

Final Report: Evaluation of the California Statewide Emerging Technologies Program

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For the

California Public Utilities Commission

Energy Division

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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

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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.

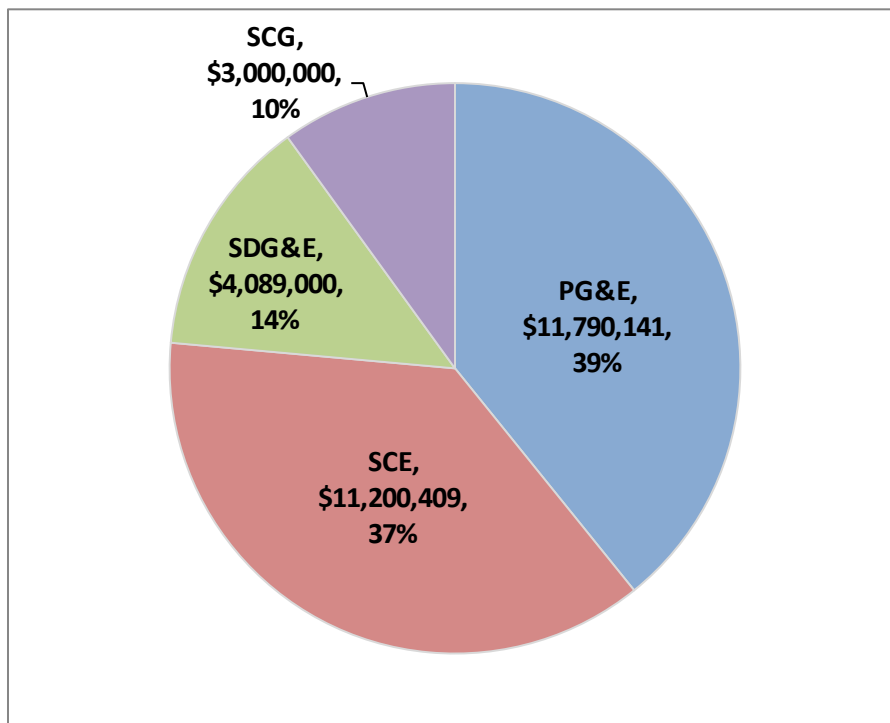
E.1 The Emerging Technologies Program (2006 – 2008 Program Cycle)

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

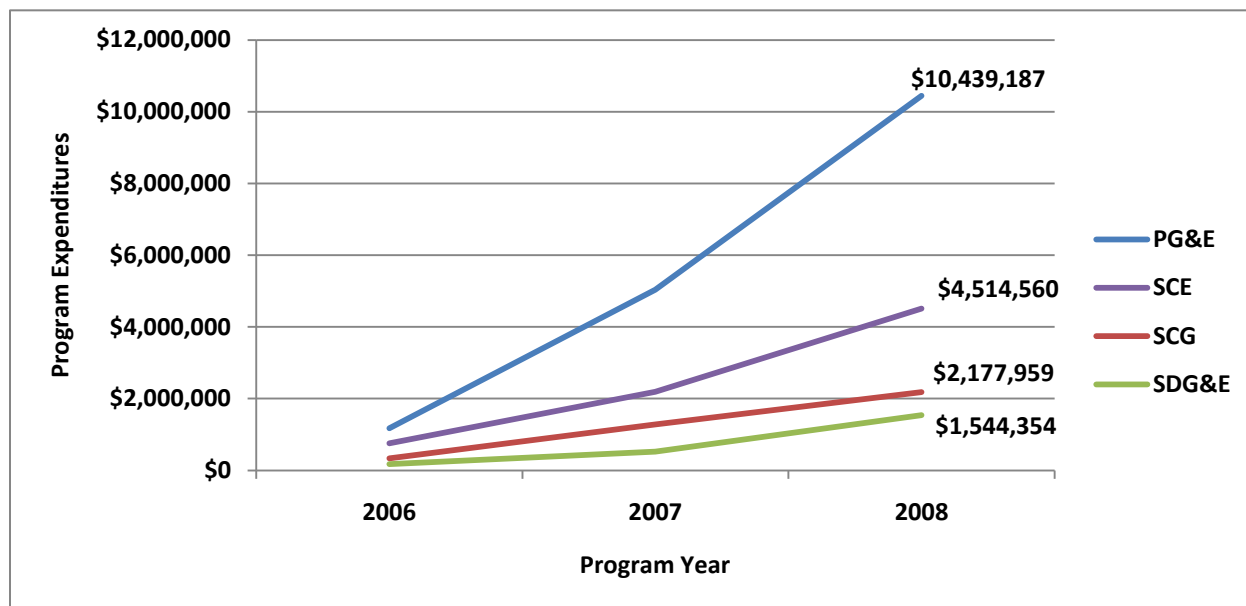


Source: PG&E, SCE, SDG&E, SCG 2006-2008 Energy Efficiency Programs Statewide Emerging Technologies Program Summaries (2006).

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://eeга2006.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 Assessment⁴ 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.