the technology installations including unexpected high costs for new equipment, extended time required to install equipment, and unexpected problems related to the installation

itself. These unexpected problems included incorrect equipment specifications or problems with the customer facility.

- **Seasonality** – Some assessments encountered challenges due to seasonality constraints. For example, if a project was delayed for an unexpected reason, then some assessments were on hold for an entire year until similar weather patterns returned. This was especially the case for HVAC assessments where field-testing had to occur during summer months.

5.6.4 Case Studies: Observations from the Transfer Process

The extent of knowledge transfer from the ETP to other utility staff varied by project, with some projects transferring little knowledge, others transferring the knowledge only to a select few, and still others transferring enough knowledge to enable utility staff to integrate the technology into an EE program. The remainder of this subsection explores the following topic areas relating to the transfer phase:

- Outcomes from the Transfer Phase
- Dissemination of Assessment Results
- Successes and Challenges in the Transfer Phase

5.6.4.1 Outcomes from the Transfer Phase

Since every ETP project studied was unique, there was a wide array of potential outcomes following the technical assessments, one of which was integration of the technology into an EE program. Of the 45 case studies examined, ten technologies were identified as being integrated into an EE program. As of September 2009, only the PG&E ceramic metal halide technology had been integrated into a *prescriptive* rebate program. These fixtures are now offered under the Express Efficiency program. In addition, the auto-DR option was being offered as a component of the Critical Peak Pricing program at PG&E, which is a demand response program, not an energy efficiency program. The other eight technologies were integrated into *custom* rebate programs.

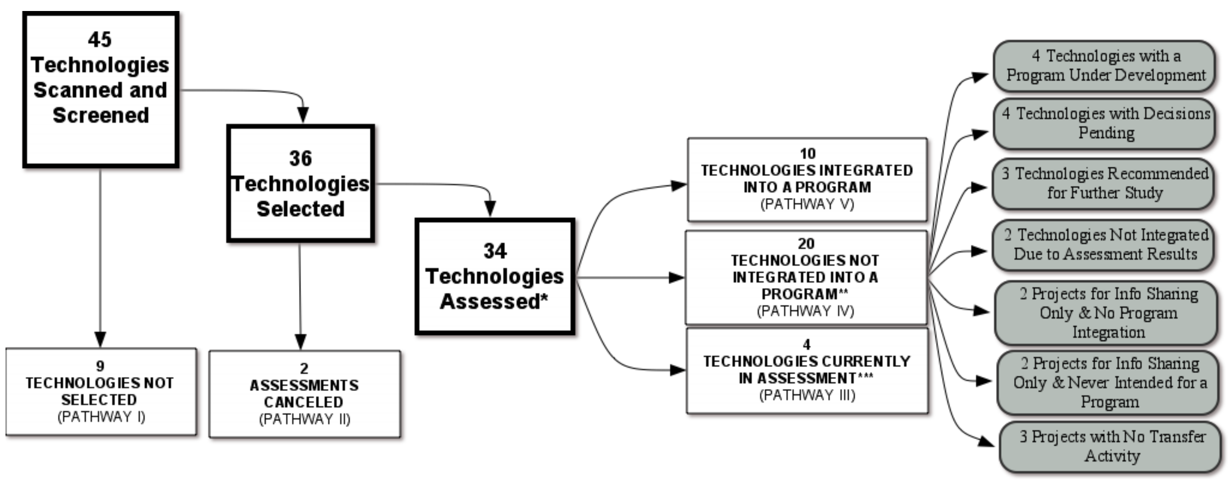
For various reasons, not all technologies assessed through the ETP were integrated into an EE program, though utilities were currently updating the transfer process to better facilitate the integration of project results into EE programs. Notably, during the 2006-2008 program cycle, PG&E formed a Technology Transfer group, whose primary objective was to facilitate the transfer of technologies to EE programs. For example, immediately after the assessment of the hot dry air conditioner technology was completed by PG&E, program staff did not have time to actively work on integrating the technology into an EE program. Once the Technology Transfer group learned about the technology, they were able to organize meetings to discuss how the utility would use the assessment results to transfer the technology into an EE program.

To fully understand the various outcomes from the transfer process, project results were disaggregated into various categories. This was done primarily to further breakdown the results of projects that were assessed but not integrated into an EE program. The results of this analysis are presented in Table 5-7 and Figure 5-9.

Table 5-7. Transfer Outcomes

Transfer Outcomes		Total Number of Cases			
		PG&E	SCE	Sempra	Total
Integrated Into EE Program	Custom	3	4	1	8
	Prescriptive	1	- -	- -	1
	Demand Response	1	- -	- -	1
EE Program Under Development		2	2	- -	4
Decision Pending		1	2	1	4
Recommended for Further Study		2	1	- -	3
Not Integrated Due to Assessment Results		1	- -	1	2
Info Sharing Only		2	2	- -	4
No Transfer Activity		- -	1	2	3
Total		**13**	**12**	**5**	**30**

Figure 5-9. Transfer Outcomes



The identified outcomes of those ETP technologies not integrated into an EE program include the following:

- **EE program under development** – Some projects led to clear EE program planning activities for future incentive offerings based at least in part on the ETP assessment findings, but these efforts were not yet completed. An example of this is the LED streetlights project in Oakland where PG&E staff was creating a new EE program set to launch in 2009. Likewise, the HID electronic ballast project and follow-up studies fed into work being done by PG&E, SCE, and Sempra on designing a new EE program for these ballasts.

- **Decision pending** – For some technologies, it was unclear what the utility planned to do with the assessment findings as of September 2009. A few reasons given for the pending nature of these projects were lack of awareness of assessment results, lack of staff available to move the technology forward, and competing priorities for staff attention.

- **Recommended for further study** – Other technologies have been recommended for further study before being considered for integration into an EE program. Findings from these assessments provided valuable information, but the utility required additional information to determine the proper course of action. For example, two PG&E air conditioning projects led to a greater understanding of the energy savings associated with the technology, but the assessments did not focus on how the utility should incent the technology. Therefore, the utility decided to conduct a pilot program following the assessment as means to support the eventual integration of the technology into an EE program.

- **Not integrated into an EE program due to assessment results** – Two technologies were not recommended for an EE program due to specific assessment results or policy reasons. In one case, the Thermosorber for food processing project, the assessment confirmed significant energy savings for the technology. However, the assessment also identified a number of reliability and maintenance issues with the technology, so it was determined that it was not yet ready to be integrated into an EE program.

- **Information sharing only** – Some technologies were not moved into an EE program but the ETP staff did share project results with EE staff. These projects can be split into two varieties. The first were those projects never intended for an EE program, such as those focused on generating paper studies or fact sheets. The second were those projects resulting in information sharing only, with no efforts to develop a corresponding incentive offering.

- **No transfer activity** – Three projects studied for the ETP case studies had completed assessments no discernable transfer activity. In these cases, the assessment results were not shared outside the ETP and no attempts were made to integrate the projects into an EE program.

5.6.4.2 Dissemination of Assessment Results

The extent to which ETP staff disseminated project results to other utility staff and the public varied widely among the projects studied. Methods for disseminating this information also varied from very informal (e.g., side conversations) to very formal (e.g., formal meetings and presentations). Examples of formal methods of information dissemination identified by the evaluation team were the following:

- **Presentations within the utility** – Formal information sharing within a utility was conducted for the majority of projects in the form of presentations made by ETP staff to other utility staff. Sharing assessment results within a utility was an important step in integrating a technology into an EE program.

- **Emerging Technologies Coordinating Council (ETCC)** – ETP staff used the ETCC to disseminate project results by uploading project reports to the ETCC website and by presenting assessment results to other utilities at ETCC meetings. The website allowed the utilities to share the results with the general public, while presenting at meetings allowed the ETP staff to share and discuss assessment results with other utilities. As of October 2009, 50% of projects with information on the ETCC website also have their reports posted. Some project reports have not been posted because the assessment was not complete, the report was not yet final, or the report was only recently finalized. Results of projects posted to the ETCC website are listed in Table 5-8, below.

Table 5-8. ETCC Website Posting Status as of October 2009

Utility	Project Posted	Report Posted
PG&E	14	11
SCE	14	3
Sempra	2	1
Total	**30**	**15**

- **Conference presentations** – Two ETP project managers mentioned that assessment results were presented at conferences. Conference presentations provided an opportunity for the public, especially trade groups, to learn about the technologies and corresponding assessment results.

- **Technology centers** – Results of the Aggregate Analysis, discussed in Section 4.3, showed that ETP project managers presented some assessment findings to the Customer Technology Application Center, the Agricultural Technology Application Center, the Technology Test Center, Pacific Energy Center, and the California Lighting Technology Center. However, data collection efforts for the case studies did not provide any evidence that this occurred. These presentations may not have been mentioned in interviews with project managers or they may not have occurred for the projects in the Case Study sample.

Informal information sharing also occurred in a variety of ways. ETP project managers often communicated assessment findings to interested parties through informal conversations with other utilities or research entities actively working with a given technology. Information shared informally among utilities led to further research on some technologies, such as the HID electronic ballasts project. Similarly, projects on wet cleaning for dry cleaners at other utilities fed into the ETP assessment conducted by Sempra.

More information sharing took place with projects focused on end-uses with existing coordinating bodies. For example the Western Cooling Efficiency Center organized a meeting for utilities and research centers to discuss the future of hot dry air conditioners. At this meeting, utilities were provided an opportunity to discuss their plans for moving forward with this technology. Likewise, Case Study results showed that the lighting industry was also highly coordinated along the entire west coast, due in large part to efforts by the California Lighting Technology Center and the DOE’s Gateway Program. Through this network, information about lighting technologies assessed in the ETP was often shared across many utilities and stakeholders within and outside of California.

5.6.4.3 Successes and Challenges in the Transfer Phase

A number of aspects of the transfer phase were found to be particularly successful, including:

- **Informal information transfer** – Project staff indicated that the transfer process often resulted in substantial information transfer through informal discussions both within and outside of the utilities. While some projects did not leave much evidence of formal information transfer, informal conversations often led to transfer of the knowledge gained during an assessment.
- **Involving EE program staff in the assessment** – When EE program staff was actively engaged in an ETP project, they helped move the emerging technology into an EE program following the assessment. For example, in some instances PG&E EE program staff was provided with ETP assessment updates and when the assessment was completed, program staff was already familiar with the technology and ready to transfer the technology into their program.

In addition, a number of aspects of the transfer phase were found to be particularly challenging, including the following:

- **Undefined roles in transfer process** – The process of transferring a technology from the ETP to an EE program had not been clearly defined and mapped out at the time the majority of assessments were completed. In many cases, the specific role of particular staff (both ETP and EE staff) in incorporating these technologies into EE programs was unclear to interviewed stakeholders. This may have led to some information not effectively being transferred from ETP staff to EE program staff with a clear goal of integrating the technology into an EE program.
- **Limited staff and staff turnover** – The number of utility staff (both ETP and EE staff) dedicated specifically to the transfer phase varied across utilities and in some cases was limited. Without a clear champion moving the technology into a program, some projects became stalled in the transfer phase. In addition, many utility staff changes occurred during the 2006-2008 program cycle. In some cases, when original project managers left the ETP, the momentum to move a technology from ETP to an EE program seemed to have been reduced.
- **Tracking information after the assessment** – There did not appear to be a formalized process for tracking ETP projects after a technical assessment was completed, a situation that intensified the risk of information loss due to staff turnover. Likewise, this situation also increased the likelihood that ETP projects recommended for further study or those with pending decisions could lose momentum after an assessment is completed.

5.6.5 Case Studies: Conclusions

The Case Study analysis provided an opportunity to understand, in depth, a variety of projects initiated and undertaken within the ETP. The Case Study analysis shows that the ETP has been able to assess technologies across a number of different market sectors and end-use categories, and even within particular sectors and/or end-use categories, the ETP projects covered a wide variety of technologies. In addition, the Case Study results show that ETP processes were refined considerably over the course of the 2006-2008 program cycle, as the Program evolved during that timeframe. Select findings from the Case Study analysis include:

- ETP staff identified candidate technologies from a variety of sources, and the technologies were formally screened using processes that were developed and refined during the 2006-2008 program cycle. The screening processes provided a formal means to research whether or not the technologies would likely offer energy savings and whether or not the ETP had the ability to conduct the assessments. During the screening process, ETP project managers identified difficulties in determining the accuracy of emerging technology claims. As noted previously in the Business Risk Assessment and Aggregate Analysis discussions, not all projects within the 2006-2008 program cycle have screening documentation in place and, for those that do, the quality of documentation produced by ETP staff varied across projects and utilities.

- ETP projects addressed a number of objectives within each assessment, but primarily focused on field verification of energy savings and technical performance. A number of different stakeholders were involved in ETP projects, including consultants, customers, and technology vendors. While ETP project managers often noted that they spoke to ETP staff at other utilities about their assessments, there was limited evidence of formal coordination of projects across utilities.

- After technical assessments were completed, ETP project managers communicated results to interested parties within the utility and external to the utility, using both formal and informal means. If assessment results were positive, ETP staff generally recommended the technology for inclusion in an EE program. Of the 34 technologies in the Case Study sample that progressed into the assessment phase, one technology is offered through a prescriptive rebate program, eight technologies are offered through a custom rebate program, and a number of others are still being considered for an incentive offering. The ETP did not have the means to formally track technologies after assessments were completed, a factor that limited the ability of project stakeholders to remain engaged in the process and push the technology into an EE program.

6 IMPACT ASSESSMENT

This chapter summarizes findings related to the impact assessment including:

- Discussion of ETP data tracking efforts and database development initiatives undertaken by the evaluation team including the team's recommendations for improving this function in future program cycles (Section 6.1)
- Discussion of the methods and approach used by the evaluation team to identify ETP technologies that had been transferred to the IOUs' 2006-2008 energy efficiency programs and subsequent market adoption rates (Section 6.2)
- Discussion of the methods and approach used by the evaluation team to conduct the Peer Review and the results and recommendations generated from this task (Section 6.3).

6.1 Data Collection and the Development of the Emerging Technologies Program Database

Project data collection was an ongoing effort throughout the course of the evaluation. The evaluation team's initial efforts focused on collecting basic, readily available information from the IOUs via formal data requests. Later efforts by the evaluation team focused on addressing data gaps and inconsistencies from the initial data collection efforts, working with the IOUs to develop additional data, and incorporating project level data collected by the evaluation team during the Aggregate Analysis, Business Risk Assessment, and impact analysis tasks into the Master Database created by the evaluation team. This Master Database, which is described in more detail in the remainder of this section, was essential to the evaluation team for defining the ETP project population for sample development purposes and for providing project level data for the various evaluation efforts.

The challenges associated with collecting this data from the IOUs emphasized the need for a well organized ETP project tracking system. The evaluation team worked with the CPUC and the IOUs to develop a project tracking database for the IOUs to use during the 2010-2012 ETP program cycle. This database, the Emerging Technologies Program Database (ETPdb), will integrate and enhance existing program tracking functions to allow the IOUs to better document and retain program knowledge in the face of staff turnover and staff additions; to allow the CPUC to better observe ETP program activity throughout the program cycle including program progress as measured by select performance metrics; and to facilitate more productive and cost-effective program management and evaluation.

This section describes the evaluation team's data collection and ETPdb development efforts.

6.1.1 Data Collection

The first interim report described initial data collection efforts conducted by the evaluation team. These efforts focused on collecting data from IOU-maintained databases, including basic project information for categorization and cost purposes (e.g., project expenditures, technology end-use, intended customer sector, and project status). Primary objectives of this initial effort were for the evaluation team to 1) assess the evaluability of the ETP based on data availability and 2) define the eligible project population such that sample designs for the various evaluation efforts (i.e., Aggregate Analysis, Business Risk Assessment, Case Studies, Peer Reviews, and impact assessment) could be initiated. Data from formal data requests and from the IOU maintained ETCC database were reviewed and compiled by the evaluation team into a Master Database.

The data summary presented in the first interim report was limited due to several circumstances, including:

1. Inconsistencies in project naming/numbering conventions and project presence across separate data submissions by any individual IOU;
2. Inconsistencies in status, sector, and end-use categorization both across and within IOUs; and
3. Lack of time-series data on project status (i.e., a longitudinal view of a project's progress through the ETP participation process).

6.1.2 ETP Data Tracking

Subsequent data collection efforts initiated by the evaluation team focused on removing data inconsistencies and ambiguities, resolving data gaps, and enabling sample design and sample selection for evaluation efforts. The evaluation team worked closely with ETP staff to accomplish this task, using an iterative process to develop a complete and comprehensive ETP dataset.

The evaluation team continually cleaned, refined, and updated the Master Database with data collected from the IOUs through data requests and the ETCC database. One significant challenge to data collection was the lack of consistent project titles and/or numbering at the IOUs. Considerable effort was needed from the evaluation team to synchronize data across sources through the assignment of a Master Project ID Number (and corresponding Master Project Title) for each project. Data fields were cleaned and categories were standardized through ongoing discussions with ETP staff.

The Master Database was further updated with information obtained through the various evaluation efforts (e.g., communications between the evaluation team and the IOUs in developing samples for Peer Review, Business Risk Assessment, and Case Studies) and further efforts to clean datasets and complete document collections (e.g., screening documents and assessment application forms). Evaluation team members have in turn been able to use this Master Database to perform the queries necessary for sample development across the various evaluation efforts.

The Master Database development effort was hindered primarily by the following obstacles:

1. **Lack of a unique and un-changing IOU-assigned project identifier.** At all IOUs, various datasets used different project names to describe the same project, sometimes with only slight variation, and sometimes requiring communication with IOU staff to match projects across datasets. PG&E was the notable exception to this, with all funded PG&E projects receiving such an identifier, and a relatively small number of proposed projects being ambiguously represented across data submissions.

2. **Lack of a common categorical perspective on project attributes, both across IOUs and within IOUs.** For example, one project may be described by a project manager as being applicable to the "commercial" sector, whereas a similar project may be categorized by another project manager as applicable to the "restaurant" sector. As another example, there were not standardized sets of categories to describe project status – a key metric for tracking projects over time and for process evaluation - either across or within IOUs.

And most generally;

3. **Lack of thorough, standardized project tracking efforts at the IOUs.** It was extremely difficult, time consuming, costly, and – ultimately – not feasible, for the evaluation team to fully recreate project level ETP tracking data after the fact: the large number of projects that ETP staff work on simultaneously and staff turnover made this task particularly challenging.

Nonetheless, the evaluation team used the information provided by the IOUs to construct a Master Database to the best of its abilities. The most recent version of this database is included as an electronic appendix (Appendix K) to this report.

6.1.3 Emerging Technologies Program Database (ETPdb) Development

In response to the difficulties that the evaluation team experienced in developing a Master Database, the CPUC requested that the evaluation team develop a standardized database for the IOUs to populate and routinely update going forward (i.e., beginning with the 2010-2012 program cycle). The database, which was named the Emerging Technologies Program Database (ETPdb), would support the following efforts:

1. **CPUC Oversight and EM&V** – to include program and project tracking functions;
2. **Institutional information retention** – to retain knowledge gained through previous program implementation cycles and evaluation efforts in the presence of staff turn-over and an increasing volume of project activity; and
3. **Information sharing across IOUs and other agencies** – to ensure the information disseminated by the ETP is accurate and current.

The evaluation team accepted this task as part of the 2006-2008 evaluation effort and the IOUs committed to working with the evaluation team to define the database structure and content. In addition, in the 2009-2011 PIPs (now the 2010-2012 programs), the IOUs committed to updating the final database on a quarterly basis.

The evaluation team developed this ETPdb, which is capable of capturing basic information about projects and tracking project status and expenditures over time. The team developed an initial draft of the database structure based on their understanding of the ETP processes and the data needs for the team's various evaluation efforts. This structure was presented to the CPUC ED and MECT project management team in September 2008. Based on CPUC/MECT feedback, the structure was revised into a second draft and presented to IOU ETP staff in October 2008. Feedback from all stakeholders (i.e., IOUs, CPUC/MECT, and evaluation team members) was incorporated into revised versions of the database in an iterative process, culminating in a final ETPdb structure.

Once the ETPdb structure was finalized, it was determined that several fields and categorical lists in the database warranted additional work with IOU ETP staff to specify. Weekly meetings were held between the evaluation team and the IOUs' ETP staff during Spring 2009 to develop these remaining aspects of the ETPdb. The meetings were used to discuss ETPdb objectives, agree to database structure for the more straightforward topics, and assign ETP staff to lead larger, consensus-based efforts across the IOUs for more complicated or contentious topics.

The end result of the weekly meetings was a further revised database structure, which the evaluation team provided to the CPUC ED and MECT project management team in May 2009. Additional feedback on the revised structure was provided by the IOUs in August of 2009. The evaluation team then revised the structure in consultation with the CPUC ED and MECT project management team. This effort remains a work in progress per guidance received from the CPUC in order to ensure that the final ETPdb fully meets stakeholder needs specified for the 2010-2012 program cycle. The current version of the ETPdb structure is included as an electronic appendix (Appendix L) to this report.

While the ETPdb structure was being developed, the scope of the ETP was expanded to include zero net energy building efforts and expanded technology advancement activities. The evaluation team explicitly requested input from the IOUs on how the database would need to be expanded to capture the details of the 2010-2012 ETP. While expanded technology advancement activities are captured in the existing database structure, zero net energy building efforts are not, and may require additional fields and/or categories to accurately track these efforts going forward.

In parallel to this effort, the evaluation team built a prototype, online version of the ETPdb. When the database is complete, the IOUs will have the option of updating the database online via a graphical user interface, or via a specified database structure. The prototype consists of both a database schema (i.e., formal description of database structure) and an ergonomic user interface. The user interface design attempts to break the large quantity of data fields into manageable, meaningful groups, and enable clean, straightforward data entry. Figure 6-1 through Figure 6-4 are screenshots from the prototype and demonstrate the "look and feel" and basic features of the application. It is important to note that the ETPdb development efforts remain ongoing and the figures presented below are for illustration only; the final ETPdb content may change as the effort evolves.

Figure 6-1. ETPdb log-in page

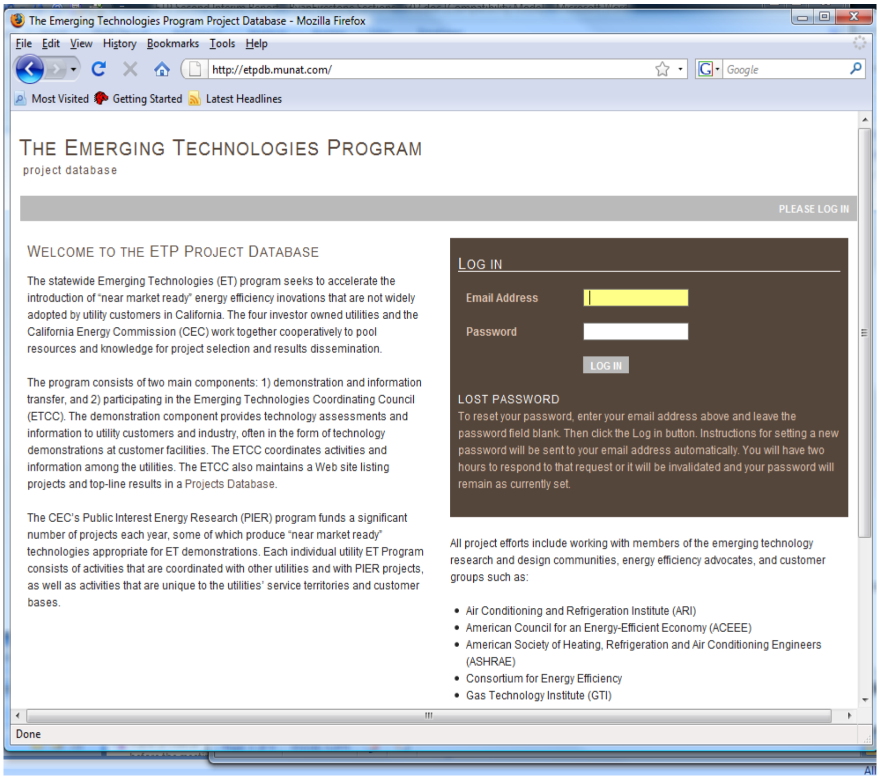


Figure 6-2. ETPdb – editing and organizing lists for fields

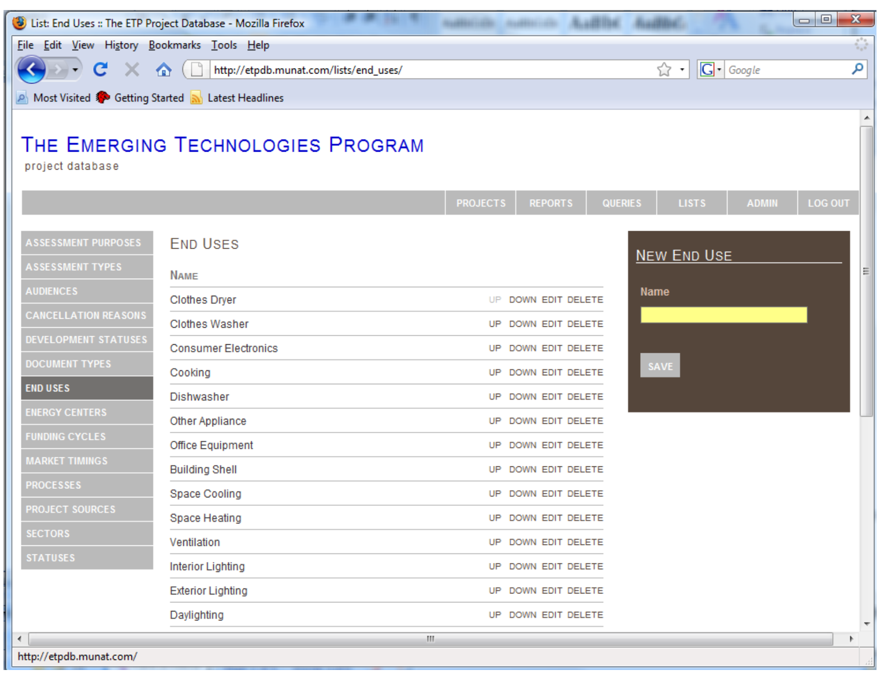


Figure 6-3. ETPdb – entering project data

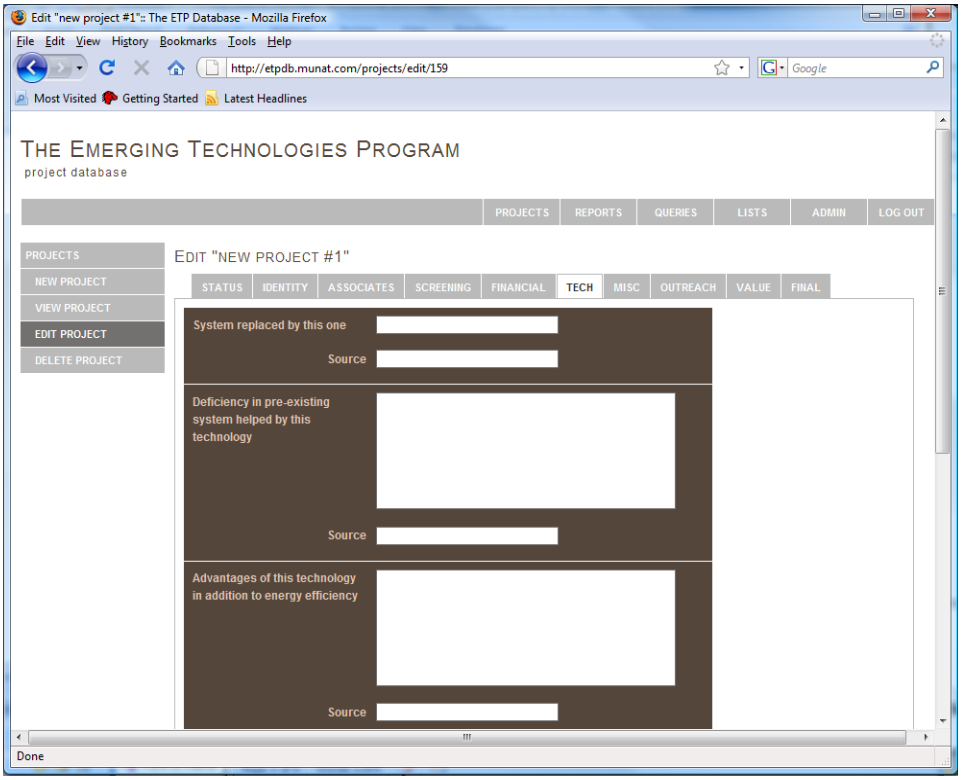
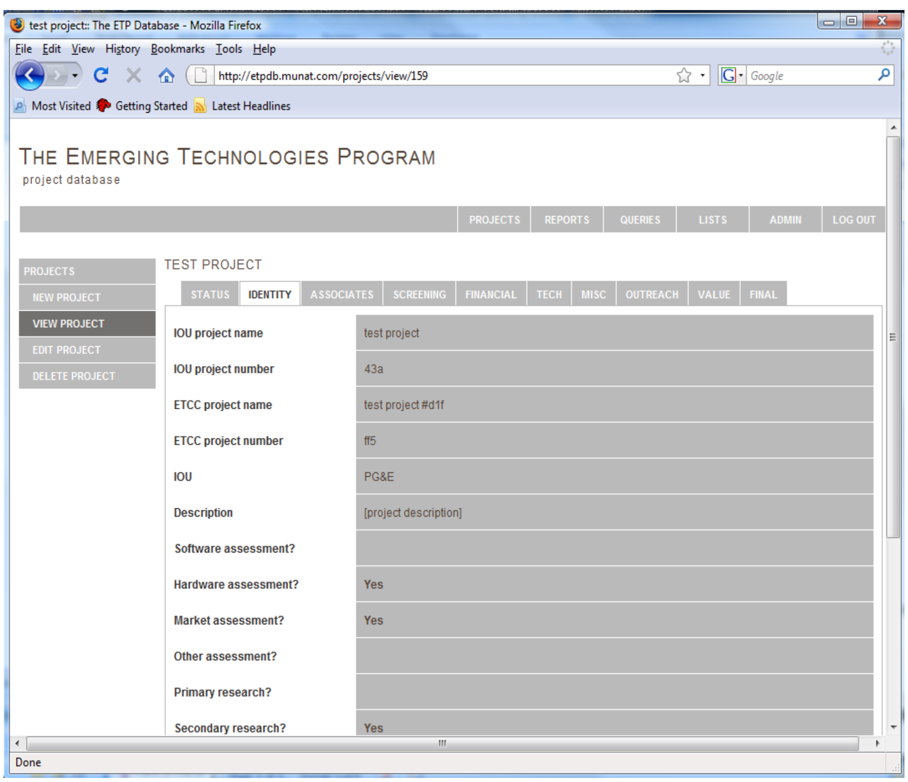


Figure 6-4. ETPdb – reviewing project data



The schema and "look and feel" specifications for the ETPdb were provided to the CPUC's EEGA website contractor to build the ETPdb on a platform compatible with the Energy Efficiency Groupware Application (EEGA) website.[78] The evaluation team supported the CPUC's ETPdb development and efforts through the duration of the 2006-2008 evaluation contract.

The CPUC will be responsible for hosting the ETPdb on EEGA and maintaining the database on an ongoing basis. Final 2006-2008 evaluation team ETPdb efforts will include 1) conducting a day-long workshop at the CPUC for IOU ETP staff to explain the structure and functionality of the final ETPdb as hosted on EEGA and 2) back-filling the ETPdb with data compiled for 2006-2008 projects in the Master Database.

6.1.4 Data Collection Recommendations

Data collection for this evaluation was time consuming for both the evaluation team and the IOUs. This effort and the resulting data submissions revealed that current project tracking efforts at the IOUs are not sufficient to support the level of program tracking and program evaluation that the CPUC requires, particularly going forward as the ETPs become larger and more diverse. A major issue to be resolved is the development of unique and un-changing IOU-assigned ETP project identifiers that can be used to trace the trajectories of given technologies both within the ETP and within the EE programs (for those technologies recommended for inclusion in the EE programs). The evaluation team collaborated with ETP staff and the CPUC to develop initial specifications for these identifiers for use in subsequent program cycles.

The ETPdb is a significant step in this direction. The CPUC should continue to work with the IOUs to refine the ETPdb and ensure that is gets updated quarterly. Furthermore, the CPUC should develop query and reporting features for the ETPdb that will make the database particularly *useful*. A successful ETPdb will not only collect the requisite information, but will enable the ETPs to be more efficient at using and retaining project information and will allow the CPUC, and (for certain data fields) the public to review and benefit from the ETPs.

6.2 ETP Technologies Transferred to EE Programs

A second aspect of the impact assessment was to gather and analyze data on the degree to which energy efficiency and demand response technologies and measures (technologies) assessed by the ETP and recommended for inclusion in the IOUs' EE programs have been incorporated in the EE programs and subsequently adopted by program participants. That aspect of the impact assessment is presented and discussed in this section.

[78] Conversations with CPUC ED staff revealed that Intergy Corporation would serve as the CPUC's IT liaison on this project. Intergy designed, developed, and maintains the Energy Efficiency Groupware Application (EEGA) website that allows public access to CPUC Energy Efficiency program reports for the 2006-2008 program cycle.

6.2.1 Transferred ETP Technologies: Approach

To analyze the uptake of ETP technologies into EE programs, the evaluation team used the data sets provided by the IOUs, the results of other evaluation components (e.g., the Aggregate Analysis), and conversations with ETP staff to identify the ETP projects that had produced technologies that were transferred to (i.e., formally incorporated into) an EE program. For each transferred ETP project, the evaluation team prepared a synopsis that included the following information:

- ETP Project Name
- ETP Project Description
- Year in which ETP project was initiated
- Year in which ETP technology was considered for incorporation into an EE program
- Name of EE program to which ETP technology was transferred
- EEGA number for EE program
- Description of transferred ETP technology
- Data on extent to which transferred ETP technology was adopted by participants in 2006-2008 EE programs, as measured by energy savings associated with technologies incented through the programs.

The synopses, which are included as Appendix M, were used to guide an examination of the extent to which technologies transferred from ETP projects to EE programs had been incorporated into the EE programs and subsequent adopted by program participants. The metric chosen for this analysis was the total energy savings (kWh) associated with transferred technologies over the three-year period of the 2006-2008 program cycle.

6.2.2 Transferred ETP Technologies: Data Collection Methods

The information used to prepare the ETP project synopses was extracted from materials provided by the IOUs in response to data requests made by the evaluation team, other aspects of the evaluation (e.g., the Aggregate Analysis), and conversations with ETP staff.

A first source of information was documentation provided by the IOUs in which ETP staff identified previous ETP projects for which technologies had been transferred to EE programs being implemented during 2006-2008 timeframe. The IOUs provided this information in response to a data request made by the evaluation team for the following information for each ETP technology integrated into EE programs since 2003:

- Description/name of emerging technology transferred to EE resource programs
- Year of integration into EE program and EE program name and number

The data on the extent to which ETP technologies have been incorporated in the IOUs' 2006-2008 EE programs were developed using measure-level tracking data provided by the IOUs that cover rebates paid through EE programs during the 2006-2008 program cycle (i.e., from 1/01/2006 through 12/31/2008). The final tracking databases used for the analysis were obtained from the following (self-extracting) ZIP files:

- For PG&E, PGE_FROZEN_2008Q4_3-16-09.exe
- For SCE, Q408_SCE_v.3-3-09.exe
- For SDG&E, Installed Projects-SDG&E-2006-2008_Revised_03-24-09.exe
- For SCG, Installed Projects-SCG-2006-2008_Q4-Revised_03_24_09.exe

These files provided tracking data for IOU and third-party EE programs, and data for both types of programs were used in the analysis.

To the extent possible, information on names or measure codes for transferred ETP technologies were used to identify line-items in the EE program tracking data pertaining to number of units rebated and expected energy savings (kWh) for the technologies. However, a lack of standardized names or codes linking transferred ETP technologies to measures in the EE program tracking databases severely limited the evaluation team’s ability to conduct this analysis. In some cases an IOU would identify technologies from several ETP projects as falling under a broader EE technology category. For example, the measures coming out of ETP projects examining LED lights (task, exterior, and downlights) would all be categorized as falling under a single LED measure category in the EE programs. In these cases, analytical judgment was applied by the evaluation team to determine which EE measures could reasonably be associated with transferred ETP technologies.

Because analytical judgment was required, some uncertainty exists regarding how well the evaluation team was able to identify transferred ETP technologies in the IOU EE program tracking databases. Particular uncertainty arises with respect to transferred ETP technologies where a measure code was not available for matching against an EE measure code. In such cases, the transferred ETP technology was considered not to be included in the EE program, unless descriptions for the ETP and EE measures could be found that showed a good match. This was deemed a conservative approach by the evaluation team that likely would result in some under-matching of ETP technologies against EE measures.

For transferred ETP technologies that were identified as matching against EE measures, the energy savings reported in the EE program tracking databases were used as the measure of associated savings. Thus, the savings attributed to transferred ETP technologies were the *ex ante* expected first year gross savings for all units of the measure installed over the three year period 2006-2008.

6.2.3 Transferred ETP Technologies: Results

ETP projects for which technologies were transferred to EE programs are listed in Table 6-1 for PG&E and Table 6-2 through Table 6-7 for SCE. For Sempra, the ETP was funded at a low level before 2006 and no technology transfer was identified from the ETP to the EE programs before 2006. Although some technologies identified by Sempra 2006–2008 ETP projects were recommended for consideration as EE program measures, no activity for transferred ETP technologies was recorded in Sempra EE program tracking system data for the period 2006–2008.

For each project listed in a table, information is provided regarding the technologies addressed in the project and the year in which the project was initiated in the ETP. In addition, each project is assigned to one of broad categories:

- **Demo**: Technology demonstration projects, which were undertaken to develop further information regarding the performance of a particular ETP technology;
- **Support**: EE program support projects, which were undertaken to provide information for developing / refining EE programs;
- **Tools**: Tool development projects, which were undertaken to provide methods that could be used to assess the performance of a technology in customer specific applications; and
- **Policy**: Projects undertaken to provide information for public policy, including standards development.

Measures examined in the technology demonstration projects were most likely to have energy impacts if transferred to an IOU EE program and to be found in the EE program tracking databases. Although the three other types of projects might eventually result in savings, measures considered in those projects were not as likely to be found in the EE program tracking databases.

Table 6-1. PG&E ETP Projects with Technologies Transferred to EE Programs

ETP Project Name	Project Technologies / Measures	ETP Year Initiated	Type of Project
Stairwell Dimming Evaluation	New stairwell lighting fixtures using occupancy sensors to turn on lighting only when someone is in the immediate vicinity.	2004	Demo
Integrated Classroom Lighting	Integration of daylight with advanced electric lighting systems in classrooms.	2004	Demo
80 PLUS PCs	Power supply for desktop computers and desktop-derived servers.	2005	Demo/ Policy
Electronics Opportunity Study	Developments in computing, display technology, power supplies,	2005	Policy
Stability and Accuracy of VAV Terminal Units at Low Flow	VAV terminal units	2005	Demo
Data Center Airflow Management 1	Case study of air management baseline performance with a focus on high density data centers	2005	Demo

Data Center Airflow Management 2	Energy assessments at several data centers to determine the annual energy savings and peak demand savings achievable by new air-flow management technologies.	2005	Demo
Pumps and Fans	Quantify PG&E's market opportunity in industrial, agricultural, and commercial applications to reduce pump and fan energy use and system demand	2005	Support
CFL Downlights	CFL downlights as alternatives to traditional incandescent systems in home kitchens	2005	Support
Supermarket Kitchen Demand Control Ventilation III Demonstration Project	Ventilation demand control system in a supermarket food service application	2005	Demo
Computer Network Power Save Software	Energy saving software for computers	2006	Support
Marketable Technologies for the Hospitality Segment	HVAC controls, both for individual rooms and common areas	2006	Support
Automated Demand Response for Critical Peak Pricing Pilot	Automated software and hardware for interfacing with building energy management systems to allow for automated demand response.	2006	Support
Efficient Power Supplies for Servers	Extension of the 80+ program, looking at energy efficient power supplies for servers.	2006	Support
Fume Hood (DR)	Lowering fume hood sashes as demand response measure	2006	Demo
Data Center Economizer	Economizers to use outside air if it is cooler outside then inside the data center.	2006	Demo
Refrigerated Case Lighting in Supermarkets/Retail	Replacing fluorescent lighting in frozen food and refrigerated cases with LEDs	2006	Demo
Super CFL	Specification for a high-performance CFL that addresses such customer issues as color, instant start, and dimming capability.	2006	Support
HID Electronic Ballast	Compared performance of electronic ballasted HID lighting to magnetic ballasted HID lighting	2006	Support

Table 6-2. SCE Residential ETP Projects with Technologies Transferred to Energy Efficiency Programs

ETP Project Name	Project Technologies / Measures	ETP Year Initiated	Type of Project
Heat Pump Water Heater	Energy Efficient Electric Water Heater	2001	Demo
LED Task Lights	Light Emitting Diode (LED)	2004	Demo
LED Exterior Lights	Light Emitting Diode (LED)	2004	Demo
Variable-Speed Pool Pump	Variable Speed Pool Pump	2004	Demo
Residential Economizer Cycle	Whole house fan	2004	Support
Evaporative Cooling Technologies Assessment	Evaporative cooling	2006	Support
LED Screw-In Floodlight Systems	Light Emitting Diode (LED)	2007	Demo
Residential LED Downlights	Light Emitting Diode (LED)	2007	Demo

Table 6-3. SCE ETP Projects for Small & Medium Business Sector with Technologies Transferred to Express Efficiency Program

ETP Project Name	Project Technologies / Measures	ETP Year Initiated	Type of Project
Chapman University	Screw-In Compact Fluorescent Lamps	1998	Demo
City of Compton City Hall	Screw-In Compact Fluorescent Lamps	1998	Demo
Los Amigo Market & Liquor T-8 Electronic Ballasts	T-8 or T-5 Lamps w/Electronic Ballasts	1998	Demo
Palm Spring Chamber of Commerce - Indirect/Direct Evaporative Cooling	Advanced Evaporative Coolers		Demo
Kott's Berry Farm	Commercial Electric Combination Oven	1999	Demo
Soak City's Pier Grill	Commercial Electric Combination Oven	1999	Demo
RTTC Anti Sweat Heater	Special Doors /low/no Anti-Sweat Heat	1999	Demo
Foster Enterprise	Evaporative Fan Controller	1999	Demo
Costco	ECM and PSG Motors	1999	Demo
CTG Lighting Retrofit	T-8 or T-5 Lamps w/Electronic Ballasts	2000	Demo
NRDC Daylighting Control	Photocells	2000	Demo
Pomona Portable Classroom Day Lighting Control	Photocells	2000	Demo
Long Beach Aquarium VSD Chiller Retrofit	Variable Frequency Drives	2000	Demo

Wienerschnitzel Restaurants Electric Griddle	Commercial Electric Fryer	2000	Demo
Ralph Grocery - Glass Doors	New Refrigeration Display Case w/Door	2000	Demo
LA County T5 HO & Variable Geometry Reflector	High Bay Fixtures (T-8 or T-5)	2002	Demo
Super T-8 Fluorescent Field Demonstration	T-8 or T-5 Lamps w/Electronic Ballasts	2003	Demo
Advanced Classroom Lighting	T-8 or T-5 Lamps w/Electronic Ballasts	2003	Demo
Instant Start Super T-8 lamp/ballast - First Presbyterian	T-8 or T-5 Lamps w/Electronic Ballasts	2003	Demo
Stairwell Lighting Bi-Level Switching	Occupancy Sensors	2003	Demo Support
Food Service Technology Center	Commercial Connectionless Steamers	2003	Demo Support
Food Service Technology Center	Insulated Holding Cabinets	2003	Demo Support
Kitchen Down Light	T-8 or T-5 Lamps w/Electronic Ballasts	2004	Demo Support
Portable Office Lights	T-8 or T-5 Lamps w/Electronic Ballasts	2004	Demo Support
Occupancy Sensor Night Lights for Hotels/Motel Guest-Rooms	Occupancy Sensors	2004	Demo Support
Occupancy Bi-level Control of Area Lights	Occupancy Sensors	2005	Demo Support
CEE/FEMP	Commercial Ice Machine	2005	Demo Support
Food Service Technology Center	Commercial Elect. Griddle	2005	Demo Support
Food Service Technology Center	Commercial Electric Combination Oven	2005	Demo Support
Food Service Technology Center	Commercial Electric Convection Oven	2005	Demo Support
CEE/FEMP	Solid Door Reach-In Ref./Freezers	2005	Demo Support
CEE/FEMP	Glass Door Reach-In Refrigerator	2005	Demo Support
LED Channel Light	LED Channel Signs	2006	Demo Support

Table 6-4. SCE ETP Projects for Large Business Sector with Technologies Transferred to Express Efficiency Program

ETP Project Name	Project Technologies / Measures	ETP Year Initiated	Type of Project
College of the Desert Variable Chilled Water Pumping	Variable Frequency Drive	Unknown	Demo
Palm Spring Chamber of Commerce - Indirect/Direct Evaporative Cooling	Advanced Evaporative Coolers	Unknown	Demo
City of Compton City Hall	Screw-In Compact Fluorescent Lamps	1988	Demo
Queen Mary Variable Speed Chiller	Variable Frequency Drive	1997	Demo
Chapman University	Screw-In Compact Fluorescent Lamps	1998	Demo
Long Beach Marina Shipyard Pulse Start Metal Halide	HID Fixtures Exterior	1999	Demo
Church of Our Savior - Metal Halide	HID Fixtures Exterior	1999	Demo
Knott's Berry Farm	Commercial Electric Combination Oven	1999	Demo
Soak City’s Pier Grill	Commercial Electric Combination Oven	1999	Demo
Knott's Berry Farm	Commercial Electric Convection Oven	1999	Demo
Soak City's Pier Grill	Commercial Electric Convection Oven	1999	Demo
RTTC Anti Sweat Heater	Special Doors /low/no Anti-Sweat Heat	1999	Demo
Foster Enterprise	Evaporative Fan Controller	1999	Demo
Costco	ECM and PSG Motors	1999	Demo
CTG Lighting Retrofit	T-8 or T-5 Lamps w/Electronic Ballasts	2000	Demo
Wrightwood Camp Exterior Lighting - Metal Halide	HID Fixtures Exterior	2000	Demo
County of Orange-Pulse start Metal Halide Lights	HID Fixtures Exterior	2000	Demo
NRDC Daylighting Control	Photocells	2000	Demo
Pomona Portable Classroom Day Lighting Control	Photocells	2000	Demo
Long Beach Aquarium VSD Chiller Retrofit	Variable Frequency Drive	2000	Demo
South Coast Plaza Variable Speed Chiller Retrofit	Variable Frequency Drive	2000	Demo
Wienerschnitzel Restaurants Electric Griddle	Commercial Electric Fryer	2000	Demo

Ralph Grocery - Glass Doors	New Refrigeration Display Case w/Door	2000	Demo
LA County T5 HO & Variable Geometry Reflector	High Bay Fixtures (T-8 or T-5)	2002	Demo
Super T-8 Fluorescent Field Demonstration	T-8 or T-5 Lamps w/Electronic Ballasts	2003	Demo
Advanced Classroom Lighting	T-8 or T-5 Lamps w/Electronic Ballasts	2003	Demo
Instant Start Super T-8 lamp/ballast - First Presbyterian	T-8 or T-5 Lamps w/Electronic Ballasts	2003	Demo
Stairwell Lighting Bi-Level Switching	Occupancy Sensors	2003	Demo Support
CTAC Classroom Displacement Ventilation	Advanced Evaporative Coolers	2003	Demo Support
Food Service Technology Center	Commercial Connectionless Steamers	2003	Demo Support
Food Service Technology Center	Insulated Holding Cabinets	2003	Demo Support
Occupancy Sensor Night Lights for Hotels/Motel Guest-Rooms	Occupancy Sensors	2004	Demo Support
Occupancy Bi-level Control of Area Lights	Occupancy Sensors	2005	Demo Support
CEE/FEMP	Commercial Ice Machine	2005	Demo Support
Food Service Technology Center	Commercial Elect. Griddle	2005	Demo Support
Food Service Technology Center	Commercial Electric Combination Oven	2005	Demo Support
Food Service Technology Center	Commercial Electric Convection Oven	2005	Demo Support
CEE/FEMP	Solid Door Reach-In Refrigerator./Freezers	2005	Demo Support
CEE/FEMP	Glass Door Reach-In Refrigerator	2005	Demo Support
LED Channel Light	LED Channel Signs	2006	Demo Support
Electronic Dimming Ballasts for Pulse Start Metal Halide	HID Fixtures Exterior	2007	Demo Support
Demand Ventilation for Commercial Kitchens	Variable Frequency Drive	2007	Demo Support
Hot/Dry Air Conditioner	Packaged Terminal AC > 2 tons	2007	Demo Support

Water Treatment Strategies for Evaporative Cooling Systems	Advanced Evaporative Coolers	2007	Support

Table 6-5. SCE ETP Projects for Large Business Sector with Technologies Transferred to Standard Performance Contract Program

ETP Project Name	Project Technologies / Measures	ETP Year Initiated	Type of Project
Rock Industries VSD Vacuum Pump	VSD Vacuum Pump	1998	Demo
Ralph's Dairy Milk Plant Membrane Technology	Milk Plant Membrane Technology	1998	Demo
Nakano Food Membrane Technology	Membrane Technology	1998	Demo
Panda Express - Perforated Supply Plenum	Perforated Supply Plenum	2002	Demo
Denny's Restaurant - EE Kitchen Ventilation System	EE Kitchen Ventilation System	2002	Demo
Stairwell Lighting Bi-Level Switching	Stairwell Lighting Bi-Level Switching	2003	Demo
Network Management of Computer	Network Management of Computer	2003	Support Tools
Advanced Control for Plastic Granulators	Advanced Control for Plastic Granulators	2003	Support
Plastic Resin Dryer	Plastic Resin Dryer	2004	Support
Occupancy Bi-level Control of Area Lights	Occupancy Bi-level Control of Area Lights	2005	Demo Support
Macy's Turbocore Compressor	Turbocore Compressor	2005	Demo
Industrial Compressed Air System Index	Industrial Compressed Air System Index	2005	Tools
Variable Speed Dust Collection System for Furniture Industry	Variable Speed Dust Collection System	2005	Support
Office of the Future - Phase 1		2006	Policy
Amgen - Automatic Sash Positioning System	Automatic Sash Positioning System	2006	Demo
Case Index Testing for Single Compressor Systems	Case Index Testing for Single Compressor Systems	2006	Tools
Electrodialysis for wine industry	Electrodialysis for wine industry	2006	Support
Variable Dust Collection/Mark-up Air System	Variable Dust Collection/Mark-up Air System	2006	Support
Minimum Safety Illumination Level for Induction Lighting System	Induction Lighting System	2007	Support

Specification and Program Development for Data Center	Specification and Program Development for Data Center	2007	Support Tools
Variable Speed Die Casting Machine	Variable Speed Die Casting Machine	2007	Support
Irvin Ranch - Circulator for Water and Wastewater Treatment	Circulator for Water and Wastewater Treatment	2007	Demo
Positive Displacement Pump and Control for Injection Molding	Positive Displacement Pump and Control for Injection Molding	2007	Support
Honeycomb Wheel Drying - Accent Plastics	Honeycomb Wheel Drying	2007	Demo
Magna Drive VSD for Large Motors and Pumps	Magna Drive VSD for Large Motors and Pumps	2007	Demo
Variable Speed Control of Polystyrene Vacuum Systems	Variable Speed Control of Polystyrene Vacuum Systems	2007	Support

Table 6-6. SCE ETP Projects for Large Business Sector with Technologies Transferred to Industrial Energy Efficiency Program

ETP Project Name	Project Technologies / Measures	ETP Year Initiated	Type of Project
Nunes Brothers Dairy Milling Barn	VFDs in Milking Vacuum System	1999	Demo
Riverside Dairy/McMoo Farms: HVLS Fan	Fans for Cooling Cows	1999	Demo
Precipitation of Salts for Fluid Bed / Lime Process	Precipitation of Salts for Fluid Bed / Lime Process	2003	Support
Optimization of Wastewater Aeration	Optimization of Wastewater Aeration	2006	Support

Table 6-7. SCE ETP Projects with Technologies Transferred to Savings by Design Program

ETP Project Name	Project Technologies / Measures	ETP Year Initiated	Type of Project
NRDC Integrated Design	Integrated design	2000	Demo
Pomona Portable Classroom Integrated Design	Integrated design	2000	Demo
Southeast Learning Center (Maywood Learning Academy)	Integrated design	2001	Demo
El Segundo School District - Integrated Design	Integrated design	2001	Demo

Table 6-8 (for PG&E) and Table 6-9 (for SCE) provide estimates of the total *ex ante* expected first year gross kWh savings for projects where ETP technologies could be identified as having been transferred to EE programs. Comparing the totals from the two tables shows a higher total savings for SCE than for PG&E. However, this comparison also is suggestive of the limitations of the available data in tracking the uptake of transferred ETP technologies. In particular, much of the savings for the SCE ETP technologies come from evaluations of commercial and residential lighting technologies. There is some difficulty in assessing the linkages between ETP and EE lighting measures because the ETP technologies are not defined with a high degree of specificity as to what was accomplished on those technologies during the ETP projects. Thus, it is likely that there is an over-attribution of EE savings to the ETP lighting measures.

Table 6-8. kWh Savings for Technologies Transferred from the PG&E ETP

Target Market	**ETP Project Name**	**Annual *ex ante* kWh Savings for Transferred Technologies**
Commercial	Computer Network Power Save Software	15,247,800
Commercial	80 Plus PCs	6,594,866
Commercial	Electronics Opportunity Study	124,848
Industrial	Data Center Airflow Management #2	919,822
Lighting	HID Electronic Ballast	266,955
Lighting	Refrigerated Case Lighting in Supermarkets/Retails	117,173
Lighting	Stairwell Dimming Evaluation	731,080
Mass Market	Residential Air Conditioner Charge and Air Flow Verification Study	34,952,226
	Total	**58,954,770**

Table 6-9. kWh Savings for Technologies Transferred from the SCE ETP

Target Market	ETP Project Name	Annual *ex ante* kWh Savings for Transferred Technologies
Commercial	Evaluations of Commercial Food Service Equipment	3,304,445
Commercial	Evaluations of Commercial Air Conditioning Equipment	15,968,435
Commercial	Evaluations of Commercial Lighting Technologies	122,136,888
Commercial	Evaluations of Commercial Refrigeration Equipment	18,209,140
Commercial	Rock Industries VSD Vacuum Pumps	1,955,750
Commercial	Macy's Turbocore Compressor	888,217
Residential	Heat Pump Water Heater	23,744
Residential	Residential LED Downlights	31,651,522
Residential	Evaporative Cooling Technologies Assessment	20,728
Residential	Variable Speed Pool Pump	1,827,948
	Total	**195,986,817**

For Sempra (both SDG&E and SCG), the ETP was funded at a low level before 2006 and no technology transfer was identified from the ETP to the EE programs before 2006. Although some technologies identified by Sempra 2006–2008 ETP projects were recommended for consideration as EE program measures, no activity for transferred ETP technologies was recorded in Sempra EE program tracking system data for the period 2006–2008. As shown by the project descriptions in Appendix M, Sempra has undertaken several ETP projects during the 2006-2008 program cycle that may provide subsequent energy impacts via EE program deployment.

6.3 Peer Reviews

The Peer Review process provides a rigorous and formal means to offer objective, expert advice to program and project managers. At the heart of this process, a group of qualified and independent Peer Reviewers are selected and empowered to make judgments about technology assessment projects based on a set of objective criteria and documented evidence. This section discusses the approach used by the evaluation team to apply the Peer Review process to the ETP evaluation, including the recruitment of the Peer Review steering committee; the development of criteria to guide project selection, peer selection, and project evaluation activities; and peer recommendations for future ETP assessment projects.

6.3.1 Peer Reviews: Approach

The Peer Review process implemented in this evaluation followed guidance provided by the U.S. Department of Energy's *Peer Review Guide,*[79] and consisted of the following four phases:

Preparation: A steering committee was identified to guide the work of evaluation team staff responsible for implementing the Peer Review effort. The committee's first tasks were to establish criteria for 1) the selection of projects for Peer Review, 2) the selection of peers to evaluate these projects, and 3) the evaluation of the selected projects by the peers. Using the project selection criteria, evaluation team staff selected a sample of ETP technology assessment projects for Peer Review.

Pre-review: Evaluation team staff recruited and gained steering committee approval for three qualified peers for the review of each assessment project. Using standardized data collection forms (including specific metrics) and procedures to increase reliability, staff then trained approved peers regarding the review process, collected and distributed project documentation (e.g., ETPA, ETOS, Long Form) to the peers, and set up logistical arrangements for a review session with the project manager. Peers reviewed documentation and prepared questions for the review session. In many cases, the peers wrote up questions that were provided to the project manager in advance of the review session, in order to facilitate discussion during the session. In some of these cases, the project manager provided written responses prior to the review session.

Conduct of Reviews: All review sessions were conducted via web conference. Each web conference began with the utility ETP project manager presenting a review of the subject technology assessment project. Peers then had the opportunity to ask questions and discuss the project with the project manager, contractors and other personnel involved. Immediately following each Peer Review web conference, the peers and review leader reconvened privately on the phone to confer about what they heard during the review session and to discuss the evaluation metrics. The Peer Review web conferences were recorded for subsequent review by the peers as they completed their evaluations of the assessment projects.

Post-review: Following each review session, peers completed an evaluation form based on the project evaluation criteria. Evaluation team staff then prepared a draft report documenting the review session and summarizing the peers' ratings, comments, and recommendations. The draft report was then circulated to peers and the project manager for comment. Following incorporation of those comments by the review leader, the draft report was delivered to steering committee members for review and comment. The review report was considered complete following incorporation of steering committee comments.

[79] Energy Efficiency and Renewable Energy Task Force. 2004. *EERE Peer Review Guide*. Washington DC: US Department of Energy.

6.3.2 Peer Reviews: Data Collection Methods

In May and June 2008, evaluation team staff worked with each utility's ETP management to identify PRSC representatives. By mid-June, the steering committee membership was complete including representatives from the IOUs' ETP programs, the CPUC ED and MECT project management team, and evaluation team (see Table 6-10). During teleconferences in July and August 2008, evaluation team staff led discussions regarding the scope of Peer Review activities as well as criteria to be used in the selection of projects for Peer Review, criteria for the selection of peers, and criteria to be used by the peers in evaluating the assessment projects.

Table 6-10. Peer Review Steering Committee Membership

Name	Organization
Ayat Osman	California Public Utility Commission
Richard S. Ridge	Master Evaluation Contractor Team
Tsosie Reyhner	Pacific Gas and Electric Company
Henry Lau	Southern California Edison Company
Abdullah Ahmed	Sempra Utilities
Brent Barkett	Summit Blue Consulting
Scott Albert	GDS Associates, Inc.
Jay Stein	E SOURCE
Dan Greenberg	E SOURCE

6.3.2.1 Peer Review Scope

Initial scoping discussions led to consensus by PRSC members that peers would be asked to consider the design and conduct of each peer-reviewed project, and the conclusions that project staff drew as a result of the project, but that activities both upstream of the assessment project (such as the screening process leading to a utility's decision to conduct a technology assessment) and downstream of the project (such as the utility's success in deploying the technology in its energy efficiency programs) would not be within the scope of Peer Review activities. As discussed in previous sections of this report, these upstream and downstream activities were assessed through other aspects of the evaluation including the Business Risk Assessment, Case Study, and technology transfer research tasks.

6.3.2.2 Peer Review Project Selection Criteria

The PRSC also achieved consensus on both project selection criteria and peer selection criteria during a July 2008 teleconference. The California Energy Efficiency Evaluation Protocols indicate that key criteria for the selection of projects for Peer Review include those projects with the greatest budgets and those offering the greatest expected benefits. The PRSC agreed that it was necessary to add certain threshold evaluability criteria, to ensure that a given project was a viable candidate for Peer Review. These criteria include such considerations as whether a given project had been funded through the 2006-2008 program cycle, whether a given project was or would be complete (as indicated by the availability of a final report) in time to allow for Peer Review within the timeframe of this evaluation, and whether the utility project manager was still on staff.

The PRSC also discussed a set of diversity criteria, such as fuel diversity (electricity or natural gas), end-use sector diversity (residential, commercial, institutional, or industrial), project management diversity (reviewing projects conducted by a diverse set of project managers) and others. After discussing these potential criteria, the PRSC achieved consensus that such criteria are relevant only insofar as they can be expected to affect the quality of a technology assessment project. The committee agreed that project management can be expected to affect project quality, whereas fuel source, customer sector, and the other proposed diversity criteria were unlikely to be determinants of project quality. The PRSC therefore agreed that evaluation team staff should attempt to minimize the number of projects selected for Peer Review that were supervised by any single project manager, so as to include the work of the greatest number of project managers in the selected sample of projects. The final set of project selection criteria are presented in Table 6-11.

Table 6-11. Final Project Selection Criteria

Threshold Criteria
Funded by 2006 – 2008 ETP cycle
Final report complete or to be complete by March 31, 2009
Availability of project manager (still employed by utility)
Primary Criteria
Assessment project budget
Estimated energy and demand savings (where available)
Diversity Criteria
Project management diversity

6.3.2.3 Peer Selection Criteria

The PRSC arrived quickly at consensus on the criteria to be used for peer selection. There were just two: technical competence and objectivity. Simply stated, the PRSC directed evaluation team staff to ensure that 1) all peers selected to review assessment projects have the requisite expertise to understand both the technology they are asked to review and the technology assessment project, and 2) that the peers have no conflicts of interest that could influence their evaluation of the assessment project.

The review leaders were responsible for identifying candidates who meet these criteria. Candidates' credentials to serve as a peer are assessed through interviews or through the review leader's knowledge of their work. The top three candidates who willing to serve as a peer were asked to complete a conflict of interest form (attached as Appendix N). If the review leader was satisfied that each candidate was free of conflicts of interest, the peers' resumes and conflict of interest forms were forwarded to the PRSC for approval. In a few cases, PRSC members raised concerns regarding a candidate peer's potential conflict of interest. Most of these cases were resolved by the review leader seeking additional information from the candidate and distributing it to the PRSC, but there was one case in which a candidate peer had to be replaced due to concerns about the candidate's relationship with the project contractor.

6.3.2.4 Peer Review Project Evaluation Criteria

The criteria used by the peers in evaluating ETP assessment projects were developed through discussions within the PRSC in two teleconferences and numerous email exchanges. The steering committee agreed upon criteria that closely follow the scope of the Peer Review process. These criteria focus on the quality of the design of an assessment project, the quality of the project's execution by utility staff and contractors (if any), the quality of project documentation, and the quality and comprehensiveness of the conclusions drawn regarding the technology, given the results of the project. Descriptions of these criteria and the metrics used to evaluate performance relative to the criteria are presented in Table 6-12.

Table 6-12. Project Evaluation Criteria

Criterion name	Description	Metrics
Quality of project design	Was the technology assessment project designed in such a way that it was likely to produce evidence sufficient to determine the utility's proper course of action (i.e., whether the technology in question should be incorporated into the utility's EE programs, promoted directly to the market (without utility subsidy), or neither)?	1. All variables necessary to characterize technology performance are identified. 2. Project designed to collect data on all variables necessary to characterize both incumbent technology and technology being assessed. 3. Analytical steps necessary to draw conclusions are identified
Quality of project execution	Did project staff execute the project design such that its results were credible, accurate, and repeatable? Where execution deviated from the original project design, were these deviations necessary and based on good judgment?	1. Evidence that both the existing technology (if any) and technology being assessed were properly installed and commissioned as necessary. 2. Project staff measured, calculated, or collected accurate data on all variables necessary to characterize the performance of both the existing technology and the technology being assessed. 3. Project staff performed analytical steps properly. 4. Project staff identified any deviations from project design and presented valid reasons for such deviations.
Quality of project output	Did project staff document the technology assessment project and its results such that: The project's goals, conduct and accomplishments are understandable? The linkage between information developed by the project and conclusions drawn by staff are clear?	Project documentation clearly describes the technology, the context for its application, assumptions made, the design and conduct of the assessment project, the results achieved, and conclusions drawn from those results.
Quality of conclusions	Are the conclusions that staff drew from the project based on evidence developed by the project? Are there important conclusions supported by the evidence that are not explicitly stated? Where project results are inconclusive, is this stated explicitly? Are needs for additional research identified?	1. Conclusions drawn are valid, based on evidence developed by project. 2. Conclusions drawn are comprehensive. 3. Needs for further research are identified where project results are inconclusive.

6.3.3 Peer Reviews: Project Selection

The selection of the sample of projects for Peer Review took place in the fall of 2008, following collection of the data necessary to rank projects according to the project selection criteria discussed earlier.[80]

For all projects that passed the threshold criteria, data were assembled on project budget, estimated electrical energy savings (GWh), estimated thermal energy savings (million therms), and estimated demand reduction (MW) as reported in program documentation provided by the IOUs. As the individual IOUs used different methods to estimate the energy and demand savings for their projects, these estimates are not directly comparable across utilities. PG&E expressed energy and demand savings in terms of lifecycle potentials, whereas SCE expressed them in terms of annual values for its service area. Evaluation team staff were careful to ensure that energy and demand savings were expressed on a consistent basis within the data set for each utility, so that each utility's assessment projects could be ranked against one another on an equal footing. Note that energy and demand savings estimates were only sporadically available for projects conducted by Sempra, and that where these estimates did exist, they were not provided on a consistent basis (technical vs. market potential, multi-year vs. single-year penetration, etc.). As a result, Sempra projects were ranked on the basis of project budget alone.

Once all energy and demand savings data were collected for all ETP projects satisfying the threshold criteria, a ranking index was created for each project using the following formula:

$$Index_i = 2*B_i/B_{max} + EES_i/EES_{max} + EDR_i/EDR_{max} + TES_i/TES_{max}$$

Where

$Index_i$ = the ranking index for project i,

B_i = project i's total budget,

B_{max} = the maximum budget for all projects satisfying the threshold criteria for the given utility,

EES_i = the electrical energy savings for project i,

EES_{max} = the maximum estimated electrical energy savings for all projects from a given utility,

EDR_i = the estimated electrical demand reduction for project i,

EDR_{max} = the maximum estimated demand reduction for all projects from a given utility,

TES_i = the estimated thermal energy savings for project i,

[80] See Section 6.1 for a more detailed discussion of the evaluation team's efforts to organize and synchronize project-level data made available from the ETP managers.

TES_{max} = the maximum estimated thermal energy savings for all projects from a given utility.

Thus each project was compared only to other projects conducted by the same utility. Note that each project's budget had twice the weight given to its thermal and electrical energy savings, and electrical demand reduction in the calculation of the index.

The final step was to sort each utility's projects in declining order of the ranking index and to select the top-ranked projects from each utility.

The "Office of the Future—Phase II" project was an exception to the process described above. This exception was necessary because all three of the IOUs were involved in this project, but energy and demand savings estimates were not available for individual service areas, and the project could therefore not be included in the individual utility rankings. In aggregate, the three utilities contributed $365,000 for this project, and a single-year, statewide estimate assuming that 5 percent of existing office space is retrofit to the phase II specification amounts to 148 GWh and 43.4 MW demand savings.[81] These estimates clearly place this project at or near the top of each utility's ranking, and justify its inclusion in the Peer Review group.

The sixteen projects selected for Peer Review are listed in Table 6-13, Table 6-14, and Table 6-15.

[81] Personal correspondence, Doug Avery, Southern California Edison, January 22, 2009.

Table 6-13. PG&E Projects Selected for Peer Review

Project Title	Energy Savings Estimate (GWh)	Demand Reduction Estimate (MW)	Energy Savings Estimate (MM therms)	Total Assessment Budget ($000)	Project Manager	Date of Peer Review Session
Mechanical Vapor Recompression	0	0	45	110	Ryan Matley	3/3/2009
Hot Dry Climate Air Conditioner Field Test (Phase 1 and 2)	26	54	0	218	Sherry Hu	9/21/2009
Data Center Air Management Tool 2	27	10	0	345	Ryan Matley	9/21/2009
LED Exterior - Streetlighting Oakland	201	51	0	45	Mary Matteson Bryan	5/18/2009
HID Electronic Ballast	149	33	0	100	Mary Matteson Bryan	6/24/2009

Table 6-14. SCE Projects Selected for Peer Review

Project Title	Energy Savings Estimate (GWh)	Demand Reduction Estimate (MW)	Energy Savings Estimate (MM therms)	Total Assessment Budget ($000)	Project Manager	Date of Peer Review Session
Office of the Future-Phase II*	148 Statewide	43 statewide	No estimate	365	Doug Avery	7/21/2009
Variable Dust/Make-up Air System	4	1	No estimate	150	Roger Sung	4/11/2009
Automatic Sash Positioning System	21	0	No estimate	80	Roger Sung	10/7/2009
Induction Lighting System	11	0	No estimate	100	Doug Avery	5/12/2009
LED MR16 Lighting System	1	0	No estimate	70	Vireak Ly	7/7/2009
LED Open Sign	1	0	No estimate	55	Vireak Ly	10/6/2009

*All three utilities contributed funding to the Office of the Future project, and energy and demand savings estimates are statewide. As described above, this project was selected outside of the normal ranking process.

Table 6-15. Sempra Projects Selected for Peer Review

Project Title	Energy Savings Estimate (GWh)	Demand Reduction Estimate (MW)	Energy Savings Estimate (MM therms)	Total Assessment Budget ($000)	Project Manager	Date of Peer Review Session
Ice Bear Thermal Energy Storage Evaluation	No estimate	No estimate	No estimate	275	Jerine Ahmed	10/2/2009
Hamman ICE II Interior LED lighting	No estimate	No estimate	No estimate	95	Jerine Ahmed	10/2/2009
Hotel Guest Room EMS study	No estimate	No estimate	No estimate	95	Jerine Ahmed	8/12/2009
UCSD Data Center Evaluation	No estimate	No estimate	No estimate	85	Abdullah Ahmed	9/28/2009
CHP System Evaluation	No estimate	No estimate	No estimate	75	Ed Becker	6/17/2009

As noted in the above tables, Peer Reviews of these 16 projects commenced in March of 2009 and were conducted through October 2009. Copies of all final Peer Review reports are included as Appendix O.

6.3.4 Peer Reviews: Results and Recommendations

At the outset, it must be acknowledged that conducting technical assessments of emerging technologies is an inherently challenging activity, requiring considerable time and investment of significant financial and intellectual capital. Moreover, the ETP assessments seemed rarely to proceed entirely as expected from start to finish. The majority of peer-reviewed assessment projects encountered unexpected developments at some point that in some way affected project execution and/or results. Evaluations conducted in the field at customer-owned facilities (as most of the peer-reviewed projects were) proved to be particularly subject to such difficulties, because constraints specific to the customers' facilities or operations added to surprises the ETP staff sometimes faced regarding the subject technology itself. The ETP staff conducting these field experiments often found themselves at the mercy of a customer's willingness to permit changes that would be necessary to run the assessment in an ideal way, such as altering production processes or calibrating or installing additional instrumentation.

Nonetheless, among the peer-reviewed project sample, there are examples of projects that the peers found to be well designed and executed, and that provided valid and very useful information to utility staff and other stakeholders, regardless of whether the technology assessed turned out to be a viable candidate for transfer to an EE program. The following are illustrative examples:

- Sempra ran a project evaluating the performance of a combined heat and power system based on a natural gas-fired internal combustion engine coupled to an 85 kW generator (the ENI 85 Combined Heat and Power System) that the peers found to be very well designed and executed. This project, conducted at Southern California Gas' Power Quality and Distributed Energy Resources Test Lab, followed a clearly defined and articulated testing plan based on the most relevant evaluation protocol. All sensors used for collecting data were well calibrated, and the entire project was very well documented.

- The peers involved in reviewing PG&E's in situ assessment of mechanical vapor recompression (a technology that substantially reduces the energy requirements of concentrating fluids such as milk or fruit juice) at a dairy processing plant were all highly complementary of the project. Although this project was not designed in conjunction with an evaluation protocol, it did follow a well-defined and executed monitoring plan, and the data analysis was clearly presented and documented. The peers were particularly complimentary of the fact that in this project, ETP staff identified measurement problems and made adjustments to minimize their affect on data analysis and project conclusions.

- Southern California Edison's evaluation of light emitting diode (LED) replacements for traditional neon "Open" signs is a third example of a very well designed and executed technology assessment project. The peers were very complimentary of this project, giving it consistently high ratings for all metrics from project design through the quality of the conclusions drawn by project staff.

There were also examples among the peer-reviewed project sample of projects for which the peers identified ways in which project design, execution, documentation, and/or the conclusions drawn by project staff might have been improved. As the purpose of this report is to identify opportunities for the utilities to improve future implementation of the ETP, the remainder of this section will focus on recommendations for future ETP implementation emerging from peer comments.

The peers identified numerous issues regarding the quality of the peer-reviewed technology assessments, and for most of these expressed or implied recommendations that in their view would have improved the results of the assessment. Some of the issues identified by the peers are specific to the particular assessment project in which they arose, and do not hold generally applicable lessons for future ETP implementation. However, many of their recommendations are more generally applicable and can be organized into the following broad categories:

- Scientific Rigor
- Project Management
- Cost Data Collection
- Validity and Applicability of Results
- Market Viability

- Documentation

The generally applicable recommendations organized by broad category are presented below; all of the peers' verbatim comments are available in the individual Peer Review reports, which can be found in Appendix O.

6.3.4.1 Scientific Rigor

The peers found shortcomings in many of the reviewed projects that in some manner relate to the scientific rigor applied to determining the energy and demand savings offered by an emerging technology. The most common issues in this category focus on establishing a valid baseline for comparison, calibrating sensors, documenting measurement uncertainty and complying with relevant evaluation protocols where they exist. But perhaps the most important issue that requires resolution is the appropriate level of scientific rigor for assessment projects funded through the ETP.

1. **Issue:** The 16 Peer Reviewed projects exhibited a broad range in terms of the scientific rigor applied in assessing the energy and demand savings potential of the evaluated technologies. This diversity appears to reflect a range of understanding or opinion among the ETP project managers regarding the fundamental goals of and theory behind the ETP. The peer panels were often disappointed that what they saw as shortcomings in scientific rigor led to project results that were of unknown accuracy and limited applicability or in some cases, results that in their view were completely invalid. On the other hand, ETP project managers sometimes expressed the opinion that the level of scientific rigor expected by the peers was unnecessary for a given project to achieve its goals. This difference in the perceived need for scientific rigor underlies many of the issues identified by the peers.
   Recommendation: The CPUC and ETP management at each utility must come to agreement on the role of and goals for the ETP. Once consensus on these has been achieved, the goals for and theory behind the ETP must be clearly and unambiguously communicated to all ETP staff and contractors, and ETP management at each utility must ensure that sufficient scientific rigor is applied to each assessment project to ensure that the project and the program as a whole meet the established goals.

2. **Issue:** Valid assessments of energy and demand savings and the incremental costs of an emerging technology can be made only when the incumbent technology is accurately identified. In some cases, there is no physical incumbent technology, but rather standard practice or simply the absence of the emerging technology that the project seeks to assess. The incumbent technology was clearly identified in most, but not all peer-reviewed projects.
   Recommendation: ETP project managers should clearly identify and document the incumbent technology to which the emerging technology will be compared in every assessment project. In the rare cases where no incumbent technology or standard practice can be identified (such as PG&E's Data Center Airflow Assessment Toolkit project), this fact should be explicitly stated in project design documentation as well as in project final reports.

3. **Issue:** Valid assessments of energy and demand savings and the incremental costs of an emerging technology can be made only when the baseline performance of the incumbent technology is accurately characterized. Most peer-reviewed projects did a creditable job of establishing accurate baseline performance, but some failed in this regard. In some such cases, the incumbent technology was not properly commissioned, in others known degradation mechanisms (such as lumen depreciation for lighting technologies) were not accounted for. When an emerging technology is intended to displace a functional incumbent technology, the degraded performance of the incumbent technology may be the appropriate baseline. In others, such as when the emerging technology will compete against the incumbent technology at replacement time or in a new application, the appropriate baseline is the properly commissioned incumbent technology operating in "as new" condition.
   Recommendation: It is essential that the proper baseline performance of the incumbent technology be accurately characterized in every ETP assessment project. The problems resulting from improper characterization of baseline performance that were revealed in some of the peer-reviewed projects can be avoided if assessment project design documentation identifies not only the incumbent technology, but also whether "as is" or "as new" operation is the proper baseline for comparison. Where "as new" operation is the appropriate baseline, ETP assessment projects must be designed to be conducted at new construction sites, or alternatively, the incumbent technology could be re-commissioned to "as new" condition.

4. **Issue:** When multiple changes to the system under study occur during the data collection period, it's difficult or impossible to establish a valid baseline for pre-retrofit performance. Without a clear characterization of baseline performance, it is not possible to accurately assess the energy or demand benefits of the technology being evaluated.
   Recommendation: It is critical that ETP assessment projects be designed such that the only change made to the system under study between the pre- and post-retrofit period is the installation of the technology or technique being evaluated. When multiple energy savings measures are installed in the course of a project, it is essential to install instrumentation and stage data collection so that the energy consumption impacts of each measure can be determined independently of the others.

5. **Issue:** Measurement instrumentation is vulnerable to inaccuracy due to a variety of physical mechanisms. Without calibration, it's impossible to know the accuracy of the data collected, yet many of the peer-reviewed projects either did not calibrate the instrumentation used to collect data, did not investigate the calibration of instrumentation already in place in a customer facility, or simply failed to document instrument calibration. In one case, a contractor insisted that calibration was unnecessary for the sensors used in a project because they were supposed to come calibrated from the manufacturer.
   Recommendation: ETP assessment projects should document the calibration of the instrumentation used to measure and characterize technology performance. This is vital both for instrumentation provided and installed as a part of the assessment project as well as for customer-owned sensors that are already present at the test site. Where the assessment is designed to use data collected from customer-owned instrumentation, the

calibration of that instrumentation must be verified prior to the initiation of data collection.

6. **Issue:** The error bounds around estimates of energy or demand savings were rarely calculated or presented in the peer-reviewed sample. Without such information, it is not possible to understand the reliability of the results.
   Recommendation: ETP project managers should present the uncertainty associated with all measured data in project documentation. When a technology assessment project requires measurements of multiple parameters, conduct an accumulated error analysis so that the potential magnitude of the uncertainty can be fully understood by the project team, EE program managers, and other interested parties.

7. **Issue**: In one project, data were discarded because employees at the customer facility where the technology was being tested interfered with the intended operation of the technology. As this behavior may be representative of what will be encountered in the field, one peer raised the concern that discarding this data biased the results of the assessment.
   Recommendation: Instruct ETP staff not to discard data solely because customers use the technology in an unexpected manner, as this use may be indicative of what will be encountered in the field.

8. **Issue:** Initial datasets from several assessment projects had to be discarded due to problems with instrumentation or dataloggers.
   Recommendation: ETP staff should validate the accuracy and proper sensitivity of sensors and the proper functioning of dataloggers prior to initiating data collection in order to avoid these types of issues.

9. **Issue:** Some technologies, notably many lighting technologies, suffer from performance degradation over time, making it more difficult to assess their long term energy savings.
   Recommendation: Although it can be difficult and expensive to assess long-term performance of certain technologies, ETP projects designed to do so will provide more accurate and useful results for EE program managers. Where it is not possible or practical to monitor the long-term performance of a technology known to degrade over time, ETP assessments should identify the known degradation mechanisms and their likely impact on energy and demand savings and market acceptance.

10. **Issue**: In some Peer Reviewed projects, anomalous data points were used in the evaluation of savings, but the reasons for the anomalies remained unexamined and or unexplained, bringing energy and or demand savings results into question.
    Recommendation: ETP staff should investigate and attempt to explain anomalous data collected in the course of assessment projects. Where such data cannot be explained, ETP staff should exercise considerable care in the inclusion or exclusion of the data from the analysis, and in every case, provide a rationale for the ultimate treatment of these data.

11. **Issue:** Even when an incumbent technology is well-understood, it is still of value to take measurements in order to characterize its performance. Doing so will avoid the uncertainty introduced when a monitored measure is compared to an abstract baseline. Where this is not done, it’s impossible to know what portion of the difference in

performance between the baseline and the emerging technology is due to simply the difference between theoretical and in-situ performance.
Recommendation: ETP staff should measure and document the baseline performance of the incumbent technology in every ETP assessment project

12. **Issue:** Poor project design hampered data collection, analysis and the validity of conclusions for some projects. Use of a relevant monitoring protocol could have eliminated or at least ameliorated such problems.
Recommendation: Where a relevant monitoring protocol exists, such as the International Performance Monitoring and Verification Protocol (IPMVP), its use will likely improve project design and communication among members of the project team.

6.3.4.2 Project Management

For a small number of projects, the peers indicated concerns regarding fundamental project management issues, including allowing a vendor to conduct an assessment of its own technology and allowing a project to be conducted with no apparent evaluation plan.

1. **Issue:** Technology manufacturers or vendors have an obvious conflict of interest in conducting an assessment of the performance of the technology they represent. This conflict inherently casts doubt on the validity of the study, regardless of its actual quality.
Recommendation: ETP staff should reject funding proposals for projects in which a manufacturer or vendor would evaluate its own technology.

2. **Issue**: Well thought-out project plans identify the goals of technology assessment projects and specify details for data collection and analysis that help ensure that project results will be accurate, credible and useful. One of the Peer Reviewed projects appears to have been conducted entirely without an identifiable project plan. This assessment failed to measure several fundamental variables, leading the peers to question the validity and applicability of project results.
Recommendation: Prior to funding an ETP assessment project, ETP staff should require approval of a written project plan that, at a minimum, includes a description of project goals, identification of all variables affecting the performance of both the incumbent and emerging technology, a monitoring plan to collect the data necessary to characterize both baseline and emerging technology performance, a description of procedures that will be used to validate the calibration of all instrumentation, and a description of the analytical procedures that will be applied to the collected data.

3. **Issue:** The peers observed that the validity of some assessment projects was substantially reduced or even eliminated as a result of unexpected problems that arose in the field during the assessment.
Recommendation: ETP staff should establish formal procedures to communicate problems that endanger project validity to senior ETP management, and to carefully consider terminating such projects prior to completion where warranted. ETP project managers should be encouraged to raise the alarm when unexpected factors compromise the value of an assessment.

6.3.4.3 Cost Data Collection

There seemed to be differences of opinion among ETP project managers as to whether collection of cost data was within the scope of ETP technology assessments. Peer comments across projects were largely uniform, indicating that it is important for ETP projects to collect and document this information.

1. **Issue:** Few of the peer-reviewed projects included the collection of cost data to purchase, install, operate, or maintain the emerging technology being evaluated. Even among project managers employed by the same utility, there appeared to be differences of opinion regarding whether collection of such data was within the scope of an ETP project. Such information is essential to a utility's decision as to whether or not to deploy a technology through its EE programs.
   Recommendation: Technology evaluation projects will provide more value to EE program managers and others if they are designed to collect information on the incremental cost of procuring, installing, operating, and maintaining the technology being evaluated. ETP staff should collect and document these types of cost data.

6.3.4.4 Validity and Applicability of Results

The peers raised concerns for some projects regarding the applicability of energy and demand savings estimates determined at one facility to other locations or facility types. These concerns frequently focused on the peers' perception that the performance data collected did not adequately characterize the technology being assessed, making it difficult or impossible to extend energy and demand savings estimates to other facilities.

1. **Issue**: The results of some peer-reviewed field assessment projects were extended to estimate energy and demand savings at a broad range of facility types or a broad range of operating conditions, even though important attributes that influenced energy and demand savings at the tested facility had not been investigated or characterized. This led peers to question the validity of applying the savings estimates beyond the specific facility where the technology was installed.
   Recommendation: ETP staff should design assessments to monitor all variables that affect a technology's performance and develop models that account for these variables if extending results to additional facility types or operating conditions.

2. **Issue:** In the course of some technology assessments conducted at customer facilities, modifications were made to systems over and above the installation of the technology that ETP staff sought to study. These additional modifications obfuscated the energy and demand impacts of the technology under study, making it difficult or impossible to arrive at valid conclusions regarding the technology. Nonetheless, in at least two of these cases, ETP staff did articulate conclusions.
   Recommendation: Train ETP staff to draw conclusions regarding a technology's performance only where the effect of that technology can be isolated from other system changes that occur during the test period. Encourage ETP staff to recommend subsequent research where an assessment project's results are inconclusive.

6.3.4.5 Market Viability

In several projects, peers suggested that documenting non-energy attributes of the subject technology would have provided important additional information regarding the technology's market viability.

1. **Issue:** The peers occasionally identified non-energy attributes of a technology being assessed that could play a pivotal role in the market's adoption of that technology, but that were not investigated as part of the ETP assessment project. In addition to saving energy and reducing demand at acceptable cost, emerging technologies must satisfy additional consumer performance expectations, as noted previously in the Business Risk Assessment and Case Study discussions.
   Recommendation: ETP staff should design technology assessment projects to investigate and document important non-energy performance characteristics that may provide crucial insight into market viability and the advisability of transferring a technology to an EE program. Questions to consider in this regard include: Does the emerging technology provide all of the amenities provided by the incumbent technology? Is the quality of the amenity provided by the emerging technology different in some way from that provided by the incumbent technology? Is the emerging technology broadly applicable in a wide variety of facilities, or is its practical use limited only to certain niches?

6.3.4.6 Documentation

Peers noted shortcomings in the documentation for many of the peer-reviewed projects.

1. **Issue:** Many of the final assessment reports described the technology and the assessment project clearly, but others did not. In some cases, this led to divergent conceptions between peers and the ETP project team about the intent of the assessment project, and therefore criticism of project execution that may have been based on false assumptions.
   Recommendation: Future ETP implementation would benefit from greater attention to documenting projects so that by reading the final assessment report, as well as interim project documentation, individuals unfamiliar with the assessment project could gain an adequate understanding of the context and goals of the project, the incumbent technology (if any), the technology installed or other changes made to the existing system, the results of those changes, instrumentation used to collect data, data analysis procedures and the conclusions drawn by project personnel.

2. **Issue:** Many peer-reviewed projects used simulation models to estimate annual energy savings at a specific facility, or to generalize the results obtained at a facility to other climate zones. Often where such models were used, the input parameters were not documented by project staff, making it difficult or impossible to understand what was modeled.
   Recommendation: ETP staff should document the assumptions and parameter values used as inputs to technology performance models developed for assessment projects.

The Peer Review results indicate that ETP staff should institute a variety of operational changes to improve the execution and rigor of technology assessments conducted through the

ETP. Doing so will increase the validity and usefulness of information disseminated by the ETP to utility staff and other stakeholders. ETP staff have demonstrated the ability to design and conduct assessments in an exemplary manner; however, the Peer Review results indicate this to be the exception rather than the norm in terms of program implementation. The recommendations presented above, if acted on in concert with ongoing efforts by ETP staff to refine program operations, will increase the quality and consistency of subsequent ETP technology assessments.

7 SUMMARY OF FINDINGS AND RECOMMENDATIONS

This chapter presents findings and recommendations generated by the evaluation team during the evaluation of the 2006-2008 ETP. Based on the work conducted over the course of the project, the evaluation team concluded that the design of the ETP as implemented during the 2006-2008 program cycle was plausible and that the implementation processes developed by the utilities were consistent with the broad program intentions outlined within the corresponding Program Implementation Plans (PIPs). In addition, the team found that ETP staff had acted on recommendations made in prior program evaluations and had met their goals in terms of the following three metrics documented in the 2006-2008 PIPs to be used to measure the progress of the Statewide ETP:

1. Number of technology assessments initiated:

Utility	Technology Assessments Specified in 2006-2008 PIP	Technology Assessments Actually Initiated (2006-2008 Program Cycle)
PG&E	45	67
SCE	45	54
SDG&E	20	20
SCG	18	25

Source: ETP tracking data compiled into master evaluation database.

2. Annual updates to the Emerging Technology Database
3. Quarterly meetings of the Emerging Technologies Coordinating Council

A high level synopsis of additional ETP activities during the 2006 – 2008 program years includes the following:

- PG&E focused primarily on lighting and HVAC projects while SCE focused primarily on lighting and industrial process projects and Sempra focused primarily on lighting and water projects;
- The majority of projects surveyed for PG&E (88%) and SCE (77%) were expected to obtain both electrical energy (kWh) and demand (kW) savings while the majority of Sempra's projects (69%) were expected to generate gas (therm) savings;
- Analysis of utility ETP and EE program tracking systems revealed that PG&E's transferred ETP technologies had generated approximately 59 GWh of ex ante expected first year gross savings and that that SCE's transferred ETP technologies had generated approximately 196 GWh of ex ante expected first year gross savings. Although some technologies identified by Sempra ETP projects were recommended for consideration as EE program measures, no activity for transferred ETP technologies was recorded in Sempra EE program tracking system data for the period 2006 –2008.

> As discussed in Section 6.2, a variety of ETP technologies have generated the observed ex ante expected first year gross savings impacts. The majority of impacts can be attributed to lighting technologies (e.g., evaluations of commercial lighting technologies and residential LED downlights), HVAC technologies (e.g., residential air conditioner charge and air flow verification study and evaluations of commercial air conditioning equipment), and information technologies (e.g., computer network power save software and 80+ personal computers).

The evaluation team also observed inconsistencies in program operations across the utilities and numerous opportunities to improve program performance.

The discussion that follows is organized by major evaluation activity such that findings are presented for each activity:

- Program Design Assessment (Section 7.1.1)
- Program Implementation Assessment (Section 7.1.2)
- Impact Assessment (Section 7.1.3)

It is important to note that many of the findings and recommendations overlap evaluation activities; thus, the recommendations are grouped together and presented in Section 7.2. The chapter concludes with additional considerations posed by the evaluation team for the ETP based on knowledge gained during the evaluation as well as an understanding of California's evolving programmatic and regulatory landscape (Section 7.3).

7.1 Findings

Select findings associated with each major evaluation activity are presented in this section.

7.1.1 Findings: Program Design Assessment (PDA)

The essence of the Program Design Assessment was to review, document, and assess the design of each IOU ETP. The intent of this assessment was to gauge the extent to which each IOU ETP, as designed during the 2006-2008 program cycle, was capable of meeting the needs of California for future energy efficiency technologies and, if not, how the programs should be restructured. The primary research tasks conducted as part of the Program Design Assessment include:

- Development of final program theory and logic models and associated performance indicators (Section 7.1.1.1)
- Business Risk Assessment (Section 7.1.1.2)
- Aggregate Analysis (Section 7.1.1.3)

Findings from each of these tasks are presented in the remainder of this section.

7.1.1.1 Program Theory and Logic Models and Associated Performance Indicators

PDA1. Finding: The final program theory and logic models (PTLMs) and associated performance indicators developed by the evaluation team were used to assess the plausibility of the ETP design. The evaluation team concluded that the program design is plausible; however, the team noted that the ability of the ETP to help EE programs achieve energy and demand impacts may have been compromised by lack of feedback between the ETP and the EE programs to which technologies had been transferred. The evaluation team also noted that ambiguity exists in terms of how the performance indicators specified in the PTLMs would be used to assess program progress over time, primarily due to a lack of well-defined and mutually agreed upon (between the ETP and CPUC) success criteria for each indicator.

7.1.1.2 Business Risk Assessment

PDA2. Finding: The evaluation team found that many ETP projects were lacking adequate information to support their selection into the ETP. The range of scores across final Business Risk Assessment data collection tools was large, likely as a result of different methods for preparing the Business Risk Assessment data and different processes for tracking the data. However, each utility had at least one project in the “above average” quadrant, indicating that the approach within each utility allowed for a successful outcome.

PDA3. Finding: The ETP technology selection process should be informed by knowledge about the risks associated with a given technology as well as its associated leadership team and ability to gain market traction. Currently, ETP staff place a high priority on technology risks and a lower priority on leadership team and market traction risks. Knowledge about the needs of the market, the structure of the market and industry, and the market size (among other factors) provides a basis for understanding the likelihood that a given technology will succeed in attaining significant market adoption. Some such information is already available through statewide market studies, but additional research will be required to develop the specific data needed for ETP staff to make informed technology selection decisions.

PDA4. Finding: Currently, the ETP focuses on the technology aspects of new technologies while placing lesser emphasis on the risks associated with the technologies’ market traction and leadership teams (having some staff with entrepreneurial experience). Examining these other aspects of the business case for a given product requires interdisciplinary discussion and analysis.

PDA5. Finding: The Business Risk Assessment process provides a venue for ETP staff to document how they selected technologies for assessment. In addition to their professional judgment, ETP staff may talk to representatives of several key stakeholder groups, including potential customers, competitors of a specific vendor, industry experts, former colleagues, and distributors. In some cases, formal market studies are appropriate. The Business Risk Assessment revealed, however, that formal documentation of ETP decision-making in this regard was often lacking and ETP staff advised the evaluation team that it had been several years since the inception of many assessments and that trying to re-create the information used to make the technology selection would be difficult.

7.1.1.3 Aggregate Analysis

PDA6. Finding: The mix of technologies covered for the statewide ETP portfolio appears reasonable. The evaluation team notes that SEMPRA, with the smallest program budget, assessed the majority of projects expected to produce gas savings. Overall, 25% of the projects included in the aggregate analysis were focused on gas savings. Whether this is consistent with the latest potential studies or consistent with the California Strategic Plan is unknown. While ETP stakeholders believe the distribution of projects targeting gas and electric impacts should be specified, they do not know what the distribution should be, although there is an assumption that "someone" understands this and is actively managing the ETP portfolio.

PDA7. Finding: The aggregate analysis and other evaluation components found that Sempra may have staffing issues that prevent ETP staff from operating the ETP as efficiently as possible. Sempra has a smaller ETP budget than the other utilities and it has the highest number of projects per manager. Together, these factors contributed to the evaluation team's perception that Sempra ETP staff were stretched in some aspects of program implementation.

PDA8. Finding: The evaluation team found documentation of useful technical potential estimates for only 36% of ETP projects. This is consistent with other aspects of the evaluation that highlighted the need for improved documentation of ETP decision-making and implementation processes (e.g., migration of projects through the ETP phases).

7.1.2 Program Implementation Assessment (PIA)

The essence of the Program Implementation Assessment was to assess how effectively and efficiently each IOU ETP was being implemented during the 2006-2008 program cycle, including any synergies that emerged from statewide collaboration. The primary research tasks conducted as part of the Program Implementation Assessment include:

- Process Mapping (Section 7.1.2.1)
- Status of Recommendations from the Evaluation of the 2004/05 ETP Cycle (Section 7.1.2.2)
- Assessment of the Nature and Frequency of Interactions among ETCC Stakeholders (Section 7.1.2.3)
- Stakeholder Interviews (Section 7.1.2.4)
- Case Studies (Section 7.1.2.5)

Findings from each of these tasks are presented in the remainder of this section.

7.1.2.1 Process Mapping

PIA1. Finding: The process mapping exercise revealed that the ETP implementation processes developed by the utilities during the 2006-2008 program cycle were consistent with the broad program intentions outlined within the corresponding PIPs. The most significant differences were observed in the transfer phase, where the majority of program efforts were concentrated upon the transfer of information to internal utility staff rather than external stakeholders. This change in focus was largely an outgrowth of the increased importance placed on meeting resource acquisition goals and the role the ETP plays in ensuring that the utilities have adequate technologies offered through EE programs to meet these goals.

7.1.2.2 Status of Recommendations from the Evaluation of the 2004/05 ETP Cycle

PIA2. Finding: The evaluation team used the various evaluation components to determine that ETP managers and staff had actively responded to the recommendations made in previous program evaluation efforts. However, in most instances, the programmatic responses remained ongoing exercises that could benefit from more formalized procedures and improved documentation of program activities. The only recommendation not fully addressed regarded the timely completion of final technology assessment reports, a process that has been hampered by utility concerns over potential liabilities related to disseminating information that may present a technology in an unfavorable light.

7.1.2.3 Assessment of the Nature and Frequency of Interactions among ETCC Stakeholders

PIA3. Finding: The evaluation team believes that the ETCC meetings serve the purpose of bringing ETP staff together to informally discuss technologies being considered for each utility's ETP, providing networking opportunities regarding specific technologies, and presenting possible collaboration opportunities across the utility ETPs. However, the team notes that the observed lack of formality hinders the ability to document decisions made during the meetings and track subsequent actions taken on specific discussion topics. In addition, attendance at the meetings appeared to be limited to utility staff and a select group of program stakeholders, a factor that likely contributes to limited awareness of the ETP among a broader stakeholder group.

7.1.2.4 Stakeholder Interviews

PIA4. Finding: Stakeholders universally agreed that the ETP should play a crucial role in ensuring that there are sufficient technologies for the State of California to achieve its objectives in energy efficiency. The ETP is expected to provide a mechanism for identifying promising technologies and moving them into the marketplace. Perhaps the biggest area of confusion among ETP stakeholders concerns how technologies are selected for examination within the Program. Several people recommended that this process be made more inclusive and more transparent in order to ensure that program resources are being focused where they will achieve maximum results.

PIA5. Finding: Stakeholders questioned whether or not the incentives in place at present are sufficient to encourage the ETP to focus on longer-term projects. Because the utilities have ambitious energy and demand impact goals for each three-year program cycle, there is a tendency for utility staff to expect the ETP to meet their more immediate need for new technologies. As a result, there is a concern among outside parties that the ETP places a disproportionate emphasis on near-term technology development at the risk of not devoting sufficient attention to the longer-term planning horizon and statewide strategic goals.

7.1.2.5 Case Studies

PIA6. Finding: ETP implementation processes were refined considerably over the course of the 2006-2008 program cycle. ETP staff identified candidate technologies from a variety of sources and assessed technologies across a number of different market sectors and end-use measure categories. ETP projects addressed a number of objectives within each technology assessment, but primarily focused on field verification of energy savings and other aspects of technology performance (e.g., non-energy performance considerations). A variety of stakeholders were involved in a typical ETP project, including consultants, customers, and technology vendors. While ETP project managers often said they spoke to other utilities about their assessments, the evaluation team found limited evidence of formal coordination of projects across utilities.

PIA7. Finding: After ETP staff completed technology assessments, project managers communicated results to interested parties within the utility and external to the utility, using both formal and informal means. If assessment results were positive, the ETP recommended the technology for inclusion in an EE program. Only one of the 34 technologies in the Case Study sample that moved into the assessment phase is now offered through a prescriptive EE program; eight technologies are offered through a custom EE program, and a number of others were being considered for an incentive at the time the Case Studies were conducted. The utilities did not have the means to formally track technologies after an assessment was completed, a factor that limited the ability of project stakeholders to stay engaged in the post-assessment process (e.g., transfer to an EE program).

7.1.3 Impact Assessment (IA)

The essence of the Impact Assessment was to document the extent to which short-, mid-, and long-term objectives were being achieved by each IOU ETP during the 2006-2008 program cycle, including the extent to which ETP technologies have been transferred to utility EE programs. Primary research tasks conducted as part of the Impact Assessment include:

- Data collection and the development of the Emerging Technologies Program Database (Section 7.1.3.1)
- Assessment of ETP technologies transferred to EE programs (Section 7.1.3.2)
- Peer Reviews (Section 7.1.3.3)

Findings from each of these tasks are presented in the remainder of this section.

7.1.3.1 Data Collection and the Development of the ETP Database

IA1. Finding: This evaluation was hindered by a lack of consistent, well organized project data. This impacted the evaluation in several ways. A significant amount of time and budget went into cleaning and organizing data received from numerous data requests, as well as working with ETP staff to clarify gaps and inconsistencies. Moreover, this was a taxing exercise for ETP staff who provided considerable amount of support to achieve data gathering and cleaning tasks. Because the collected data were the basis for various evaluation sample selections and project reviews, data gaps, delays, and inconsistencies propagated throughout the evaluation.

IA2. Finding: The ETPdb will require refinement during the initial transition period and as the expanded scope of the 2010-2012 programs is realized. This will require continuous communication between the CPUC and the IOUs, especially initially, to ensure that the correct data is being captured efficiently and unambiguously.

7.1.3.2 Assessment of ETP Technologies Transferred to EE Programs

IA3. Finding: The evaluation team identified the ETP projects that had produced technologies that were transferred to an EE program using a range of sources. Data sets provided by the IOUs, the results of other evaluation components (e.g., the aggregate analysis), and conversations with ETP staff were all important components of this data collection effort. The analysis revealed that PG&E's transferred ETP technologies had generated approximately 59 GWh of *ex ante* expected first year gross savings and that that SCE's transferred ETP technologies had generated approximately 196 GWh of *ex ante* expected first year gross savings. Although some technologies identified by Sempra ETP projects were recommended for consideration as EE program measures, no activity for transferred ETP technologies was recorded in Sempra EE program tracking system data for the period 2006 –2008.

The evaluation team experienced considerable difficulties conducting this analysis due to inconsistent and/or non-existent project naming and numbering conventions, decision documentation, and feedback loops between the ETP and the EE programs to which technologies were recommended for transfer. In many instances, the evaluation team was not able to identify in EE program tracking systems technologies classified as having been transferred from the ETP. In addition, the evaluation team had difficulty assessing the linkages between ETP and EE lighting measures because the ETP technologies were not defined with a high degree of specificity as to what was accomplished on those technologies during the ETP projects.

IA4. Finding: The inadequate tracking systems hinder the ability of ETP staff to communicate the efforts and successes of the program to external stakeholders and are symptomatic of a lack of formal feedback loops between the ETP and the EE program staff. As a result, the situation also creates a lack of accountability for ETP staff who have historically been judged on the number of technology assessments they complete rather than on what happens to those technologies after they have been recommended for transfer to an EE program. While the evaluation team understands that the EE program managers have primary responsibility for promoting the adoption of emerging technologies in the marketplace, ETP managers' role in increasing the probability of adoptions comes in the form of a rigorous screening of candidate technologies, a scientifically rigorous assessment of selected technologies, and a formal and systematic process for transferring these technologies to EE programs.

7.1.3.3 Peer Reviews

IA5. Finding: The degree of scientific rigor applied to the peer-reviewed projects varied considerably from one project to another—even within the same utility. This diversity in rigor appears to reflect diversity of understanding and opinion among ETP project managers regarding the fundamental goals of and theory behind the ETP. Coupled with project documentation that frequently failed to explicitly state the goals of an assessment project, differences in the perceived need for scientific rigor between peers and ETP project managers led to many of the issues raised by the peers.

IA6. Finding: The Peer Reviews demonstrated that individuals at each of the IOUs are capable of designing and conducting high quality technology assessments and producing correspondingly high quality project documentation. The scores awarded by the peers in many of their reviews indicate, however, that the quality of assessment projects was not consistently high.

IA7. Finding: Few of the peer-reviewed assessment projects collected data on the incremental costs necessary to purchase, install, operate or maintain the technologies that were assessed. Some ETP project managers stated that the collection of these data was outside the scope of their assessment projects, while others stated that it was definitely within scope.

IA8. Finding: Many of the final assessment reports described the technology and the assessment project clearly, but others did not. In some cases, this led to divergent conceptions between peers and the ETP project team about the intent of the assessment project, and therefore criticism of project execution that may have been based on false assumptions.

7.2 Recommendations

The evaluation team has generated a number of recommendations based on the findings discussed previously, many of which were identified by more than one evaluation activity. The recommendations have been grouped into the following categories with the findings associated with each in parentheses:

1. ETP Planning:
   - **Recommendation (1)** (*based on PDA6 and PIA5*)
   - **Recommendation (2)** (*based on PDA 2*)
   - **Recommendation (3)** (*based on PDA8*)
   - **Recommendation (4)** *(based on PIA3*)
   - **Recommendation (5)** *(based on IA2*)
2. Program Theory and Logic Model:
   - **Recommendation (6)** (based on PDA1and IA4).
3. Technology Selection:
   - **Recommendation (7)** (based on PDA2)
   - **Recommendation (8)** (based on PIA4)
4. Technology Assessment:
   - **Recommendation (9)** (based on IA5, IA6, IA7)
   - **Recommendation (10)** (based on IA8)
5. Program Documentation:
   - **Recommendation (11)** (based on PDA1, PDA5, PIA1, PIA2, PIA3, IA8, IA1, IA3, PIA7, PIA6, IA2)
6. Program Staffing and Training Needs:
   - **Recommendation (12)** (based on PDA7)

- **Recommendation (13)** (based on PDA2, PDA4, IA6)

7. Emerging Technologies Coordinating Council (ETCC):
    - **Recommendation (14)** (based on PIA3)

Recommendation (1)

ETP managers should assess the distribution of ETP projects by fuel type, specify future project distribution targets, communicate those targets to ETP project managers and implementation staff, and then work with ETP staff to manage ETP technology selection processes to achieve these targets.

For instance, one option to consider would be to mine the residential and nonresidential potential studies for ideas about the appropriate technology balance across market sectors and fuel types. ETP managers should collaborate with the CPUC and other stakeholders during this assessment.

Recommendation (2)

ETP staff should establish priorities for areas in which significant market research efforts should be performed based on the ultimate ETP goals.

The priorities should align with the ultimate goals of the ETP as specified by ETP staff and the CPUC to help ensure that program implementation strategies remain aligned with the ultimate program goals. The prioritized market research efforts would help identify market opportunities worthy of exploration and possible resource investment by the ETP. As an example, the utilities and other program stakeholders could collaborate to establish a clear technology agenda, which would then be used as the basis for developing technology-specific projects. Obvious focal points for this approach would include the "Big Bold" Energy Efficiency Strategies specified in the California Long Term Energy Efficiency Strategic Plan as well as additional energy efficiency goals adopted by the CPUC.

Recommendation (3)

ETP staff should develop robust technical potential estimates (and when feasible the expected market adoption values based on market research completed by ETP staff, other utility staff, or other external organizations) for technologies considered for inclusion in the Program. Doing so will provide ETP staff and other stakeholders additional information regarding the magnitude of savings possible from ETP activities, data that could be used to prioritize ETP investment decisions.

Recommendation (4)

ETP staff and the CPUC should collaborate to ensure that budgets approved for the ETP provide sufficient detail regarding funds allocated to near-term vs. long-term program activities to help ensure that a near-term focus does not dominate Program activities. This tension, which can be exacerbated by the length of technology assessment projects (which can last up to four years), is likely to continue and, as a result, the CPUC and the utilities may need to revisit structural issues related to the regulatory treatment of the ETP within the California policy context.

Recommendation (5)

ETP staff and the CPUC should collaborate to ensure a smooth transition to the 2010-2012 program cycle and corresponding use of the ETPdb. This will involve multiple aspects including the following:

- Clear and regular communications between the utilities and the CPUC,
- Continuing the development of the ETPdb with specific attention to incorporating new performance indicators associated with the 2010-2012 ETP designs,
- Standardizing program operations to make them more consistent and supportive of a common data tracking format, and
- Better documenting programmatic activities and decision-making.

Undertaking these activities will improve program management and reporting capabilities and facilitate subsequent efforts to evaluate the overall success of the program.

Recommendation (6)

ETP staff should work with the CPUC to review the program theory and logic models submitted with the 2010-2012 ETP PIPs and finalize the performance indicators that will be used to assess program progress during the 2010-2012 evaluation cycle. ETP staff and the CPUC should also define and reach agreement on the success criteria associated with these indicators and incorporate the requisite data collection and documentation processes into program implementation. Please refer to Chapter 4 for more details on program theory and logic models, performance metrics and success criteria. Once finalized, the performance indicators and success criteria will improve the ability of ETP management and the CPUC to:

- Track program progress over time,
- Identify opportunities for increasing program effectiveness based on observed progress towards performance indicators and other factors,
- Communicate program efforts and successes to external stakeholders, and
- Support ongoing program management and evaluation.

Recommendation (7)

ETP staff should integrate key aspects of the Business Risk Assessment (e.g., development of compelling value propositions and documentation of program decision-making (i.e., due diligence)) into the program implementation process. This will enable ETP staff to consistently justify their resource investment decisions across all projects within the ETP portfolio.

Recommendation (8)

ETP staff should establish technology selection process that incorporates inputs from the CPUC and other stakeholder interests and perspectives. The technology selection process should be transparent, rigorous and well documented to help ensure that program implementation strategies remain aligned with the ultimate program goals.

Recommendation (9)

ETP management should establish a consistent set of standards for design, execution, and documentation of technology assessment projects. These standards should include consistent guidelines for scientific rigor (at a minimum, procedures to 1) establish representative baselines, 2) calibrate sensors, 3) document measurement uncertainty, and 4) comply with relevant evaluation protocols where they exist) that would be implemented in technology assessment. Also these standards should include the collection of incremental cost data to support cost-effectiveness assessment of candidate emerging technologies.

- The apparent inconsistency of understanding the need for scientific rigor among ETP staff suggests that the ultimate goals of the Program have not been broadly and uniformly communicated. ETP management, the CPUC, and other interested stakeholders should engage in a dialogue regarding the ultimate goals of the ETP and the degree of scientific rigor necessary to support those goals. Such a dialogue would support development of a common understanding and common expectations for scientific rigor both within the ETP and across stakeholder groups.
- ETP staff and the CPUC should collaborate to establish a set of standards for the design, execution, and documentation of technology assessments to promote consistently high-quality assessment projects, and thereby the value of the ETP. The standards should be supported by a rigorous and consistent training regimen on the application of these standards required of ETP staff and possibly other program stakeholders.
- The collection of incremental cost data should become standard practice for ETP assessment projects to support cost-effectiveness assessments of candidate emerging technologies.

Recommendation (10)

Future ETP implementation would benefit from greater attention to documenting assessment projects so that by reading the final project report, individuals unfamiliar with the project could gain an adequate understanding of the fundamental aspects of the project including the following:

- Context and goals of the project,
- Description of the incumbent technology (if any),
- Installed technology or other changes made to the existing system,
- Results of those changes,
- Instrumentation used to collect data,
- Data analysis procedures, and
- Conclusions drawn by project personnel.

The adoption of a standard reporting template that includes these elements would help to ensure that project reports are useful to parties outside of the assessment project.

Recommendation (11)

ETP staff should refine the quality and consistency of documentation procedures for program- and project-level budget expenditures and the following program elements:

- Decision-making and criteria for technology selection
    - ETP should strive to create consistent project naming and numbering conventions, decision documentation, and feedback loops between the ETP and the EE programs to which technologies were recommended for transfer.
    - ETP staff should better document technology selection decisions including which stakeholders were involved in select aspects of those decisions. Doing so would greatly reduce the amount of time required to prepare Business Risk Assessment data in future program cycles and would also help ETP staff better justify resource investment decisions.
- Decision-making and standards for technology assessment
    - ETP staff should make a concerted effort to improve the quality and consistency of program documentation to ensure a clear record of program processes and decision-making (at both the program and project levels) exist. This recommendation is made because one of the issues observed during the Case Study analysis was the challenge of consistency across the various program undertakings, especially the documentation of program decision-making. This variability underscores an issue that will be important to the utilities as the ETP increases in scale – consistency. The Program at present depends heavily upon the people rather than the process.
- Decision-making and criteria for technology transfer
    - The utilities should continue efforts to refine program implementation processes to develop more formal and better documented procedures, especially for the transfer phase. A major focus should be placed on improving the quality and consistency of documentation regarding program decision-making (e.g., rationale for recommending a technology for transfer) and data tracking processes (e.g., assigning unchanging master ID numbers to all ETP projects). Creating consistency in implementation processes will help facilitate comparisons of program performance across the utilities and also increase the ability of ETP staff to coordinate and optimize research and communication efforts.
    - ETP staff should continue efforts to improve documentation of program processes and procedures and associated decision-making. Improved documentation is critical given the continued evolution of the ETP during the 2006-2008 program cycle as well as the pending transition to the expanded program scope approved for the 2010-2012 program cycle. The 2010-2012 ETP PIPs reflect continued progress made by ETP managers and staff to address recommendations generated during program evaluation efforts; however, attention is still needed on the following priority areas:

  - Generating feedback loops between the ETP and EE programs to assess the success of transferred technologies and identify and mitigate barriers to anticipated levels of market adoption,
  - Improving program data tracking systems and operations including consistent updates of the ETCC database, and
  - Collaborating with the utilities' respective regulatory affairs staffs to streamline internal review processes for final technology assessment reports.

- Data tracking systems and operations including reporting and updating the ETP database as well as consistent updates to the ETCC database
  - As the ETP increases in size, diversifies its program activities, adds new staff, and sheds staff during anticipated turnover cycles, a standardized project tracking system with adequate query and reporting functionality will be necessary to retain and make use of program information - both within and across utilities. The ETPdb developed by the evaluation team in collaboration with the CPUC and the utilities should serve this purpose. Going forward, basic data tracking activities should be implemented to facilitate informative review of and provide insights into the ETP. Such activities would include the following:
    - Assigning unchanging master ID numbers to ETP projects,
    - Archiving data in a standard format as it is collected, and
    - Refining implementation processes to facilitate tracking of technologies transferred from the ETP to EE programs.

- ETP staff should collaborate with EE program staff to create consistent project naming and numbering conventions, decision documentation, and feedback loops between the ETP and the EE programs to which technologies were recommended for transfer. Doing so will increase project stakeholder involvement in the post-assessment process, thereby helping to drive the incorporation of ETP technologies into EE programs. It will also facilitate improved tracking of adoptions of ETP technologies in EE programs to support program management and subsequent program evaluations.

Recommendation (12)

Sempra management should examine existing ETP staffing levels and consider increasing them as needed to increase the efficiency of ETP operations. Additionally, Sempra management should consider other potential resource solutions such as the use of third-party vendors similar to the model used in the Portfolio of the Future program.

Recommendation (13)

ETP management should ensure staffing qualification and training needs in the following areas:

- **Implementation of the Business Risk Assessment Framework**: A regular and ongoing (e.g., quarterly) training regime on the salient features of the Business Risk Assessment framework should be implemented to assist ETP staff in incorporating these elements into program operations.

- **Technology Selection Process**: The ETP should expand its use of interdisciplinary project teams, one of the hallmarks of successful product development efforts, to improve technology selection processes and increase the likelihood that candidate technologies will succeed in EE programs as well as in the broader market.

- **Technology assessment process**: Refer to Recommendation 9.

Recommendation (14)

ETP staff and other ETCC stakeholders should take the following steps to improve the effectiveness of the ETCC meetings:

- More formally discuss and document decisions regarding 1) planning of technology assessments (e.g., have other utilities performed a similar assessment that can be leveraged to improve the proposed assessment design or offer other lessons learned?) and 2) transfer of technologies into other IOUs (e.g., how can other IOUs use the results of a completed assessment for their own needs?),

- Improve meeting minutes to clearly document each meeting's action items, distribute the meeting minutes within several days of meeting completion, and then devote some portion of the next meeting to report on progress made toward completing the specified action items, and

- Endeavor to broaden meeting participation to include a more diverse set of participants working within the realm of emerging energy technologies (e.g., representatives from regulatory bodies, academia, the national labs, the VC community, etc.).

7.3 Lessons Learned for Subsequent Evaluations of the ETP

The evaluation team learned lessons over the course of the evaluation that could help inform the content and structure of subsequent evaluations of the ETP. In addition, the evaluation team noted ideas for subsequent research that could be addressed by later program evaluations to better elucidate ETP processes and opportunities. These items are summarized at a high level in the remainder of this section.

- The timing of subsequent evaluation cycles should be better aligned with the timing of program implementation cycles to allow both formative and *complete* summative results (e.g., census samples) of programmatic activities to be developed.

- Early in the next evaluation cycle, the evaluation team should use the program theory and logic models presented in the 2010-2012 PIPs to create performance indicators for the links in the models. These indicators and the associated success criteria should be agreed to by the CPUC and IOUs in advance of measurement and assessment by the evaluation team. The evaluation plan should be based on the assessment of the links in the models as well as the agreed upon performance indicators and success criteria.

- Future evaluations should seek to better understand the multi-actor context of the ETP including the ETP's role within the RD&D marketplace, its relative influence on technology commercialization paths, and the effectiveness of partnering arrangements in place between the ETP and other market actor groups.

- Future evaluations should identify and describe the various ways new technologies enter into utility energy efficiency programs including the percentage of new technologies generated by the ETP as opposed to other methods.

- Future evaluations should expand the number interviews conducted with energy efficiency program mangers as well as vendors/manufacturers of technologies assessed through the ETP to better understand ETP implementation processes, the benefits of ETP participation, and programmatic response to findings and recommendations generated during evaluation activities.

- Future evaluations should continue data collection efforts with program stakeholders to better understand market awareness of ETP activities, opportunities for collaboration across various stakeholder groups, and alignment of ETP investment decisions with California's strategic energy initiatives.

- Future evaluations should conduct a more in-depth examination of the value of ETP activities to ratepayers. This could involve primary data collection with relevant market actor groups as well as improved documentation of the impacts of ETP technologies transferred to and adopted by utility energy efficiency programs.

- Future evaluations should explore the pros and cons associated with alternative program implementation models (e.g., a single statewide ETP or an ETP operating under a person/entity with centralized decision-making authority and associated accountability) to determine if a revamped program structure could achieve efficiencies in program operation and cost-effectiveness.

- Program- and project-level data collection/review should be a high priority from the start of the next evaluation cycle. The overarching specification of data needs should be presented to the IOUs early on to set their expectations – these specifications should then be modified regularly to reflect ongoing evolution of the program (and therefore the evaluation) and should be referenced routinely to communicate to the IOUs what data is still needed and in what format.

- The ETPdb should streamline subsequent program management and evaluation activities. This assumes that a strong QA/QC process is in place including the following:

    - The evaluation team should perform monthly QA/QC on the evaluation database and monitor new additions to assure that data are entered in a correct and complete manner and to clarify areas of uncertainty as they arise.

    - There should be monthly contact between the evaluation team and the IOU ETP program managers (the overall managers, not the multiple project managers) regarding the number of projects within the database at a given time. The numbers observed by the evaluation team and the ETP managers should match month after month.

  - The evaluation database should be the sampling frame for any evaluation activity addressing projects that have encumbered ETP funding.

- The next evaluation should include a review and refinement of the ETPdb. Questions to address should include:

  - **Modification** - What fields are ambiguous and/or are not being completed as anticipated?

  - **Removal** - What fields are irrelevant or redundant and can be removed?

  - **Addition** - What additional fields are needed to capture the details of the evolving program?

  - **Process** - How effective and efficient is the process of uploading data from the IOUs to the CPUC/EEGA? How can the ETPdb reporting and querying features be improved to better serve the IOUs, the CPUC, and the evaluators?

- Future evaluation teams should be multi-disciplinary in nature; this will ensure that the ETP is considered from a broad perspective, one that acknowledges and understands the complexities and nuances of the RD&D marketplace.