PY2010-2012 CALIFORNIA STATEWIDE EMERGING TECHNOLOGIES PROGRAM EVALUATION PHASE I REPORT VOLUME I - FINDINGS

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For the

California Public Utilities Commission

Energy Division

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A NOTE ON VOLUME I

This is the first of two documents that comprise the evaluation results of the Phase I: Assessment of Design and Implementation for the PY2010-2012 Emerging Technologies Program (ETP).[1] Contents of the two documents are:

Volume I has two sections:

- The first section introduces the ETP, and gives a brief overview of the Methodology as well as Integrated Findings and Recommendations. These include program-wide findings and six key recommendations for the ETP going forward.
- The second section provides Element-Specific and Detailed Findings and Recommendations. These detailed chapters, by element, are provided specifically to help the ETP staff better understand our detailed findings, and how each of our recommendations applies to the elements in the 2010-2012 program cycle.

Volume II provides appendices in support of our findings. We group the appendices by evaluation plan tasks, and include:

- Detailed evaluation methodology, research questions and the ETP program performance metrics
- ETP scoring tools, as well as assessments of select program element scoring tools, content analysis and internet survey methodologies and data collection instruments, case studies and literature reviews for select elements
- ETP projects as of Q1 2012 categorized by end-use, market reviews for select program elements, and PG&E's technology roadmaps
- Evaluability Assessment
- ETP Database review

[1] Comprise the utility-specific ETPs operated by four investor-owned utilities (IOUs): Pacific Gas and Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas and Electric (SDG&E).

EVALUATOR CONTACT INFORMATION

Table 1 presents the contact information for the firms evaluating the PY2010-2012 Emerging Technologies Program. Itron is the prime contractor and serves as oversight for the efforts undertaken by the subcontractors. Opinion Dynamics is responsible for the majority of the activities and reporting undertaken in the evaluation. SBW Engineering is leading the development of the guidelines for conducting ETP technology assessments with Navigant Consulting supporting this effort.

Table 1. Key Evaluator Contact Information, by Firm

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1. EXECUTIVE SUMMARY

This document provides interim findings and recommendations from the PY2010-2012 Statewide Emerging Technologies Program (ETP) process evaluation. The findings in this report represent early findings (primarily based on data through Q4 2011, with a status update in Q1 2012). This research was intended to provide early feedback to the program, and help build a common understanding in anticipation of an impact assessment. We will assess impacts in a future evaluation effort, and release the final report in mid-2013.

The mission of the 2010-2012 ETP as described in the Program Implemenation Plans (PIPs) filed with the California Public Utilities Commission (CPUC), is to support increased energy efficiency market *demand* and technology *supply* (the term supply encompassing breadth, depth, and efficacy of product offerings). This is made possible by contributing to development and deployment of new and under-utilized energy efficiency (EE) measures (that is, technologies, practices, and tools), and by facilitating their adoption as measures in the investor-owned utility (IOU) EE portfolio to help support California's aggressive energy and demand savings goals.

The ETP established three goals in support of its mission:

- **Goal 1)** Increased adoption of Energy Efficiency (EE) measures through program elements such as Technology Assessments, Market & Behavioral Studies, Scaled Field Placements, and Demonstration Showcases.
- **Goal 2)** Increased EE technology supply through program elements such as Technology Development Support and Business Incubation (TRIO).
- **Goal 3)** Support of the California Strategic Plan and related solutions, including zero net energy (ZNE).

The ETP began in the late 1990s. Until 2009, the program's design was focused on assessing technologies (i.e., the Technology Assessment element) with the assessments carried out *in-situ* and at SCE's Technology Testing Center. Over the history of the program, implementation efforts were strengthened to more directly support the IOU portfolio. However, during the planning period for the 2010-2012 cycle, the CPUC adopted California's first Long Term Energy Efficiency Strategic Plan (CEESP)[2], which provided an additional direction to the ETP (to support not only the IOU EE portfolio but also the broader market) and as reflected under Goal 3 above. In addition, the program budget increased from approximately $30 million (PY2006-2008) to $43 million for the 2010-2012 cycle.

As such, in PY2010-2012, ETP staff expanded program design by incorporating five new program elements: Scaled Field Placements, Demonstration Showcases, Market & Behavioral Studies, Technology Development Support, and Business Incubation (TRIO). The IOUs developed these five new program elements in PY2010-2012 to help address the long-term policy goals of supporting increased demand and supply of innovative energy efficiency technology in support of the CEESP.

[2] Adopted on September 18, 2008. Note that 2009 was a bridge year, with no formal program implementation plans.

Status as of Q1 2012

As of Q1 2012, the ETP had exceeded its objective of initating projects across all program elements, with the exception of Scaled Field Placement (which reached 60% of its objective over the time period assessed—27 out of 36 months). Over the same time frame, the ETP implementation efforts expended considerably less than the overall ETP statewide program budget of $43 million (about 34%). However, for three of these elements, the program has up to six years following the initiation of the projects to complete the project (and presumably spend the allocated budget).[3]

Table 3 summarizes the overall project status (both projects initiated and projects completed) and expenditures for each element as of Q1 2012. When including the expected costs of committed projects, the IOUs have 58% of the overall budget either committed or spent.

Table 3. ETP Element Overall Project and Budget Status Summary as of Q1 2012

ETP Element and IOUs	2010-2012 PIP Objective (initiated projects)	Projects Initiated in 2010 or 2011	% of Project Initiated vs. Objective	2010-2012 Program Budget [a]	Program Expenditures (Inception-To-Date)	% of Budget Spent as of Q1 2012
Technology Assessments	73	130	178%	$ 29,400,396	$ 10,079,535	34%
Scaled Field Placement	15	9	60%	$2,968,695	> $606,464	20%
Demonstration Showcase	14	23	164%	$5,068,732	> $1,760,439	35%
Market and Behavioral Studies	4	21	525%	$1,699,263	> $834,464	49%
TRIO	3 per year	9	100%	$1,188,840	> $462,732	39%
Technology Development Support	6	6	100%	$797,387	> $394,970	50%
Technology Test Centers	NA	NA	NA	$2,237,141	$895,519	40%
Total	**121**	**198**	**164%**	**$43,360,456**	**$ 15,034,123**	**35%**

[3] As per the Energy Efficiency Policy Manual, Version 4.0 (July 2008) R.06-04-010, pp. 5, "In their program planning applications, the Program Administrators shall jointly propose emerging technologies programs and increases to current funding levels for these programs. The main purpose of these programs should be to increase the probability that promising technologies will be commercialized within 6 years of program funding and thereby increase the chance of obtaining additional energy savings from these technologies in the long run."

[a] SCG and SDG&E do not track their budget or expenditures by element. We have placed all their costs under technology assessment, although both utilities are active in other elements.

Overarching Findings

This evaluation sought to examine: (1) Alignment of the ETP with PIP, and (2) the ETP's Support of the CEESP. As such, the Evaluation Team assessed the implementation of the program against both the PIP (which is the guiding document for design and implementation of the program) and the broader effort of supporting emerging technologies to meet long-term policy goals, as described throughout the CEESP.

Overarching findings from our evaluation include:

- **The ETP is mostly implemented according to the PIP:** The PIP is the guiding document for design and implementation. The ETP is implemented according to the PIP Action Strategies (implemented 26 of 37 Action Strategies according to PIP). Some Action Strategies were not assessed in this phase of the evaluation because longer-term measurements are needed. As expected during the course of implementation, the IOUs have altered some Action Strategies.

- **Implementation varies across IOU territories:** While this is a statewide program, there is considerable variation in implementation across the state. This variation is in part due to different budgets across the IOUs (the Sempra utilities have a substantially lower budget than do PG&E and SCE). While the IOUs plan to implement all elements, drawing on the strengths of each IOU could offer a better effective statewide approach.

- **The ETP brings value to the marketplace:** The IOUs provide a variety of support for EE technologies, approaches and practices. Specifically, through their Technology Assessments (130 initiated to date as shown in the status update), the IOUs are verifying energy savings claims, which is one of the primary needs identified through our evaluation efforts and the main outcome expected of Technology Assessments. Through Demonstration Showcases (23 initiated as of Q1 2012), the IOUs are demonstrating and increasing the visibility of these technologies. The ETP is also testing products and practices to determine the feasibility of emerging technologies in advance of codes and standards, and identifying and providing performance specifications, through the Technology Development Support efforts.

Based on our review of the design, accomplishments, and assessment of the needs of the market, ETP is demonstrating clear value to both the IOU EE portfolio and the broader CEESP goals. Our research also identified areas of process improvement to ensure that the current activities are being done more effectively, as well as some gaps where the ETP could provide additional support for the CEESP within their current resources.

Recommendations

Based on our findings, our recommendations fall into six main areas described below. Additional details that support our findings and analysis are provided in the Element-Specific and Detailed Findings and Recommendations section of this report.

- ***Recommendation: Align Goals and Budgets.*** Review and revise the budgets allocated for Market and Behavioral studies and TRIO. Both appeared to be over-budgeted in the 2010-2012 cycle.

Alternatively, there may be a need to increase the objectives for these elements to better align with the dollars allocated.

- ***Recommendation: Focus outcomes of existing elements, and move towards explicitly describing (and monitoring) outcomes for the next program cycle.*** Overall, the 2010-2012 program incorporated program elements with six specific outcomes. An assessment of the early projects in the 2010-2012 program cycle found that projects were not always clearly implemented or tracked by the appropriate outcome. We recommend that ETP staff focus projects by outcomes for the next cycle to help ensure that their projects are implemented more closely with their intended design and will lead to the expected outcomes.

- ***Recommendation: Coordinate and Tailor Scanning and Screening.*** Given that the elements have very different outcomes, the IOUs should develop specific screening tools for each element. The development of specific screening tools will ensure that project selection meets expected program outcomes. General screening tools that are not outcome specific make it difficult for the ETP staff to select projects with varied intended outcomes. Collaboration across the IOUs to discuss opportunities to improve tools statewide can help with the development of outcome-specific tools. By discussing the criteria used for project selection, and why it varies across utilities, the IOUs can identify what criteria are IOU appropriate only or needed across the state.

- ***Recommendation: Enhance Reporting.*** Recommendations related to enhancing project reporting vary across the elements. Some address quality, while others deal with type or timing of reporting efforts. Specific recommendations include:

  - For Technology Assessments, work to enhance quality of reporting. Improve clarity of technical information through the development of a guidance document on scientific rigor.

  - For Demonstration Showcases, enhance the quality of efforts through explicitly identifying the target audience prior to designing a project.

  - For MBS, enhance timeliness of reporting. While timeliness information was based on early implementation efforts, the IOUs should seek to ensure that key stakeholders receive MBS reports (or the information that will be in the reports) early enough to inform decisions.

  - For TDS, formalize documentation to include 1) results from the project, 2) contact information, and 3) project selection criterion.

- ***Recommendation: Improve Data Tracking.*** Each IOU should comprehensively and accurately track ongoing activities in the ETP database. Projects cover long time frames and can extend beyond the current program cycle. Key data is missing and does not show the extent of the ETP activities. Tracking should be comprehensive and timely to reflect ongoing activities and status to the CPUC-ED and evaluators. In addition, the IOUs should include additional variables within the ETP database to reflect new program outcomes.

- ***Recommendation: Further Support CEESP.*** While ETP alone is not expected to meet CEESP goals, there are changes that could be made to the ETP that would allow the program to better support the CEESP. Understanding the ETP's position in the market relative to others who are also supporting emerging technologies will be critical to enhancing the value of the ETP's current efforts. In addition, being more strategic with activities and resources, and sharing information

collected through the ETP will also help support CEESP. Specific examples of actions to support the CEESP are described in Chapter 12.

The evaluation team distinguishes our recommendations for the ETP in the following document sections: Volume I: throughout Chapter 4, and Sections 5.6, 7.6, 8.6, 9.6, 10.6, and 11.6.

Next Steps: Assessing Impacts

The findings from the process evaluation will help to inform the next phase of the evaluation where we will assess the impacts of the program. Drawing on the main goals of the program, the Evaluation Team will determine the evaluation activities that will occur under this next phase.

2. INTRODUCTION AND OVERVIEW

According to the Program Implementation Plans (PIPs), the Emerging Technology Program (ETP) has established three goals in support of its mission:

- **Goal 1)** Increased adoption of Energy Efficiency (EE) measures through program elements such as Technology Assessments, Market & Behavioral Studies, Scaled Field Placements, and Demonstration Showcases.

- **Goal 2)** Increased EE technology supply through program elements such as Technology Development Support and business incubation (TRIO).

- **Goal 3)** Support of the California Strategic Plan and related solutions, including zero net energy (ZNE). Within Goal 3, ETP plans to advance innovative measures or strategies; and the SCE Technology Test Center will create a ZNE test facility[4].

The mission of the 2010-2012 ETP as described in the PIPs filed with the California Public Utilities Commission (CPUC), is to support increased energy efficiency market *demand* and technology *supply* (the term supply encompassing breadth, depth, and efficacy of product offerings). This is made possible by contributing to the development and deployment of new and under-utilized EE measures (that is, technologies, practices, and tools), and by facilitating their adoption as measures in the IOU EE portfolio to help support California's aggressive energy and demand savings goals. In addition, as shown under goal 3 above, one of the three goals of the ETP is to "support the Strategic Plan and related solutions, including zero net energy [ZNE]."[5]

The ETP began in the late 1990s. Until 2009, the program's design was focused on assessing technologies (i.e., the Technology Assessment element) with the assessments carried out *in-situ* and at SCE's Technology Testing Center. In PY2010-2012, ETP staff expanded the design and incorporated five new program elements: Scaled Field Placements, Demonstration Showcases, Market & Behavioral Studies, Technology Development Support, and Business Incubation (TRIO).

The IOUs developed these five new program elements in PY2010-2012 to address the long-term policy goals of supporting increased demand and supply of innovative energy efficiency technology in support of the CEESP. The next section describes an overview of the program, followed by each element, and then an overview of the ETP in the context of the CEESP.

[4] We note that the program managers chose to discontinue the Residential ZNE Facility in 2012.

[5] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; 15. SCE-SW-009 Emerging Technologies.doc pp. 780; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

2.1 OVERVIEW OF THE ETP PROGRAM

The 2010–2012 funding cycle includes a budget for the Statewide ETP of approximately $43 million, a significant increase compared to previous program cycles[6]. Additionally, the PY2010–2012 ETP has an expanded focus. While earlier program cycles focused primarily on Technology Assessments, the PY2010–2012 program cycle is composed of program elements each with a specified budget as shown in Table 4. Program staff designed these multiple program elements to work together to address the key market barriers that can delay new measure introduction and adoption of emerging technologies into the IOU EE portfolio. According to the PIP, "the IOUs will apply these program elements in a comprehensive effort to address the range of EE market barriers that ETP can either influence directly or through efforts supporting other EE and Integrated Design Side Management (IDSM) programs."[7]

Table 4: ETP Budget by Element

ETP Program Elements	Program Implementation Budget				
	SCE	PG&E	SCG[a]	SDG&E[a]	Total ETP
Technology Assessments	Evaluate new technologies for performance claims and overall effectiveness in reducing energy consumption and peak demand				
	$7,762,216	$14,072,326	$3,515,000	$4,050,854	**$ 29,400,396**
Scaled Field Placements	Placement of measures at customer sites to gain market traction and information				
	$1,994,020	$974,675			**$ 2,968,695**
Demonstration Showcases	Expose customers to new measures in 'real world' demos to create visibility and awareness				
	$3,522,112	$1,546,620			**$ 5,068,732**
Market & Behavioral Studies	Targeted research on customer behavior and decision-making to understand perceptions to speed adoption				
	$ 523,520	$1,175,743			**$ 1,699,263**
Technology Test Centers	Test facilities to evaluate performance of new technologies (SCE only)				
	$ 2,237,141				**$ 2,237,141**
Business Incubation (TRIO)	Generate innovative program ideas with outreach and 'non-traditional' approaches (training, workshops, mentoring).				
	$906,528	$282,314			**$ 1,188,842**
Technology Development Support	Transform early stage technology into marketable energy efficient products				
	$249,188	$548,199			**$ 797,387**
Total	**$17,194,725**	**$18,599,877**	**$3,515,000**	**$4,050,854**	**$ 43,360,456**

[a]SCG and SDG&E programs include activities in all elements (except the Technology Test Center). They do not have specific budgets for each element. We have included their budget under Technology Assessments.

[6] For example, the statewide 2006-2008 cycle budget was approximately $30 million and the statewide 2004-2005 budget was approximately $8 million. The original 2010-2012 ETP budget was $55 million that was changed during the period due to fund shifts to other programs (CPUC Disposition on 2/10/2012 via Advice letter 3235-G-A/3091-E-A.

[7] Southern California Edison's 2010-2012 Energy Efficiency Plans, January 2011, pp. 772.

Below we provide a description of each program element as described in the PIP.

Technology Assessment: The IOUs conduct Technology Assessments to assess energy savings, or to "evaluate performance claims and overall effectiveness in reducing energy consumption and peak demand for new or under-utilized EE measures."[8] According to the PIP, Technology Assessments are conducted via *in-situ* testing, laboratory testing or paper studies.[9] The information provided in the assessments allows IOU EE program managers to construct workpapers estimating energy and demand savings over the life of a measure and helps external stakeholders understand performance.[10] The assessments aim to increase measure awareness, increase market knowledge, and reduce performance uncertainties, and in doing so, reduce barriers to adoption.[11]

EXAMPLE OF A PG&E TA PROJECT:
ET HOME ENERGY MANAGEMENT LAB TECH ASSESSMENT SMART THERMOSTATS (ET11PGE1071)

According to PG&E, the purpose of this lab test project is to evaluate the energy savings potential from a Wi-Fi enabled Honeywell programmable thermostat, a thermostat that users can access via the Internet or a Smartphone. The main goal is to assess energy savings potential to reduce energy consumption through behavior-based programs combined with an enabled technology.

PG&E used primary research (lab testing) to determine an energy savings technical potential of about 400 GWh, 1.7 MW and close to 8,000 therms. The project also reports a lifetime technical potential of close to 6,000 GWh, 25 MW and 131 million therms. These results from the lab tests will directly support PG&E's Honeywell Thermostat Pilot program and in performing the field tests.

PG&E states that residential homeowners who have a central HVAC and high energy bills will be able to benefit from this project. While the target audience for this project is the EE Program managers, results are also intended for a larger audience through the ETCC website (where the report is posted). The study was conducted between August 2011 and January 2012, and had a budget of $550,000.

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EXAMPLE OF SDG&E TA PROJECT: LED TASK LIGHT (ET10SDGE0007)

According to SDG&E, the purpose of this project is to determine the energy savings potential and installation cost of the components of the Advanced Energy Office—Office of the Future. The lighting technology will allow both building-wide control and personal control (where possible) to tune lighting, shutting it off or setting it back in office spaces during extended unoccupied periods—all of which can reduce energy usage.

SDG&E expects this technology to be useful for owners and operators of commercial office space to help them maintain employee satisfaction and productivity while reducing electricity and natural gas usage. The study was initiated in January 2011 and is currently ongoing with a budget of $15,000.

[8] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; 7. SCE-SW-009 Emerging Technologies.doc pp. 772; SCG SW Emerging Technologies Final.doc, pp. 7; SDGE SW Emerging Technologies Final.doc, pp. 7.
[9] Ibid.
[10] Ibid.
[11] Ibid.

Technology Test Center Description (SCE Only): The Technology Test Center (TTC) performs technology assessments to assess savings and performance issues in a lab setting. The PIP states that the main function of the TTC is "to provide impartial laboratory testing and analysis of technologies…these activities will be used to expand the portfolio of energy efficient (EE) measure offerings, quantify energy savings for EE measures, alleviate concerns about performance uncertainties, and verify the feasibility and validity of proposed codes and standards enhancements."[12] The TTC, operated by SCE, comprises three test facilities: the Refrigeration Technology Test Center, the HVAC Technology Test Center, and the Lighting Technology Test Center. For the 2010-2012 program cycle, SCE is building a ZNE Test Center[13].

Scaled Field Placement: The Scaled Field Placement (SFP) element coordinates the placement of a technology in a customer's facility (i.e., *in-situ*) for the purposes of educating end users or stakeholders (i.e., installers, builders, procurement officers) through their firsthand experience with the technology[14]. As currently deployed, the IOUs may place the same measure across several sites or several measures within a single site. Scaled Field Placements attempt to expose those with adoption influence to technologies to increase "market traction and possibly gain market information."[15] ETP may collect information from customers regarding the installation (adoption of the measure and barriers faced).

EXAMPLE OF AN SCG SFP PROJECT:
COMBINED CENTRAL HEATING AND HOT WATER CONTROL (ET10SCG0005)

According to SCG, the purpose of this project is to to assess a company's proprietary controls for a specific combined space heating and domestic water system. This project is an extension of a Technology Assessment that tested the energy savings associated with adjusting the temperature of the same combined system. The project involved placement of the controls in customer sites to assess capability to adjust the temperature based on the summer/winter usage pattern of the combined system.

SCG believes that this project will help obtain a replicable solution for running the combined system more efficiently, and is targeted towards managers of multifamily residential complexes equipped with the specific combined central heating and hot water supply systems. Given that the current estimate is 2,000 of these units in SCG service territory, SCG believes that their involvement is critical to promote the technology to the target market.

The Scaled Field Placement was initiated after a Technology Assessment in February 2009. The project was completed in December 2011 with a budget of $150,000.

Demonstration Showcase: The Demonstration Showcase (DS) element is intended to expose target audiences to new measures in real-world demonstrations, and as such, increase visibility and awareness of emerging technologies. Demonstration Showcases generally incorporate a suite of new technologies at a single site, although occasionally a showcase may highlight a single technology.

[12] Ibid.

[13] We note that the program managers chose to discontinue the Residential ZNE Facility in 2012.

[14] Ibid.

[15] Ibid

Key attributes of a showcase include that it "is open to the public or to an interest group…, that many viewers are encouraged to visit, and that it may highlight a systems approach rather than an individual measure."[16]

EXAMPLE OF AN SCE DS PROJECT:
ZNE COMMERCIAL FOCUSED RETROFIT (E T10SCE2030)

According to SCE, the purpose of this project is to showcase integrated energy efficiency measures with renewable generation that will help achieve a Zero Net Energy performance in commercial buildings. SCE worked in collaboration with the University of California to retrofit the Recreation Center at University of California Santa Barbara with measures including HVAC, Lighting, Envelope, Controls, Pool Pumps, and University-funded solar measures.

SCE believes that this whole building solution will work to effectively combine energy efficiency measures to achieve total energy savings greater than singular measures working individually. Additionally, by identifying energy efficiency solutions to achieve ZNE and integrated renewable energy strategies, this project will showcase a packaged, replicable solution of energy efficiency measures for ZNE commercial retrofits. SCE also believes that given the collaboration with the University of California, the showcase has a potential for high visibility among commercial building owners, especially other UC/CSU campuses (who are customers of SCE) and EE program managers.

The study was initiated in May 2010 and is currently ongoing with an expected completion in Q2 2014. The project has a budget of $250,000.

Market & Behavioral Studies: The Market & Behavioral Studies (MBS) element involves performing targeted research to understand the market for emerging technologies. As per the PIP, MBS projects are studies to enhance market intelligence of customer needs and "decision triggers" to improve acceptance of new or under-utilized technologies in the energy efficiency portfolio."[17]

Market & Behavioral Studies attempt to capture customer perceptions, acceptance, market readiness, or market potential for new or underutilized technologies.[18] This may be done through either primary or secondary research. The expected outcome of this research is to "contribute to increased measure awareness, market knowledge, and reduced performance uncertainties for ETP stakeholders (i.e., the energy efficiency program managers) and IOU customers."[19] According to the program managers, MBS efforts may be conducted before, after, or in parallel to a related program element effort.

[16] Ibid.
[17] Ibid.
[18] Emerging technologies are new energy efficiency technologies, systems, or practices that have significant energy savings potential but have not yet achieved sufficient market share (for a variety of reasons) to be considered self-sustaining or commercially viable. Emerging technologies include early prototypes of hardware, software, energy design tools, or services. "Under-utilized" technologies are technologies with verified and documented low market penetration rates.
[19] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; SCE-SW-009 Emerging Technologies.doc; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc

EXAMPLE OF AN SCE MBS PROJECT:
AIR BLOWER MARKET ASSESSMENT STUDY (ET10SCE4010)

This study performed in-depth primary research on customers' understanding and awareness relating to air blower technology and areas where the technology can be applied to achieve cost-effectiveness. The study also looked at market size of potential adoption, customer level of interest and awareness, obstacles and barriers, and financial drivers. The main goal for this market assessment study was to assess the market opportunity for the adoption of air blower technology in four standard industrial classification (SIC) groups, through primary research methods (telephone survey).

SCE selected this project after a related Technology Assessment to assess the market awareness and understanding for the new technology. As such, the data is intended primarily for the IOU energy efficiency program managers.The study was conducted between May 2010 and December 2010, and had a budget of $18,000.

Technology Development Support: Technology development support is one of two ETP elements specifically designed to intervene on the supply (push) side of emerging technologies (the other element is TRIO). This element consists of "taking an early-stage technology or concept and transforming it into a saleable product."[20] Further, the PIP notes that the Technology Development Support program element helps to bridge the gap between research and development (R&D) and the market, by contributing to "increased readiness and availability of EE measures for customers and EE program managers and reduced uncertainties for program participants."[21]

EXAMPLE OF AN SCE TDS PROJECT: INTERNALLY ILLUMINATED MENU BOARDS FOR MULTIPLE APPLICATIONS (ET10SCE5010)

According to SCE, the purpose of this study is to determine cost-effective, energy savings solutions for the retrofit and replacement of existing menu boards. These improvements are required to produce equal or better luminance across the face of the menu board, use less energy than the existing system, and have the capability of dimming and responding to a remote demand response signal. The main goal is to test the most promising solutions in the Technology Center's Lighting Lab and then field test those solutions. The successful technology solutions that prove viable will be recommended for inclusion in future incentive programs offered by SCE.

SCE selected this project after multiple internal brainstorming sessions (between ETP, Demand Response and Codes and Standards programs) and meetings with industry players to tap into a market segment that represents opportunity for energy savings that has thus far gone un-tapped. The data is intended primarily for the IOU energy efficiency program managers, quick service food resturants, and other market sectors that use illuminated boards.

The deliverable for this project is a white paper that chronicles the work that SCE has done over the last couple of years to influence and cause the development of cost-effective, easy-to-install retrofits for existing menu boards. These same technologies are expected to become the industry standards for new menu board construction in the near future. The study was conducted in December 2010, and had a budget of $10,000.

[20] Ibid
[21] Ibid

TRIO: The Business Incubation Support element, known as Technology Resource Incubator Outreach (TRIO), focuses on providing training and networking for entrepreneurs and companies providing energy saving technologies.[22] As per the PIP, TRIO provides information regarding the IOUs' demand-side management rebate and incentive processes, and information on the Emerging Technologies program, through IOU-hosted events.

The PIP identifies two goals for the TRIO program element: to contribute to the market transformation with efforts that accelerate the commercialization of energy-efficient measures, and to provide transparency of each IOU's demand-side management rebate and incentive processes.[23]

ETP in the Context of the CEESP

In September 2008, the CPUC adopted the CEESP, creating a single roadmap to achieve maximum energy savings across all sectors in California. This comprehensive plan for 2009 to 2020 and beyond is the state's first integrated framework of goals and strategies, covering government, utility, and private sector actions, and holds energy efficiency as the highest priority resource in meeting California's energy needs.[24] Emerging technologies are one of five policy tools outlined in the CEESP, which also includes incentives, codes and standards, education and information, and technical assistance. ETP plays a role in helping to meet goals, although many other entities are involved. The use of emerging technologies as one of the five policy tools acknowledges the importance of work in this area, and specifically the significant role of the IOUs' Statewide Emerging Technologies Program.

The following CEESP goals are set forth by the Big, Bold Energy Efficiency Strategies (BBEES)[25]:

- All new residential construction in California will be zero net energy by 2020.
- All new commercial construction in California will be zero net energy by 2030.
- The Heating, Ventilation, and Air Conditioning (HVAC) industry will be transformed to ensure that its energy performance is optimal for California's climate.

In addition, for existing buildings, the CEESP states that:

- 50% of existing commercial buildings will be equivalent to zero net energy buildings by 2030
- Energy consumption in existing homes will be reduced by 20% by 2015 and 40% by 2020 through universal demand for highly efficient homes and products.[26]

The CEESP chapter on Research & Technology (R&T) underscores this policy tool of emerging technologies as integral in moving California towards achieving CEESP goals. The R&T chapter notes that "the development, enhancement, deployment and operation of more and better energy efficiency

[22] Ibid
[23] Ibid.

[24] The CEESP was developed through a collaborative process involving the IOUs and over 500 individuals and organizations working together over an 11-month period.

[25] Note that there is also a BBEES related to low-income customers, which is not discussed here.

[26] These are not big, bold strategies, but are important goals of the CEESP.

related technology is fundamental to achieving California's energy efficiency vision and goals."[27] Table 5 outlines the CEESP-established R&T goals and expected outcomes of the goals.

Table 5. CEESP Research & Technology Goals and Outcomes

Research and Technology Goals	Goal Outcomes
Refocus utility and Energy Commission energy efficiency research and technology support to create demand pull and set the research agenda for both incremental and game-changing energy efficiency technology innovations.	Ratepayer-funded R&D programs[a] explicitly support widely applicable whole-building improvement, lighting, and plug load solutions envisioned in this Plan and will be used to leverage other private and public funds for the deployment of new technologies.
Conduct targeted emerging technologies R&D to support the Big, Bold Energy Efficiency Strategies and integrated energy solutions goals.	Profound improvement in equipment efficiency as well as new building materials and designs aimed at achieving more efficiency from new buildings than technically feasible today, and necessary to achieve zero net energy and hot/dry climate HVAC outcomes.

[a] Ratepayer-funded R&D programs include activities within the California Energy Commission and the Emerging Technologies Program.

The early 2010-2012 evaluation efforts covered in this report assess the ETP in light of both the specific program goals outlined in the PIP, and the CEESP policy context.[28] This report is a process evaluation that focuses on assessing the design of the program and the effectiveness of program implementation. The next section is an overview of the research activities that support the findings in this report.

[27] California Energy Efficiency Strategic Plan, January 2011, pp. 79

[28] These goals are also noted in the CPUC-ED Policy Decision: D.09-09-047, 9/24/09.

3. PY2010-2012 ETP EVALUATION METHODOLOGY

The PY2010–2012 evaluation builds on the PY2006–2008 evaluation and focuses on the design, implementation, strategy, and impacts of the ETP. The evaluation includes certain activities performed in previous evaluations, such as aggregate analysis, program theory and logic models, and targeted audience surveys. Key findings from the previous evaluation were used to help craft specific research activities. (Note that a detailed methodology can be found in Volume II).

The evaluation is phased. In Phase I, beginning in September 2011, the Evalaution Team focused on the first research area: the program design and implementation assessment. This report provides findings from the Phase I data collection. Phase II, beginning in 2013, will focus on an impact assessment that will cover the remainder of the evaluation period. The team will develop a Phase II research plan in 2012 and 2013.

Phase I of the PY2010–2012 evaluation includes three key areas of emphasis:

(1) Assess the current status of the program

(2) Understand the current program design (through examining the theory of each element) and provide recommendations for the future design of the program

(3) Assess the current implementation of the elements and provide recommendations to help improve the program

Phase I began in September 2011 and focused on the first research area: the program design and implementation assessment. This report provides findings from the Phase I data collection. Note that Phase I focused on ETP's early efforts (including activities that occurred in 2011 and the first quarter of 2012 in some cases), and early feedback was provided to the IOUs throughout this process. This report draws on those earlier evaluation efforts. Phase II will begin in Q3 2012, and will focus on an impact assessment that will cover the remainder of the PY2010–2012 program cycle.

Figure 1 shows the overarching research goals for the ETP. Two of the evaluation goals are still in process:

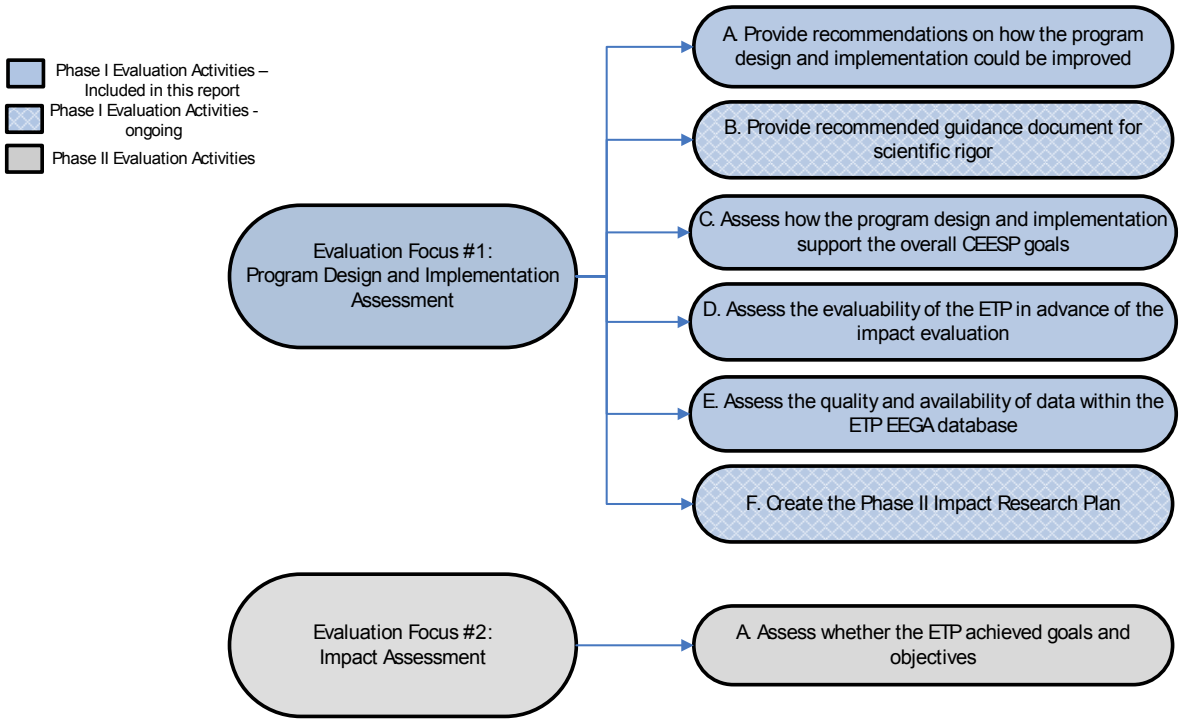
Goal B: Scientific Rigor Guidance Document (expected completion date TBD) and

Goal F: Phase II Impact Research Plan (expected completion date of November 2012). Detailed and corresponding information for each objective shown in the figure below can be found in Volume II.

The Phase I Evaluation plan[29] and Volume II provide greater detail regarding our evaluation efforts describing each evaluation goal.

[29] The evaluation plan is located here: http://www.energydataweb.com/cpucFiles/pdaDocs/749/PY2010-2012%20ETP%20Evaluation%20Plan_Final_2011_09_2.pdf

Figure 1. Overarching Research Focus Areas and Goals



As shown above, the evaluation includes process and impact assessments. Each of these efforts reinforces and supports the main objectives of the evaluation, which is to assess whether the ETP is realizing its PIP goals for the current program cycle, and California's Energy Efficiency Strategic Plan long-term goals.

The Evaluation Team collected information regarding each program element through a variety of data collection activities. Primary data collection included in-depth interviews with ETP program managers, energy efficiency program staff and other stakeholders, meetings with key staff at each IOU, surveys of ETP and energy efficiency project managers, and observations of activities. Secondary data collection included literature reviews and examination of IOU program files and databases. The team conducted these activities to understand how the IOUs implement the program element, to describe any changes to program implementation, and to provide recommendations for process improvements. The team performed data collection and analysis in September 2011 through July 2012.

To help ensure that the evaluation reflected an understanding of the overall emerging technologies market, and the specific areas where the ETP can contribute to helping support the CEESP, the evlauation efforts also included a full-day working session with external market stakeholders (i.e., an Expert Panel), as well as follow-up conversations with some in this group, as needed.

Each data collection instrument included a series of detailed research questions developed as part of the Phase I evaluation plan. The table below provides a summary of the methodology for data collection and evaluation activities for each of the ETP elements. The complete methodology with the evaluation goals, objectives, and detailed research questions by area is available in Volume II.

Table 6: Data Collection and Evaluation Activities by Element

	Technology Assessment and Technology Test Centers	Scaled Field Placement	Demonstration Showcase	Market & Behavioral Studies	TRIO	Technology Development Support	Start and Finish Date
Data Collection Activities							
In-Depth Interviews	Conducted 5 in-depth interviews with the 4 IOUs	Conducted 3 in-depth interviews with the 4 IOUs	Conducted 3 in-depth interviews with the 4 IOUs	Conducted 3 in-depth interviews with the 4 IOUs	Conducted 3 in-depth interviews with the 4 IOUs	• Conducted 3 in-depth interviews with the 4 IOUs. • Conducted 4 in-depth interviews with project stakeholders	Initiated interviews in May 2011; completed interviews in March 2012

	Technology Assessment and Technology Test Centers	Scaled Field Placement	Demonstration Showcase	Market & Behavioral Studies	TRIO	Technology Development Support	Start and Finish Date
Program Material Review	• Program Implementation Plan • List of TAs conducted between January, 1, 2010 and September,1 2011 • List of scored, approved, and funded measures for assessments between January, 1, 2010 and September,1 2011 • Final reports that describe results and conclusions from each completed assessment • Documentation of information dissemination regarding technical reports • Cost data per technology assessed, where available • The 2006-2008 ETP Evaluation Report • Screening score sheets used by the ETP program staff • Information collected from ETP program manager interviews conducted in May 2011 • ZNE Test Center construction progress report • Budgeting information	• Program Implementation Plan • Sample of SFP proposals and scorecards • List of scored measures • List of internally-tracked variables (PG&E, SCE) • Budgeting information	• Program Implementation Plan • List of Demonstration Showcases as of September 15, 2011 with project information • Complete screening and scoring documents • PG&E: Emerging Technology Opportunity Summary (ETOS), and other materials regarding screening • SCE: Scorecard, Concept Proposal, Project Funding Proposal, Documents supporting funding decisions • Marketing materials, where available • Budgeting information	• Program Implementation Plan • PG&E: Completed report, Scoring Tools • SCE: Completed reports, scoring tools, proposal form, scorecard • Sempra: Scoring tools and presentation • Budgeting information	• Program Implementation Plan • Attendance lists from symposiums and roundtables • Survey data collected by IOUs at TRIO events • Materials from TRIO events (presentations, handouts) • Budgeting information	• Program Implementation Plan • Sample TDS proposal and scorecards • Presentations made by TDS staff (SCE) • Customer contact information (SCE) • Budgeting information	Review of program materials occurred from September 2011 through March 2012

	Technology Assessment and Technology Test Centers	Scaled Field Placement	Demonstration Showcase	Market & Behavioral Studies	TRIO	Technology Development Support	Start and Finish Date
On-site Observation	TTC observation conducted on October 7, 2011 Attended ET Open Forum spotlight on October 26, 2011.	The Evaluation Team had originally planned to visit Demonstration Showcase and Scaled Field Placement projects, but this did not occur due to delays in the program implementation and few completed projects.		NA	• Attended PG&E TRIO Round Table at Pacific Energy Center on August 30, 2011 • Observed an I4E workshop on September 29, 2011 • Attended SCG TRIO Symposium at SoCalGas Energy Resource Center on February 28, 2012	NA	On-site observation was conducted in August, September, and October, 2011, as well as February 2012

	Technology Assessment and Technology Test Centers	Scaled Field Placement	Demonstration Showcase	Market & Behavioral Studies	TRIO	Technology Development Support	Start and Finish Date
Target Audience Surveys / interviews	Conducted a quantitative online survey of 51 IOU staff members (out of 167 IOU staff members contacted) that received the Technology Assessments reports.	NA	NA	Conducted a quantitative online survey of 51 IOU staff that received the Market & Behavioral Studies.	Three interviews with investors and three interviews with entrepreneurs working in the California energy efficiency market, to learn more about how they interact with funding sources and IOU energy efficiency programs.	NA	Survey was fielded October-November 2011.

	Technology Assessment and Technology Test Centers	Scaled Field Placement	Demonstration Showcase	Market & Behavioral Studies	TRIO	Technology Development Support	Start and Finish Date
ETP Database	Reviewed information on the projects as provided in the Q1 2012 update to this database for all elements except TRIO.						Review was conducted in December, 2011 for Technology Assessments, and after March, 2012 for all elements.
Evaluability Assessment	• Reviewed and updated current program impact logic models in the January 2011 PIPs. • Set impact priorities and success criteria for logic model links. • Discussed proposed theories, models, and success criteria with CPUC and IOUs to create final memo of agreed upon program theory and logic models. • Conducted 2 workshops and ongoing in-depth interviews with the 4 IOUs to identify program theory and logic model as well as potential performance indicators for each element.						Workshops held through March 2012.
Primary / Secondary Research to Assess Market Position	• For TA, performed Investigative Journalism research by reviewing internal IOU documents, review of the ACEEE website, reports, conference proceedings, and an online search using appropriate search terms. • For TTC, built upon research conducted for Technology Assessments, but focused on testing facilities.	NA	Conducted literature review to understand what is known about how people are affected by interacting with integrated technologies in settings such as Demonstration Showcases.	Conducted literature review to understand best practices around timing for performing a study (process frameworks) and choosing the appropriate type of study (conceptual frameworks).	Conducted primary research to understand how investors and entrepreneurs interact with funding sources and IOU energy efficiency programs.	Performed Investigative Journalism research by reviewing ACEEE website, reports, conference proceedings, and an online search using appropriate search terms.	Research conducted in October, 2011 through May 2012.
Evaluation Activities							

	Technology Assessment and Technology Test Centers	Scaled Field Placement	Demonstration Showcase	Market & Behavioral Studies	TRIO	Technology Development Support	Start and Finish Date
Content Analysis	Three evaluation staff reviewed the reports to determine clarity and relevance.	NA	NA	Two evaluation staff reviewed the reports to determine clarity and relevance.	NA	NA	Analysis conducted in October-December 2011, with follow up in June-July 2012.
Aggregate Level of Analysis	Obtained the Emerging Technology Quarterly Reports and complied statistics from the data to illustrate the composition of the portfolio, the end-uses, sectors, project length, etc. for all elements except TRIO.						Analysis conducted in June-August on data provided through March 2012.
Review of Scoring Tools	Reviewed each IOU's scoring tools to provide a description of the process and recommendations to improve the tools and scoring processes, where applicable.						Analysis conducted from September 2011 through March 2012.
Survey Analysis	Compiled statistics of the target audience's (i.e., those who received TA reports) survey responses.	NA	NA	Compiled statistics of the target audience (i.e., those who received MBS reports) survey responses.	NA	NA	Analysis conducted from October through December 2011.
Expert Panel	One Expert Panel was conducted to determine whether ETP is positioned in California's Research, Development, Demonstration, and Deployment (RDD&D) energy efficiency market to be able to contribute to the expected goals as articulated in CEESP. ETP plays a role in helping to meet goals, although many other entities are involved. Details about the Expert Panel can be found below.						Expert Panel held in May 2012.

Data Collection Activities

The evaluation team conducted surveys with a sample of program participants. In the case of TA and MBS surveys, the total number of participants sampled reflected a census of program participants (i.e. the case of TA and MBS report recipients). In the case of TRIO in-depth interviews, a snowball sample[30] approach was conducted.

In-depth interviews: The evaluation team conducted in-depth interviews with the 4 IOUs. An interview was conducted with each IOU for each of the six program elements. In addition, for TDS we conducted 4 interviews with project stakeholders. These interviews began in May 2011 and continued through March 2012.

Program material review: The evaluation team conducted a thorough review of program materials for each IOU for each of the six program elements. The materials reviewed included (but not limited to); Program Implementation Plan, list of projects scored/approved/conducted, tools used for proposals, screening, scoring, marketing materials, final reports/presentations, and budgeting information. In addition, for TRIO we reviewed the attendance list from symposiums and roundtables as well as the survey data collected by the IOUs at TRIO events. This review was conducted from September 2011 through March 2012.

On-site Observation: The evaluation team conducted on-site observation for the Technology Assessment element (attended ET Open Forum spotlight event), Technology Test Center element, and TRIO (attended roundtable event, attended symposium, and observed workshop). These observations were conducted in August, September, and October, 2011, as well as in February 2012. The Evaluation Team had originally planned to visit Demonstration Showcase and Scaled Field Placement projects, but this did not occur due to delays in the program implementation and few completed projects.

Target Audience Surveys / interviews: The evaluation team conducted target audience surveys (quantitative online survey) with 51 IOU staff members (out of 167 IOU staff members contacted) that received the Technology Assessments and/or Market & Behavioral Studies. The evaluation team conducted a census with TA and MBS recipients. In addition, for TRIO, we conducted three interviews with investors and three interviews with entrepreneurs to learn more about how they interact with funding sources and IOU energy efficiency programs. For TRIO, entrepreneurs and investors were identified through a snowball sample approach. The survey was fielded in October through November 2011 and the interviews were conducted in January through February 2012.

ETP Database: The evaluation team reviewed information on the projects as provided in the Q1 2012 in the ETP database for all elements except TRIO. This review was initially conducted in December, 2011 for Technology Assessments, and after March, 2012 for all elements (including Technology Assessments).

[30] "Snowball sampling. A distinct variety of non-probability samples is the snowball sample. Snowball sampling relies on previously identified group members to identify other members of the population. As newly identified members name other members, the sample grows like a snowball. Often snowball sampling is used when a population listing is unavailable and cannot be compiled by searchers." G.T. Henry, *Practical Sampling,* Applied Social Research Methods Series, Volume 21, pp. 21.

Evaluability Assessment: The evaluation team reviewed and updated current program impact logic models in the January 2011 PIPs for each program element, which included; setting impact priorities and success criteria for logic model links, discussing proposed theories, models, and success criteria with CPUC and IOUs to create final memo of agreed upon program theory and logic models, and conducting 2 workshops and ongoing in-depth interviews with the 4 IOUs to identify program theory and logic model as well as potential performance indicators for each element. The workshops were held through March 2012.

Primary / Secondary Research: The evaluation team conducted primary and secondary research for five of the six program elements (research performed for Technology Assessment was used to understand the Scaled Field Placement element). For Technology Assessment, Technology Test Centers, Technology Development Support and TRIO, we performed Investigative Journalism research to understand and assess market position for each of the elements. Activities included; reviewing internal IOU documents, review of the ACEEE website, reports, conference proceedings, an online search, and market actor interviews. For Demonstration Showcase and Market and Behavioral Studies, we conducted literature review to understand best practices in process, frameworks and timing for conducting appropriate projects/studies. Activities included; reviewing internal IOU documents, review of the ACEEE website, reports, conference proceedings, and an online search. The research was conducted between October 2011 and May 2012.

Evaluation Activities

Content Analysis: The evaluation team conducted content analysis for the Technology Assessment and Market and Behavioral Studies elements, where evaluation staff reviewed available reports to determine clarity and relevance. The analysis was conducted in October through December 2011, with follow up in June through July 2012. The sample for the Technology Assessments content analysis was drawn from a total of 35 Technology Assessments reports completed by ETP during the 2010-2012 program cycle (some of which began in the 2009 program cycle). Out of these 35 reports, we sampled 11 reports using a stratified simple random sample. We believe this was the best, most cost-effective approach to ensure that all sub-groups were adequately represented in the sample. We divided the population into six strata and performed a simple random sample in each stratum. The strata are categorized by IOU and author type (internal or external author).

Aggregate Level of Analysis: The evaluation team conducted an aggregate level of analysis for each of the program elements, except TRIO. We reviewed the Emerging Technology Quarterly Reports and compiled statistics from the data to illustrate the composition of the portfolio, the end-uses, sectors, project length, etc. for the elements. This analysis was conducted in June through August 2012 on data provided through March 2012.

Review of Scoring Tools: The evaluation team reviewed each IOU's scoring tools to provide a description of the process and recommendations to improve the tools and scoring processes, where applicable. This review was conducted from September 2011 through March 2012.

Survey Analysis: The data collected through the surveys conducted for Technology Assessment and Market and Behavioral Studies was analyzed by the evaluation team. We compiled and reported the relevant statistics of the target audience. The analysis was conducted from October through December 2011.

Expert Panel Methodology: Opinion Dynamics conducted an Expert Panel[31] on May 26, 2012. The Expert Panel was conducted as part of the evaluation efforts of the Statewide ETP to determine whether ETP is positioned in California's RDD&D energy efficiency market to be able to meet the expected goals as articulated in CEESP. To support the panel discussion, the Evaluation Team conducted primary and secondary research prior to the panel[32] (details about the research performed can be found within the element-specific chapters in the next section, Element-Specific and Detailed Findings and Recommendations and in Volume II).

Expert Panel candidates were sourced by the CPUC-ED and the IOUs. Of the eleven participants, five were based upon a list provided by the IOUs, three were based upon a list provided by the CPUC-ED, and two were sourced from both. Expert Panelists included individuals who had over 10 years of experience in energy efficiency, and were either a strategic thinker (i.e., understands California's future needs and understands policy implications) or an end-use subject matter expert (HVAC, Integrated Design, Lighting, Market and Behavioral, Plug-Load and Smart Appliances). Organizations represented on the panel included the California Energy Commission, Western Cooling Efficiency Center, EPRI, E-Source, California Lighting Technology Center, Gas Technology Institute, Energy Solutions, National Building Institute, Lawrence Berkeley National Laboratory, and manufacturers.

Table 7: Expert Panelists by Criteria

#	Source of Name	Subject Matter Expert	Strategic Thinker	Funding Source
1	CPUC	Cross-Cutting		Private
2	CPUC		X	Public
3	CPUC	HVAC	X	Both Public and Private
4	CPUC	Integrated Design	X	Both Public and Private
5	CPUC/ IOUs	Manufacturer		Private
6	CPUC/IOUs	HVAC	X	Both Public and Private
7	IOUs	Cross Cutting	X	Both Public and Private
8	IOUs	Cross Cutting		Both Public and Private
9	IOUs	Lighting		Public
10	IOUs	Gas Technologies		Both Public and Private
11	IOUs	Cross Cutting	X	Both Public and Private

We note that the selected Expert Panelists work with the ETP on projects, which may affect their understanding of the ETP design, implementation, and impact on the market. Thus, while individuals may be biased towards their organization or individual needs, we sought to overcome this through the aggregate analysis of the group, and the iterative process of following up with panelists on particular

[31] The Expert Panel was divided into four sessions: (1) discussion of market pull tactics to achieve CEESP goals, (2) discussion of market push tactics to achieve CEESP goals, (3) presentation by the IOUs describing the ETP, and (4) discussion about whether the ETP should perform the tactics discussed in sessions 1 and 2 and areas of possible improvement.

[32] The Evaluation Team conducted research using two primary data collection methods: investigative journalism and literature review; both methods require formulating a focused research question (what is expected to be researched), gathering the data, compiling key information with appropriate references, analyzing gathered data, and writing up the results.

issues to understand the nature of individual comments, and supporting findings through our review of secondary research. Additionally, we conducted the panel in three parts to remove any further potential bias about individual understanding of ETP. These three parts are described below.

The first part of the panel was a guided discussion of possible tactics (i.e., activities) that the emerging technology market needed, regardless of who would perform the activity. This helped to highlight realized and unrealized tactics for the 2010–2012 ETP.[33] To inform this discussion, we gathered data on the various research activities prior to the panel, including investigative journalism and literature review. The IOUs then helped set the stage for the experts through a webinar that carefully explained the current ETP so that attendees had a similar level of knowledge upon which to base the rest of their discussions. After the IOUs presented, we showed the connections between the ETP and current CEESP goals, ensuring that the group of experts understood that the ETP is not solely responsible for CEESP goals. We used the remainder of the panel time to identify "gaps" for research possibilities that any researcher may pursue. This included discussions of specific end-use needs; other players in the market, besides ETP, that are currently performing similar activities, as well as areas of prioritization for ETP given these other players.

[33] To select the most appropriate tactics, the panelists were asked to use a scalar rating for each tactic. The scores were then compiled and analyzed so that no one response could sway overall findings.

4. ASSESSMENT OF ETP DESIGN AND IMPLEMENTATION

The ETP has been implemented in California for over a decade. Over this timeframe, the program has heavily focused on gathering information needed to support the inclusion of emerging technologies in the IOU energy efficiency programs. As such, the focus of the ETP is primarily on meeting the needs of the IOU-portfolio.[34]

This focus on IOU-portfolio needs is appropriate given past program cycle goals and objectives, and it remains an appropriate primary focus for the current 2010–2012 program cycle. However, due to the development and adoption of the CEESP[35] as a statewide policy tool, the ETP broadened its goals in the 2010–2012 program cycle to include a secondary focus. As discussed in the Introduction section of this report, the IOUs established three goals in the ETP PIP, with the third goal clearly focused on supporting CEESP:

- **Goal 1)** Increased adoption of EE measures through program elements such as Technology Assessments, Market & Behavioral Studies, Scaled Field Placements, and Demonstration Showcases.
- **Goal 2)** Increased EE technology supply through program elements such as Technology Development Support and business incubation (TRIO).
- **Goal 3)** Support of the California Strategic Plan and related solutions, including ZNE.

The Evaluation Team assessed the implementation of the program against both the PIP, which is the guiding document for design and implementation of the program, and the broader effort of supporting emerging technologies to meet California's long-term policy goals, as described throughout the CEESP.

Our assessment of the ETP as compared to the PIP found that the ETP is generally being implemented according to the PIP. As of Q1 2012, the program had implemented 26 of 37 Action Strategies. Of the Action Strategies not yet implemented, some were not assessed by the Evaluation Team because longer-term measurements are needed.

However, as we look at the ETP implementation across the state (as described in greater detail below and in the detailed element-specific chapters), there is considerable variation across the IOUs. Aspects that vary include budgets, selection of projects, implementation processes, reporting, and level of activity. In looking across the utilities, SCE has been the most active in the development of projects over the time frame assessed, as shown in Table 9 below. The Sempra utilities, however, have a much smaller budget compared to the other IOUs. As such, the Sempra utilities' program implementation attempts to combine many of the activities into a single project as their budget cannot support as many

[34] This was further supported by the presentation about ETP given by the IOUs on May 26, 2012, where the ETP is shown to work closely with the IOU portfolio programs.

[35] The CEESP was first drafted in 2009, and subsequently revised in 2011.

projects. While the current implementation plans show that that each IOU implements all program elements, the evaluation team believes that drawing on the strengths of each IOU could offer a more effective statewide approach. For future implementation plans, the IOUs may want to consider relaxing the objective of explicitly completing the breadth of activities required by "all elements" and allow individual IOUs to draw on their unique strengths to help support emerging technologies with a more limited array of activities. Despite the variation in implementation across the IOUs, the statewide effort is making progress towards achieving the PIP objectives (see Table 9).

In addition to assessing the program against the element-specific PIP objectives, we also sought to understand whether the program is supporting the CEESP to the best of its ability with its available resources. One of the difficulties with assessing the ETP's support for the CEESP is that there is not a common understanding of how the ETP should support the CEESP. This lack of clarity is further exacerbated by the fact that the CEESP goals are not aimed specifically at the IOU energy efficiency portfolio, but rather at a much broader group of market actors and stakeholders. As such, at the time of our assessment, there were no common metrics by which to assess the ETP's progress towards the third PIP goal of "Support of the California Strategic Plan and related solutions." (Note that the IOUs are currently developing a roadmap that will guide the IOU effort in this area for the 2013–2014 program cycle, but this roadmap was not available to the Evaluation Team as it is still under development).[36]

To better understand specifically where support for emerging technologies is needed in relation to the CEESP, the Evaluation Team drew on existing knowledge of the program, literature reviews specific to the various program elements, a secondary review of organizations engaged in activities to support emerging technologies, as well as a full-day discussion (and follow up discussions) with key stakeholders in the market. (The description of this Expert Panel discussion is provided in the methodology.) This effort was a three-part process:

1. **Identifying general areas needed to support CEESP goals.** The evaluation team conducted a detailed review of the CEESP, in addition to secondary market research to assess key market tactics for supporting energy efficiency RD&D. Based upon this review; we presented these tactics to an Expert Panel for discussion, revision and additions. This discussion identified areas/activities that are specifically needed for emerging technologies in California (i.e. not specific to the IOU ETP activities). This effort allowed for an initial framework to describe activities, tactics, and strategies that might be needed in the area of "supporting the development of emerging technologies to reach the CEESP goals."
2. **Understanding the roles of external players.** After this first step (discussed above), the Evaluation Team identified external players that operate within the California energy efficiency RDD&D market, (i.e., non-IOU organizations such as the California Energy Commission (CEC), the Electric Power Research Institute (EPRI), national labs, manufacturers, etc.) to better understand which areas were already being filled by others. While this effort was not comprehensive, as mentioned above, it helps to start to understand and identify key gaps and research needs.

[36] Per CPUC Order D.12-05-015, Ordering Paragraph 104, the IOUs are developing the roadmap in 2013-2014 to guide activities after 2015.

3. **Identifying and prioritizing areas where the ETP could provide support.** Finally, the Evaluation Team drew on the panel of experts to prioritize which of the gaps could best be filled by the ETP.

Below we lay out seven high priority areas where the ETP could provide value to California's energy efficiency RD&D market (see Table 8).

Table 8. Summary of Priority Areas for ETP (to help support the CEESP goals)

Perform verification and demonstration of technology performance and energy savings claims for EE technologies	• √
Test products and practices to determine feasibility and potential energy savings in advance of (Reach) Codes & Standards	• √
Identify and provide emerging energy efficiency performance specifications	• √
Increase visibility of emerging energy efficient technologies	• √
Gather, improve, and disseminate data on performance of systems from past pilots, assessments, and technology demonstrations	• Opportunity exists
Disseminate knowledge to encourage energy efficient product development and delivery	• Opportunity exists
Collectively choose a high-profile collaborative activity	• Opportunity exists

The current program already conducts activities in four of the seven areas. Specifically, through their Technology Assessments (130 initiated as of Q1 2012), the IOUs are verifying energy savings claims, which is one of the primary areas identified. Moreover, through Demonstration Showcases (23 initiated as of Q1 2012), the IOUs are demonstrating and increasing the visibility of these technologies. The ETP is also testing products and practices to determine the feasibility of these technologies in advance of codes and standards, and identifying and providing performance specifications, through the Technology Development Support efforts.

As such, based on our review of the design, accomplishments, and assessment of the needs of the market, the ETP is demonstrating clear value to both the IOU energy efficiency portfolio and the broader CEESP goals.

Our research, however, also identified areas of process improvement to ensure that current activities are implemented more effectively. In addition, the Evaluation Team identified gaps where the ETP could provide additional support for the CEESP within its current resources. Areas for improvement are discussed in the sections below.

Our findings and recommendations fall into six main areas described below. Additional details that support our findings and analysis are provided in the Detailed Findings and Recommendations section

of this report.

4.1 ASSESSMENT OF OBJECTIVES AND BUDGETS

The PY2010–2012 PIPs set a statewide objective of initiating 73 Technology Assessment projects, 15 Scaled Field Placement projects, 14 Demonstration Showcase projects, 4 Market & Behavorial Studies, 9 TRIO events, and 6 Technology Development Support projects. Statewide, the ETP has initiated projects in all of the elements. Table 9 provides an overview of the ETP program element project status against these goals, as well as the budget status by IOU as of Q1 2012.

As shown in the table, as of Q1 2012,the ETP has exceeded all element objectives with the exception of Scaled Field Placement (reached only 60% of objective) as of the time period assessed (27months). Over the same time frame, the IOUs expended considerably less than the overall ETP statewide program budget of $43 million (about 35% with a total of 58% spent or committed[37]). However, for some of these elements, the program has up to six years following the initiation of the projects to complete the project (and presumably spend the allocated budget). [38]

While the program appears to be on-track statewide, in particular for some elements such as Technology Assessments and Demonstration Showcases, much of the effort has been initiated by SCE and the Sempra utilities (SCG and SDG&E). As of Q1 2012, PG&E had not yet achieved most of the element objectives (except for Market & Behavorial Studies and TRIO); however, the program cycle was not yet complete.

Table 9: ETP Element Project and Budget Status Summary as of Q1 2012

ETP Element and IOUs	2010-2012 PIP Objective	Projects Initiated as of Q1 2012	% of Project Initiated vs. Objective	2010-2012 Program Revised Budget [a]	Program Expenditures (Inception-To-Date)	% of Budget Spent as of Q1 2012	Proposed/ Actual Budgets for Ongoing and/or Completed Projects	% of Proposed/ Actual Budget over Total Budget
ETP Total	**112**	**189**	**169%**	**$43,360,456**	**$15,034,123**	**35%**	**$9,950,500**	**23%**
Technology Assessment								
PG&E	28	14	50%	$14,072,326	$5,350,897	38%	$817,000	6%
SCE	30	74	247%	$7,762,216	$4,728,638	61%	$1,993,000	26%
SCG	7	21	300%	$3,515,000	$1,822,116	52%	$494,000	14%
SDG&E	8	21	263%	$4,050,854	$2,491,780	62%	$435,000	11%

[37] Committed does not include overhead and labor for administrative tasks.

[38] As per the Energy Efficiency Policy Manual, Version 4.0 (July 2008) R.06-04-010, pp. 5, "In their program planning applications, the Program Administrators shall jointly propose emerging technologies programs and increases to current funding levels for these programs. The main purpose of these programs should be to increase the probability that promising technologies will be commercialized within 6 years of program funding and thereby increase the chance of obtaining additional energy savings from these technologies in the long run."

ETP Element and IOUs	2010-2012 PIP Objective	Projects Initiated as of Q1 2012	% of Project Initiated vs. Objective	2010-2012 Program Revised Budget [a]	Program Expenditures (Inception-To-Date)	% of Budget Spent as of Q1 2012	Proposed/ Actual Budgets for Ongoing and/or Completed Projects	% of Proposed/ Actual Budget over Total Budget
Statewide	**73**	**130**	**178%**	**$29,400,396**	**$10,079,535**	**34%**	**$3,739,000**	**13%**
Scaled Field Placement								
PG&E	7	4	57%	$974,675	$103,938	11%	$1,095,000	112%
SCE	4	3	75%	$1,994,020	$502,526	25%	$297,000	15%
SCG	2	1	50%	SCG does not report expenditures by element in the ETP database			$150,000	NA
SDG&E	2	1	50%	SDG&E does not report expenditures by element in the ETP database			$30,000	NA
Statewide	**15**	**9**	**60%**	**$2,968,695**	**$606,464**	**20%**	**$1,572,000**	**53%**
Demonstration Showcase								
PG&E	5	1	20%	$1,546,620	20,289	1%	$150,000	10%
SCE	5	8	160%	$3,522,112	$1,740,150	49%	$2,140,000	61%
SCG	2	3	150%	SCG does not report expenditures by element in the ETP database			$350,000	NA
SDG&E	2	11	550%	SDG&E does not report expenditures by element in the ETP database			$605,000	NA
Statewide	**14**	**23**	**164%**	**$5,068,732**	**$1,760,439**	**35%**	**$3,245,000**	**64%**
Market and Behavioral Studies								
PG&E	1	10	1000%	$1,175,743	$403,806	34%	$787,000	67%
SCE	1	10	1000%	$523,520	$430,658	82%	$270,000	52%
SCG	1	1	100%	SCG does not report expenditures by element in the ETP database			$105,000	NA
SDG&E	1	0	0%	SDG&E does not report expenditures by element in the ETP database			$0	NA
Statewide	**4**	**21**	**525%**	**$1,699,263**	**$834,464**	**49%**	**$1,162,000**	**68%**
TRIO								
PG&E	3 events per year rotating between IOUs	3	100%	$282,314	$88,062	31%	$0	0%
SCE		3	100%	$906,528	$374,670	41%		0%
SCG		1	100%	SCG does not report expenditures by element in the ETP database				NA
SDG&E		2		SDG&E does not report expenditures by element in the ETP database				NA
Statewide	**9 over three years**	**9**	**100%**	**$1,188,842**	**$462,732**	**39%**	**$0**	**0%**
Technology Development Support								
PG&E	2	1	50%	$548,199	$162,798	30%	$200,000	36%

ETP Element and IOUs	2010-2012 PIP Objective	Projects Initiated as of Q1 2012	% of Project Initiated vs. Objective	2010-2012 Program Revised Budget [a]	Program Expenditures (Inception-To-Date)	% of Budget Spent as of Q1 2012	Proposed/ Actual Budgets for Ongoing and/or Completed Projects	% of Proposed/ Actual Budget over Total Budget
SCE	2	5	250%	$249,188	$232,172	93%	$32,500	13%
SCG	1	0	0%	SCG does not report expenditures by element in the ETP database			$0	NA
SDG&E	1	0	0%	SDG&E does not report expenditures by element in the ETP database			$0	NA
Statewide	**6**	**6**	**100%**	**$797,387**	**$394,970**	**50%**	**$232,500**	**29%**
Technology Test Center								
SCE	**NA**	**NA**	**NA**	**$2,237,141**	**$895,519**	**40%**	**$0**	**0%**

Source: Objectives are from the IOU PIPs, Projected Initiated, budgets, expenditures and proposed budgets are taken from the Q1 2012 ETP DB, proposed budgets for PG&E are taken from Q1 2012 monthly Data Request

[a] The 2010-2012 Program Revised Budget is consistent with the Fund Shift Report updated on April 12, 2012 and excludes rebalanced budget from AL 3235-G-3901-E.

b Excludes the budget for one project which was listed as 'Unknown' in the ETP Database.

SCG does not report expenditures by element in the ETP database, so all expenditures are within TA.

As documented above, many of the elements and projects were still in progress at the time of our early evaluation efforts. Moreover, unlike other IOU energy efficiency programs, three of the four IOUs have four years after project initiation to complete several of their projects for three key elements (i.e., Technology Assessments, Scaled Field Placements, and Demonstration Showcases).[39] As such, while the IOUs spent 35% of their budget as of Q1 2012, it is difficult to assess whether program element spending is on track for three of the IOUs (SCE, SDG&E and SCG) given that it is still early in the program implementation cycle (that is, given the four additional years for implementation, 27 months into a potential 84 month cycle). As of this early assessment, however, the Evaluation Team identified three areas in need of consideration in terms of goals and budgets. These three areas include: (1) PG&E's budgeting and expenditure requirements in light of the length of time needed to complete projects, (2) MBS goals and budgets, and (3) TRIO goals and budgets.

PG&E, with 14 initiated projects as of Q1 2012, may have difficulty meeting their objective of 28 technology assessments within the remainder of this program. However, discussions with the program manager indicate that there will be more than 28 assessments completed by the end of the year. According to the program managers, PG&E's budgets cannot be carried over between program cycles[40] As such, they must spend their budget within the multi-year program cycle. This can become problematic when the average technology assessment (where PG&E targets much of the ETP budget) takes 11 months from start to end with the current projects showing as long as 23 months. While PG&E's current method of accounting for budgets can assure a clean understanding of what projects were paid out of which program cycle, it is not compatible with the time needed for implementation of the projects. As such, there may be unintended consequences of this accounting practice. While no

[39] PG&E does not include this extended period for projects in their PIP.

[40] This may be a larger PG&E policy that the ETP program manager cannot change.

formal recommendation is made in this area, we describe this finding so that PG&E and the CPUC can identify and discuss any possible issues related to their goals in advance of the close of the program cycle.

Related to one specific element, MBS, the current PIP objective is to complete 4 studies. This initial objective was selected by assuming that each utility would complete at least one study. However, as of Q1 2012, the IOUs had initiated 21 studies (and completed 11) while spending approximately 50% of the overall budget. While these numbers indicate that this element is over budgeted statewide, this may be particularly true for PG&E which, as of Q1 2012, initiated 10 studies while committing about 60% of their budget (including spent and committed budget). Based on our assessment of the status, the MBS goals and budgets need to be better aligned by either increasing the number of expected studies or reducing the budget for this activity. Given the value of the MBS studies, increasing the number of expected studies appears to be the better choice for ETP.

Finally, for TRIO, implementation has shifted from PIP design to focus on event-based education and outreach, rather than screening, soliciting, and bringing in potential program participants. The program has already surpassed their objective of 3 events per year, holding 9 events (6 symposiums and 3 roundtables) in 2010-2012 while only spending 39% of the budget. The total event costs were $172,807 in 2010-2012 (which excludes labor costs); average costs per symposium and roundtable are $28,045 and $10,860, respectively. Given the changed focus and reduced costs associated with the current implementation, this element also appears to have more budget than necessary to meet the objectives listed in the PIP. We note, however, that SCE indicates that they may have utilized some of the TRIO funding to initiate related TRIP[41] efforts in the current program cycle.

Based on these findings, the Evaluation Team recommends the following.

Recommendation: Align Objectives and Budgets

Review and revise the ETP budgets allocated for Market and Behavioral studies and TRIO. Both appeared to be over-budgeted compared to the objectives listed in the PIP for the 2010-2012 cycle. Alternatively, there may be a need to increase the objectives for these elements to better align with the dollars allocated.

4.2 ASSESSMENT OF OUTCOMES

The program became more complex between the previous program cycle (PY2006-2008) and the current cycle (2010-2012) when the IOUs revised the design of ETP. The update created several new elements consisting of multiple activities that the IOUs expected to bring about different outcomes. It can help to think about ETP in comparison to the design of many resource acquisition programs. Essentially, the ETP is a project-based program with all custom projects, each of which can have multiple tactics or activities employed. Projects vary across five dimensions: (1) end-use, (2) stage of product development cycle, (3) targeted audience, (4) expected outcome, and (5) data sources (e.g.

[41] The Technology Resource Innovation Program (TRIP) solicits a competitive bidding process to fund third party programs that leverage innovative EE and/or IDSM technologies and approaches. SCE's 2013-2014 Program Implementation Plans, July 2, 2012, pp. 274.

primary and secondary data). This variation requires a strong design with a consistent thread of reasoning applied across the entire program to enable clear understanding of each activity and a goal-directed implementation of each project.

Based on our review of each of the elements of the ETP, there are opportunities to focus outcomes and move closer to a consistent thread of reasoning for each element or activity. Focusing outcomes will help design projects to meet the intended outcome. Moreover, focusing outcomes will provide a better opportunity to demonstrate the effects of the projects undertaken within each element.

Element-specific findings from our early assessment include:

- **Technology Assessments**: While this element has the explicit outcome of validating savings claims, many projects are not documenting savings, or are not focused on savings, which is essential to informing potential program adoption. In our close review of 12 sample reports: 5 of the reports provide per-unit savings values (a key output of a technology assessment); 3 reports provide a per-unit savings that can be calculated based on the information presented in the report; and the remaining 4 reports do not provide savings data (they were either missing or the project was not savings focused). This omission was also seen in a review of all of the projects available in the ETP database at the time of our review, 11 of 24 completed projects had information on savings in the ETP dataset, while 8 projects report zero savings, and 5 projects are blank (notably 3 of these projects were not going to be recommended for inclusion in the portfolio). Additionally, the IOUs sometimes house projects that focus on validating savings for multiple sites or integrated suites of measures under Demonstration Showcase and Scaled Field Placement, which may diffuse the intended outcome of these projects.

- **Scaled Field Placement:** Providing market influencers with the opportunity to "try out" technologies so they would influence future purchases was one of the primary expected outcomes of this type of project. While the outcome of a Scaled Field Placement appears to be market traction, projects that validate savings for multiple sites appear to be housed under Scaled Field Placement, and it is unclear whether there is a clear market influencer with the ability to lead to market traction. As of Q1 2012, for example:
  - The SDG& "Energy-Dashboard w/ Energy Mgr project" (ET11PGE3161) is listed as a Scaled Field Placement, but project documentation indicates that the project focuses on testing efficacy and energy savings potential facilitated through Pulse Energy EMS and energy coaching. Additional Scaled Field Placement projects that focus on validating savings are provided in Section II.

- **Demonstration Showcases:** There appear to be two different outcomes for Demonstration Showcases. While some of the listed Demonstration Showcase projects appear to focus on increasing visibility once a technology is proven, other Demonstration Showcases appear to be more aligned with the outcome of validating savings (discussed under Technology Assessment above). As of Q1 2012, for example, the following Demonstration Showcase projects appear to focus more on validating savings than increasing the visibility of proven emerging technologies:
  - SCE ZNE Inverter Grid Study (ET11SCE2010) is a Demonstration Showcase that, according to project documentation, uses simulation to identify grid impacts from ZNE.
  - SDG&E "LED Theater Stage Lighting" (ET11SDGE0005) is a Demonstration Showcase project that, according to project documentation, determines the energy savings

potential and installation cost for LED theatrical lighting. Additional examples are provided in the detailed chapters of the next section, Element-Specific and Detailed Findings and Recommendations.

Additional discussion about TDS and TRIO outcomes are provided in the specific write-ups for each of these elements.

We acknowledge that the ETP will undergo program design changes in the 2013-2014 program cycle; moving away from activities aligned with program elements to alignment with product development stages (i.e. development support, assessment and introduction support)[42]. Despite this change, our findings (and recommendations) are relevant because we expect that the six outcomes will continue into the next program cycle.

Once each of the elements (or activities) under the ETP are more focused, the program performance metrics (PPMs) can also be better aligned with expected outcomes. Below we discuss our recommendations about focusing outcomes and data collection to facilitate monitoring of the progress of the program based on the findings above.

Recommendation: Focus outcomes of existing elements, and move towards explicitly defining (and monitoring) outcomes for the next program cycle

Overall, in PY2010-2012, there appear to be six specific outcomes. The early projects in the PY2010-2012 program cycle were not always clearly implemented or tracked by their appropriate outcome. Doing this for the next program cycle will help to ensure that projects as implemented align more closely with their intended design. Table 10 shows the summarized specific recommendations for each element, using expected outcomes as a guide. The table also includes recommended data for the IOUs to collect and provide annually to the CPUC as a tool for the both the IOUs and CPUC to monitor program progress.

Table 10. Summary of Outcomes, Element-Specific Recommendations, and Suggested Data to Monitor Program Performance

Outcomes	Current Element	Specific recommendations for existing elements (2010-2012 cycle)	Data to collect to monitor program performance (future program cycles)
Savings validated or assessed	Technology Assessment	Keep estimates of savings as sole objective of all technology assessments. Broaden to include multiple-site and integrated assessments.	1. The number of new emerging technology (ET) measures recommended for transfer into the IOU EE Portfolio including but not limited to each of the following: (a) Advanced HVAC technologies

[42] PG&E's 2013-2014 Emerging Technologies PIP Addendum developed in July 2012 states that the "The new 2013-14 Emerging Technologies Program implementation plan will be simplified to the following sub-programs: 1. Technology Development Support (TDS), 2. Technology Assessments (TA), and 3. Technology Introduction Support (TIS)."

Outcomes	Current Element	Specific recommendations for existing elements (2010-2012 cycle)	Data to collect to monitor program performance (future program cycles)
			(b) High efficiency plug loads and appliances (c) Advanced lighting technologies (d) Integrated design 2. Technical potential impacts (energy savings and demand reduction) of the ET measures recommended for transfer into the EE portfolio.
Market traction (by working with individuals with market influence)	Scaled Field Placement	Focus on market traction and targeting market influencers. Narrow to work only with key market influencers; and focus on the actions of these influencers.	1. The type of participant included in the program (i.e., that the chosen participants have several sites or serve many customers).
Visibility of new or underutilized technologies	Demonstration Showcases	Narrow to exemplary showcases only (exemplary showcases emphasize visibility of successful technologies and systems.	1. Completed and in–progress demonstration showcase with description of the visibility of the showcase or the visibility based on how information regarding the showcased technology was disseminated. 2. Self-reported increase in knowledge by randomly selected sample of targeted stakeholders who either 1) visited the DS or 2) were informed about the benefits of DS in a different channel.
Market intelligence	Market & Behavioral Studies	Broaden use of studies to help determine needs for overall program.	1. Annual listing of studies with descriptions that focus on market level information. 2. Self-reported increase in knowledge among internal ET stakeholders about the technologies targeted by the M&B studies. 3. Self-reported increase in knowledge among external ET stakeholders about the technologies targeted by the M&B studies.

Outcomes	Current Element	Specific recommendations for existing elements (2010-2012 cycle)	Data to collect to monitor program performance (future program cycles)
Market support through performance specifications or protocols	Technology Development Support	Remove market intelligence activities from TDS and move to Market & Behavioral Studies efforts.	1. Number of new performance specifications produced or underway as a result of TDS. 2. Number of new performance specifications presented to manufacturers/private industry for possible action. 3. Number of new protocols created and/or equipment test procedures produced or underway as a result of TDS efforts. 4. The type of ETP measures where the IOUs work directly with a single market actor including but not limited to each of the following: (a) Advanced HVAC technologies (b) High efficiency plug loads and appliances (c) Advanced lighting technologies 5. The number and type of consortiums in which ETP staff members participate with the description of the link between the type of performance specification ETP staff work on within the consortium.
Networking and education of how entrepreneurs can work with IOUs	TRIO	Narrow by targeting events by end-use and stage in the technology development cycle.	1. Percent of attendees who voluntarily respond and self-report increased understanding on how to do business with utilities. 2. Number of events with a focus on stage in the technology development cycle and those that focus on end-uses: (a) Advanced HVAC technologies (b) High efficiency plug loads and appliances (c) Advanced lighting technologies (d) Other 3. Type of attendees at the events.

4.3 ASSESSMENT OF SCANNING AND SCREENING

As discussed above, each of the elements in the 2010-2012 program cycle was designed to have unique

outcomes. As such, the projects within each element should reflect these outcomes. For example, a Technology Assessment should be designed to validate savings, while a Scaled Field Placement should be designed to increase market traction. In total, five of the elements (i.e., TA, SFP, DS TDS, and MBS) require some form of scanning and screening prior to initiating a project.[43]

However, only SCE has tailored screening tools to select SFP, DS, TDS and MBS projects that align with the intended program element outcome. The other IOUs rely on the Technology Assessment screening tool (PG&E's Emerging Technology Opportunity Summary [ETOS] and Sempra's Emerging Technology Project Assessment [ETPA]) for all projects, or in the case of some program elements (MBS and TDS), do not have screening tools. Tailored screening and selection tools specific to expected outcomes can help to ensure that project selection meets these outcomes.

In our review of the selection criteria for the core element, Technology Assessments, which has been the central focus of the ETP since its inception, there is variation in terms of the scoring criteria (see Table 11).

[43] TRIO as implemented does not screen for event attendees. SCE's Technology Test Center receives technologies for assessment from Technology Assessments projects, and as such, does not screen for projects.

Table 11. Project Selection Criteria for Technology Assessments

IOU	Potential for Energy Savings	Market Risk	Other Factors Considered
PG&E	Market Size **(20%)** (number of units or sites in PG&E territory, price compared to alternative technologies, % of market where tech is applicable, maximum possible energy and demand savings over tech lifetime)	Estimated Market Penetration **(60%)** (enables savings, technical risk, product risk, market penetration risk, other risks,	Applicable project and internal advocate **(20%)**
SCG	Technical Savings Potential **(20%)**	Market Information (Market Risk) **(15%)** Technology Economics (Simple Payback Period) **(15%)**	Criticality of SCG Involvement **(15%)** Program Viability **(15%)** Technology Risk **(10%)** Non Energy Benefits **(10%)**
SDG&E	Cumulative Market Potential **(20%)** Technical Savings Potential **(10%)**	Market Risk **(15%)** Simple Payback (Tech Economics) **(10%)** Potential Customers **(5%)**	Criticality of SDG&E Involvement **(15%)** Technical Risk **(15%)** Non Energy Benefits **(10%)**
SCE	Will generate info needed for EE program **(20%)** Lifecycle Savings & Demand Reduction (considered, but no score applied)	Level of barriers to adoption **(10%)** Considered, but no score applied: Potential # of Customers Known Market Penetration	Alignment with BB Strategies for ZNE **(25%)** Host Site Identified **(15%)** Maintain portfolio balance **(10%)** Use current testing methodology **(10%)** Opportunities for collaboration **(10%)**
Range of Weighting:	**20%-30%**	**10%-60%**	**20%-70%**

While there may be utility-specific reasons for variation across the state (such as unique customer or geographic characteristics), it is unclear why the Technology Assessment screening criteria differ to the extent shown above. (Classifications in the table were created by the Evaluation Team but the weighting is based on the IOU's tools.) Documenting the rationale for these differences would be a useful exercise for the IOUs to collaboratively work together on enhancing their selection criteria to reflect statewide goals as well as individual IOU needs.

Some criteria that differ across the utilities that could be discussed among the IOUs include:

- **Applicable project and internal advocate (20% -- PG&E)** –This criterion helps to consider internal advocacy for the technology, approach or practices assessed, helping to foster transfer of the technology to the IOU energy efficiency portfolio.
- **Criticality of utility's involvement (15% -- SCG & SDG&E)** –This criterion can help assure that the project would not occur in the absence of the utility's involvement, thus helping to position the utilities in areas where they are filling a gap.
- **Opportunities for collaboration (10% -- SCE)** – This criterion helps to consider collaboration to help foster a network, which is important to the development of emerging technologies given

the myriad stakeholders and entities engaged in technology development and deployment.

Additional findings from our early assessment, by element, include:

- **Scaled Field Placement**: All projects should target customers with multiple sites, where the market influencer would place technologies in a site and expand to other sites after being influenced. We found that SCE is the only IOU that has a tailored screening tool that aligns with the intended outcome for this program element. Using tools that are not specific to the market influencers could lead to selection of projects that will not achieve expected outcomes. For example, eight of the nine projects reviewed had not selected a site (although the project itself had been selected). SCE's selection criteria incorporate a review of whether the market influencers have potential to influence a large number of future purchasers, installers, or recommenders. Potential sites are selected based on the site's visibility and customer's leadership position in its industry. The scoring tool also reviews technology market readiness by identifying whether the project is a proven technology that is commercially available, if there is a risk of performance failure, and if the performance can be monitored and measured. The latter is a fundamental criterion for scoring projects, as measures with high-risk of failure may not achieve the intended goal of positively influencing customer influencers to purchase and use these technologies.

- **Demonstration Showcases:** The selection criteria for projects varied across the IOUs with only SCE having a screening process that is specific to the Demonstration Showcase element. Statewide, the current set of selection tools does not ensure that the Demonstration Showcases will fulfill their planned outcomes because three of the four IOUs do not have tailored tools. As a statewide program, all the IOUs should use clear and specific selection tools that consider visibility, audience and the ability for knowledge transfer. All IOUs consider visibility, but the selection tools do not all include visibility as a criterion.

    - PG&E has a tool (ETOS) that is not specific to Demonstration Showcase, although it gathers some useful information. PG&E staff works with multiple people to select a project.

    - SDG&E and SCG use informal selection criteria when selecting technologies to incorporate in a project, including whether Zero Net Energy enabling technologies are applicable. Two of the three proposed projects for SCG incorporate ZNE technologies; however, information is limited regarding the technology choices for these projects. One of SDG&E's 11 projects incorporate bundled end-use measures; the Energy Innovation Center incorporates both lighting measures and solar. However, the remaining projects focus solely on lighting measures.

    - SCE has tailored tools for Demonstration Showcases, using three separate tools to collect information and score projects. The unique aspects of SCE's tool critical to Demonstration Showcase expected outcomes include: 1) alignment with Big Bold initiatives, 2) whether the system of measures are comprehensive and market ready, 3) whether the showcase encompasses a significant number of stakeholders, 4) whether the solution can be replicated, 5) whether the site chosen is optimal, and 6) whether the project fits well with SCE goals.

- **Technology Development Support:** SCE is the only IOU that has tailored screening tools for

TDS. (PG&E uses the TA tool and SCG and SDG&E do not have a selection tool.) SCE tools determine whether a technology qualifies for technology development support, including a description of the project, expected improvement, market intelligence, and estimated demand/energy savings. For the expected improvement, staff must consider several concepts including SCE's role in technology improvement or product specification development, the deliverables, and if the effort will lead to a Technology Assessment, Scaled Field Placement, or Demonstration Showcase. SCE then utilizes a scorecard to assess projects with scoring parameters including the ability of the measure to have the potential to reduce energy on a "game changing" level, mitigation of adoption barriers through assisting with the development of technology, availability of infrastructure, and SCE customer involvement. However, given the variety of activities that can be offered to support technology development, the existing SCE tools could be further refined to support the expected outcomes for product specification and protocols and standards development. For product specifications, the tool could incorporate other project identification strategies in addition to Technology Assessment candidates. For protocols and standards, the tool could incorporate a description of the need for testing protocols and updating standards, the target stakeholders/decision-makers who will support the new standards and testing protocols developed as part of the project, as well as a value statement for how the effort will support the development of reach codes.

Additional details on these findings, as well as findings for MBS, are documented in the next section, Element-Specific and Detailed Findings and Recommendations. Based on these findings, we recommend the following.

Recommendation: Coordinate and Tailor Scanning and Screening

Given that the elements have very different outcomes, the IOUs should develop specific screening tools for each element. Even if the future program does not specifically call out an element, the development of specific screening tools will ensure that project selection meets expected program outcomes. General screening tools that are not outcome specific make it difficult for ETP staff to select projects with varied intended outcomes.

Collaboration with other IOUs to discuss opportunities to improve tools statewide can help with the development of these outcome-specific tools. By discussing the criteria used for project selection, and why it varies across utilities, the IOUs can identify what criteria are IOU appropriate only or needed across the state. Documenting the rationale for differences (i.e., climate zone appropriate, IOU specific risks and viability, etc.), can also provide program stakeholders with an understanding of the differences across the IOUs in terms of portfolio needs and organizational structures, as well as help to ensure that future project impact evaluation are assessed against these criteria.

The specific selection criteria for each element by IOU are described in greater detail in the element-specific chapters in the next section, Element-Specific and Detailed Findings and Recommendations.

4.4 Assessment of Reporting

A review of existing reporting efforts suggests that there are opportunities to enhance reporting through 1) quality and type of reporting, 2) the intended audience for reporting, and 3) the timeliness of reporting. These opportunities vary across the program elements and are discussed below.

Quality and Type of Reporting

Both the Evaluation Team and EE program managers who read the completed Technology Assessment reports found the findings of the technology assessment reports clearly laid out. The reports followed logical formats with clear conclusions. However, the Evaluation Team's review of completed Technology Assessment reports demonstrated that these reports do not consistently include savings values and technical potential for assessed technologies.

- Many projects are not documenting savings, or are not focused on savings, which is essential to inform potential program adoption. As noted above, five of the 12 reports[44] that were available for review at the time of our early evaluation effort provide per-unit savings values; for 3 reports the per-unit savings can be calculated based on the information presented in the report; and the remaining 4 reports do not provide savings data (they were either missing or the project was not savings focused).

- Many reports do not document technical potential. Only 1 of the 12 reports that were available for review[45] provides technical potential for the technology assessed (SCE's Variable Speed Drive (VSD) for Die Casters project (ET10SCE1070)).

A review of a sample[46] of Technology Assessment reports provides a snapshot of the level of scientific rigor incorporated into the assessment based upon recommendations from the PY2006-2008 evaluation. There were seven distinct recommendations reviewed using a zero to one scale for each area as shown in the table below. Recommendations that were fully implemented would receive a maximum score of 1. The score across the recommendations ranged from 0.2 to 0.7). Therefore, the difficulties specified in the 2006-2008 evaluation around variability in the technology assessments were borne out in the review of these 11 reports.

Table 12. Analysis of Technical Content

Recommendation	Mean Score (Out of 1)	# Reports with Score of 0	# Reports with Score of 0.25	# Reports with Score of 0.5	# Reports with Score of 0.75	# Reports with Score of 1
ETP project managers should clearly identify and document the incumbent technology to which the emerging technology will be compared in every assessment project.	0.70	2	0	2	1	6

[44] Based on the data request, the Evaluation Team received reports for 12 of the 24 completed projects.

[45] Ibid.

[46] The sample for the Technology Assessments content analysis was drawn from a total of 35 Technology Assessments reports completed by ETP during the 2010-2012 program cycle (some of which began in the 2009 program cycle). Out of these 35 reports, we sampled 11 reports using a stratified simple random sample. We believe this was the best, most cost-effective approach to ensure that all sub-groups were adequately represented in the sample. We divided the population into six strata and performed a simple random sample in each stratum. The strata are categorized by IOU and author type (internal or external author).

Recommendation	Mean Score (Out of 1)	# Reports with Score of 0	# Reports with Score of 0.25	# Reports with Score of 0.5	# Reports with Score of 0.75	# Reports with Score of 1
ETP staff should validate the accuracy and proper sensitivity of sensors and the proper functioning of data loggers prior to initiating data collection.	0.61	2	2	1	1	5
ETP staff should measure and document the baseline performance of the incumbent technology in every ETP assessment project.	0.59	4	0	1	0	6
ETP assessment projects should be designed such that the only change made to the system under study between the pre-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 energy consumption impacts of each measure can be determined independently of the others.	0.57	4	0	1	1	5
Develop more robust technical and market potential estimates.	0.32	6	0	3	0	2
Project managers should present the uncertainty associated with all measured data in project documentation.	0.27	7	0	2	0	2
Use relevant monitoring protocol such as the International Performance Monitoring and Verification Protocol for technology assessment.	0.20	6	3	1	0	1

For Technology Development Support projects, both PG&E and SCE developed an array of deliverables targeted to the product developer/manufacturer related to establishing product baselines and product specifications. These deliverables provide recommendations for product enhancements or development of specifications.

The reporting for this element is understandably less than other program elements. However, we suggest that documentation be formalized to include project results, participant/consortium contact information, and project selection criteria. Formalizing documentation will provide consistent findings across projects, and will also support subsequent measurement of program impacts. If the specification is open source, the IOUs should disseminate the information widely; if not, this document could be used by the CPUC and the Evaluation Team to better understand program element activities.

Intended Audience for Reporting

The emphasis of reporting tends to focus on internal ETP and IOU EE program staff. As per the ETP database, 73 of the 190 (38%) initiated projects have 'EE Program Managers' as their primary reporting audience. Some projects identify external audiences; 8 of the 190 (4%) initiated projects have listed either 'conferences', 'customers' or 'professional organizations' as their primary audience in the ETP database. However, it is unclear whether the remaining 109 (57%) projects will be disseminated as they have either 'none,' 'unknown,' or 'other' as their primary audience in the ETP database. An example includes the following:

- For **Demonstration Showcases,** 15 of 23 initiated projects had defined a specific target audience in the ETP database (all except one were EE program managers), while the remaining 8 projects had "None" or "Unknown" as the primary audience. The Demonstration Showcase literature review (see Volume II) suggests that showcases should have a clear understanding of the audience prior to design and implementation of a showcase for knowledge dissemination to tailor showcases to the intended audience; to help understand existing levels of knowledge, professional role or position; and to determine into which Diffusion of Innovation theory adopter category they may fall.

Many stakeholders in California could benefit from the knowledge gained by the ETP. Since the CEESP goals rely on many stakeholders, not just the IOUs, the IOUs could more actively disseminate findings to a broader group of external stakeholders, which should start with the Emerging Technologies Coordinating Council (ETCC) but could expand beyond that forum.

Timeliness of Reporting

Overall, given the dissemination methods for program elements, timely reporting at key stages of the project is essential for informing internal and external stakeholders.

For Market & Behavioral Studies, an online survey of IOU staff who received MBS reports or information regarding the report, show that the reports were not timely. Three of the seven respondents (this was a census of staff who had received the reports) noted that they received MBS information after they had selected a new technology for their program.[47]

Some projects typically take a long time to get off the ground given the complexity of the projects. For example, a given Demonstration Showcase project can account for up to $1 million and take up to 46

[47] The survey asked about the timeliness of receiving information contained in the report (which could have been provided through other channels such as informal discussions, workshops, etc.). For the one respondent who had received information about the study through a channel other than a report, the respondent noted that they had received the information after making a decision to adopt a technology into the portfolio.

months to complete. As such, there is a need for clear reporting over the program cycle to inform stakeholders on project status.

Because it is difficult to state all of the details of a project in advance and the details of implementation generally become clear as the project develops, there is a need to document progress at agreed-upon stages over the development of the project. Stakeholders need regular updates on status to understand progress within this element.

Recommendation: Enhance Reporting

Recommendations related to enhancing project reporting vary across the elements. Some address quality, while others deal with type or timing of reporting efforts. Specific recommendations include:

- For **Technology Assessments,** work to enhance quality of reporting. Improve clarity of technical information through a guidance document on scientific rigor. Some areas for improvement are: 1) documenting uncertainties in the overall research, 2) discussing the market potential, and 3) description of the protocol being used for the specific field measurement.

- For **TDS**, formalize documentation to include 1) results from the project, 2) contact information, and 3) project selection criteria. Formalizing documentation will provide consistent findings across projects, and will also support subsequent measurement of program impacts.

- For **Demonstration Showcases,** enhance the quality of efforts through explicitly identifying the target audience prior to designing a project. SCE is the only IOU to incorporate a module in their concept proposal to assess whether the target audience has been identified, who they are, and the number of stakeholders that can be exposed to the project.

- For **MBS**, enhance timeliness of reporting. While timeliness findings were based on early implementation efforts, the IOUs should seek to ensure that key stakeholders receive MBS reports (or the information that will be in the reports) early enough to inform decisions.

4.5 ASSESSMENT OF DATA TRACKING

Currently, interim reporting to stakeholders includes quarterly updates to the CPUC on new projects and status via the ETP database, as well as monthly updates on expenditures through an ongoing data request.

Our review of the program-tracking database indicates that the data does not provide sufficient details for the CPUC to gauge whether the program elements are being implemented to meet performance metrics. The IOUs and CPUC should determine what information the CPUC desires that is not overly burdensome to provide. The Evaluation Team provided the IOUs and CPUC with two memos describing the ETP database contents, as well as proposed additional variables to improve analysis. See Volume II for the detailed findings.

Reclassification of projects within the database over time

Review of the ETP database over time indicates re-classification of projects into different program

elements, which indicates a lack of clarity regarding intended outcomes. For future program impact assessment, the Evaluation Team will need to assess program efforts against the stated program outcomes. For example,

- PG&E revised two of the current program cycle projects that were originally classified as a Technology Assessment to a Scaled Field Placement. These include:
    - ET11PGE3131: "EMS Fault Detection Diagnostics," which, according to the program-tracking database, tests the software's ability to find specific HVAC system faults. (Previously noted as ET11PGE1131), and
    - ET11PGE3161: "Pulse Energy -Dashboard w/ Energy Mgr", which according to the database, tests efficacy and energy savings potential facilitated through Pulse Energy EMS and energy coaching. (Previously noted as ET11PGE1161).
- PG&E revised two of the current program cycle projects that were originally classified as a Scaled Field Placement to Market & Behavioral Studies. These include:
    - ET11PGE3191: "Continental Automatic Building Association (CABA) Research Project", which, according to the program trracking database, identifies North American consumer behaviors and attitudes surrounding the connected home), and
    - ET11PGE3241: "EPRI-Coordinated Early Deployments of Efficient end-use Tech-Phase 1", which bridges the gap in the development pipeline between field demos and utility programs with early deployments).
- For Sempra, SCG originally listed project ET10SCG0001 "SF/MF WH data/survey" as a Technology Assessment, but re-classified the project as a Market & Behavioral Studies. In addition, SDG&E provided documents regarding a co-funded project with SCE entitled "Backlit Signs Market Study" as a Market & Behavioral Studies, but classified this project as a Technology Assessment in the ETP database.

Uneven Reporting across IOUs

The Evaluation Team found that data tracking included in the ETP database is uneven across the utilities. Only SCE consistently updated the database (quarterly). In addition, our analysis of the quarterly reports[48] found that the four IOUs provide information in their quarterly reports differently. The Sempra utilities do not enter their reports cumulatively leading to difficulty understanding the total number of program activities that have occurred.

Inaccurate or Missing Data in Database

Further, program information found in the program tracking database was found in some cases to be inaccurate, missing or conflicting. The data in the ETP database is also inconsistent with other sources of information that the IOUs provide to the Energy Division. Specifically, there were several gaps in key

[48] Note that this analysis was conducted in Q4 2011 of Q2 2011 activities. See Volume II for more detailed information on the ETP database.

database variables regarding technology types, timing of projects, type of research performed, and technical potential.

- For Technology Assessment projects, we found that there was missing data in the ETP database that are highly relevant towards tracking project progress with CPUC, external stakeholders and the Evaluation Team. Overall, we conducted an analysis of the 21 numeric ranges of the data provided in the quarterly reports.[49] Of the fields that provide numeric ranges, we found that 79% of cells that were completed had valid data (that is, values other than the "-99" value that indicated missing information).[50]

- For reporting of project progress points[51] in the quarterly reports, we found inconsistent data. We found that very few (1%) of program activities were missing progress points, but that the overall timeline of progress points is not always clear. There were progress points that do not follow the timeline of a program activity (e.g., completed in 2009, when program activities were initiated in 2010). Element-specific findings regarding data tracking for Technology Assessments, Scaled Field Placement, Demonstration Showcases, and Technology support are provided in the next section, Element-Specific and Detailed Findings and Recommendations.

Recommendation: Improve Data Tracking

Each IOU should comprehensively and accurately track ongoing activities in the ETP database. Projects cover long time frames and can extend beyond the program cycle. Key data is missing and does not show the extent of activities. Tracking should be comprehensive and timely to reflect ongoing activities and status to CPUC and evaluators.

In addition, the IOUs should include additional variables within the ETP database to reflect new program outcomes. As of the 2010-2012 program cycle, five new program elements were added to the Emerging Technologies Program. New program element activities are important to track to understand if the projects are reaching program element goals as well as to learn key information regarding project type, e.g., segment, end-use type, etc. Volume II provides proposed additional variables for ETP and CPUC consideration.

4.6 ASSESSMENT OF SUPPORT FOR CEESP

As discussed above, the ETP efforts are currently supporting the CEESP goals. However, our research also identified some areas where the ETP could provide additional support for the CEESP within their current resources. Specifically, strengthening or formalizing some of the current efforts will help to

[49] This analysis pertained to the technology assessment program activities only, and only those program activities that provided data under the variables.

[50] Note that this analysis was conducted in Q4 2011 of Q2 2011 activities. See Volume II for more detailed information on the ETP database.

[51] There are five progress points that are used in the ETP database to indicate the stage of the project, from initiation through completion or cancellation.

better support the CEESP (e.g., dissemination and coordination, more strategically laying out activities to support longer-term technologies).

Broaden dissemination and coordination

One area, in particular, that can be strengthened is the coordination and dissemination of information to external stakeholders (that is, individuals outside of the IOUs who are also working to develop emerging technologies). While coordination is occurring with external stakeholders, at the time of our early evaluation efforts, the IOUs have several opportunities to disseminate information more broadly.

One of the ways in which dissemination is supposed to occur is through the ETCC website. At the time of our evaluation, only 6 of 21 completed Technology Assessment reports and 3 of 11 completed Market & Behavioral Studies reports were posted (as of July 2012). Some dissemination, however, is occurring. Note that in addition to the studies that were posted, Technology Development Support publicizes testing procedures and protocols in several cases (part-load boiler procedure informing ASHRAE 155, SCE Internally Illuminated menu board distributed to CSA, ISA, and manufacturers).[52] A more consistent implementation of dissemination efforts through ETCC and other pro-active efforts, however, can help to increase knowledge in the market and move both the IOUs and others forward in their efforts to support the development of emerging technologies.

The need for (and the value of) further dissemination and coordination was also evident in our discussions with external stakeholders. Specifically, key stakeholders who were identified by the IOUs and CPUC as being very knowledgeable in this area were unaware of much of what the ETP was currently doing. While these individuals were certain that the ETP was "doing good work," they did not have a good sense of exactly what the ETP was doing.

Identify strategic market position

As the IOUs broaden their focus beyond meeting the needs of the IOU EE program managers and the IOU EE portfolio, it would help for ETP staff to develop and document their strategic market position (that is, the role that they want to have with regards to other market players).

In reviewing the current market position for the ETP elements, we found that the Technology Assessment element is well positioned in the California energy efficiency residential and commercial market for emerging and under-utilized technologies. Detailed research methodology and findings are provided in Volume II.

Overall, the Evaluation Team found that Technology Assessment is uniquely positioned within the emerging energy efficiency technologies market for the following reasons:

- The ETP Technology Assessment element is one of the few publicly funded entities that conduct early deployment stage assessments. Other publicly funded entities, such as universities and national labs, primarily focus on early stage R&D and conduct technology assessments in-lab.

[52] These projects include: ET11PGE5231 Partial-Load Boiler Efficiency Test Procedure, ET10SCE5010 Internally Illuminated Menu Boards for Multiple Applications.

- The ETP has the ability to selectively target technologies that are aligned with the state's goals, rather than an individual manufacturer's goals. Other efforts by private entities (both lab and *in-situ*) are conducted only for their products, which may or may not be aligned with CEESP goals.

- Additionally, for any type of *in-situ* testing, the IOUs have a long-standing relationship with customers that can be drawn upon to help test products. Their customer relationships allow them to have access that other organizations may not have and could allow them to play a large role in understanding and addressing behavioral economics[53]—that is, the drivers for the emotional side of choices, as they have access to customers. This ability to access customer sites is a strength that also supports other activities such as Demonstration Showcases or Scaled Field Placement. For example, the IOUs can use their customer contacts to set up a Demonstration Showcase in a visible location, such as a theater or restaurant (as they are currently doing).[54]

In addition, the ETP Technology Assessment element is one of the few publicly funded entities that has a breadth of different activities, allowing the ETP to work across various stages of the technology development continuum. For example, SCE's Technology Test Center staff indicate they participate in weekly meetings where they collaborate on project planning and testing and share results such as providing air conditioning maintenance assessment results from a lab assessment to help with a scaled field placement or demonstration showcase.

Our team also looked at the ETPs' efforts in the area of ZNE, since this was explicitly called out as one of the PIP goals. In our review of the literature, the Evaluation Team found 25 entities that conduct ZNE testing. For the 25 entities found in the online search for ZNE testing, the team performed a thorough inspection online to determine the following parameters:

- Description of entity efforts
- Funding sources (sustainability of funding as well as where funding will be used, i.e., direction/long-term goals of funding)
- Whether the building was built for consumer usage (i.e., commercial building occupied by customers) or testing (*in-situ* or in lab)

Based on the criteria above, the team found eight entities whose efforts, funding sources, and activities were similar in scope to the TTC ZNE test center[55]. Additional criteria were applied to these entities:

- Sector (Residential vs. Commercial – since SCE's TTC Zero Net Energy applies to the Residential sector)
- Location (within California or not)

[53] Findings from the expert panel indicate that this tactic was considered highly relevant for increasing market demand for emerging energy efficient technologies.

[54] Note that interviews with ETP program staff indicated that identifying and gaining customer acceptance for in-situ testing, scaled field placements and demonstration showcases is a key challenge for staff.

[55] We note that the program managers chose to discontinue the Residential ZNE Facility in 2012.

Based on the additional criteria above, only one other program performed similar functions, and this was an IOU program that was initially part of the ETP, but later became a standalone program—PG&E's pilot ZNE Program. PG&E's program is testing ZNE within residential buildings, but not specifically within a laboratory setting.[56] In addition, the TTC is unique in its funding source (its mandate for energy efficiency products is clear and does not change based on policy or preference changes) and activities (performs lab testing of technologies that are near-market ready). As such, SCE's ZNE Technology Test Center is unique in California's energy efficiency market.

These findings about Technology Assessments and ZNE efforts through SCE's TTC begin to demonstrate that the IOUs are positioned well in terms of some of their current activities.

As mentioned above, one of the difficulties with assessing the ETP's support for the CEESP is that there is not a common understanding of how the ETP should support the CEESP. A clearly defined market position for the ETP would help with 1) defining ETP's role vis-à-vis other market players, 2) providing a framework for activities (such as development, assessment and introduction support) and level of effort for these activities in support of that position, and 3) guiding selection of end-uses and projects. For example, if lighting is an end-use with a lot of current support provided by other market actors, there may be a greater need for the ETP to advance plug loads. Or alternatively, if upstream support is lacking in a particular area, the IOUs should consider positioning their activities upstream to help meet the CEESP goals. Information gathered from external stakeholders show that more R&D activities may be needed in support of certain end-uses such as climate-appropriate HVAC or plug loads while more deployment activities are needed for end-uses such as lighting or integrated design. (Note that some of these specifics are discussed in Chapter 12).

As the market can change over time, we suggest that ETP program staff assess their market position relative to other market actors annually and subsequently allocate appropriate resources based upon their findings (we discuss this in greater detail in our recommendations section).

Recommendation: Further Support CEESP

While the ETP alone is not expected to meet CEESP goals, there are changes that could be made to the ETP program that would allow the program to better support the CEESP. Understanding the ETP's position in the market relative to others who are also supporting emerging technologies will be critical to enhancing the value of the current efforts in this area. In addition, being more strategic with activities and resources, and sharing information collected through the ETP will also help support CEESP. Specifically, some considerations to further support CEESP efforts include:

- Broadening dissemination and the intended target of the ETP efforts by posting all completed reports to ETCC (after redacting confidential information) and looking for proactive ways to further disseminate findings about savings and other market intelligence in the area of emerging technologies to targeted stakeholders outside of IOUs (e.g., email list serve groups by key end-use or targeted newsletters to identified stakeholders).

- Determining the ETP's strategic market position in support of the CEESP goals relative to other entities in the market. An assessment of market position would support the identification of

[56] A full list of entities can be found in Volume II.

strategic areas for the ETP as well as help to set a framework for technology and project selection. For example, as part of determining market position the IOUs could consider areas that align with one of their unique strengths (i.e., customer contacts), and set goals for conducting large collaborative projects with other external stakeholders. The process of determining market position will also allow ETP staff to identify and further collaborate with existing organizations operating in the California energy efficiency RDD&D market, such as EPRI, National Labs, California Energy Commission, various universities, Western Cooling Efficiency Center, Department of Energy (DOE), and others working outside of California. Note that some existing research is being conducted in this area (e.g., a process study led by SCE) and additional work could be done through Phase II of this evaluation that could help inform the IOUs' market position for the future.

- Further adjusting project screening tools to reflect the ETP's market position as laid out in a unifying action plan (described above).

4.7 Overview of Ongoing Efforts

The findings from the process evaluation will help to inform the next phase of the evaluation where we will assess the impacts of the program. Drawing on the main goals of the program (and the outcomes for each project), we will determine the impact evaluation activities that will occur under this next phase. These specific activities are not yet set, but the plan will be publicly available for comment once determined.

In the next section, we provide the detailed findings for each element, as well as our detailed findings from the Expert Panel.

ELEMENT-SPECIFIC AND DETAILED FINDINGS AND RECOMMENDATIONS

As stated before, the ETP is a complex and multi-faceted program. While the IOUs do not implement each of these different elements in a vacuum, discussion of the program is facilitated through separate sections by element. Next, we provide detailed chapters, by element, specifically to help the ETP program staff better understand the Evaluation Team's detailed findings, and how each of the recommendations applies to the elements in the 2010-2012 program cycle.

5. TECHNOLOGY ASSESSMENTS

This chapter includes findings from the Technology Assessment element. Technology assessments performed by SCE's Technology Test Center (TTC) are included within this chapter. The next chapter provides a more detailed description of the TTC.

5.1 TECHNOLOGY ASSESSMENT DESCRIPTION

According to the Program Implementation Plan (PIP), Technology Assessments are conducted to "evaluate performance claims and overall effectiveness in reducing energy consumption and peak demand for new or under-utilized Energy Efficiency (EE) measures."[57] This effort is expected to help increase technology supply either through the EE portfolio rebated measures or within the energy efficiency market. According to the PIP:

- "Technology Assessments are conducted via *in-situ* testing, laboratory testing, or paper studies."
- "Assessments provide data for EE [energy efficiency] rebate programs to construct workpapers estimating energy and demand savings over the life of the measure."
- "Information developed regarding measures will assist external stakeholders to understand performance, reducing barriers to implementation, [through] increased measure awareness, market knowledge and reduced performance uncertainties for ETP stakeholders and IOU customers."[58]

5.2 EVALUATION METHODOLOGY

The Opinion Dynamics Evaluation Team collected information regarding the Technology Assessments program element through a variety of data collection activities. The team conducted these activities to understand how the IOUs implement the program element, to describe any changes to program implementation, and to provide recommendations for process improvements. We performed much of the data collection and analysis in September through November 2011, although the aggregate analysis extended through mid-2012 (with data through Q1 2012). Each data collection instrument included a series of detailed research questions developed as part of the evaluation plan.[59]

[57] Taken from the Program Implementation plan. The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; 7. SCE-SW-009 Emerging Technologies.doc pp. 772; SCG SW Emerging Technologies Final.doc, pp. 7; SDGE SW Emerging Technologies Final.doc, pp. 7.

[58] Ibid.

[59] Note that we provide detailed research questions in Volume II.

Table 13. Data Collection Activities for Evaluation of TA Program Elements

Data Collection Activity	Description
In-Depth Interviews	Conducted six in-depth interviews with the four IOUs for TA
Program Material Review	• Document(s) regarding screening and selection criteria • List of technical assessments conducted between 1/1/10 and 9/1/11 • List of scored, approved, and funded measures for assessments between 1/1/10 and 9/1/11 • Final reports that describe results and conclusions from each completed ETP assessment, discussion of ETP results, and other communication and documentation, where applicable • Documentation of information dissemination regarding technical reports • Cost data per technology assessed, where available • The 2006-2008 ETP Evaluation Report[60] • Screening score sheets used by the ETP program staff[61] • Information collected from ETP program manager interviews conducted in May 2011[62]
ET Open Forum Observation	Attended ET Open Forum spotlight on October 26, 2011. The ET Open Forum is a TA-funded activity that assists ETP with their scanning process.
Target Audience Surveys	Conducted a quantitative online survey of 51 IOU staff members (out of 167 IOU staff members contacted) that received Technology Assessments reports, the Market and Behavioral Studies, or both.
ETP Database	Reviewed information on the projects as provided in the quarterly updates to this database.
Evaluability Assessment	Two workshops and ongoing in-depth interviews with the four IOUs to identify program theory and logic model as well as potential performance indicators for each element.
Expert Panel	One expert panel was conducted to determine whether ETP is positioned[63] in California's Research, Development, Demonstration and Deployment (RDD&D) energy efficiency market to be able to meet the expected goals as articulated in CEESP.
Secondary Research to Assess Market Position	The Evaluation Team performed research by reviewing internal IOU documents and the American Council for an Energy-Efficient Economy (ACEEE) website, reports, and conference proceedings, and by conducting an online search using appropriate search terms. The research uncovered a total of 30 entities (7

[60] Summit Blue Consulting, LLC; Energy Market Innovations; Opinion Dynamics Corporation; Strategic Energy Technologies; ADM Associates, Inc.; E SOURCE GDS Associates, Inc.; SDV/ACCI California Technology Innovations, Inc. "Interim Report #1 for the PY 2006-08 California Statewide Emerging Technologies Program." 2008.

[61] Note that the screening score sheets are scoring tools developed by each IOU to assess whether a technology should be assessed are provided in Volume II

[62] Findings from these interviews were provided to the CPUC and IOUs in June 2011.

[63] We define "positioned" as where the ETP aims its activities in the RDD&D energy efficiency market to contribute to the CEESP goals.

Data Collection Activity	Description
	companies found through the internal review and 23 entities found through the online search). Although this is not an exhaustive list, it is still relevant to make inferences about work being performed similar to TA within the overall CA EE market. These entities were categorized by funding (public and private funding) and testing (in lab, *in situ*, both) to determine where they fit into the overall CA EE market.

We performed a qualitative analysis of the program manager interviews and Technology Assessment reports as well as screening and selection criteria and tools. Additionally, using the information from our data collection activities, we performed four distinct evaluation activities.

Table 14. Evaluation Activities

Activity	Description of Activity
Content Analysis	Reviewed the TA reports to determine clarity and relevance. To minimize potential bias, three different evaluation staff assessed each report and compared results to determine whether there was inter-rater reliability in the scores assigned to each report. A PhD engineer also closely reviewed each report to determine if the reports aligned with selected 2006-2008 ETP Evaluation Report recommendations.[64] Developed a sample design for choice of reports to review.
Aggregate Level of Analysis[a]	Obtained the Emerging Technology Quarterly Reports submitted by each utility to the CPUC and compiled descriptive statistics from the data to illustrate the composition of the portfolio, end-uses, sectors, project length, etc. This analysis is designed to achieve 2 objectives: 1) to describe for each utility the basic components or elements that make up the ETP and provide the necessary broader context for assessing the performance of the ETP (e.g., types of technology assessments, average duration of projects, collaboration with other institutions/agencies; and 2) to determine, for each utility, the extent to which the overarching program and policy objectives have been met (e.g., addressing the needs of all customer sectors, assuming acceptable levels of risk, etc.).
Review of Scoring Tools	Reviewed each IOU's scoring tools to provide a description of the process and recommendations to improve the tools and scoring processes (see detailed review in Volume II).
Survey Analysis	Compiled descriptive statistics of the survey responses.

[a] California Public Utilities Commission, *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. (2006) pp. 71.

The sample for the Technology Assessments content analysis was drawn from a total of 35 Technology Assessments reports completed by ETP during the 2010-2012 program cycle (some of which began in the 2009 program cycle).

[64] Summit Blue Consulting, LLC; Energy Market Innovations; Opinion Dynamics Corporation; Strategic Energy Technologies; ADM Associates, Inc.; E SOURCE GDS Associates, Inc.; SDV/ACCI California Technology Innovations, Inc. "Interim Report #1 for the PY 2006-08 California Statewide Emerging Technologies Program." 2008.

Out of these 35 reports, we sampled 11 reports using a stratified simple random sample. This was the best, most cost-effective approach to ensure that all sub-groups are adequately represented in the sample, given limitations posed by time and resources. The population was divided into six strata and a simple random sample selected in each stratum. The strata are categorized by IOU and author type (internal or external[65] author). Table 15 shows the sample design and chosen sample points.

Table 15. Technology Assessment Content Analysis Sample

	Strata	Population Size	% of Population	Sample Size	% of sample
Strata	SCE Internal Author	10	29%	3	27%
	PG&E Internal Author	4	11%	1	9%
	PG&E External Author	9	26%	3	27%
	SCG Internal Author	3	9%	1	9%
	SCG External Author	2	6%	1	9%
	SDG&E External Author	7	20%	2	18%
Sample by IOU	SCE	10	29%	3	27%
	PG&E	13	37%	4	36%
	SCG	5	14%	2	18%
	SDG&E	7	20%	2	18%
	Totals	**35**	**100%**	**11**	**100%**

To minimize the bias in analyzing the reports, three different evaluation staff assessed each report and compared results to determine whether there was inter-rater reliability in the scores assigned to each report. If there was more than a 10% variation in the scores assigned to a report (four of the 11 reports), we discussed and attempted to reconcile any differences in the ratings. We then averaged the three scores given to each report to develop a final score.

We also assessed the same reports on a more technical level reviewing 2006-2008 evaluation recommendations (items # 3, 25-26, and 28-31). A Ph.D. engineer closely reviewed each report and determined if the technology assessment reports were aligned with the recommendation. After that, another engineer reviewed the reports and adjusted some of evaluated values. We used a zero to one scale for each recommendation as shown in Table 16.

[65] Some Technology Assessments reports were completed by outside firms.

Table 16. Analysis of Technical Content

Item #[a]	2006-2008 Evaluation Recommendation	IOU Response: Specific program change	Scoring Scale
25	ETP project managers should clearly identify and document the incumbent technology to which the emerging technology will be compared in every assessment project	Incumbent technology is clearly identified in all assessment unless it is a new or new application of existing technology	0 = Recommendation not followed 0.25 =Not clear if recommendation followed 0.50 = Recommendation somewhat followed 0.75 = Recommendation mostly followed 1 = Recommendation followed
26	ETP assessment projects should be designed such that the only change made to the system under study between the pre-post-retrofit periods 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 energy consumption impacts of each measure can be determined independently of the others	Understood and this approach is included in enhancements of scientific rigor for ET elements, especially assessments	
28	ETP staff should validate the accuracy and proper sensitivity of sensors and the proper functioning of data loggers prior to initiating data collection.	Utilities will document the calibration of instrumentation per manufacturer's specifications when conducting their own measurements. When working with consultants, utilities will request an instrumentation plan documenting the calibration protocols to ensure proper accuracy.	
29	Project managers should present the uncertainty associated with all measured data in project documentation	[No response provided by IOUs in this document for this recommendation]	
30	ETP staff should measure and document the baseline performance of the incumbent technology in every ETP assessment project	[No response provided by IOUs in this document for this recommendation]	
31	Use relevant monitoring protocol such as the International Performance Monitoring and Verification Protocol for technology assessment	[No response provided by IOUs in this document for this recommendation]	
3	Develop more robust technical and market potential estimates	One of the new program elements. Budget for this is small. "Robust" should mean using data that is not from the manufacturer, using secondary data from reputable sources, or gathering primary data when necessary	

Item #[a]	2006-2008 Evaluation Recommendation	IOU Response: Specific program change	Scoring Scale
[a] Item numbers correspond to the 60 Day Recommendations Report Attachment regarding the 2006-2008 Emerging Technologies Program (ETP) M&V Recommendations.			

5.3 CURRENT TECHNOLOGY ASSESSMENT ELEMENT DESCRIPTION AND STATUS (AS OF Q1 2012)

This report presents interim findings based upon a snapshot of ETP as of Q1 2012. As such, the summary of status, as well as findings and recommendations within the report, are based on 27 out of the 36 months in the program cycle.

5.3.1 TECHNOLOGY ASSESSMENT STATUS

Below is a description of projects and status of Technology Assessments as of Q1 2012.

Project Status

The Program Performance Metric (PPM) for the Technology Assessment program element is "the number of ETP measures that have gone through a Technology Assessment and that are adopted into the EE portfolio, including but not limited to each of the following:

- Advanced HVAC technologies
- High efficiency plug loads and appliances
- Advanced lighting technologies"[66]

According to the PIPs, the statewide objective for PY2010-2012 for the IOUs is to assess 73 technologies under the Technology Assessment element. The IOUs have exceeded this objective. The table below provides a summary of the PIP objectives as well as the number of projects initiated by each of the IOUs in the 2010-2012 program cycle.

Table 17: Technology Assessments as Stated in 2010-2012 PIPs

IOU	2010-2012 PIP Objective	TAs Initiated as of Q1 2012	% of TAs Compared to Objective
PG&E	28	14	50%
SCE	30	74	247%
SCG	7	21	300%
SDG&E	8	21	263%
Statewide	**73**	**130**	**178%**

Source: IOU PIPs and Q1 2012 ETP DB

Of the total initiated projects, the IOUs report that 24 are completed, 73 are ongoing, and 25 have been put on hold or have been stopped[67] (no status information is available for eight of the projects). SCE,

[66] IOU PIPs: PG&E, pp. 5; SCE pp. 793; SCG, pp.26; SDG&E, pp. 26.

SDG&E, and SCG have up to 4 years since the initiation of the project to complete the project.[68] The table below provides a summary of the Technology Assessment status by IOU.

Table 18: Summary of TAs Initiated, by IOU (as of Q1 2012)

IOU	Total Initiated	Total Completed	Ongoing	On Hold or Stopped by ETP	No Status Reported
PG&E	14	2	9	3	0
SCE	74	18	42	13	1
SCG	21	4	9	1	7
SDG&E	21	0	11	10	0
Statewide	**130**	**24**	**73**	**25**	**8**

Source: First element within Q1 2012 ETP DB

SCG and SDG&E have conducted projects that cut across program elements, i.e., technology assessments that also have a scaled field placement or demonstration showcase aspect. The IOUs have changed the project element type in the ETP database over the 2010-2012 program cycle, indicating a lack of clarity on the part of the IOUs in terms of how to categorize these efforts. For all of SCG and SDG&E completed Technology Assessments, there are no savings data and no technical potential in the ETP database. At this point, SCG and SDG&E's reporting does not provide enough information to inform internal or external stakeholders of savings impacts and potential for the assessed technology.

The PIPs also have an objective for the IOUs to transfer technologies into the IOU EE programs under the Technology Assessment element. The 2010-2012 PIP objectives require that 35 technologies be transferred to the EE programs.[69] Table 19 provides an overview of Technology Assessments recommended or transferred through Q1 2012.

[67] The ETP database defines 'on-hold' as "project work has been temporarily stopped, but is planned to resume. This may be due to resource limitations. It could also be due to something like technology unavailability or circumstances dictating a project task not be started until a future date." The ETP database defines 'stopped' as "project work has stopped and will not resume under same project number (screening process would be repeated if similar work was proposed.)"

[68] This is according to the PIPs. PG&E does not have this stipulation within their PIP.

[69] We note that the Technology Assessment program element is also successful when Technology Assessments identify technologies that do not merit transfer.

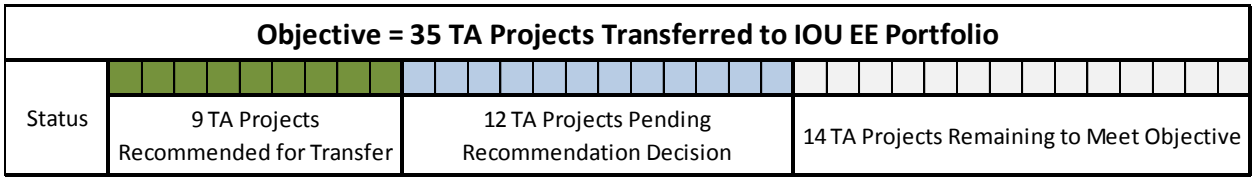
Table 19: TA Projects Transferred to EE Portfolio (through Q1 2012)

IOU	2010-2012 PIP TA Transfer Objective	Recommended for Transfer	Not Recommended	Recommendation Decision Pending*
PG&E	12	0	0	2
SCE	15	9	1	8
SCG	4	0	2	2
SDG&E	4	0	0	0
Statewide	**35**	**9**	**3**	**12**

* Note: Recommendation Pending Decision refers to ETP database variable, "Status," where ST05 is "Complete, EE measure has neither been implemented nor rejected."

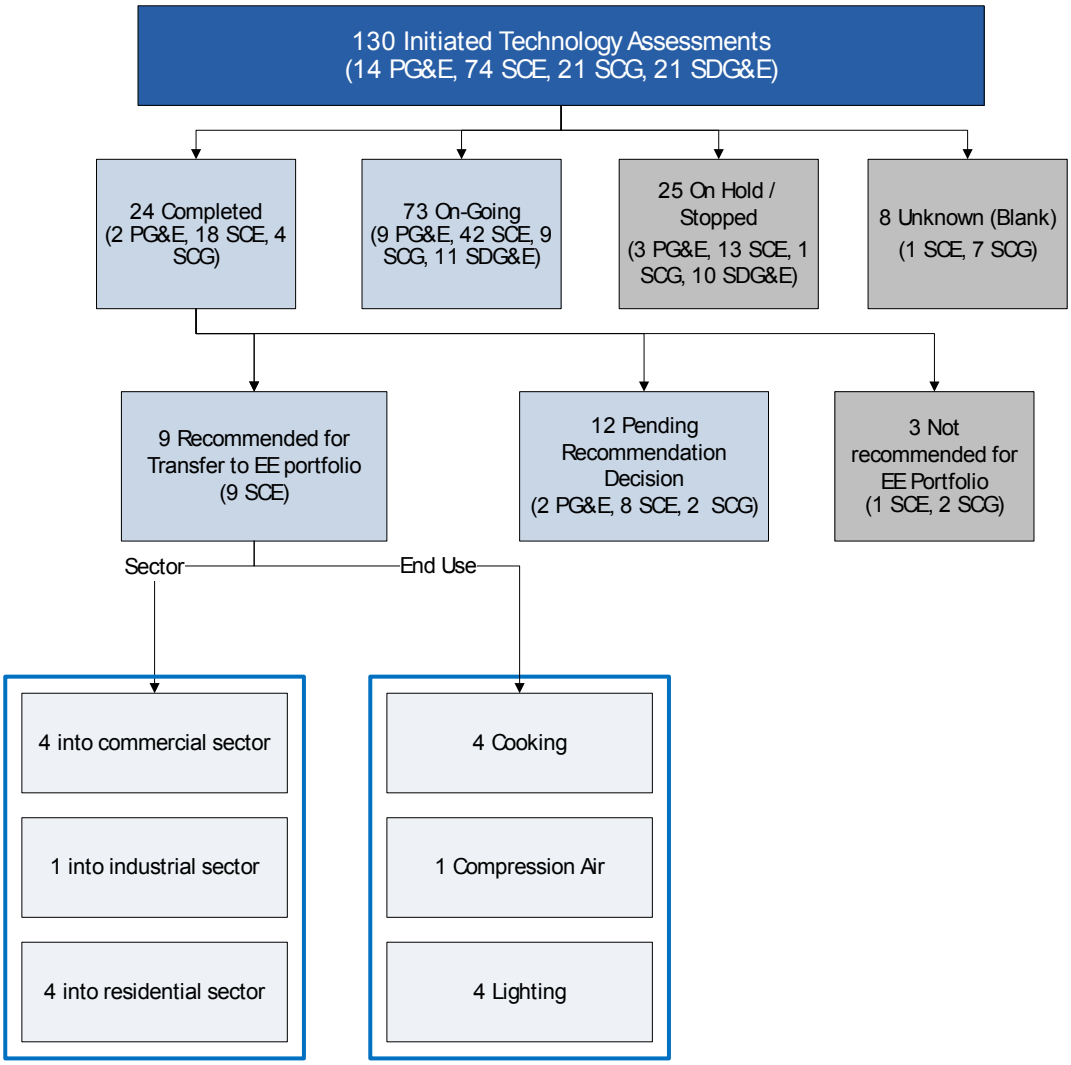
We acknowledge that delays beyond the control of the ETP program can occur between recommending a technology and the actual transfer of the technology into the EE portfolios. ETP has an additional 12 measures that are still pending a decision to recommend for transfer, and SCE has eight of these measures.

Figure 2: Technology Transferred by Status in PY2010-2012 as of Q1 2012



Of the nine technologies recommended for transfer, they are evenly split between the residential and commercial sectors, and one technology is specifically for the industrial sector. However, of these nine technologies, only four (all are for lighting in the residential sector) are directly related to the end-uses referenced in the CEESP; the other five technologies are for compressed air and cooking (Figure 3).

Figure 3: Technology Transferred in PY2010-2012 as of Q1 2012



Technical Potential and Estimated Savings for Transferred Measures

The Evaluation Team analyzed the total reported estimated savings for 21[70] of the 24 completed projects and, whenever possible, calculated the technical potential. Technical potential refers to the energy savings potential that would be captured if all energy efficiency measures were installed in all applicable and feasible applications. While technical potential is not an easy value to estimate with any precision, it is a useful metric for comparing and prioritizing technologies. Lifetime technical potential refers to the energy savings potential over the entire lifetime of the technology. It is calculated using the technical potential and the estimated effective useful lives of the technologies. Technical potential and lifetime technical potential are calculated as shown in Equation 1.

[70] Nine projects are completed and 12 projects are completed but pending decision for transfer to EE programs. The Evaluation Team did not analyze the three projects completed and later rejected.

Equation 1. Technical Potential Algorithms

$$Technical\ Potential = N\ Sites * \%\ Sites\ where\ Technical\ Feasible * kWh\ Savings$$

$$Lifetime\ Technical\ Potential = N\ Sites * \%\ Sites\ where\ Technical\ Feasible * kWh\ Savings * Estimated\ Useful\ Life$$

To calculate technical potential, the Evaluation Team used data provided by the IOUs in the ETP database for completed projects. Of the 21 completed projects in the ETP database (and not dropped for further review), 11 had sufficient data to calculate technical potential.[71] Table 20 summarizes the technical potential of the completed and transferred projects. Overall the annual technical potential, including projects that have been completed but not yet implemented, is about 8,511 GWh, 13 GW, and 8.7 million therms.[72]

Table 20: Summary of Completed TA Project Technical Potential

Project Status	Annual Technical Potential			Lifetime Technical Potential		
	GWh	GW	therm	GWh	GW	therm
Completed, recommended for transfer (n=6 of 9)	1,505	0.387	NA	9,231	2.32	NA
Completed, recommendation decision pending (n=5 of 12)	7,006	12.97	8,741,610	104,333	194	131,124,150
TOTAL	**8,511**	**13.35**	**8,741,610**	**113,565**	**197**	**131,124,150**
% of EE Portfolio Impacts[a]	**0.11%**	**0.92%**	**6.74%**			

Source: Q1 2012 ETP DB

The "Completed and Rejected" projects had either missing or"0" values in the ETP DB and are thus not shown in this table.

'n' refers to the number of projects with data to calculated technical potential.

[a] Sourced from 2010-2012 Monthly Energy Efficiency Program Report, March 2012: PGE.MN.201112.3, SCE.MN.201203.1, SCG.MN.201203.1, SDGE.MN.201203.1

Table 21 shows which projects had sufficient data and the inputs to the technical potential estimate. SCG and SDG&E completed Technology Assessments but did not report savings data in the ETP database. At this point, SCG and SDG&E's reporting does not provide enough information (i.e., savings data) to inform internal or external stakeholders of savings impacts and potential for the assessed technology.

[71] The three projects that were not recommended for transfer are not included in the total as the ETP database did not contain technical potential for those technologies.

[72] This is a known overestimation of total impacts, as ETP provides technical potential impacts, not market potential (as reported in the IOU portfolio impacts). If market potential were included, the savings would be an overestimate of actual impacts as full market potential is rarely realized.

Table 21: Completed TA Project Estimated Savings and Technical Potential by Project

Project ID	Annual Per Unit Savings Provided in TA Report?	Data from ETP Database						Estimated Technical Potential		
		Annual kWh / site or unit	Peak kW Savings / site or unit	Annual Therm Savings / Year	N sites	% Sites Use technology	Useful Life (n)	MWh	kW	Therm
Complete, EE measure recommended for transfer (n=9)										
SCE										
ET10SCE1130	No - can be calculated from data	1,522	0	0	8,754 Lamp	5%	11	666	-	NA
ET10SCE1160	Yes	75,000	13	0	2,000 Machine	10%	10	15,000	2,500	NA
ET10SCE1220	Yes	198	0.050	0	3,868,385 Lamp	95%	6	727,643	183,748	NA
ET10SCE1230	No - can be calculated from data	198	0.050	0	3,868,385 Lamp	95%	6	727,643	183,748	NA
ET10SCE1290	Yes	73	0.022	0	8,763,457 Lamp	5%	10	32,061	9,443	NA
ET10SCE1310	NA	Missing	Missing	Missing	Missing	Missing	Missing	NA	NA	NA
ET10SCE1330	No - provides baseline data only	18,431	4	0	(99) Oven	-99%	12	1,806	370	NA
ET10SCE1410	NA	0	0	Missing	0	0%	0	NA	NA	NA
ET10SCE1440	NA	0	0	Missing	0	0%	0	NA	NA	NA
							TOTAL	**1,504,820**	**379,810**	**NA**
Complete, EE measure pending recommendation decision (n=12)										
PGE										
ET11PGE1071	NA	468	0.002	10	2,070,000 Smart Thermostat in homes	41%	15	397,276	1,697	8,741,610

Project ID	Annual Per Unit Savings	Data from ETP Database						Estimated Technical Potential		
ET10PGE1001	No	2,024	4	0	360,000 Heat Pump Water Heater	9%	15	6,557,760	12,960,000	NA
PGE TOTAL								**6,955,036**	**12,961,697**	**8,741,610**
SCE										
ET10SCE1050	Yes	8,340	2	0	2,800 Store	3%	10	701	134	NA
ET10SCE1070	Yes	3,376	3	0	204 System	10%	10	69	55	NA
ET10SCE1250	NA	0	0	Missing	0	0%	0	NA	NA	NA
ET10SCE1340	NA	0	0	Missing	0	0%	0	NA	NA	NA
ET10SCE1390	NA	11,166	2	0	44,735 Steamer	10%	0	49,951	10,065	NA
ET10SCE1400	NA	0	0	Missing	0	0%	0	NA	NA	NA
ET10SCE1430	NA	0	0	Missing	0	0%	0	NA	NA	NA
ET11SCE1130	NA	0	0	Missing	0	0%	0	NA	NA	NA
SCE TOTAL								**50,721**	**10,255**	**NA**
SCG										
ET10SCG0015	NA	Missing	Missing	Missing	Missing	Missing	Missing	NA	NA	NA
ET10SCG0017	NA	Missing	Missing	Missing	Missing	Missing	Missing	NA	NA	NA
SCG TOTAL								**NA**	**NA**	**NA**
TOTAL								**7,005,757**	**12,971,952**	**8,741,610**
Complete, EE measure not recommended for transfer (3)										
SCE										
ET10SCE1240	No - Assessment not designed for savings	0	0	0	0	0%	0	NA	NA	NA
SCG										
ET10SCG0011	No - No savings from technology	Missing	Missing	Missing	Missing	Missing	Missing	NA	NA	NA
ET10SCG0012	NA	Missing	Missing	Missing	Missing	Missing	Missing	NA	NA	NA

Project ID	Annual Per Unit Savings	Data from ETP Database	Estimated Technical Potential		
		GRAND TOTAL	**8,510,577**	**13,351,762**	**8,741,610**

Source: Q1 2012 ETP DB.

Table 22 shows the completed projects lifetime savings estimates are based on the estimated effective useful life (EUL).[73]

Table 22: Completed TA Project Lifetime Technical Potential (with data)

Project	MWh	kW	Therm
Complete, EE measure recommended for transfer (n=9)	**9,231,335**	**2,328,851**	**NA**
SCE	**9,231,335**	**2,328,851**	**NA**
ET10SCE1130	7,328	NA	NA
ET10SCE1160	150,000	25,000	NA
ET10SCE1220	4,365,859	1,102,490	NA
ET10SCE1230	4,365,859	1,102,490	NA
ET10SCE1290	320,611	94,426	NA
ET10SCE1310	NA	NA	NA
ET10SCE1330	21,677	4,446	NA
ET10SCE1410	NA	NA	NA
ET10SCE1440	NA	NA	NA
Complete, EE measure recommendation decision pending (n=12)	**104,333,241**	**194,427,356**	**131,124,150**
PGE	**104,325,547**	**194,425,461**	**131,124,150**
ET11PGE1071	5,959,147	25,461	131,124,150
ET10PGE1001	98,366,400	194,400,000	NA
SCE	**7,694**	**1,895**	**NA**
ET10SCE1050	7,006	1,344	NA
ET10SCE1070	689	551	NA
ET10SCE1250	NA	NA	NA
ET10SCE1340	NA	NA	NA
ET10SCE1390	NA	NA	NA
ET10SCE1400	NA	NA	NA
ET10SCE1430	NA	NA	NA
ET11SCE1130	NA	NA	NA
SCG	**NA**	**NA**	**NA**
ET10SCG0015	NA	NA	NA
ET10SCG0017	NA	NA	NA
Complete, EE measure not recommended for transfer (n=3)	**NA**	**NA**	**NA**

[73] Data on effective useful life was provided for four of the six projects. For the remaining two, we estimated the effective useful life based on similar technologies found in the Database for Energy Efficient Resources (DEER). http://www.energy.ca.gov/deer.

Project	MWh	kW	Therm
SCE	**NA**	**NA**	**NA**
ET10SCE1240	NA	NA	NA
SCG	**NA**	**NA**	**NA**
ET10SCG0011	NA	NA	NA
ET10SCG0012	NA	NA	NA
TOTAL	**113,564,576**	**196,756,207**	**131,124,150**

Costs and Funding

The IOUs are not required to budget or track their overall ETP budgets by element. They can move budgets between elements as needed, but must remain below the overall program budget. However, at least $29 million of the ETP statewide program budget of $43 million (67%) is targeted towards the Technology Assessment element. The exact number is unknown since SCG and SDG&E do not track budgets for Technology Assessments separately from other elements.

Across all IOUs, current projects range in budget from $150 to $550,000, with the mean project costs around $56,000.[74] Budget information was either not available or noted as zero for 26 of the 130 TA projects.[75] Project costs are not identical to expenditures as IOU labor costs and administration overhead are not included in the project costs. Therefore, the actual budget for the element needs to account for labor and other aspects of implementing the element not covered specifically within project costs.

The table below provides budget and expenditure information available to the Evaluation Team. The proposed budgets are for current committed projects. PG&E has a budget of over $14 million for Technology Assessments and has spent 38% as of Q1 2012. PG&E has spent similar dollars as SCE, but since their budget is substantially larger than SCE's budget; their percent of expenditures as of Q1 2012 is lower than SCE's expenditures. PG&E currently has nine projects ongoing. However, these projects will not lead to a significant increase in spending towards the budget. Later discussions with PG&E indicated that they now have committed to projects that make up their entire budget.

[74] Note that the average excludes any missing project budgets.

[75] For the 26 projects missing budget information, 5 were active, 2 were completed with a recommendation decision pending, 2 were missing status, and 17 were stopped projects.

Table 23: Technology Assessment Element Budget and Expenditures by IOU as of Q1 2012

IOU	2010-2012 Program Revised Budget[a,b]	Program Expenditures (Inception-To-Q1 2012)	Percent of Budget Spent as of Q1 2012	Proposed/Actual Budgets for Committed Projects[c]
PG&E	$14,072,326	$5,350,897	38%	$817,000
SCE	$7,762,216	$4,728,638	67%	$1,993,000
SCG	$3,515,000[d]	SCG does not report expenditures by element in the ETP database.		$494,000
SDG&E	$4,050,854[d]	SDG&E does not report expenditures by element in the ETP database.		$435,000
Partial Total	**$29,400,396**	**>$10,079,535** (does not include SCG and SDG&E)	**34%**	**$3,739,000**

[a] Element budgets reflect those reported in the ETP database. Note that Sempra does not track their program by element.
[b] The 2010-2012 Program Revised Budget is consistent with the Fund Shift Report updated on April 12, 2012 and excludes rebalanced budget from AL 3235-G-3901-E.
[c] Source: Q1 2012 Monthly data request data.
[d] SCG and SDG&E do not report their budgets by element. This Technology Assessment budget includes Sempra's entire ETP budget.

Of the 130 projects initiated, the Evaluation Team was able to identify 2 projects with external funding partners.[76] However, it is possible that other projects utilized funding partners—if so, they were not documented. Leveraging other funds across the IOUs or with external partners helps enhance collaboration.

Timeline

The total time required to scan, screen, assess, and transfer a technology into the portfolio varies based on a number of factors, but was reported by the ETP program managers to take anywhere between six months to two years, and most frequently between one and two years. Prescriptive measures (that have deemed savings values assigned once incorporated into the portfolio) take longer to assess and transfer than customized/calculated measures due to the need to develop a workpaper for consideration and approval by the CPUC. The time required can vary widely depending on the type of technology being assessed/transferred. Within the completed projects, there was a large variation in the time taken to complete the project, with time ranging from 1 month to 23 months (average time taken to complete a project is about 11 months).

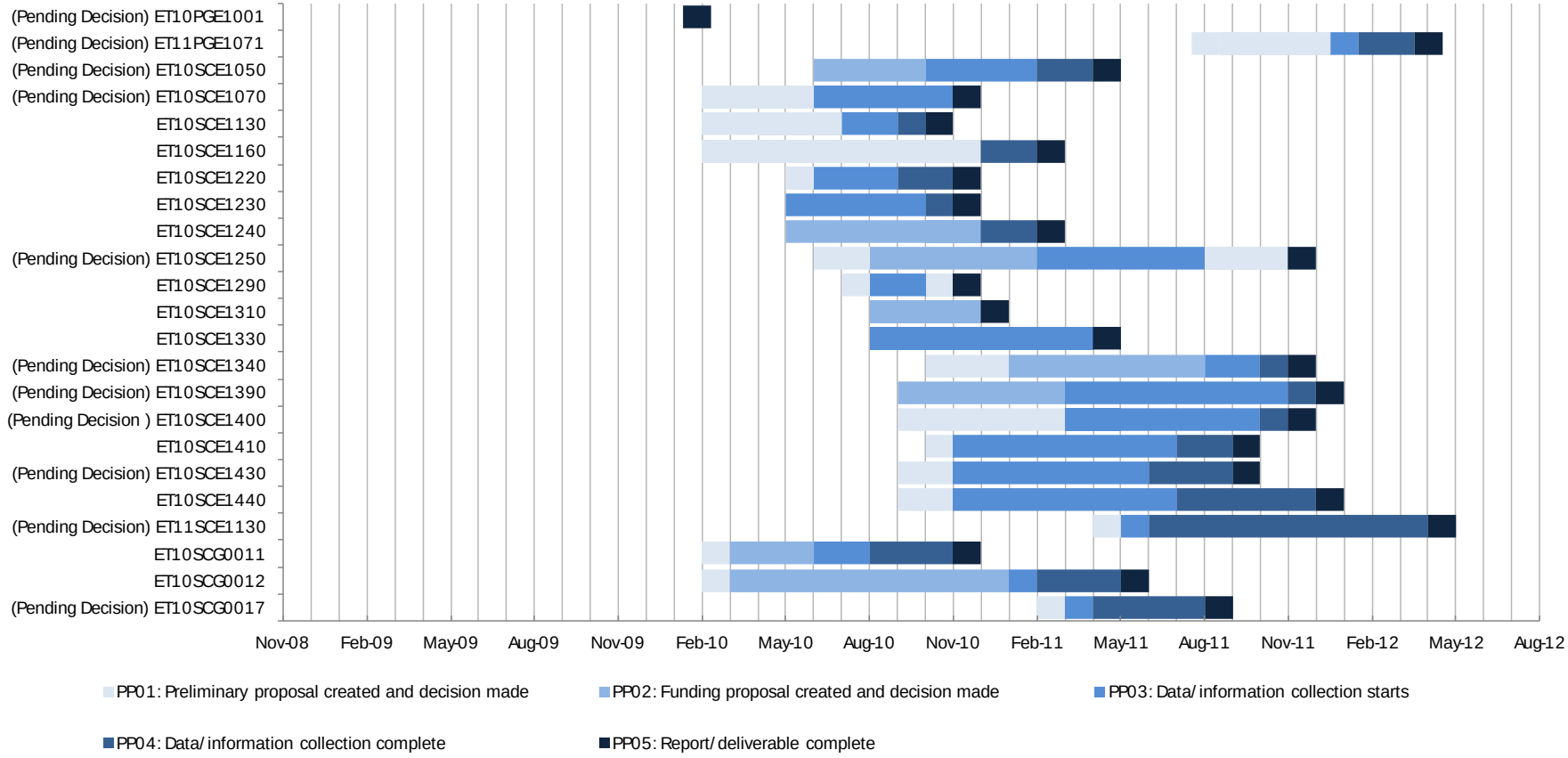
For the majority of these completed projects, the progress points[77] indicate that the project was complete in 2011 or early 2012. Figure 4 shows completed projects with their timeline (by progress point) and by IOU. The figure also indicates projects that are complete, but have pending decisions.

[76] One project by SCE (ET10SCE2010, co-funding with DOE. Source: SCE.ET.2012Q1.3) and one project by PG&E (ET10PGE1001, no description available. Source: PGE.ET.2010Q2.1)

[77] There are five progress points that are used in the ETP database to indicate the stage of the project, from initiation through completion or cancellation.

Decisions are not made immediately after completion of a project as 22 of the 24 projects were completed prior to the end of Q1 2012, but decisions were made on transfer (or not) for 12 (9 were recommended to be transferred and 3 were not). At the time of the evaluation, while there were few (n=9) projects recommended for transfer, there were three that were specifically designated as projects not to pursue. It is expected and desired that not all projects are actually pursued (or it may be that the projects under assessment are not sufficiently forward looking), so the percent of all completed projects that are recommended (37.5%) is reasonable. Because 12 of the 24 completed projects do not yet have a recommendation statement, the 9 that are recommended appears low. However, this percentage (37.5% of completed projects) could well become 87.5% if the IOUs eventually recommend these 12 projects. This percentage appears reasonable as well, although should be reassessed once the IOUs completed their determination of recommendations to be sure that there are sufficient projects begun to withstand the attrition process inherent in technology assessments.

Figure 4: Completed Technology Assessment Timing as of Q1 2012*

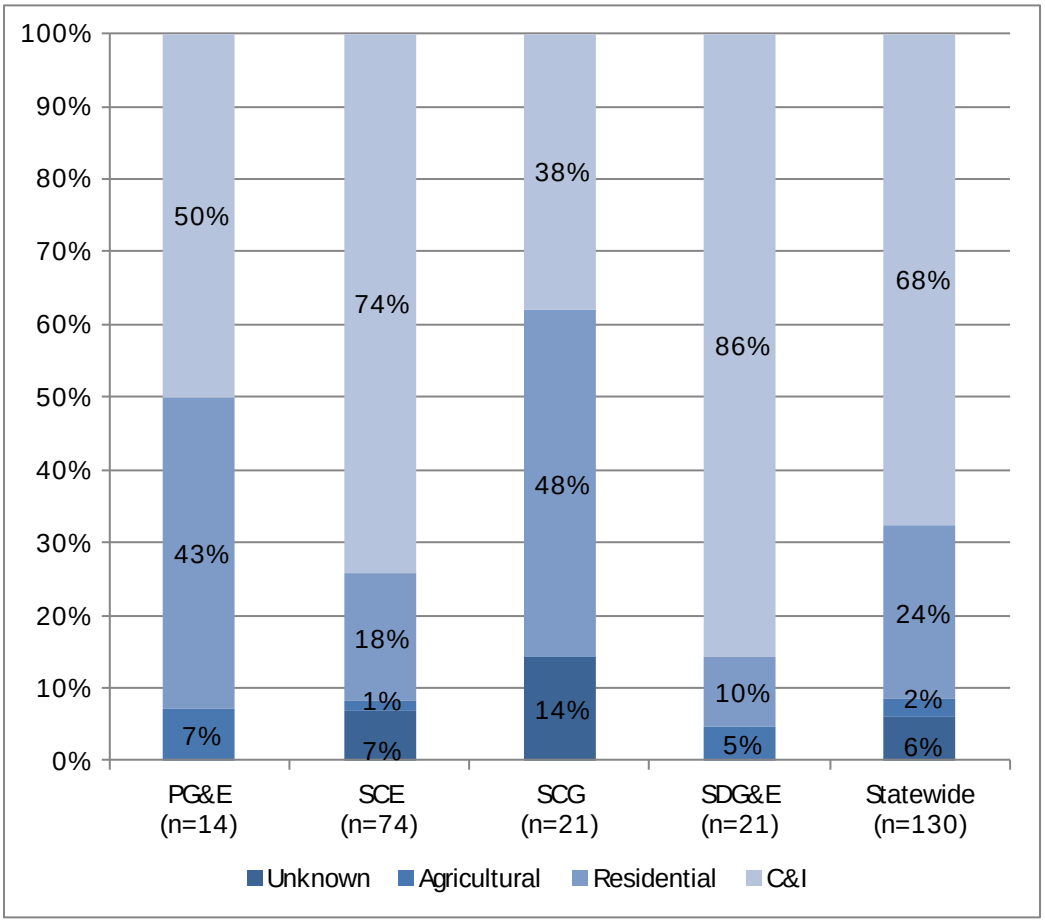


* One SCG project (ET10SCG0015) does not appear in this figure because it was completed in December 2009.

Types of Activities

Most ETP projects focus on the commercial sector, with some projects focused on the industrial, residential, or agricultural sectors. The IOUs classified about 70% of overall projects as commercial and industrial, roughly 25% of the projects have a residential or agricultural application, and the remaining 6% do not have a sector documented in the ETP database. Figure 5 below provides a breakdown by utility.

Figure 5. Projects by Market Sector (Multiple Responses Allowed)



According to the ETP database, the majority of the projects were research based and made use of primary data sources. Out of 130 projects, 104 conduct primary data collection; 15 also include secondary data.

The end-uses covered in 2010-2012 projects are shown in the table below.[78] Approximately 30% of the projects address either an HVAC or Lighting end-use. About 7% of the projects address controls, and nearly 19% of the projects are split between eight different end-use areas (such as pumps, motors, building shell, etc.). The projects marked as "Other" represent 32% of the projects. The majority of projects documented as "Other" are from PG&E and SCG. These projects are heterogeneous in nature

[78] Some projects were listed as addressing more than one end-use.

and include technologies such as foodservice applications and various water and waste treatment systems.

Table 24. Technology Assessments by End Use

End Use	PG&E (n=14)	SCE (n=74)	SCG (n=21)	SDG&E (n=21)	Statewide (n=130)
Lighting	7%	14%	0%	62%	18%
Cooking	0%	22%	5%	0%	13%
HVAC	7%	11%	24%	5%	12%
Controls	14%	8%	0%	5%	7%
Pumps	7%	4%	0%	10%	5%
Water Heating	7%	0%	24%	0%	5%
Heat Recovery	7%	3%	5%	0%	3%
Building Shell	7%	3%	0%	0%	2%
Motors	0%	3%	0%	0%	2%
Process Heaters	0%	1%	0%	0%	1%
Refrigeration	0%	1%	0%	0%	1%
Other (categories shown below)	43%	31%	43%	19%	32%
Categories included in "Other"					
Other (not specified)	36%	14%	14%	5%	15%
Unknown	0%	7%	14%	0%	6%
Food Processing	0%	3%	0%	5%	2%
Computing Equipment	7%	0%	5%	5%	2%
Compressed Air	0%	3%	0%	0%	2%
Process	0%	3%	0%	0%	2%
Fans	0%	1%	0%	0%	1%
Hospital/Medical Equipment	0%	0%	0%	5%	1%
Drying Clothes	0%	0%	5%	0%	1%
Thermal Storage	0%	1%	0%	0%	1%
Residential appliances - general	0%	0%	5%	0%	1%

In terms of end-use by IOU, SDG&E focused primarily on lighting projects (over 60% of projects focused on lighting); SCE spilt its focus between lighting, cooking, HVAC, and controls (about 55% of projects were for these four end uses); SCG split its focus between HVAC and water heating (about 48% of projects were for these two end uses); and about 20% of PG&E's projects focused on building shell, computer equipment, and pumps. Thirty-six percent of the projects for PG&E are classified as "other."

The Research and Technology (R&T) Chapter of the CEESP calls for actions that will help California achieve the goals described in the CEESP.[79] The chapter outlines actions that are needed to develop the following technology areas: Integrated Building Design (whole building improvement), Building Management Systems, and Diagnostics; Plug Loads and Controls; Climate Appropriate HVAC; and Lighting.[80] ETP plays a role in helping to meet goals, although many other entities are involved.

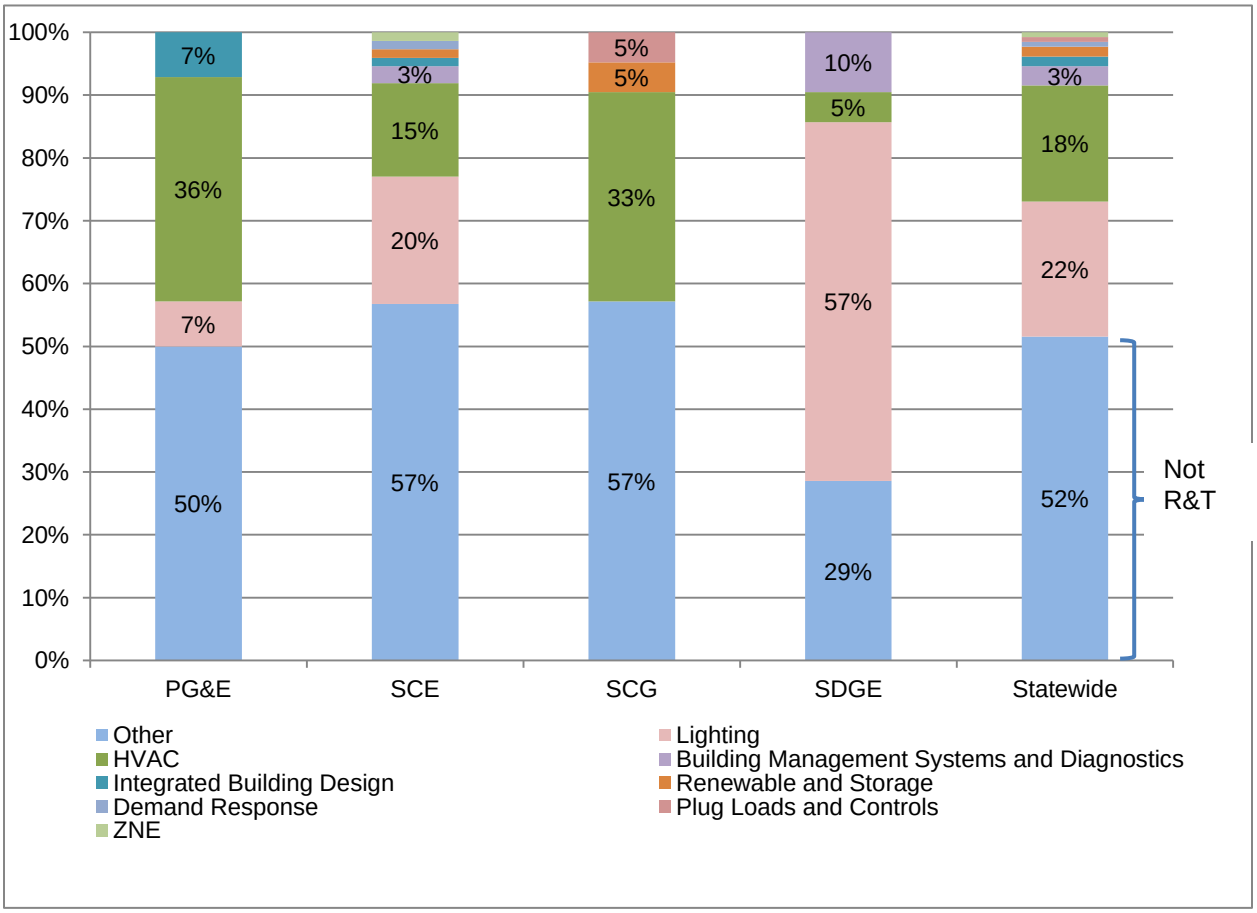
To compare the current suite of ETP projects to the R&T technology areas, we classified projects based on the end-use and description of the project provided in the ETP database by the IOUs. The IOUs were not required to make this type of categorization of their projects and may choose to bin their projects differently. Additionally, our categorization for HVAC is broad and does not categorize hot/dry climate HVAC technologies separately. However, based on our categorization, over half of projects do not fall within the key R&T framework areas outlined in the CEESP (see Figure 6)[81].

[79] In September 2008, the CPUC adopted California's first Long Term Energy Efficiency Strategic Plan (CEESP), creating a single roadmap to achieve maximum energy savings across all sectors in California. The CEESP was developed through a collaborative process involving the IOUs and over 500 individuals and organizations working together over an 11-month period. This comprehensive plan for 2009 to 2020 and beyond is the state's first integrated framework of goals and strategies, covering government, utility, and private sector actions, and holds energy efficiency as the highest priority resource in meeting California's energy needs.

[80] Source of end-use areas is from the California Energy Efficiency Strategic Plan, January 2011 Update, pp. 80.

[81] Categorization of all ETP projects by R&T technology areas can be found in Volume II.

Figure 6. Project Type by R&T Framework Area



As can be seen from the figure above, all of the IOUs are performing Technology Assessments on R&T type projects and all are putting considerable efforts into HVAC technologies. Besides HVAC, PG&E focused on lighting and integrated building design; SCG focused on plug load and controls and renewable and storage; SDG&E focused on building management systems and diagnostics; and SCE focused on lighting projects.

5.4 ASSESSMENT OF DESIGN

Technology Assessments have been the primary activity of ETP over the past six years, and evaluation activities in the past have helped to refine the program theory.[82] The purpose and theory behind a Technology Assessment has not changed since the previous program cycle. However, much of what the IOUs implemented in the previous program cycle under the name of "Technology Assessment" now occurs within different elements. This differentiation by program element has focused the Technology Assessment activities. In the current program cycle, the activities are focused on evaluating the performance claims and effectiveness of technologies in reducing energy consumption and peak

[82] A review of design for the 2004-2006 ETP is found in *Interim Report #1 for the PY 2006-08 California Statewide Emerging Technologies Program.* California Public Utility Commission – Energy Division. Summit Blue Consulting. April 2008.

demand. Compared to previous program cycles, the narrower focus of the element strengthens the program design because its objectives and intended outcomes are more clearly defined.

As a result of a workshop held on November 14, 2011, the IOUs, the CPUC Energy Division Project Manager, and the Evaluation Team developed the following program theory for the Technology Assessment element:

Program Theory: Energy efficiency program managers must continuously bring new measures into their portfolio. However, it is difficult for program managers to find new measures, know if specific measures will save the level of energy or demand that is cost-effective, or know how customers may respond to specific technologies. Information obtained through Technology Assessments allows them to learn about the new measures and make informed decisions on whether or not to include them in the energy efficiency portfolio. Technology Assessments may also collect anecdotal information to provide EE program managers with useful information regarding customer interactions with a specific technology.[83] The program element expected outcome is to verify energy savings claims and identify performance uncertainties.

To assess plausibility of program design, the design must support the overall intent of the element. For this element, the intent is to serve as a feeder to the IOU energy efficiency programs, thus allowing the resource programs to fulfill larger policy directives. As criteria for plausibility, the team identified areas that must support the overall intent of the program:

(1) The activities performed by the program must be focused to align with objectives
(2) The available funding must be large enough to support objectives
(3) The planned outcomes must be aligned with IOU and California needs
(4) The activities should not be redundant (but can be complementary) to other market influences

The first three areas are reviewed below. (Note that we provide a review of activities compared to other market influencers in Chapter 4.)

1. Program Activities

The program activities generally align with the objectives of the program that lead to bringing technologies into the energy efficiency portfolio (i.e., responsive to technologies, as they are available in the marketplace and as needed by the energy efficiency program managers). However, to better align with CEESP goals, activities should actively pursue specific technologies needed in the market. Within the program cycle, the IOUs have taken some steps to support these efforts; however, there are opportunities to expand upon those current steps. Outlined below are current design and proposed changes, including how and when ETP staff target technologies, the selection criteria used, and the entities involved by current core activities to support the IOU energy efficiency portfolio and proposed activities to support CEESP efforts (see Table 25).

- The current **scanning** process encompasses multiple sources for new technologies, approaches, and practices. These include people coming to ETP staff (i.e., primarily internal IOU personnel,

[83] The Evaluation Team worked with IOUs to develop a program theory and program outcomes for the current program cycle. We note that the program theory for this cycle is conceptually identical to the 2006-2008 theory and that the logic model is largely unchanged from the PIPs (see Volume II).

as well as manufacturers, and Public Interest Energy Research [PIER] Program) as well as ETP staff seeking out information during conferences, through personal conversations, etc. Since the previous evaluation, the IOUs have broadened their scanning efforts. The IOUs, as part of the ETCC[84], now host an Emerging Technologies Energy Efficiency Open Forum twice a year to scan for new technologies that ETP staff can consider for assessment. (See Section 5.5.1 for a description of this event.) The ET Open Forum includes attendees from the IOUs, CEC, CPUC, as well as investors, researchers, entrepreneurs, regulators, and the California and Pacific Northwest utilities. The introduction of a targeted scanning process through ET Open Forum is a positive step in providing technology assessments that support the CEESP goals. The program needs this proactive approach and, most likely, this practice will slowly change the overall distribution of assessments within the ETP portfolio.[85]

- The **screening** process is different across the IOUs, although each IOU screens technologies for their technical and market potential. Similar to the scanning process, the screening process has been refined since the last evaluation cycle as new areas for consideration were brought into the screening tools. Currently, only SCE's tool explicitly supports CEESP goals. Revising the screening tools to support CEESP goals (by end-use, sector) and across a broader technology development stage (i.e., prototype development) would more closely align with long-term policy directives. Continued refinement of the current screening tools would also enhance current IOU-focused efforts.

- The **assessment** phase activity currently consists of *in-situ* or lab evaluation of energy savings from a single technology at a single site. With the differentiation of activities across multiple elements in the 2010-2012 program cycle, the Technology Assessment element is more targeted to focus solely on verifying a technology's energy savings. Since the main outcome of this assessment is to verify energy savings, assessment of energy savings from integrated technologies or across multiple sites logically falls within this element. Currently, the IOUs differentiate energy assessments from integrated technologies (placing that effort under the Demonstration Showcase element) and multiple sites (placing those efforts under the Scaled Field Placement element). These types of assessment should be included as a Technology Assessment. Regardless of technology selected, the objective is to verify performance and energy savings of unproven technologies. As such, a Technology Assessment could include single or integrated measures, and/or be tested at various locations. This is aligned with a single focus for this element (assessing energy savings) and enhances the focus of other elements.

[84] The Emerging Technologies Coordinating Council (ETCC) coordinates the efforts of member utilities to assess and implement cutting edge, energy efficient technologies. ETCC members include: Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric (SDG&E), Southern California Gas Company (SCGC), Southern California Edison (SCE), Sacramento Municipal Utility District (SMUD), and California Energy Commission (CEC). The ETCC is supported and advised by the California's Public Utilities Commission (CPUC). The ETCC's efforts are driven by California's "Big Bold" Energy Efficient Strategies established by the CPUC and CEC in California's Long Term Energy Efficiency Strategic Plan for 2009 and beyond, and by California's commitment and aggressive schedule to reduce Carbon Dioxide emissions (AB32). http://www.etcc-ca.com/

[85] Within the TRIO element assessment, the Evaluation Team recommends increasing the frequency of the ET Open Forum and focusing each by end-use (as is already done) and by phase of product development cycle.

- The **technology transfer** phase is when the ETP staff recommend a technology for transfer (not when a technology is adopted into the EE portfolio). The ETP staff assist in the decision-making process through providing the best information possible to recommend a measure for transfer into the portfolio and help usher these technologies into the market through EE programs. However, the ETP staff does not make the decision as to whether a technology is ultimately adopted into the IOU EE portfolio; rather, IOU EE staff and the CPUC make the decision to adopt a technology into the portfolio.

  All of the IOUs have incorporated recommendations from the previous evaluation report to enhance inter-departmental transfer procedures to the IOU EE portfolio by creating committees or teams that include staff from the ETP and the EE portfolio. However, the transfer process can still be improved through enhanced feedback. The IOUs have improved the transfer stage internally, but the feedback from the IOU energy efficiency program back to ETP staff is not in place across the IOUs. SCE is the only utility that currently tracks measures that have been transferred to the IOU EE portfolio.

- Transferring a measure into the IOU energy efficiency portfolio is not the only successful outcome that the IOUs can achieve. In this sense, **knowledge transfer** is a key activity to support internal IOU EE transfer (i.e., educating an EE program manager about the merits of a particular technology), or to support external market-wide efforts (i.e., provide external stakeholders with information regarding a technology's performance so that they can target their efforts better). Technology Assessment reports should provide sufficient information to increase the readers' knowledge regarding a new technology, approach or practice and provide information to inform a decision to adopt a technology into the EE portfolio. Recipients of these reports indicated that the information provided allows EE program managers to make decisions regarding adopting or rejecting a technology for their portfolio. However, many reports do not provide information regarding energy savings for the new technology (which can be used to facilitate a decision about whether to incorporate the technology into the portfolio). Additionally, a review of these reports indicates that they could be improved through incorporating protocols for scientific rigor.

Because reaching CEESP goals requires more stakeholders than the IOUs, disseminating the outcome of technology assessments outside of the IOUs is crucial to meeting policy goals. Dissemination of reports that let a broad group of stakeholders understand if a technology has savings potential, or finding that it does not, contributes to the body of knowledge available to the market. In this way, knowledge transfer both within the IOUs, as well as knowledge dissemination to the external market, are intrinsic towards supporting the expected outcomes of this program element. The ability to perform this dissemination is present, but not always implemented as designed.

The table below provides an overview of some program design differences between the current IOU-focused design and recommended additions to include within a more CEESP-focused design. Key differences include a broader focus (i.e., increased coordination and dissemination to external stakeholders) for CEESP-focused efforts, as well as distinct selection criteria for projects by product development stage as well as technology and market risk. However, these designs are not mutually exclusive.

Table 25. Current and Proposed Program Design and Implementation Activities

Activity Type	Scanning	Screening	Assessment	Technology Transfer	Knowledge Transfer
Core Activities to Support EE Portfolio	**Who:** • Source primarily from IOU EE staff to facilitate transfer **How:** • Regular interactions with committee, etc. **When:** • Throughout, adjusting as needed	**Selection Criteria:** • Alignment with portfolio energy and demand needs • IOU EE champion (i.e., internal EE program staff invested in project) • Low market or technology risk **Product Development Stage:** • Market-ready, commercially available technology with existing supply chain	**Type:** • In-lab or in-situ • Single / multiple measures • Single /multiple sites	**Where:** • IOU EE portfolio	**To Whom:** • Internal and external dissemination
Proposed Activities to Support CEESP	**Who:** • Develop external end-use committee group to source technology (i.e., WCEC for HVAC, etc.) **How:** • Solicit feedback for technologies (TRIO, ET Open Forum, etc.) **When:** • Plan at beginning of program cycle, update annually	**Selection Criteria:** • Alignment with 5 key CEESP end-uses & sectors • Game-changing technologies (potentially more market or technology risk) **Product Development Stage:** • Prototype stage • Early commercialization without existing supply chain		**Where:** • Other ETP Program Elements • External entities (e.g., National labs, EPRI, EPIC)	**To Whom:** • External stakeholders • ETP program element staff (TDS, SFP, DS, MBS) if additional support required • IOU EE staff

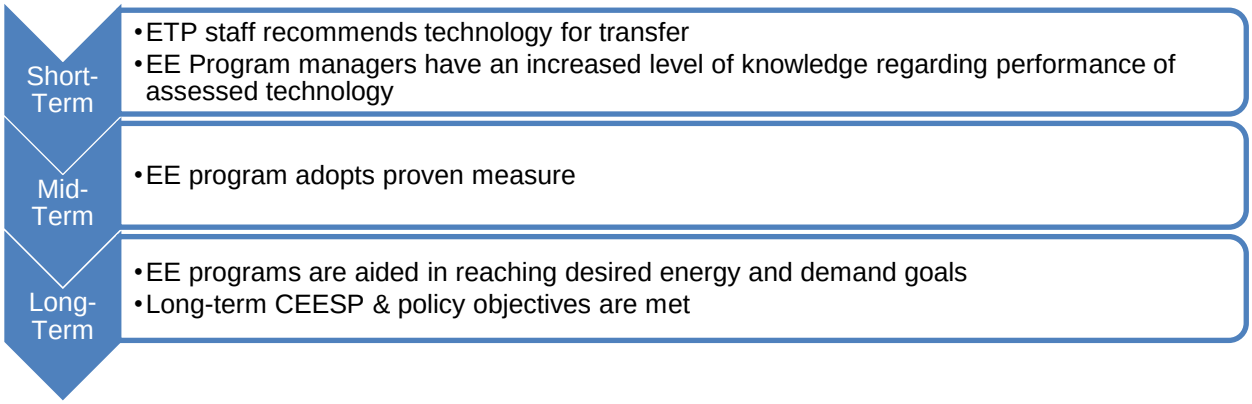
2. Available Funding

To assess funding levels, one key aspect is to determine whether scanning and screening efforts are sufficient to withstand attrition during the assessment and transfer processes. The funding for the 2010-2012 program cycle was sufficient as the IOUs have spent 35% of the budget and initiated close to double the planned technology assessments. Despite the sufficient funding, the IOUs appear unlikely to meet the objective of recommending 35 technologies for transfer into the EE portfolio within this program cycle. However, timing plays a role in the number of technologies that ETP can recommend for transfer within a program cycle. Given that the average amount of time it takes to conduct, scan for, select, assess and complete a project is 11 months, it is difficult to complete projects initiated later on in the program cycle prior to 2012. As such, any metric around projects transferred to the EE portfolio should include projects that started in previous cycles.

3. Planned Element Outcomes

While the short-term element outcomes are plausible, longer-term outcomes are tenuous because there is limited systematic feedback of the status of a measure that transferred from ETP into a resource program (SCE is the only IOU to systematically track the status of projects and whether they have been actively included in the energy efficiency portfolio). Additionally, only one IOU has selection tools in place to select projects to more fully support the targeted CEESP goals, adding to the tenuous nature of the longer-term goals.

Figure 7: Planned Technology Assessment Outcomes Specific to Program Theory



The Evaluation Team considers the program design to be plausible, but, similar to the evaluation comments in the 2006-2008 ETP evaluation, we have concerns regarding the fact that the ETP staff hand off technologies to the IOU portfolio, and has limited processes in place to track and obtain feedback about those technologies once in the IOU EE portfolio. As noted above, IOU EE program managers have the ultimate responsibility for the energy saving success or failure of the assessed technology once transferred. Success of these technologies may be contingent upon a variety of factors, such as how well the EE program manager addresses market barriers or markets the technology. Therefore, the ETP staff should be aware of the success of the measures that move into the energy efficiency portfolio and create feedback loops to allow them to better select projects in the future, but these same ETP staff should not have a metric around the energy savings of a measure once it is moved into a resource program.

However, within the purview of meeting internal IOU goals, the ETP staff can continue to help move a technology, approach or practice to a more full deployment through its existing early deployment program element activities. For example, Scaled Field Placement activities provide rich information regarding market barriers and customer adoption and provide opportunities to increase market traction over time. Demonstration Showcases provide increased visibility to targeted audiences to increase measure uptake through the IOU EE portfolio. Market & Behavioral Studies can identify market potential, barriers, and behavior around new technologies. Strengthening, and increasing, the Technology Assessments that have subsequent support provided through other ETP program elements can facilitate the adoption of technologies into the portfolio, and provide rich information in support of the EE program manager's efforts to promote the new technology.

5.5 ASSESSMENT OF IMPLEMENTATION

The PIPs contain action strategies to implement the Technology Assessment element.[86] These are as follows:

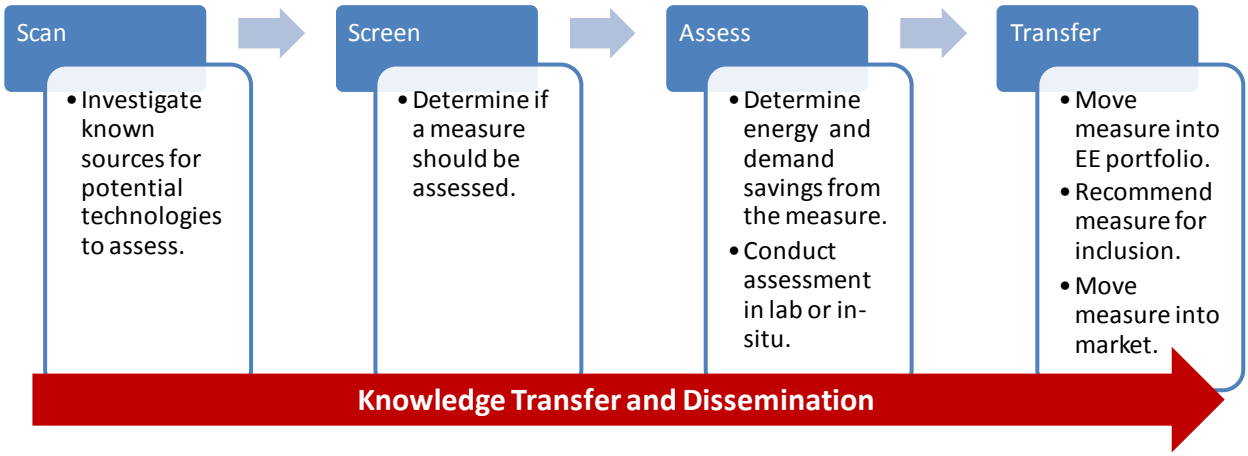
[86] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; SCE-SW-009 Emerging Technologies.doc; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

Table 26. Technology Assessment Action Strategies from PIP

Action Strategy	Action Strategy #
Scan a wide variety of sources for measures that could help IOUs meet customer needs and achieve energy savings, demand reduction, and other integrated demand-side management (IDSM) targets.	1.1.1a
Request the results from the 2008 internal USDOE assessment of priorities for DOE support of HVAC technologies as part of scanning efforts.	1.1.1b
Coordinate with statewide lighting initiatives (including the CLTC, state regulatory organizations, and other key stakeholders) to receive input to the scanning process.	1.1.1c
Execute a screening process for assessment candidates designed to ensure that the ET team most effectively focuses its time and resources on measures.	1.1.2
Conduct ET assessments to evaluate performance uncertainties and/or other attributes potential effectiveness/impact in reducing energy consumption and peak demand of new and/or under-utilized measures.	1.1.3
Develop and maintain a project-tracking database containing the variables and attributes to be tracked by all ETCC programs statewide, and data will be reported to the CPUC on a regular basis.	1.1.4
Develop a user guide specifying information required for the ETP screening process for internal and external application to potential candidate measures for ETP assessment.	1.1.5
(SCE Only) Maintain testing capability to support technology assessments.	1.1.6
The ETCC will host input sessions to promote exchange of knowledge, perspectives, and ideas two times per year.	1.1.7
(PG&E Only) Create and execute three-year ET program plans (roadmaps) based on the prioritization results, in the following portfolio areas: Commercial, Industrial, Agricultural, Lighting, Whole House, HVAC, Gas, and Business Consumer Electronics.	1.1.8
Evaluate program activity to assess the market acceptance two years, and potentially three years, after the launch of a measure transferred from ET. Review these findings with EE Program staff regarding potential improvement to both ET and EE program activities.	1.2.1
Provide information to internal stakeholders from assessments that could help IOUs' IDSM resource acquisition programs create new measures, or revise/integrate existing measures, that increase energy savings in a variety of market sectors. Specific activities will include ensuring final reports are distributed and made available, discussing results with EE program managers and IDSM clients, and assisting with communications and program documentation, as needed.	1.2.2
Communicate information on high-potential ET assessment findings to external stakeholders. Consult with internal and external partners to determine appropriate outreach activities for select specific measures.	1.2.3
Proactively serve as subject matter experts and advisors to EE and IDSM program managers. Support transfer and development of EE measures based on assessments and market and behavioral studies. Coordinate with EE programs and other IOU resources needed for successful EE measure rollout.	1.2.4

For ease of discussion, the assessment of implementation is divided into four discrete areas representing the PIP action strategies. Figure 8 provides an overview of the Technology Assessment process by each discrete area.

Figure 8. Technology Assessment Process Summary



Findings related to each of these activities are described below.

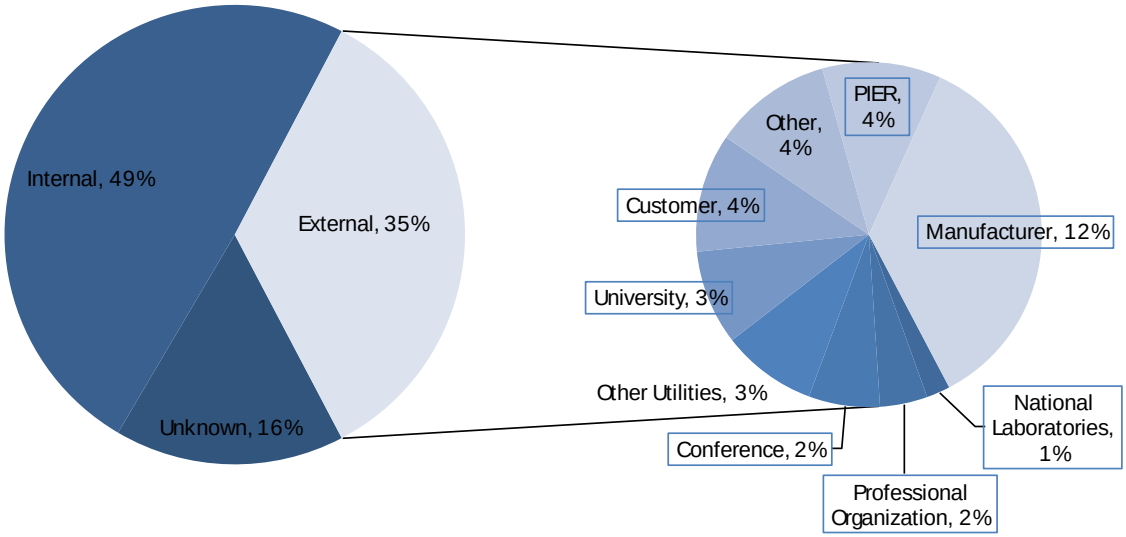
5.5.1 SCANNING FOR TECHNOLOGIES

According to the PIP, the key scanning Action Strategy is to "scan for a wide variety of sources for technologies to help IOUs meet customer needs and achieve energy savings, demand reduction, and other IDSM targets."[87]

There are a variety of sources that are used to identify candidate technologies; however, the IOUs do not track scanning activities (and were not required to track these types of activities, nor does the Evaluation Team believe this type of tracking would be useful), so it is unknown what sources were used at this stage. Based on information in the ETP database regarding the screening stage (which the IOUs do track), about half (49%) of projects arise from sources internal to the IOUs (see Figure 9). This most likely does not encompass the full extent of scanning efforts as not all scanning leads to screening or projects, but shows that the IOUs use a variety of sources to find projects.

[87] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; 22. SCE-SW-009 Emerging Technologies.doc pp. 783; SCG SW Emerging Technologies Final.doc, pp. 32; SDGE SW Emerging Technologies Final.doc, pp. 32.

Figure 9: Project Sources Across all IOUs (n=130)



Note that sources in the blue box correspond to those sources mentioned by ETP staff (see Figure 11).

As such, current scanning efforts support current IOU-focused program design: given the proposed program design of IOU- and CEESP-focused efforts, it is appropriate for the IOUs to scan the marketplace to see what is available that focuses on internal IOU needs (i.e., this scanning reacts to what is available). Interviews with ETP staff indicate that having an internal advocate (in the energy efficiency portfolio) is vital to the adoption of a technology within the energy efficiency portfolio.

However, additional activities in support of CEESP require a much broader scanning process to support the key end-uses and sectors. According to the Expert Panelists, the ETP staff target the IOU energy efficiency program managers as sources for technologies, but that to support CEESP, the ETP efforts would require a broader market focus. The IOUs should proactively choose a technology (or type of technology) to pursue and use the various components of the ETP to bring that technology to the point of an assessment (i.e., TDS, TRIO). The IOUs can also scan what is being developed within the national laboratories, PIER, or private manufacturers for assessments not yet ready for commercialization (which is occurring to a limited degree, as shown in Figure 9).

Within this program cycle, PG&E overwhelmingly uses internal sources to scan for new technologies. SCE, however, sources about one-third of its projects from external sources, such as the Electric Power Research Institute (EPRI), UC Davis, and UC Irvine to scan for new technologies. Sempra continues to work with Navigant Consulting Inc., a third-party program implementer (Portfolio of the Future), to conduct a scanning process once every two years for new technologies. As noted above, the ETP staff works with other IOU staff, such as TTC and EE program managers, through the screening and transfer phases.

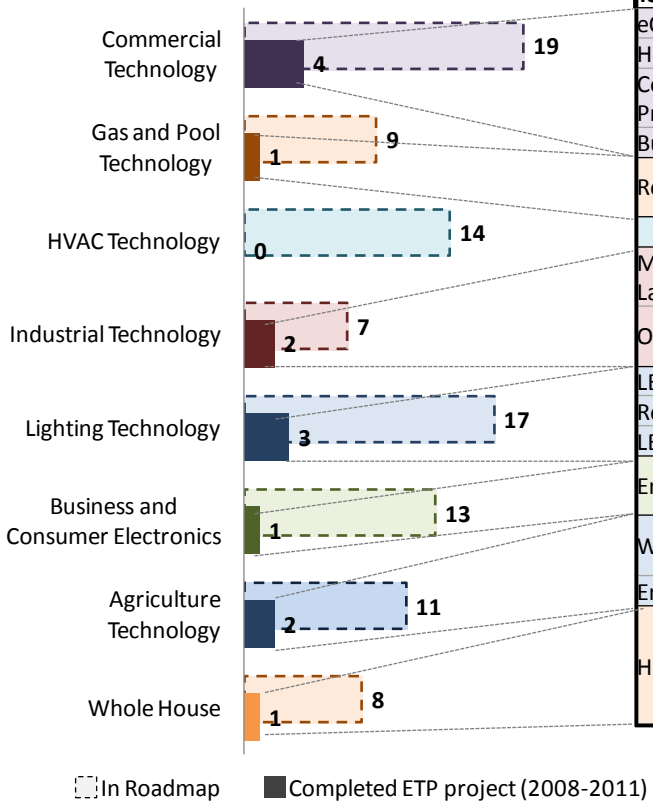
The IOUs also scan for Technology Assessments via the ETCC Emerging Technologies Open Forum on Energy Efficiency Innovations (also known as the ET Open Forum). This scanning activity occurs in person or via webinar twice a year. In 2011, two events were held and 33 presentations were made by new and emerging technology companies. According to the ETCC website, the audience for these forums includes investors, researchers, entrepreneurs, regulators, and the California and Pacific

Northwest utilities. The last forum, conducted in October 2011, had over 100 attendees. Forum agendas and past presentations are available on the ETCC website for interested parties.

The ET Open Forum is a proactive avenue to pursue projects for the ETP. The agenda typically includes an introductory presentation of ETP objectives, types of technologies likely to be included in the EE portfolio, and their desired attributes (energy/demand savings, scalable potential, and alignment with CEESP goals). The remaining presentations are from companies introducing their technologies to the ETP staff. The ET Open Forum that the Evaluation Team attended was held on October 26, 2011. Based on our observation of the event, we found that the ET Open Forum is a good approach to scanning for technology assessments that support the CEESP goals. The IOUs could expand this activity in two ways: 1) increase the number of forums to quarterly (perhaps a quarter for each of the CEESP main end uses), and 2) differentiate between commercially available technologies and pre-commercial products.

According to Action Strategy 1.1.8, PG&E created three-year ET program plans (roadmaps) in the following portfolio areas: Commercial, Industrial, Agricultural, Lighting, Whole House, HVAC, Gas, and Business Consumer Electronics. The following figure provides an overview of completed Technology Assessments by the roadmap category. As can be seen in the figure, the ETP projects correspond to PG&E roadmap categories, but do not match the level of effort envisioned by these roadmaps. If roadmaps are used going forward, metrics should be associated with the roadmap (i.e., a certain number of technology categories must show activity within the program cycle).

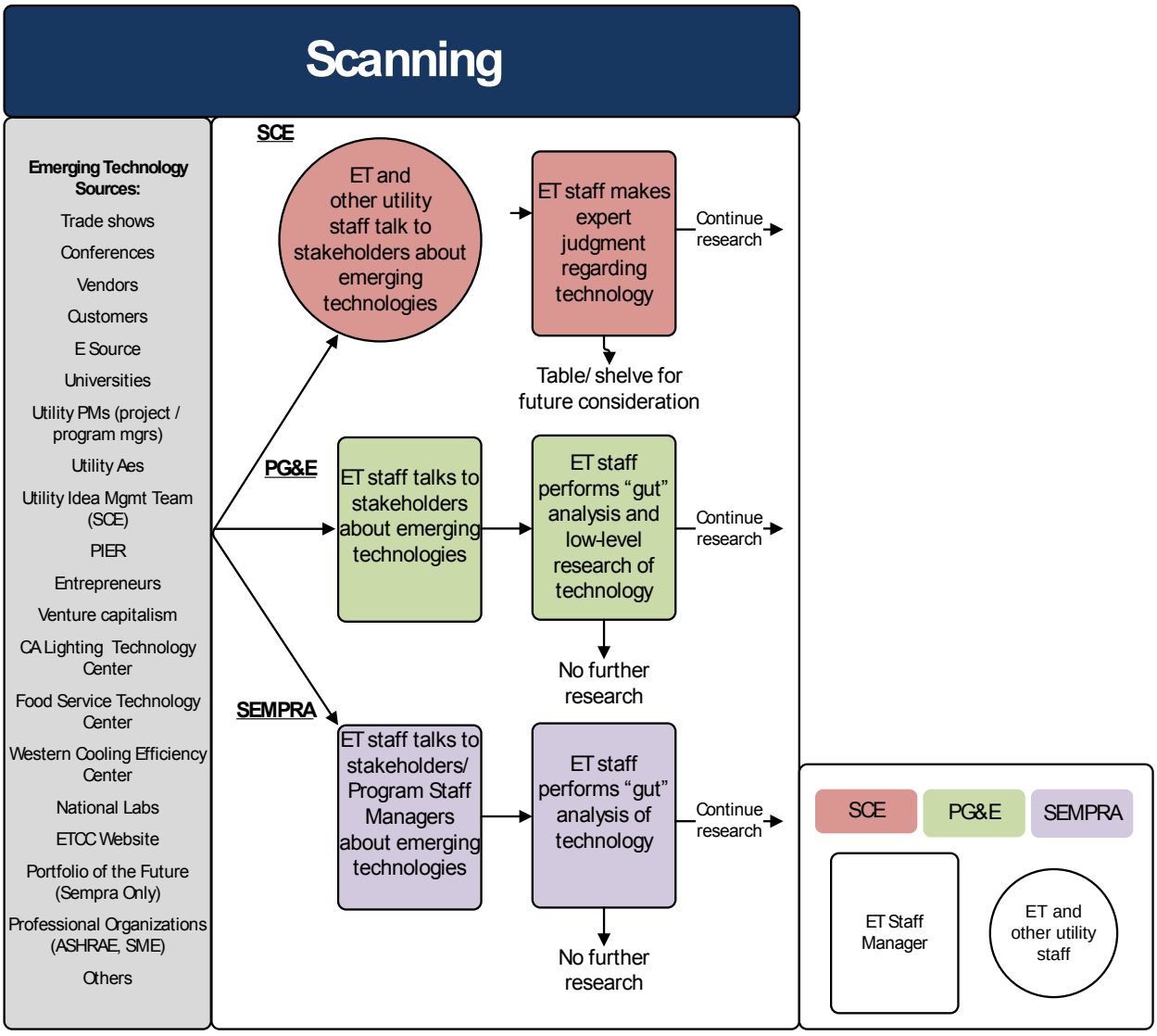
Figure 10: PG&E Roadmap Technologies Mapped to PG&E ETP Projects



Technology Category	Project #
eQuest Data Center Tool	ET11-1051
Hotel Room Controls	ET08-0825
Commercial Building Energy Management Programs	ET07-0712
Building Whole Product Definition	ET09-0909
Res. & Com. Heat Pump	ET09-0917
	ET10-1001
Microbubble Circulation & Stratification for Lagoon Wastewater Treatment	ET11-1061
Oil Field Water Management	ET11-1021
	ET11-1181
LED Street Lighting LS-2 Municipalities	ET09-0906
Retrofit High Efficiency Office Lighting	ET09-0919
LED Street Lighting Control Systems	ET09-0906
Energy Management Systems	ET11-1071
	ET11-1072
Water-Energy Pilot	ET08-0824
	ET09-0901
Energy Management Systems for Industry	ET11-1031
Home Performance Program	ET09-0918
	ET09-0924
	ET11-1081
	ET11-1151

Most methods for scanning remained relatively consistent with the process maps produced as part of the 2006-2008 evaluation, with the addition of several new sources for each IOU as described below. Figure 11 provides current scanning efforts to support assessments.

Figure 11. PY2010-2012 Technology Assessment Scanning Phase



5.5.2 TECHNOLOGY SCREENING

A review of the projects completed as of Q1 2012 suggests that the screening tools may not be designed to systematically select technologies that support key CEESP end-uses and sectors. As noted in Section 5.3, over 52% of the technologies assessed do not fall within the key R&T framework areas outlined in the CEESP Research & Technology chapter.

There is variation in both the process and the screening tools employed to select technologies for assessment. Across all IOUs, the ETP staff work internally with IOU staff to screen and score proposals. Working with other internal staff supports the program performance metric of technology transfer to the IOU EE portfolio, and is appropriate for IOU-focused efforts. However, the people involved and the steps along the process differ (these are described in Figure 12). The screening tools focus primarily on

technology savings and market potential; in addition to other factors (see Table 27 for more detail) but vary by the details used in each screening tool.

In looking at the screening criteria, there are key differences across the IOUs in terms of their scoring criteria. SCE has four tools that are used through a two-stage process to select a technology, and their scoring tools most faithfully incorporate the key considerations for screening as discussed in the PIP, including the measure's alignment with EE program strategy and CEESP goals, and resources (expense, labor) necessary to execute the assessment. PG&E, SDG&E, and SCG have one tool for technology selection. All of the tools include the measure's projected magnitude of contribution towards kWh and kW reduction.

All IOUs score technologies using a quantitative rubric as well as subjective judgment based on all data available incorporating feedback from various internal decision-makers involved in the scoring process. Each IOU weights the information gathered in the selection tools. There is variation across the IOUs in terms of their weighting criteria across factors (for more detail, see Table 28).

- PG&E weights energy savings as 20%, with the remaining 80% split between estimated market penetration and risk (60%) and internal advocates (20%). However, these criteria are not adequately clear. The weighting indicates that PG&E is risk averse, and is more likely to select projects with lower risk than higher savings. However, this may be a reflection of the quality of the screening tool, rather than the screening criteria used in practice. There are discrepancies across the screening tool (ETOS) parameters and the document meant to help fill in the screening tool (ETOS Aide). These selection criteria may be appropriate for current IOU-focused projects, but may not lead to the selection of technologies that support the CEESP.

- SCE provides their highest weight to "other factors" (70%) that include alignment with the CEESP BBEES and ZNE (25%), portfolio balance (10%), and opportunities for collaboration. These other factors provide support to the CEESP goals. This focus is consistent with policy directives and should be continued. Energy savings and market risk represent 20% and 10%, respectively. Energy savings weighting is also considered in a separate lifecycle savings and demand reduction tool that thoroughly considers potential energy and demand impacts from the technology.

- The Sempra utilities (SDG&E and SCG) use almost identical tools. The tools distribute scores across energy savings, market risk, and other factors, with more emphasis placed on criticality of Sempra's involvement, technology risk, and program viability. Consideration of whether their involvement is critical to moving a specific project forward is important as their budgets are substantially lower than the other two IOUs.

Descriptions of these tools and weighting criteria are provided in detail below (especially since PG&E and Sempra's tools are used for other program elements and are not described in later sections).

Scoring Tools

According to the PIP, "Assessment proposals are screened before an assessment is initiated, and consider the measure's alignment with EE program strategy and Strategic Plan goals, projected magnitude of contribution towards kWh and kW reduction and/or Strategic Plan goals, the degree to which the assessment output will incrementally impact the measure's adoption rate, information necessary for EE program inclusion, and resources (expense, labor) necessary to execute the

assessment."[88]

PG&E

PG&E has a single tool—the Emerging Technology Opportunity Summary (ETOS) —that both collects data on possible technologies and scores technologies. PG&E created a written document, the ETOS Scoring Aide, to assist product managers with inputting information into the ETOS scoring tool. This aide provides the methodology used to calculate and score a technology.

The tool begins with a series of questions regarding an overview of the project, project plan, technology status, market/energy demand opportunity, non-energy benefits, a value proposition summary[89], and sustainability or environmental impact. In addition, the tool provides a scoring matrix for a variety of criteria including market size, program office request, and estimated market penetration. The ETOS tool allows ETP staff to indicate whether this technology resulted from PIER activities, which is a valuable addition for tracking the sources of emerging technologies.

SCE

SCE uses a two-stage approach with four tools. The first tool, the ET Assessment Initial Review Questions, clarifies the needs for the project and what SCE hopes to achieve from the technology assessment. This tool documents whether the technology assessment is approved and assigns a project number to the assessment.

The ET Project Funding Proposal requires the ETP staff to provide a variety of information including a description of the innovation, goals, objectives, and methodology of the project; quantitative market and financial information; market intelligence; estimated demand and energy savings; prior research; and anticipated outcomes. This tool also includes project logistics, such as project duration, project budget, and plan for disseminating results, and considers transfer path to EE programs. This final item is valuable in understanding how the technology can be transferred into the EE portfolio. It considers the length of time until the technology is "program ready," additional requirements to get the technology ready, the product that will be delivered to the portfolio, if there is an EE sponsor, and what the product will look like after transfer (e.g., uptake in program, calculations, etc.) The team found that this tool is comprehensive and incorporates elements that facilitate project documentation.

The Technology Assessment Scorecard is used by ETP staff to assess a variety of information weighted according to scoring criteria. These criteria include whether the technology aligns with the CEESP Big Bold Energy Efficiency Strategies for ZNE and also supports a balanced portfolio. The scorecard also assesses the existence of barriers to adoption, testing methodology, testing results, host sites, and collaboration opportunities. Both ETP staff and the ET Steering Committee[90] fill out this scorecard

[88] The PIPs for PGE2108 ET SW PIP 01-2011 no redline.pdf; 7. SCE-SW-009 Emerging Technologies.doc pp. 772; SCG SW Emerging Technologies Final.doc, pp. 5; SDGE SW Emerging Technologies Final.doc, pp. 5.

[89] The value proposition includes the target customer, statement of customer need, product, recognized product category, statement of key benefit, primary competitive alternative (e.g., the existing technology that the emerging technology could replace), and statement of primary differentiation.

[90] SCE's ET Steering Committee reviews the project idea developed by the program or project manager. It comprises the ET Program Manager, the Element Manager and may include a subject matter expert that is

independently. This is a useful secondary review, as some criteria are known in greater detail by ETP staff rather than Steering Committee members and vice versa, (e.g., ETP staff may be more familiar with technology risk, while Steering Committee members may have a better idea of portfolio balance and alignment with Big Bold Goals).

The Lifecycle Savings and Customer Payback Potential tool is an Excel sheet that identifies the technology's potential life cycle savings (GWh) and demand (MW) reductions. Savings and demand reductions are calculated by inputting gross annual kWh and gross annual peak kW per technology, customer rate ($/unit), additional annual customer costs, initial technology customer costs, number of projects/participants, known market penetration, net-to-gross factor, estimated useful life, and technology risk (as a %). The scoring tool is very thorough and contains relevant and appropriate criteria to determine whether the ETP should assess a technology. The tool includes a variety of inputs for assessment, and clearly explains where a project manager or ETP staff member can access information to complete the form. The tool also includes an assessment of customer market potential (e.g., estimates per unit savings and dollars per unit) as well as incorporates technology risk into life cycle savings.

Sempra

Sempra uses a single tool—the Emerging Technology Project Assessment (ETPA)—to screen candidate technologies. Both SDG&E and SCG have the same scoring tools, but they differ slightly in terms of their scoring criteria. This tool identifies seven to eight criteria (for SCG and SDG&E, respectively) for determining whether a technology should undergo an assessment. The criteria include technology risk, technical savings potential, cumulative market potential, technology economics/simple payback, market information/risk/potential customers, non-energy benefits, criticality of their involvement, and program viability. As shown in Table 28, SCG and SDG&E weight their criteria slightly differently. SCG has 50% and SDG&E has 60% of their scoring on energy savings and market risk.SCG places the 10% difference in program viability, which SDG&E does not include in their tool. Both tools clearly identify specific categories associated with the scales for each parameter. Sempra also includes a value proposition, which is identical to the value proposition statement used by PG&E in their ETOS tool.

Table 27 provides an overview of the information collected through the ETP screening tools to inform technology scoring and project logistics.

deemed appropriate for a particular study. The Committee meets to evaluate the proposal against element-level criteria and program metrics.

Table 27. Information Collected by Screening Tools to Inform Scoring and Project Logistics

PG&E (ETOS)	SCE	SCG (ETPA)	SDG&E (ETPA)

PG&E (ETOS)	SCE	SCG (ETPA)	SDG&E (ETPA)
Overview • Background • Estimated Project Cost **Project Plan** • Core Idea, Description, Methods • Defined Scope/Tasks • Start/End Dates • Status of Project • Expected Results • ET Applicable • PIER Connection • Contractors Identified • CWA or Contracting Process • Host Site **Technology Status** • Technology Status/Maturity • Time to Market **Market & Energy Demand Opportunity** • Product Features • Market Segments • Plausible Energy and Demand Impacts Compared to Alternative Tech • Estimated Energy Savings **Value Proposition** • Value to CA Ratepayers **Sustainability /Environmental Impact**	**Initial Assessment Review** • Description of Tech • Commercially Available • Incumbent • Assessment Type • Assessment Staff • Objectives • Deliverables • Market Segment • Preliminary Cost Estimate • Start Date • Duration • Initial Ranking **Emerging Technology Project Funding Proposal (Long Form)** • Name of Innovation • Innovation Description • Goals, Objectives and Methodology • Quantitative Market and Financial Information • Market Intelligence • Estimated Demand and Energy Savings • Prior Research • Anticipated Outcome • Project Duration • Project Budget • Plan for Disseminating Results • Consider Transfer Path **Lifecycle Savings and Customer Payback Potential** • Gross Annual kWh and Annual Peak kW per Tech • Customer Annual Savings • Net Annual Customer Savings • Simple Payback (years) • Potential # of Customers • Known Market Penetration • Net to Gross Factor • Expected Useful Life • Technology Risk • Lifecycle Savings & Demand Reduction	**Value Proposition** **Technology Risk** • Technical Risk • Leading Suppliers **Technical Savings Potential** • Annual Energy Savings • End of Life / Early Life Replacement **Technology Economics** • First Cost • Incremental Cost • Annual Savings • Simple Payback **Market Information** • Market Development Issues • Potential Customers • Market Risk **Non Energy Benefits** • GHG Reductions • Emission Reductions • Water Usage Reductions • Maintenance Savings **Criticality of SCG Involvement** **Program Viability** • Distribution Channels • Persistence of Savings • Impact on Customer Behavior/ Training • Rebate/Upstream/Statewide/ other	**Value Proposition** **Technology Risk** • Technical Risk • Leading Suppliers **Technical Savings Potential** • Annual Energy Savings • End of Life / Early Life Replacement **Technology Economics** • First Cost • Incremental Cost • Annual Savings • Simple Payback **Market Information** • Market Development Issues • Potential Customers • Market Risk **Non Energy Benefits** • GHG Reductions • Emission Reductions • Water Usage Reductions • Maintenance Savings **Criticality of SDG&E Involvement** **Program Viability** • Distribution Channels • Persistence of Savings • Impact on Customer Behavior/ Training • Rebate/Upstream/Statewide/other

Scoring Criteria

All IOUs address technical savings potential and market potential/risk as important considerations when scoring proposed ETP projects; however, weighting for these criteria differed across the IOUs. These criteria include technology savings risk, market potential and penetration, and other factors such as non-energy benefits and need for utility support.

As appropriate for the ETP, staff considers each measure by looking at both the possible energy savings and market conditions with weights ranging from 20% to 30%. Additionally, all of the IOUs included market risk when scoring technologies. Market risk includes identifying market size/potential customers, barriers to adoption and known market penetration (weighting ranged from 10% to 60%). Finally, the IOUs consider a variety of other factors (including program viability, portfolio balance, and alignment with CEESP goals); weights range from 20% to 70%.

Table 28. Summary of Factors Considered for Technology Assessment (with weight of factor)

IOU	Energy Savings	Market Risk	Other Factors Considered
PG&E	Market Size **(20%)** (number of units or sites in PG&E territory, price compared to alternative technologies, % of market where tech is applicable, maximum possible energy and demand savings over tech lifetime)	Estimated Market Penetration **(60%)** (enables savings, technical risk, product risk, market penetration risk, other risks,	Applicable project and internal advocate **(20%)**
SCG	Technical Savings Potential **(20%)**	Market Information (Market Risk) **(15%)** Technology Economics (Simple Payback Period) **(15%)**	Criticality of SCG Involvement **(15%)** Program Viability **(15%)** Technology Risk **(10%)** Non Energy Benefits **(10%)**
SDG&E	Cumulative Market Potential **(20%)** Technical Savings Potential **(10%)**	Market Risk **(15%)** Simple Payback (Tech Economics) **(10%)** Potential Customers **(5%)**	Criticality of SDG&E Involvement **(15%)** Technical Risk **(15%)** Non Energy Benefits **(10%)**
SCE	Will generate info needed for EE program **(20%)** Lifecycle Savings & Demand Reduction (considered, but no score applied)	Level of barriers to adoption **(10%)** Considered, but no score applied: Potential # of Customers Known Market Penetration	Alignment with BB Strategies for ZNE **(25%)** Host Site Identified **(15%)** Maintain portfolio balance **(10%)** Use current testing methodology **(10%)** Opportunities for collaboration **(10%)**
Range:	**20%-30%**	**10%-60%**	**20%-70%**

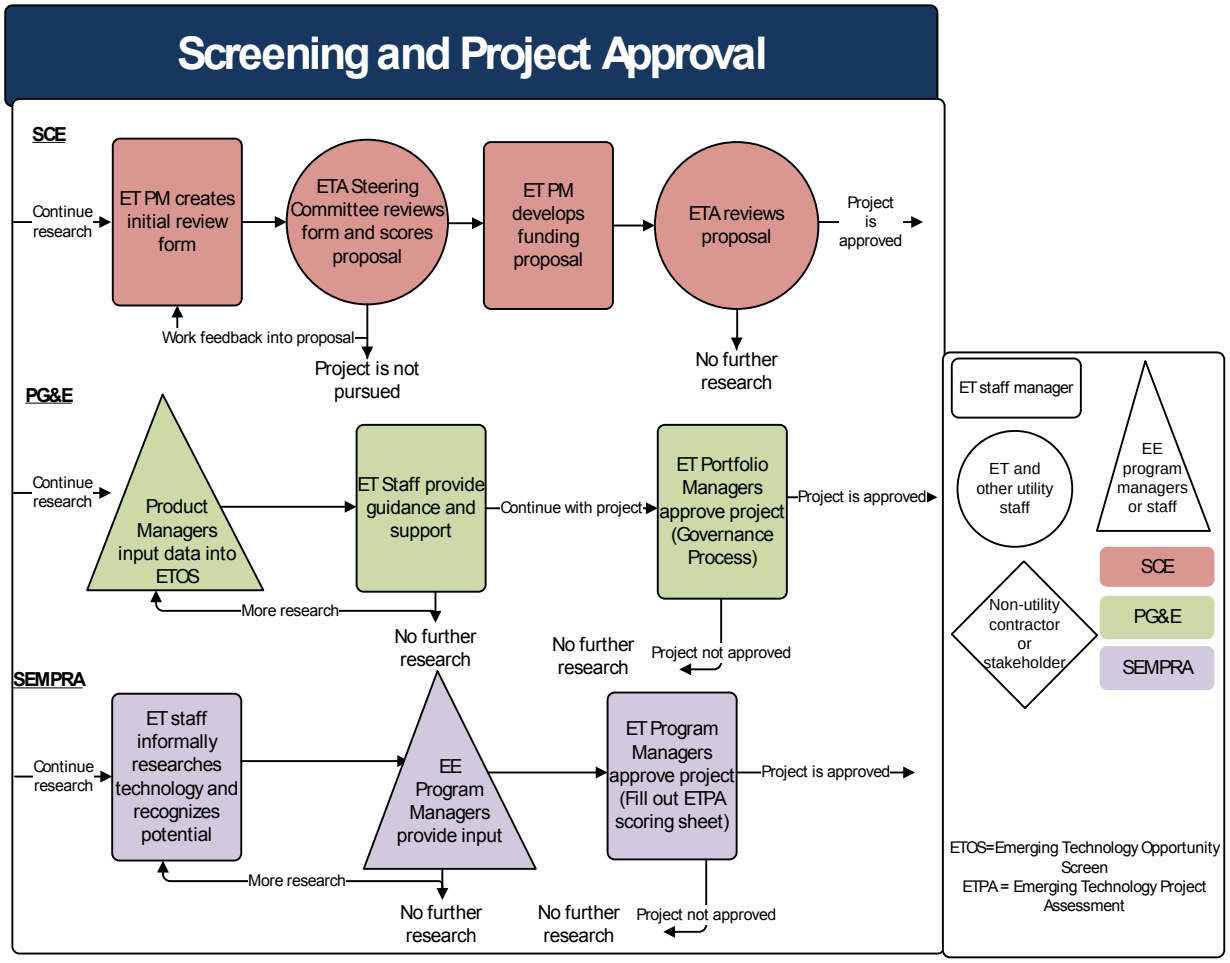
Note that the scoring factors shown in Table 28 are only part of the consideration to move projects forward. There is subjective judgment that comes into play across all IOU choices based on the totality of data available and the interactions between the various parties involved. We agree that all the data should be used, and not solely a single score, to adequately judge whether a project merits moving

forward.

Screening Process

Overall, the ET staff works internally with other IOU staff to screen candidate technologies. For all IOUs, ETP staff inputs information into the various scoring tools to determine if a technology is appropriate for an assessment. SCE and PG&E include staff from their Idea Management Team (SCE) or SPARC group (PG&E) as part of the review process. Sempra solicits input from EE program managers regarding new technology assessments. This process of including other IOU staff with different perspectives regarding the technology's position within the IOU energy efficient portfolio can provide additional nuances to the decision. Figure 12 provides a process map for screening.

Figure 12. PY2010-2012 Technology Assessment Screening Phase



5.5.3 Assessment

Overall, the assessment process remains largely unchanged from the 2006-2008 program cycle. Assessments can occur *in-situ* or in-lab for single or multiple measures. In practice, assessments are primarily conducted *in-situ* for single measures. Once a technology has been approved through the

screening process, each IOU takes the following steps:

- **SCE:** The ETP project manager creates a project plan for the assessment. ET staff then confirms the test location/site and secures the necessary resources (vendors, contractors, etc.) that were likely identified during the screening phase. If SCE can complete the assessment in a lab, they will try to do so as it typically involves a shorter time for completion.

- **PG&E:** The ETP product manager creates a Scope of Work and selects a consultant. The product manager and consultant then select the project site. The ETP product manager provides management and support throughout the assessment process. At the conclusion of the study, the consultant (or ET staff, as appropriate) submits a final report documenting findings using a standard report template. According to the ETP program managers, approximately 85% of PG&E's assessments are completed by third-party consultants, versus 15% completed by PG&E staff.

- **Sempra:** The Sempra utilities typically work with a consultant to complete technology assessments. Sempra, along with a consultant, creates an outline proposal for assessment goals. ETP staff selects the site and enters into a field demonstration agreement with the site. ETP staff, working with the consultant, performs the assessment and documents the findings in a report.

Because the reports are one of the main conduits to information dissemination to the targeted audience, the reports must be clear and relevant to decision makers. As such, through a content analysis, we scored the clarity and relevance of the Technology Assessment reports in conveying test results. We also identified whether the reports incorporated the recommendations made as a result of the process evaluation conducted during the 2006-2008 program cycle.[91] We assessed the incorporation of selected recommendations (items # 35, 39, and 40 in the original recommendations) in our content analysis, as they were the most appropriate for our efforts.

Report Clarity/Effectiveness

We conducted a content analysis on a sample of Technology Assessments reports to qualitatively evaluate the reports in terms of clarity and relevance to energy efficiency program managers. We also assessed whether the reports contained elements that respond to the recommendations made during the 2006-2008 evaluation of the ETP.[92]

When assessing the reports, we looked at the reports from the perspective of a busy energy efficiency program manager who uses these reports to gain information about a new technology that could garner savings to their energy efficiency portfolio. With this perspective, we tried to determine how useful the reports were in providing clear recommendations whether to adopt or reject a technology.

[91] Summit Blue Consulting, LLC; Energy Market Innovations; Opinion Dynamics Corporation; Strategic Energy Technologies; ADM Associates, Inc.; E SOURCE GDS Associates, Inc.; SDV/ACCI California Technology Innovations, Inc. "Interim Report #1 for the PY 2006-08 California Statewide Emerging Technologies Program." 2008.

[92] The methodology for the content analysis can be found in Section 5.2.

Table 29 provides an overview of the scoring method used for the content analysis. There were three distinct areas reviewed for the reports:

1) Clarity: maximum total possible score of 4
2) Relevance: maximum total possible score of 2
3) Incorporation of 2006-2008 evaluation report recommendations: maximum total possible score of 3

Table 29. Qualitative Method for Scoring Clarity and Relevance of Technology Assessment

Report Attribute	Item Scored	How Scored	Total Possible Score
Clarity	Is the format of the report logical?	Zero to 1	4
	Is there a Project Background / Scope / Objective section?	Zero to 1	
	Is there a Methodology section?	Zero to 1	
	Is it easy to find the report conclusions?	Zero to 1	
	Index of clarity based on above items	1 to 5 where 1=not at all clear 5=very clear	
Relevance	How relevant is the information for EE Program Managers to help decide whether to adopt or reject a technology or move forward (or not) with another element?	1 to 5 where 1= not at all relevant 5 = very relevant	2
	Does the report target its audience correctly (those that are looking to find out about technologies that will bring them energy savings)?	1 to 5 where 1= not at all relevant 5 = very relevant	
	Index of relevance based on above items	1= not at all relevant 5 = very relevant	
Incorporation of Recommendations from Previous Evaluation	ETP staff should include the incremental cost of procuring, installing and operating, and maintaining the technology being evaluated as part of the assessment. (Item #35[a])	Zero to 1	3
	ETP project managers should provide the background and objectives of the project, description of the existing system and emerging technology, results of changes, instrumentation, data analysis procedures, and conclusion drawn. (Item #39[a])	Zero to 1	
	ETP staff should document the assumptions and parameter values used as input to technology performance models developed for assessment projects. (Item #40[a])	Zero to 1	

[a] Item numbers correspond to the 60 Day Recommendations Report Attachment regarding the 2006-2008 Emerging Technologies Program (ETP) M&V Recommendations.

Overall, based upon the content analysis of the reports we determined that the reports clearly laid out the findings of the technology assessments (scoring a 3.8 out of 4). Eight of the 11 sampled reports[93] received perfect scores for clarity. The reports generally followed logical formats; had a clear background, scope, and objectives; contain a methodology section; and provided clear conclusions. The team found the reports to be relevant as well (1.8 out of 2.0). All of the reports had sections that included the background, objectives, and conclusions of the project. Additionally, the methods section of the reports documented the assumptions made. The information on the cost of procurement and maintenance of a technology was missing for a number of reports (where it was relevant for that report), resulting is a slightly lower score of 2.3 out of 3.0.

Positive Findings:

- Limitations of the testing were clearly laid out
- The report does a good job of describing the monitoring and modeling that was done
- The reports often documented presence of calibration of instrumentation per specifications

Negative Findings:

- Lack of specific information around how long data was collected on a measure
- No comparison to the typical alternative measure found in the market

Our analysis indicated the following:

- A high degree of clarity and relevance in the reports and other dissemination, which is further supported by findings from our EE program managers' survey. According to survey data, the Technology Assessment reports increased knowledge and allowed EE program managers to make a decision whether to adopt or reject a technology.
- However, the Evaluation Team as well as survey respondents noted that there were opportunities to improve the clarity of the technical (i.e., engineering) information provided in the reports. The IOUs are engaging with the Evaluation Team to create a guidance document on scientific rigor that could help to improve this finding.
- Primary users of the Technology Assessment reports are mostly internal staff, such as IOU EE program managers and engineering staff. Other internal users named by SCE include their account managers, as well as program managers. ETP staff sometimes present results externally or share with other organizations or universities.

We also conducted a target audience survey with EE program managers who receive technology assessment report information. The survey asked these respondents about the clarity and relevance of

[93] Out of the 35 reports received from the data request in fall 2011, we sampled 11 reports using a stratified simple random sample.

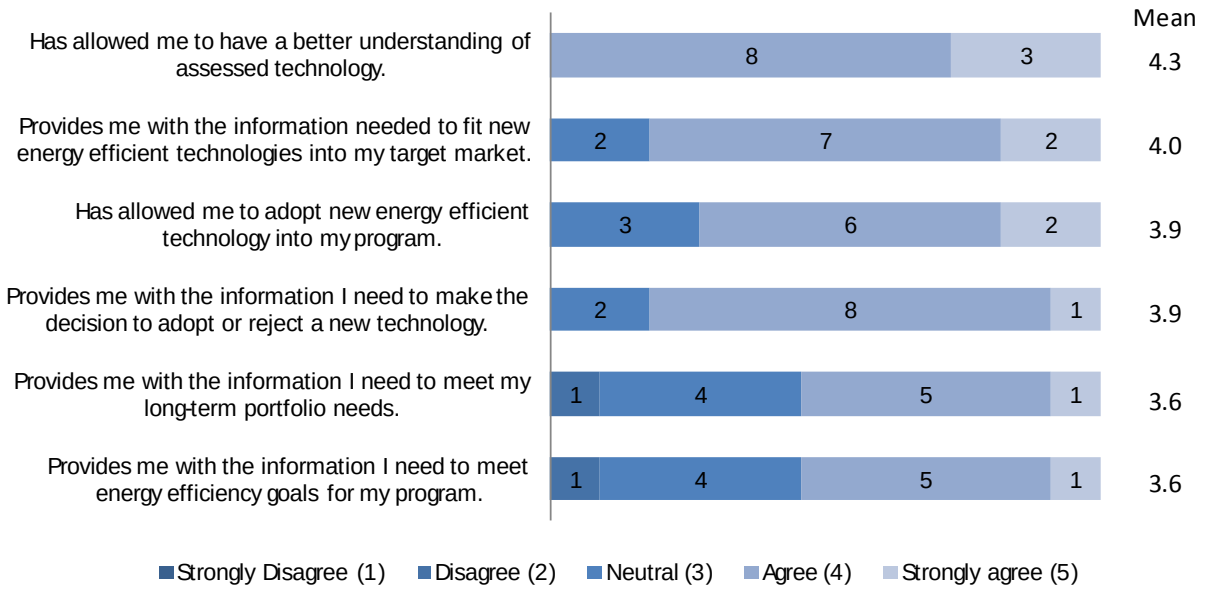
the reports. The respondents found the reports both clear and relevant (see Figure 13). Survey respondents were asked to score reports on clarity and relevancy on a 5-point scale where 1 to 2 was not clear, 3 was somewhat clear, and 4 to 5 was clear. Nine of eleven respondents scored reports as a 4 or 5 on a five-point scale for clarity. Eight out of eleven respondents scored reports as a 4 or 5 on a five-point scale for relevancy.

Almost three-fourths of respondents (8 out of 11) said that the reports were the best way to convey information regarding new technologies. The remaining respondents said there was no "best way" and that information about new technology should be conveyed in many forms. Three people stated that they did not find the studies to be very relevant. One explained that the report is not sufficient to make decisions about ETP technology and is only a "*starting point.*" Another said that the reports "*lack quantitative support, and do not align well with program requirements,"* while the third said that "*Often a decision to go or not go with a measure is reached before seeing the final reports.*" These types of comments align more with the evaluation's technical review, where there was a wider variation in technical information provided in the reports.

Regardless of the clarity or relevance, those who read the reports found them effective most or all of the time. Additionally, although small in actual number, a majority of self-identified decision-makers who have read the reports (6 out of 11) said that they use the information provided by the technology assessment reports to adopt new energy efficiency technologies into their portfolio "Most" or "All of the time." All reported that they used the reports at least some of the time.

A majority of the self-identified decision-makers reported that they "Agree" or "Strongly Agree" that the ETP Technology Assessment reports are useful in a number of ways (Figure 13). Examples include providing information needed to adopt or reject a new technology (9 out of 11), providing information needed to fit new energy efficient technologies into their target market (9 out of 11), and allowing them to have a better understanding of assessed technology (all 11 respondents).

Figure 13. Usefulness of the Technology Assessment Report (n=11)



Scientific Rigor

The IOUs do not have a single, statewide document that provides a consistent approach to guide scientific rigor (although individual IOUs do have internal protocols). The Evaluation Team is currently working with the IOUs to create a guidance document on scientific rigor for technology assessments.

A review of a sample of Technology Assessment reports provides a snapshot of the level of scientific rigor incorporated into the assessment based upon recommendations from the 2006-2008 evaluation.[94] There were seven distinct areas reviewed using a zero to one scale for each area as shown in Table 30. Recommendations that were fully implemented would receive a maximum score of 1. The score across the recommendations ranged from 0.2 to 0.7. Therefore, the difficulties specified in the 2006-2008 evaluation around variability in the technology assessments were borne out in the review of these 11 reports.

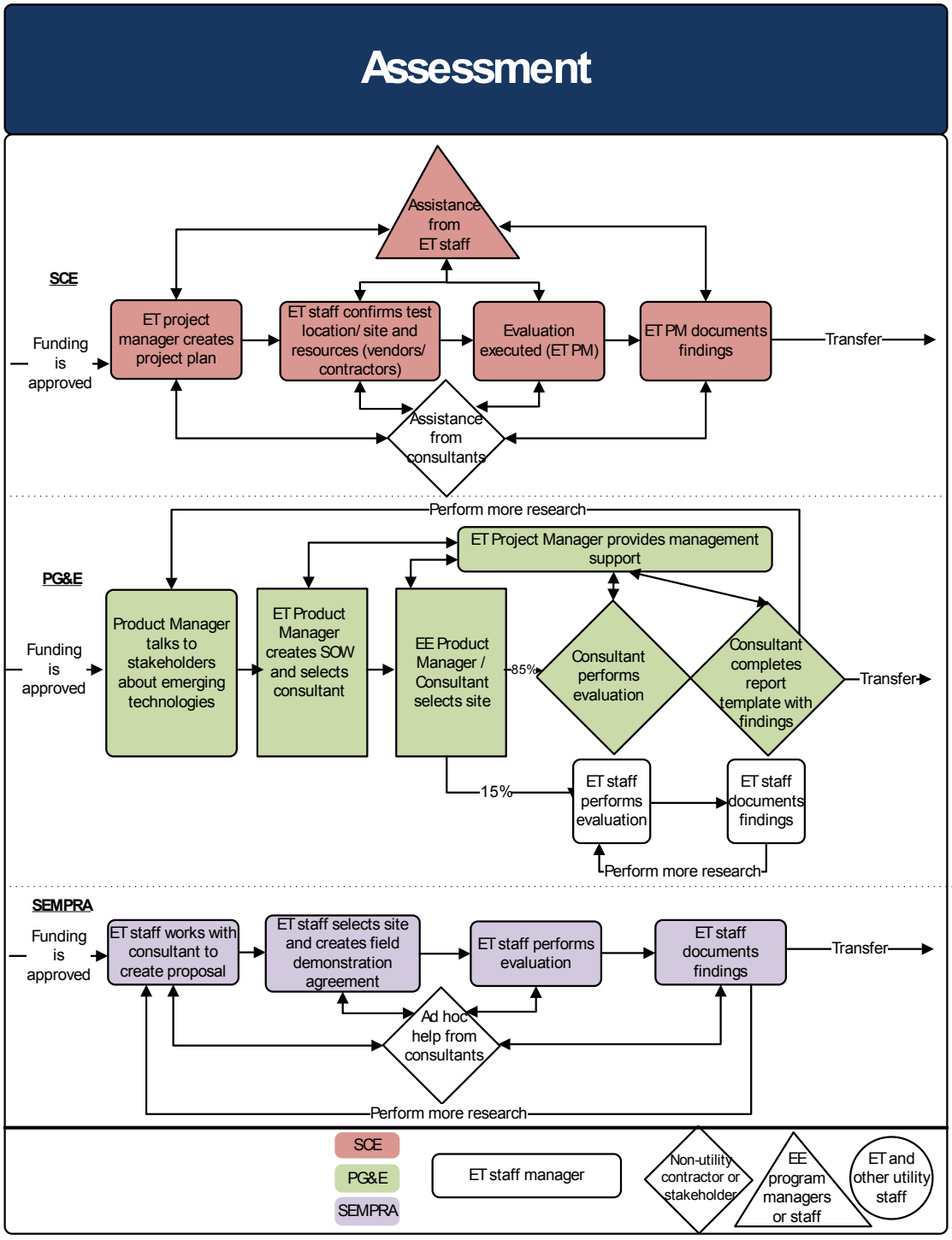
[94] The sample for the Technology Assessments content analysis was drawn from a total of 35 Technology Assessments reports completed by ETP during the 2010-2012 program cycle (some of which began in the 2009 program cycle). Out of these 35 reports, we sampled 11 reports using a stratified simple random sample. We believe this was the best, most cost-effective approach to ensure that all sub-groups are adequately represented in the sample. We divided the population into six strata and performed a simple random sample in each stratum. The strata are categorized by IOU and author type (internal or external author).

Table 30. Analysis of Technical Content

Recommendation	Mean Score (Out of 1)	# Reports with Score of 0	# Reports with Score of 0.25	# Reports with Score of 0.5	# Reports with Score of 0.75	# Reports with Score of 1
ETP project managers should clearly identify and document the incumbent technology to which the emerging technology will be compared in every assessment project	0.70	2	0	2	1	6
ETP staff should validate the accuracy and proper sensitivity of sensors and the proper functioning of data loggers prior to initiating data collection.	0.61	2	2	1	1	5
ETP staff should measure and document the baseline performance of the incumbent technology in every ETP assessment project	0.59	4	0	1	0	6
ETP assessment projects should be designed such that the only change made to the system under study between the pre-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 energy consumption impacts of each measure can be determined independently of the others.	0.57	4	0	1	1	5
Develop more robust technical and market potential estimates	0.32	6	0	3	0	2
Project managers should present the uncertainty associated with all measured data in project documentation.	0.27	7	0	2	0	2
Use relevant monitoring protocol such as the International Performance Monitoring and Verification Protocol for technology assessment	0.20	6	3	1	0	1

Figure 14 presents the technology assessment process graphically.

Figure 14. Technology Assessment Phase



5.5.4 TECHNOLOGY TRANSFER

As part of the program cycle, the ETP has the objective of recommending 35 measures for transfer into the EE programs, with the goal of producing energy savings or demand reduction (Objective 1.2). As of Q1 2012, of the 130 technology assessments initiated statewide, 24 have been completed, with 9 recommended for transfer; 12 are pending a recommendation decision; and 3 are not recommended for the IOU EE portfolio.

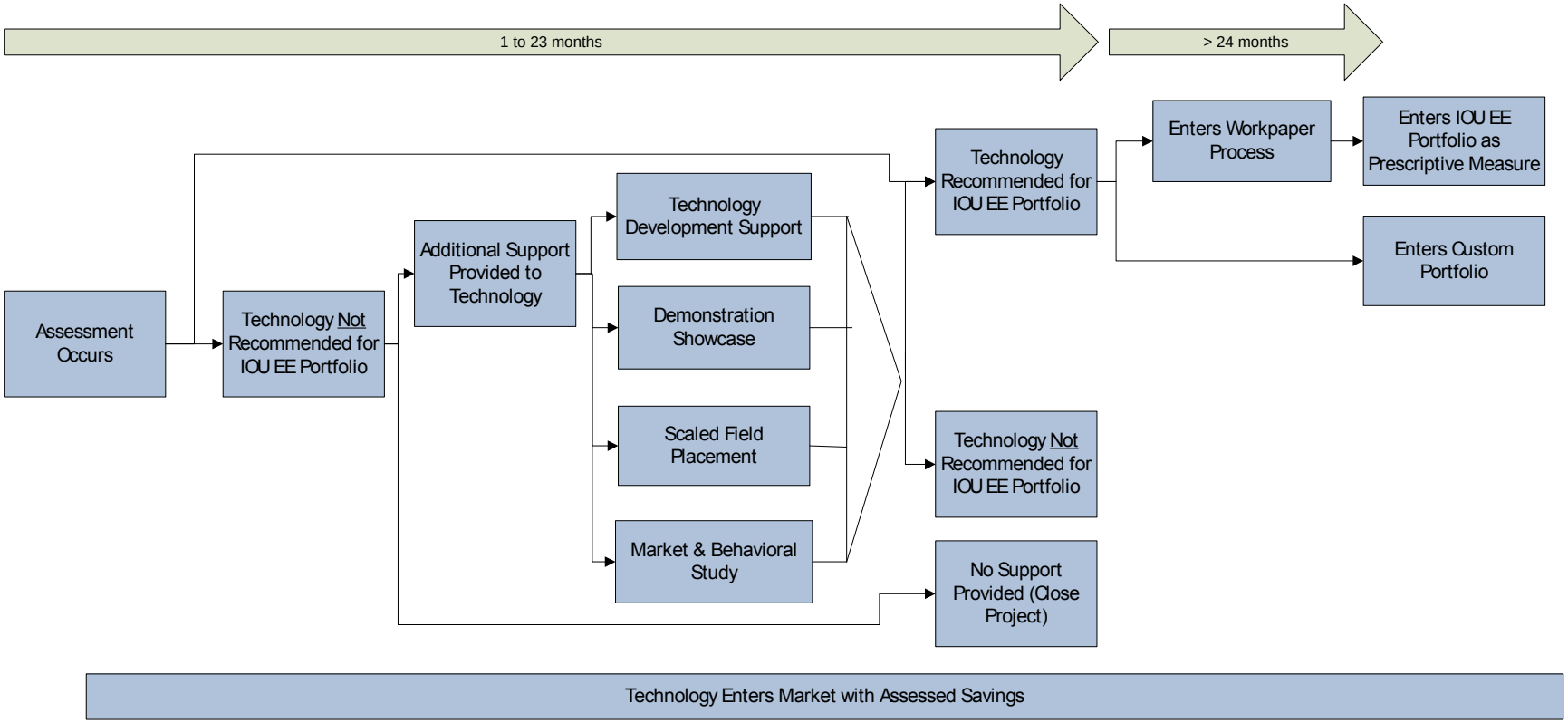
We acknowledge that delays that are beyond the control of the ETP program staff can occur between recommending a technology and the actual transfer of the technology into the EE portfolios. As such, there is a need for improved tracking and feedback between the ETP and IOU EE portfolio efforts. The PIP Action Strategy 1.2.1 indicates that ETP should evaluate program activity to assess market acceptance two to three years after the measure is transferred. However, SCE is the only IOU that has the ability to systematically track transferred measures once they are adopted into the program. SCE tracks IOU EE measure numbers once adopted and can revisit market acceptance overtime. None of the other IOUs systematically track measures that are incorporated into the portfolio post-adoption. Without the ability to track measures in the EE portfolio, the IOUs are less able to continuously improve activities.

Transfer Process

The transfer phase follows the completion of the technology assessment. Using the findings and results from the assessment, a decision is made whether to recommend incorporation of the technology into the EE portfolio as a new measure. ETP measures can be included in the EE portfolio through two avenues: 1) as a prescriptive/deemed value with a workpaper associated with the measure, or 2) as a custom/calculated measure.

Prior to being adopted into the EE portfolio, some technologies may require additional support through the early deployment stage. In this case, technologies that have undergone an assessment could subsequently become a Scaled Field Placement or Demonstration Showcase measure, receive additional market information from Market and Behavioral Studies, or could benefit from additional development support (TDS). Additionally, prior to transfer to the EE portfolio, additional market research (via a Market & Behavioral Study) regarding customer adoption may be required. Alternatively, technology transfer can also mean that a technology enters the market without entering the IOU EE portfolio. Figure 15 identifies the timeline for recommending a measure for transfer and adoption into the portfolio. It also outlines the variety of avenues in which an assessed technology can be offered to the IOUs customer.

Figure 15: Technology Transfer Process



The IOUs noted that having an internal advocate and understanding where a new measure may ultimately reside in the EE portfolio is vital to being able to move it into the EE portfolio. The IOUs have taken steps through organizational restructuring to improve this process. Sempra has developed a new "measure developer" position that coordinates efforts between ETP and the EE portfolio program managers to facilitate the transfer of technologies. SCE works with a team that incorporates both ETP staff and other IOU staff to support technology transfer, and PG&E has re-organized their team so both ETP and EE program staff are involved in a technology's life from "cradle to grave."

The transfer process is not a statewide process and most likely does not need to be. SCE and PG&E have a more formal process for incorporating IOU EE staff into the review and transfer process. Sempra has created a measure developer staff to help usher in new technologies. The IOUs vary in how they transfer ETP measures into the IOU EE portfolio:

- **SCE**: Following the completion of a technology assessment, ETP staff communicates the findings to stakeholders as well as to SCE's Idea Management Team (IMT[95]). Throughout the assessment process, ETP staff interacts with the IMT to make them aware of what technologies may be coming out of ETP so preparations can be made on the program side. To incorporate prescriptive measures (with deemed savings values) into the EE portfolio, SCE's engineering group will develop a workpaper including the assessment results for review and approval by the CPUC. This step is required before a deemed measure can be incorporated into the SCE's energy efficiency portfolio.

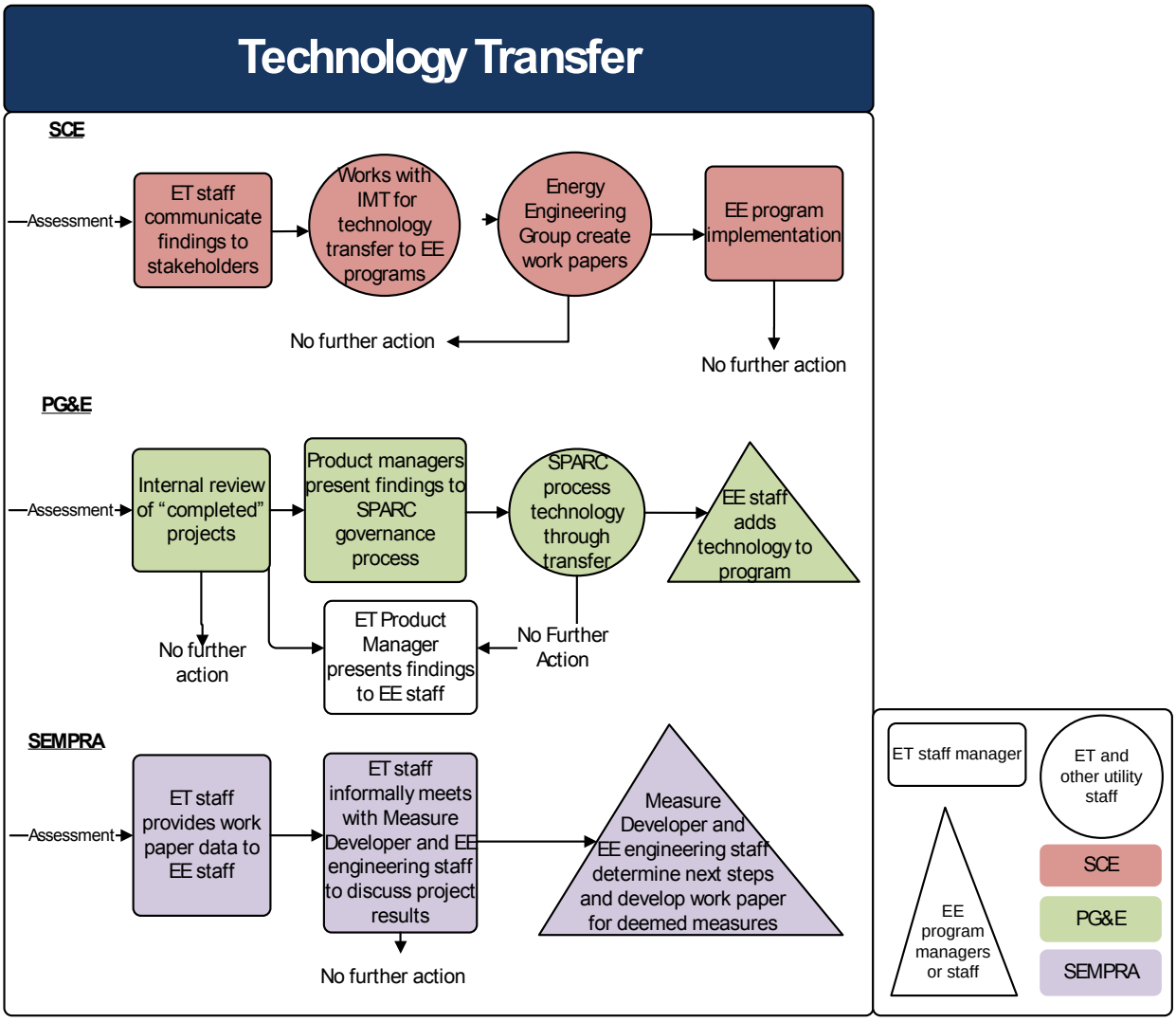
- **PG&E**: Once the final technology assessment report is reviewed internally, product managers then communicate the findings to internal stakeholders. If the technology is determined to be market ready and beneficial to the portfolio, the product manager presents the assessment findings and transfers plans through the SPARC process.[96]

- **Sempra**: Following completion of a technology assessment, ETP staff distributes the technical report to EE staff, EE engineering support staff, and measure developer. ETP staff conducts a meeting to present the findings and provide suggestions. If the EE staff accepts the technology to implement into the future EE portfolio, ETP staff assists the measure developer in developing the workpaper. Once the ETP program staff recommends a technology for transfer into the EE portfolio, the EE engineering staff develops a workpaper for deemed measures. Once approved by the CPUC (through a specific workpaper process), Sempra will transfer the technology to the portfolio. Sempra program staff mentioned a bottleneck in their transfer process as measures must go through the measure developer resulting in delays. The measure developer only reviews new technologies twice a year, so a completed measure may need to wait several months before the measure developer can work on the actual transfer. The process for measure approval also typically takes about six months for customized measures.

[95] As stated earlier, IMT runs a new clearinghouse process to prioritize potential measures. This process reviews potential measures and ranks them based on portfolio needs, such as residential, business, and program market actor needs.

[96] PG&E currently has an ET governance process which approves ET projects, and a SPARC process that incorporates an array of IOU staff to determine whether or not a technology is transferred into the program. PG&E noted that they plan to incorporate these two processes together going forward.

Figure 16. Technology Assessment Transfer Phase



5.5.5 Knowledge Transfer and Dissemination

ETP staff noted that they are actively involved in collaboration and coordination both within the IOU and outside the IOU, particularly among other ETCC members (including the four statewide IOUs, Sacramento Municipal Utility District, California Energy Commission and the California Public Utilities Commission).

The IOUs use four channels to disseminate information from a completed technology assessment: reports, newsletters, factsheets, and presentations. Not all IOUs disseminate information across all channels; Table 31 presents the different channels used by the IOUs.

Table 31. Technology Assessment Information Dissemination

	PG&E	SCE	Sempra
Technical Report	**Yes**	**Yes**	**Yes**
Email announcement	Informally	Yes	Informally
Posted to ETCC website	Yes	Yes	Yes
Posted to IOU website	No	No	No
Newsletter	**Yes**	**Yes**	**Yes**
Distributed internally	Yes	Yes	Yes
Distributed externally	Yes	No	No
Fact Sheet	**Yes**	**Yes**	**No**
Requested by and distributed to specific department/group	Yes, for service and sales team	Yes, typically to EE staff, Customer-facing account managers	No
Posted on IOU website	Yes	Unknown	Unknown
Distributed externally (vendors, customers, etc.)	Yes, distributed to staff (typically sales), then on to customers	Yes	No
Presentations/PPT	**Yes**	**Yes**	**Yes**
Internal meetings - informal events (brown bag)	Yes, brown bags for product managers and program staff	Yes	Not currently, but would like to start
External meetings	Yes, monthly ETCC collaboration calls, and Spotlight	Yes, monthly ETCC collaboration calls, and Spotlight	Yes, monthly ETCC collaboration calls, and Spotlight
Conferences and workshops	Yes, present at conferences such as ASHRAE.	Yes, presentations at ACEEE, CEE, ASHRAE	Yes, at Energy Showcase or Expo. Would like to send more people, but staff too small.

As noted in the ETP database and by ETP staff, the primary audience for TA projects is EE program managers. However, based on discussions with the Expert Panel[97], information created as a result of Technology Assessments should be disseminated more broadly and proactively to enable the entities involved with emerging technology research to learn from ETP efforts[98]. The Expert Panelists were selected from the organizations that potentially work with ETP, yet many panelists indicated that they were unaware of much of the results from Technology Assessments performed by ETP. The PIP Action Strategy 1.2.3, calls for increased external stakeholder communication when it states: "Communicate information on high-potential ET assessment findings to external stakeholders. Consult with internal and external partners to determine appropriate outreach activities for select specific measures."

The majority of completed projects within the ETP database do not have a designated audience type indicated by project (which may simply be a tracking issue, and not that there was not a specific audience in mind for the project). Expert Panelists noted that they would like to see increased visibility, more information provided to customers, and more transparency and feedback provided to industry and market actors. As such, ETP could expand the dissemination of results to a wider audience of external stakeholders. At this point, the primary deliverable for all IOUs is a written technical report, and the IOUs upload completed reports to the Emerging Technologies Coordinating Council's public

[97] The Evaluation Team conducted an expert panel to determine whether ETP is positioned in California's Research, Development and Demonstration and Deployment (RDD&D) energy efficiency market to be able to meet the expected goals as articulated in CEESP. We note that some of these panelists perform work for ETP projects.

[98] More information available externally can help those organizations focus their efforts on technologies that are shown to have savings, or identify barriers and help inform product design.

informational website etcc-ca.com. However, of the 24 completed projects in the program cycle (three projects were completed but rejected for transfer), 6 were posted to the ETCC website when accessed on July 19, 2012 (see Table 32). While the IOUs state that, typically, they may choose to not post some reports to the website due to confidentiality concerns, having only ~25% posted of the currently completed reports reduces knowledge dissemination.

Table 32. Projects Posted to ETCC Website

IOU	ETP Project Number	Project Name	Choice for Transfer stated within the ETP DB
PGE	ET11PGE1071	ET Home Energy Management Lab Tech Assessment Smart Thermostats	Recommendation Decision Pending
SCE	ET10SCE1130	LED Light for Commercial Pools	Recommended for Transfer
	ET10SCE1220	L Prize A-Lamp for Hospitality Applications	Recommended for Transfer
	ET10SCE1230	L Prize A-Lamp Laboratory Assessment	Recommended for Transfer
	ET10SCE1290	LED A-Lamp Laboratory Assessment	Recommended for Transfer
SCG	ET10SCG0008*	CEC/GTI Water Heating Study	Recommendation Decision Pending

* The ETCC Website only has descriptions for this report and not the entire report.

The IOUs also disseminate reports internally. We conducted a quantitative online survey of 51 IOU staffers who received the Technology Assessments. The survey collected data relevant to recipient awareness of the reports and the information contained within them, as well as the effectiveness of the reports in providing information for use in deciding whether to adopt or reject a new technology for the IOU EE programs. Of these 51 staffers, 19 identified themselves as decision-makers and of these 19, 11 received and read the Technology Assessments. As such, the results are based on the responses of these 11 IOU staffers.

All of the eleven IOU EE respondents received the Technology Assessment reports by email; some also received them over the Internet (55%) or in hardcopy (27%). Four respondents said that the process of receiving the reports could be improved.

For external dissemination efforts, we provide comments from the Expert Panelists for completeness and to give the IOUs a sense of how their efforts are viewed by others. We acknowledge that this is a small group, but it was one chosen by both the CPUC and the IOUs as knowledgeable about emerging technologies and working within the field.

Expert Panelists stated that there is a wide spectrum of outreach and educational activities that ETP can undertake, from educating consumers to informing engineers and manufacturers. The panel distinguished between the need to develop feedback loops, which can disseminate information throughout the industry, and educational activities, which are aimed at the general public. The panel called for more seminars, webcasts, and interim reports to disseminate knowledge to the major players in the emerging technology industry.

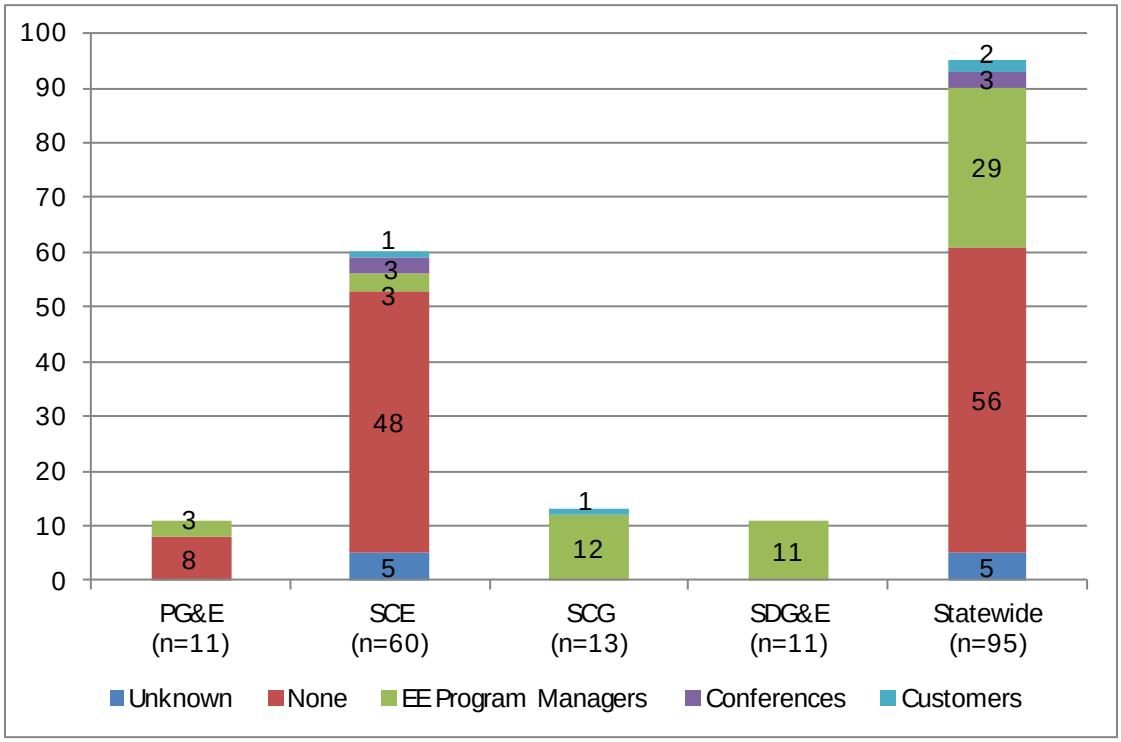
Consistent with these findings, the Expert Panelists (including representatives from 10 market organizations ranging from entrepreneurs, universities, manufacturers, etc.) felt that the ETP program is "working in a vacuum" in that most people in the emerging technology field do not know what projects the IOUs are working on. While the program does partner with specific organizations on particular projects, the panel wanted to see the program create an environment that was more conducive to broader collaboration, by ensuring that other players in the field are aware of the work

being performed through the program.

Audience

Primary users of the Technology Assessment reports are mostly internal staff, such as IOU EE program managers and engineering staff (29 of the 95 completed and active projects[99]). ETP staff sometimes presents results externally or shares with other organizations or universities. However, the majority of the projects did not have a primary audience designated to the project (61 of the 95 projects had their primary audience field as either 'none' or 'unknown') within the ETP database.[100,101] Again, we note that this may be a data tracking issue versus ETP staff not actually having an audience in mind for the information from the technology assessments.

Figure 17: Audience by IOU for Completed and Ongoing Projects*



Source: Q1 2012 ETP DB
*Total of 95 projects included in the figure; 24 completed and 71 active projects. 35 projects with a status of either 'stopped', 'missing', or 'on-hold' are not included in this figure.

[99] The status for 35 of the 130 projects in the ETP database is categorized as either "stopped," "missing," or "on-hold." These 35 projects are not included in this analysis.

[100] The primary audience for the remaining five projects was 'customer' (two projects) or 'conferences' (three projects).

[101] Of the 24 complete projects, 12 did not have a primary audience designated to the project in the ETP database.

5.6 SUMMARY OF RECOMMENDATIONS FOR TECHNOLOGY ASSESSMENTS

The recommendations for Technology Assessment fall into six overarching categories discussed in Chapter 4. The specific recommendations for Technology Assessments are summarized below:

Focus outcomes: The main outcome of Technology Assessment is to verify savings claims.

- Many projects are not documenting savings, or are not focused on savings, which is essential to inform potential program adoption.

  Eleven of 24 completed projects have information on savings in the ETP database, eight projects report zero savings, and five projects are blank (notably three of these projects were not going to be pursued). Five of the 12 reports[102] that were available for review provide per-unit savings values; for three reports, the per-unit savings can be calculated based on the information presented in the report, and the remaining four reports do not provide savings data (they were either missing or the project was not savings focused).

- Many reports do not document technical potential.

  Similar to the savings information, only 11 of the 24 completed projects have all the data necessary in the ETP database to calculate the technical potential; the remaining projects either have 0 or blank in the sites and useful life variables. Only one of the 12 reports that were available for review103 provides technical potential for the technology assessed (SCE's VSD for Die Casters project [ET10SCE1070]).

- Projects that focus on validating savings for multi-site or integrated suites of measures are sometimes housed under Demonstration Showcases and Scales Field Placement.

  As of Q1 2012, some SFP projects appear to focus on savings (and it was unclear whether the target audience represented a market influencer). For example, SDG&E's Bi-Level LED Elevator Cab Lighting project (ET11SDGE0011) focuses on determining energy savings potential and installation cost for LED lighting systems in elevators and PG&E's Pulse Energy -Dashboard w/ Energy Mgr project (ET11PGE3161) focuses on testing efficacy and energy savings potential facilitated through Pulse Energy EMS and energy coaching.

  As of Q1 2012, some DS projects focused primarily on assessing the validity of energy savings claims. For example, SCE's ZNE Inverter Grid Study (ET11SCE2010 focuses on a simulation to assess impacts, and SDG&E's LED Theater Stage Lighting (ET11SDGE0005) focuses on determining the energy savings potential and installation cost for LED theatrical lighting.

Coordinate and tailor scanning and screening: All IOUs score technologies using a quantitative rubric as well as subjective judgment based on all data available incorporating feedback from various internal

[102] Based on the data request, the Evaluation Team received reports for 12 of the 24 completed projects.

[103] Ibid.

decision-makers involved in the scoring process. Additionally, all of the tools include the measure's projected magnitude of contribution towards kWh and kW reduction. Statewide, the current set of selection tools have key differences in the scoring criteria, though, that could affect the ultimate choice of projects.

The current ET Open Forums are a good approach to scanning. To enable additional scanning, the IOUs could increase the number of ET Open Forums and differentiate between commercially available and pre-commercial products. This type of differentiation can help find technologies that will best support the EE portfolio now and longer-term CEESP policy goals.

Enhance reporting: For Technology Assessments, this includes improving the clarity of technical information through a guidance document on scientific rigor. Both the Evaluation Team and EE program managers who read the completed reports found the findings of the technology assessment reports clearly laid out. The reports followed logical formats with clear conclusions. Because these are technical documents, though, some of the information around engineering specifics were less complete. Some areas for improvement are: 1) using relevant monitoring protocol such as IPMVP, 2) present uncertainty associated with all measured data in project documentation, and 3) developing more robust technical and market potential estimates. The IOUs all have internal protocols that they follow and are currently involved with the Evaluation Team to create a single guidance document that can incorporate these suggestions.

Improve tracking: For Technology Assessments, updates should occur each quarter and additional QA should occur. The CPUC-ED requires ongoing updates for each program in the portfolio. For resource allocation programs, this occurs through monthly and quarterly updates on the ETP website. For ETP, this occurs through the ETP database and also on the ETP website. Only SCE consistently updated this database quarterly. Slightly over half of the completed projects included information on technical potential savings within the database, yet this is a key piece of information to come from the reports (i.e., of the 21 completed reports, 11 had the information, seven had a value of zero, and three were blank). Additionally, examples of other variables that are possibly incomplete include market sector (where 6% of records were blank), 56 of 95 audience variables were stated to be "none", and two of the 130 projects indicated external funding partners.

Further support CEESP: Further adjust screening criteria to support CEESP goals and broaden dissemination. To further support the CEESP, the selection tools and criteria for Technology Assessment could be further adjusted to consider the key CEESP end-uses of advanced, climate-specific HVAC, advanced lighting, plug load and smart appliances, as well as integrated building design and operations. Also, if ETP staff consider revising tools to look beyond commercially available products and targeting some measures that are earlier in the development stage, this can help meet longer-term CEESP goals. Information created as a result of Technology Assessments should be disseminated more broadly and proactively to enable the entities involved with emerging technology research to learn from ETP efforts. Of the 23 completed projects in the program cycle (three projects were completed but rejected for transfer); six were posted to the ETCC website when accessed on July 19, 2012. The IOUs should post all technology assessment reports to ETCC and consider ways to handle possible confidentiality issues with release of reports to the public. There are also opportunities for additional ways to disseminate to targeted stakeholders outside of the IOUs (e.g., email list serve groups by key end-use or targeted newsletters to identified stakeholders).

6. TECHNOLOGY TEST CENTER

6.1 TECHNOLOGY TEST CENTER DESCRIPTION

The technology test center element is only within SCE's program. The TTC evaluates the performance of new energy efficient technologies. The TTC comprises three test facilities (all located in Irwindale): the Refrigeration Technology Test Center, which focuses primarily on refrigeration; the HVAC Technology Test Center, which focuses on air conditioning; and the Lighting Technology Test Center, which focuses solely on lighting. Throughout the 2010-2012 program cycle, SCE has been working towards adding a fourth test facility, the Zero Net Energy (ZNE) Test Center. SCE expects the ZNE Test Center to contribute to California's Long Term Strategic Plan goal for zero net energy new residential construction by 2020.[104] TTC activities support ETP and other SCE programs, which include Workforce, Education & Training (WE&T) and Codes & Standards as well as other EE programs.

As a separate element, TTC is different from the other elements. The various test centers provide support to ETP through performing technology assessments as required. For the 2010-2012 program cycle, the element was called out specifically because of the addition of the ZNE test center.

6.2 EVALUATION METHODOLOGY

The Evaluation Team collected information regarding the Technology Test Center program element through three different data collection activities. The team performed data collection and analysis in September through November 2011. Each data collection instrument included a series of detailed research questions developed as part of the evaluation plan.

Table 33. Data Collection Activities for Evaluation of TTC Program Element

Data Collection Activity	Description
In-Depth Interviews	Conducted in-depth interviews with the TTC staff in Fall 2011.
TTC On-site Observation	Observation of test centers conducted on (10/7/11).
Secondary Research to Assess Market Position	The Evaluation Team augmented the secondary research performed for TA and identified a total of 55 entities (30 entities found through online lab testing research and 25 entities found through the online ZNE testing research). Although this is not an exhaustive list, it is still relevant to make inferences about work being performed similar to TTC within the overall CA EE market. For the 30 entities found in the TA research, a thorough inspection was performed to determine whether the testing was done in a lab or *in situ*. The entities that perform lab testing were relevant to TTC—based on this, 23 entities were found to be relevant.

[104] We note that the program managers chose to discontinue the Residential ZNE Facility in 2012.

Next are ZNE Test Center details regarding design and intended goals, implementation activities, whether the center is being implemented as designed, and where a test center such as this is positioned in the market. Following discussion of the ZNE test center is a description of the currently active test centers.

6.2.1 ZNE TEST CENTER

Design

According to the PIP, TTC staff will use the ZNE Test Center "to investigate the viability of energy efficiency, demand response, smart meters, and on-site renewable generation in ways that meet the needs of builders and occupants."[105,106] The new facility will be designed to test the interactive effects between a range of different envelope, space conditioning, lighting, plug-load, and renewable generation technologies.

According to TTC staff, the goal of the ZNE Test Center is to test sets of IDSM solutions that have proven to be viable from prior research or technology applications efforts, bring these technologies into a consolidated space, and see how they perform in conjunction with other energy efficient and demand response controls and technologies. This will allow TTC staff to test the potential energy savings from these solutions.

The ZNE Test Center, when operational, is also designed to test these solutions to determine how much on-site generation would be required to offset the energy usage of the building. Through ZNE testing, TTC staff seeks to answer the question of how to employ a collection of technologies to create a residential building that has ZNE consumption over a one-year period. Notably, the ZNE Test Center is not going to be a zero net energy facility; rather, it will evaluate ZNE technology that could be used in ZNE residential construction. According to TTC staff, the ZNE Test Center will become an integral component of TTC that will bring additional value because the existing facilities are designed to test single end-use technologies and cannot monitor or evaluate multiple technologies at the same time.

TTC staff noted that there are a variety of reasons for developing the ZNE Test Center at SCE. These include testing the interactions among multiple technologies to reduce technology uncertainties, evaluating simulation tools with applications for both residential and commercial end-uses, and understanding technologies that are applicable to SCE customers within SCE's specific climate zones.

Because there is a high degree of uncertainty whether the interaction of multiple technologies will achieve stated individual energy savings, the TTC staff believes that a new ZNE Test Center will reduce these uncertainties on a systems level. During the program manager interview, one TTC staff member stressed that "addressing th[is] uncertainty from an integrated system level standpoint was… a strong

[105] The SCE PIP is located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx entitled: SCE-SW-009 Emerging Technologies.doc pp. 803.

[106] We note that the program managers chose to discontinue the Residential ZNE Facility in 2012.

emphasis for [the ZNE] effort, to see how we can really remove the hurdles that we have to pave the path for 2020."[107]

According to TTC staff, the ZNE Test Center focuses on residential testing needs as stated in the PIP. This is primarily because other entities are already constructing commercial ZNE labs.

ZNE testing may also contribute to higher confidence in simulation tools that are currently used for both residential and commercial sectors to better predict the behavior of an overall building. According to TTC staff, "validating [these tools] within the lab environment…could help make the tools that are currently used for both residential and commercial better…"[108] Further, TTC staff noted that "there really needs to be a lot of confidence established in some of the existing simulation tools, and this lab, because of its hopefully future sophisticated monitoring and instrumentation capability, can bring a lot of valuable insight to the simulation community and validate a lot of work efforts…that are taking place."[109]

The ZNE Test Center may also play a complementary role with other commercial ZNE labs.

TTC staff noted that the Emerging Technologies Program is well positioned to design the ZNE Test Center because of its familiarity with the characteristics of SCE customers and climate zones. TTC already approaches assessments by looking at market barriers in addition to energy savings verification. According to TTC staff, SCE's ETP is well-positioned to conduct ZNE research because the method to achieve ZNE varies significantly by climate zone. According to TTC staff:

> *This is especially the case as other groups conducting ZNE research, such as National Renewable Energy Lab, Lawrence Berkeley National lab, and Oak Ridge National Laboratories, often focus on national needs with multiple climate zones that are not relevant to the 16 climate zones in California. – TTC Staff*

Further, staff believe that SCE understands its customers. "We have the true knowledge of our customer's operation through… [the] interactions we have with them… so we have a good handle on what makes them tick and their economics…We are talking about applied technology validation that would hopefully make good sense to the customers and since we know their needs and wants for the most part that is very valuable."[110] TTC staff noted that SCE's internal resources and the application of the testing results to both the residential and commercial sector makes it well positioned to design a ZNE lab.

When we talked with staff late in 2011, SCE was working with a contractor to define specifications for the ZNE Test Center that will meet their budget. While not certain, it is likely that the ZNE Test Center will be a modified residential home that will allow for considerable engineering testing within the home. The test center is expected to incorporate sections of removable building envelope, be able to

[107] TTC Staff interview conducted in October 2011.

[108] TTC Staff interview conducted in October 2011.

[109] Ibid.

[110] Ibid.

adjust internal heating and cooling loads as well as plug loads, and monitor all end uses in the center to determine energy use and potential savings. The available insulation and wind of Irwindale (where the test center will be built) will drive any installed solar or wind generation at the center (depending on what is chosen). The center will be subject to Irwindale weather (e.g., temperature and humidity).

TTC Position in the Market

To help understand a residential ZNE Test Center within the larger context of what is available in the market, we expanded our Technology Assessment secondary research to include ZNE assessments. Besides Technology Assessments, the team found 25 entities that conduct ZNE testing. For the 25 entities found in the online search for ZNE testing, the team performed a thorough inspection online to determine the following parameters[111]:

- Description of entity efforts
- Funding sources (sustainability of funding as well as where funding will be used, i.e., direction/long-term goals of funding)
- Whether the building was built for consumer usage (i.e., building occupied by customers) or lab testing (thus site or lab)

Based on the criteria above, the team found eight entities whose efforts, funding sources, and activities were similar in scope to the ZNE test center. Additional criteria were applied to these entities:

- Sector (Residential vs. Commercial – since TTC ZNE is for the Residential sector)
- Location (within California or not)

Based on the additional criteria above, only one program performed similar functions—PG&E's pilot ZNE Program, which is testing ZNE within residential buildings, but not specifically within a laboratory setting.[112] This finding indicates that the ZNE Technology Test Center is unique in the California energy efficiency market. In addition, the TTC labs appear to be well positioned within the California EE market as the lab is unique in its funding (mandates for energy efficiency products is clear and does not change based on policy or preference changes) and activities (performs in lab testing of technologies that are near-market).

ZNE Test Center Implementation

According to program manager interviews, planning for the ZNE Test Center began in early 2010. We note that the program managers chose to discontinue the Residential ZNE Facility in 2012.The site for the new center was selected in the summer of 2011, and the design/build contract for the firm tasked with constructing the test center will be awarded in November 2011. TTC staff expects the construction of the test center to be completed by the end of 2012. According to TTC staff, the test center will be

[111] Based on what is known about the ETP Element, the Evaluation Team determined the appropriate parameters to research.

[112] Full list of companies can be found in Volume II.

fully operational when the data acquisition system is put in place. The design firm and the total cost of the system will determine the length of time required to get the data acquisition system operational. According to TTC staff, an operational ZNE Test Center "depends on when we have the data acquisitioning system up and running; there are some questions with the budget right now that we have in place and whether we will be able to get a full data acquisition system up and running by the end of 2012, and we may be able to do something with the budget that we have right now in order to get that piece going…"[113]

TTC staff said the goal is to have adequate infrastructure for the data acquisition system in place by the end of 2012 to start leveraging project funding needed to begin tests. The progress that TTC staff described corresponds to the major milestones and anticipated future schedule that SCE provided to the Evaluation Team.

Table 34. List of ZNE Test Center Milestones

Date	Milestone
Feb. 16, 2010	Held internal brainstorming and strategic planning session
May 7, 2010	Conducted PUC-required Public Workshop in compliance with directive in Decision 09-09-047
Sep. 2010	Formed official partnership with SCE's Corporate Resources (CR) and initiated formal CR project
Nov. 2010-Jan. 2011	Held several forums with key internal stakeholders to identify qualified firms to design and construct the ZNE TTC
Feb. 2011	Conducted preliminary interviews with candidate design firms
Jun. 2011	Finalized site selection following extensive evaluation process involving internal and external stakeholders
Jun.-Jul. 2011	Conducted site visits with candidate design firms and visited relevant past projects
Aug. 2011	Initiated variance proceedings with City of Irwindale
Jul. – Sep. 2011	Developed RFP scope of work language through collaborative efforts of multiple stakeholders
Sep. 15, 2011	Issued design-build RFP
Sep. 21, 2011	Conduct Bidder's Conference
	FUTURE ACTIVITIES
Oct. 7, 2011	Proposals due to SCE
Nov. 1, 2011	Award contract
Apr. 2012	Develop construction documents
May 2012	Complete permitting process
Jun. 2012	Begin construction
Dec. 15, 2012	Construction complete

Source: SCE Response to Data Request #1

[113] TTC staff interview conducted in October 2011.

ZNE Test Center Planning

Although TTC staff is still working on the needs that the ZNE Test Center will address, TTC staff noted that the ZNE Test Center will require the capability to test the interactive effects between different systems. For example, the center should have the ability to test different types of wall assemblies and determine the impact these assemblies have on a building's air conditioning performance. According to TTC staff:

> *The testing needs would be the ability to measure interactive effects between different systems…So as you can imagine most of these labs are generally focused on single… system testing and now … looking at interactive effects… there is very little to no effort currently around the country to test interactive effects between different end-uses within a home…– TTC Staff*

ZNE Test Center planning requires developing ZNE Test Center capabilities and specifications. TTC staff is in the initial stages of developing these capabilities and specifications. According to the program manager interview, TTC staff intends to "create a state of the art facility… that will have the capability of testing packages of solutions that enhance the long term strategic goals of zero net energy for residential."[114] TTC staff has developed a list of guiding principles that it will share with the design team to achieve desired functionality.

ZNE Test Center Dissemination of Information

TTC staff discussed a variety of dissemination activities to address ZNE Test Center planning progress. A ZNE public workshop held in May 2010 informed attendees of the progress of the ZNE Test Center and elicited feedback from energy efficiency and renewable energy stakeholders. Specifically, IOU staff, CPUC staff, and representatives of national labs, local governments, and design firms attended. The attendees were invited through SCE's ETP email blast, which is a list of email addresses for 300 internal and external stakeholders. TTC staff specifically reached out to Lawrence Berkeley and Oak Ridge National Laboratories to participate. TTC staff may hold an additional public workshop before the design is finalized to elicit additional feedback.

ZNE Test Center progress is disseminated through quarterly reports as requested at ETCC meetings. The progress reported through this channel is usually a high-level summary of the status of the ZNE Test Center. Future information dissemination activities will be similar to TTC's current information dissemination efforts (we discuss these activities in the TTC section below).

ZNE Test Center Coordination and Collaboration

For ZNE Test Center planning, TTC staff participates in brainstorming and other informal planning activities where TTC staff has started developing residential testing needs for the ZNE Test Center. According to TTC staff, they have developed an informal list of needs that they have not yet documented formally.

[114] TTC Staff Interview conducted in October 2011.

TTC staff has solicited advice for developing ZNE testing needs both internally and externally. Within SCE, TTC staff has reached out to staff from other ETP elements and other SCE programs, such as Codes and Standards, Sustainable Communities, Advanced Homes, the Energy Education Center, and Advanced Technologies Group. Externally, TTC staff has reached out to the CPUC, other IOUs, national laboratories, UC Irvine, several local governments, as well as design firms.

6.2.2 Technology Test Center Design and Implementation

Below we describe TTC design and implementation, by outlining the goals of the Technology Test Centers as well as the activities undertaken to achieve these goals.

Technology Test Center Design

According to the PIP, SCE's Technology Test Centers "provide unique capabilities for evaluating the performance of new technologies" in the areas of refrigeration, air conditioning, and lighting.[115] The PIP states that the main function of the TTC is "to provide impartial laboratory testing and analysis of technologies…these activities will be used to expand the portfolio of energy efficient (EE) measure offerings, quantify energy savings for EE measures, alleviate concerns about performance uncertainties, and verify the feasibility and validity of proposed codes and standards enhancements."[116] In addition, the TTC's secondary function is to act as a repository of technical information and expertise.

According to TTC program managers, TTC testing contributes to development of test standards for new technologies. While technology assessment projects focus primarily on assessing the energy usage of equipment, TTC staff notes that they also attempt to identify any other potential non-energy-related barriers to adoption and try to find solutions to these within project assessments. These barriers can include issues such as product safety, quality, shopper comfort, ease of use, etc. For example, TTC is currently testing fast food chain light up advertisement signs, with the primary goal of testing different retrofit lighting options for these signs. In the process, they are testing both the energy usage as well as the lighting's impact on the visual appearance of the sign to ensure the advertisement maintains its quality and customer appeal while also saving energy.

TTC staff has also been working with grocery stores for over eight years to develop a more energy efficient solution for reach-in coolers. This research helped to inform the energy performance standards for these technologies. When TTC first started to work with grocery stores, they found that grocery store owners were not interested in discussing energy efficient solutions since energy costs tend to be approximately 1% of their overhead. Instead, they found that by talking with store owners about product quality, keeping food consistently at the right temperature, and maintaining shopper comfort

[115] The SCE PIP is located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx entitled SCE-SW-009 Emerging Technologies.doc pp. 803.

[116] The SCE PIP is located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx entitled SCE-SW-009 Emerging Technologies.doc pp. 803.

by keeping refrigerated air within the cooler instead of the aisles, these grocery store owners were more interested in discussing new technology opportunities.

TTC also coordinates activities with a variety of efforts and programs external to ETP. In support of WE&T efforts, TTC staff has conducted trainings for material consultations, and has designed and taught full-day courses for the Energy Education Center (formerly CTAC & AgTAC). TTC has performed technical evaluations for other external efforts and programs, including Codes and Standards, Demand Response, other EE programs, and third-party funded activities. In its support of existing programs, TTC contributed to standards for grocery store reach-in coolers, tested HVAC maintenance savings assumptions, and tested the first clothes washer prototype that is smart grid compatible for a demand response program. Additionally, TTC has performed outreach functions such as contributing to industry publications or presenting at industry conferences.

Technology Test Center Implementation

Below is a description of TTC activities, including the technology assessments, information dissemination, and coordination and collaboration activities.

Description of the Center and Activities

TTC staff is involved in a variety of activities, which include developing a project plan, building a testing lab from scratch, testing products or technologies, and reporting and disseminating results. The TTC assessment process described by TTC staff includes identifying issues with an energy efficient technology, such as quality, energy usage, and psychological elements, and then developing potential solutions to overcome these issues. In addition, TTC staff looks at technologies to better understand energy savings, loss opportunities, and opportunities for additional energy and demand savings through technology modifications. During technology testing, the eight climate zones in SCE's service territory are often simulated to test how the technology performs under various weather conditions. For example, TTC staff tested LED street lighting in eight different climate zones because performance depends upon the temperature.

Figure 18. Food Preparation Equipment Testing

The centers are housed in a large warehouse-type space approximately 3,000 to 4,000 square feet in size, mainly containing small offices, laboratories, and testing equipment. Within the space, there are a variety of rooms, including a mechanical chamber where compressors are tested; a heating, ventilation, and air conditioning (HVAC) testing chamber, a walk-in freezer chamber; a controlled environment test chamber for multiple end uses; several lighting testing areas; and a data processing room.

To fully understand, describe, and assess TTC activities, we conducted a site visit and observed and photographed testing activities. During our visit, we observed tests being conducted

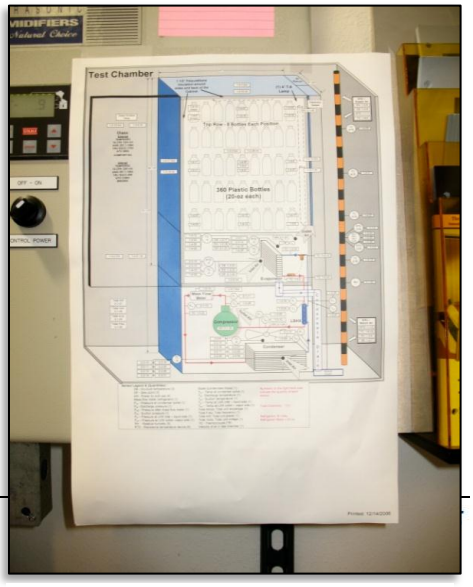


Figure 19. Design for Refrigeration Test Chamber

for refrigeration, air conditioning, and lighting technologies. For example, an HVAC system was being tested in a controlled environment in the HVAC Technology Test Center, and a food preparation station for use in fast-food restaurants was being tested in a controlled environment in the Refrigeration Technology Test Center. During this same visit, TTC staff was testing the characteristics and longevity claims of different lighting products made by original equipment manufacturers (OEMs) in the Lighting Technology Test Center (see Figure 21).

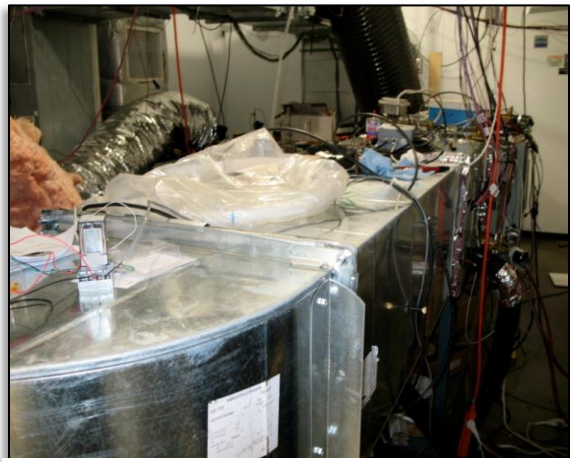


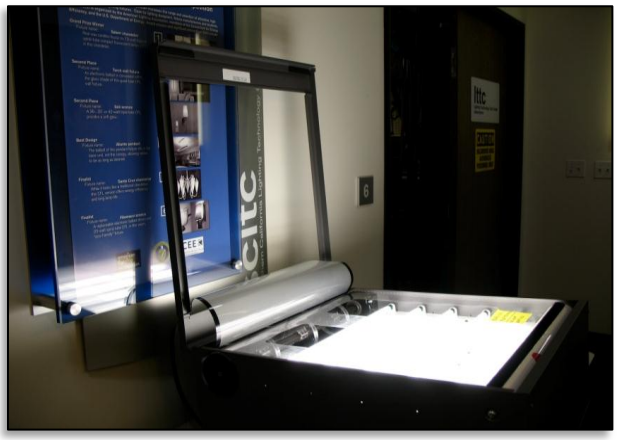
Figure 20: HVAC Maintenance Testing

Many activities are conducted in the different rooms and test chambers in the TTC. For example, in the control environment room, two tests were performed during our visit. The first test assessed a residential clothes washer hooked up to a smart meter to identify the product's demand response capabilities. This test both reviewed energy usage, e.g., metered usage, and identified potential problems a consumer may have interacting with the machine and the information provided by the smart meter.

In the HVAC testing chamber, TTC staff tested an HVAC system in a controlled environment. On that particular day, the testing focused on assessing maintenance benefits, testing the equipment under multiple outdoor weather conditions, and testing HVAC diagnostic equipment at the same time to determine whether the diagnostic equipment captured the same information captured by the testing equipment. In the controlled environment test chamber, TTC staff tested a food preparation station for a fast food chain, by testing the interaction between hot and cold drawers sitting on top of one another in a station.

TTC staff also conducted lighting tests for both lighting characteristics and OEM longevity claims. This center has a dark room lab testing a fast food chain menu light-up board sign, specifically testing T5's and control systems to potentially retrofit these menu boards in restaurants. The center has a large and small sphere for testing bulbs and fixtures on a system level (e.g., testing characteristics, optics, drivers, reflectors, heat, and lumens). In addition, a room set up like an office with an adjustable ceiling simultaneously tests lighting at different ceiling heights as well as task lighting.

During the site visit, we observed many activities occurring at the center, with very enthusiastic and passionate employees. TTC has eight full-time employees, which include project managers and technicians[117]. The center invites TTC staff to submit ideas that relate to energy efficient or renewable technology testing into a "brain box" at any time, and the



[117] Eight employees are primarily focused on TTC activities, but only 2-3 full time staff equivalents are funded.

information is summarized and reviewed quarterly to determine how it can be applied.

According to program managers, a technical advisory committee, comprising advisors from throughout the country, provides input and approves the plans for each project (as appropriate). Each project varies in timing depending upon the type of technology being tested. For lighting technologies, testing can range from two weeks to six months depending on the test and research question. For HVAC, testing can take anywhere from six months to 1 ½ years, while for refrigeration, testing time averages between three to nine months. This excludes time spent prior to testing for project planning, designing, and building the lab for testing (which can take weeks or months since the staff must build the test rigs from scratch), or the time spent writing up results and reports. Projects may be delayed due to such factors as technical difficulties, equipment availability, resource limitations, and issues developing new test methods.

Figure 21. Lighting Testing

TTC staff members report that they conduct an average of seven assessments per year. The Technology Test Center performance metric[118] is described as the number of ETP measures evaluated at the TTCs that are adopted into the EE portfolio (and/or available in the market). According to TTC staff, the centers have completed 24 technology assessments since January 1, 2010, and adopted 22 of these technologies.[119]

Technology Test Center Dissemination of Information

Once the tests are complete, TTC staff reports on results and disseminates information widely through publications and conferences. TTC staff estimates that about 85% of staff time is dedicated to technology assessments, with the remaining 15% dedicated to information dissemination efforts. The staff develops technical reports on the assessed technologies, which are included on the Emerging Technologies Coordinating Council website.[120,121] TTC staff reports as requested to the California Public Utilities Commission (CPUC) at the quarterly ETCC meeting. Information is also disseminated through publications, with the TTC staff averaging about five publications per year. Further, TTC staff presents papers and speaks at conferences, as well as consulting on activities for other programs. TTC staff also spends time providing technical information used in handbooks and engineering text books. For example, TTC staff has written two chapters in the American Society of Heating, Refrigeration Air Conditioning Engineers (ASHRAE) refrigeration handbook since 2002 and has provided new technology expertise for chapters in engineering textbooks.

[118] Program performance metric from Resolution E-4385: SCE AL 2476E.

[119] We note that the number of completed assessments and measures adopted provided from the response to our data request is inconsistent with the data found in the ETP database. TTC staff note that the adopted technologies may not be the same as those completed during the current program cycle, since they could have come from the prior program cycle.

[120] http://etcc-ca.com

[121] The projects listed on this website are only for ETP-funded projects.

Technology Test Center Coordination and Collaboration

TTC staff members report that they occasionally participate in internal meetings or seminars which disseminate results from assessments or other lab efforts. Other collaboration activities occur on a one-on-one basis where staff shares information informally regarding current testing activities and input about the ZNE Test Center.

TTC engages in a variety of coordination efforts inside and outside of the ETP. Inside the ETP, TTC staff participates in weekly meetings with other ETP element representatives, where they collaborate on project planning and testing and share results. For example, TTC staff will provide air conditioning (A/C) maintenance assessment results for a scaled field placement or demonstration showcase. According to TTC staff, "there is a lot of collaboration and expertise and information sharing between TTC's unique expertise and serving as a resource for projects that are being developed…[projects] that are feeding into or being developed as part of demonstration showcases, as well as scaled field placements and technology development support. So there is a linkage between that and all those subject matter expertise and engineers…"[122] TTC staff noted that the ability to coordinate with staff working on the other ETP elements was still in its infancy since the elements are relatively new.

TTC coordinates with many external organizations to help plan projects and disseminate testing results. In addition, coordination efforts provide an opportunity for the TTC to support tangential efforts to train the workforce on emerging technologies. These efforts include presenting at various conferences and meetings, performing evaluations for entities external to the ETP, supporting Workforce Education & Training, and connecting with external organizations that help inform its project planning process. Table 35 describes coordination efforts that the Technology Test Centers conduct outside of the ETP. Note that this is not an exhaustive list of entities but is provided to highlight current coordination activities.

Table 35. TTC Staff Presentation and Coordination Efforts Outside of ETP

Presentation and Coordination Efforts	Specific Activities
Presentations outside of ETP	➢ ASHRAE Annual Meeting ➢ Federal Utility Partnership Working Group ➢ ACEEE Summer Study ➢ D&ES Quarterly Tech Briefing ➢ ET Summit ➢ EEI Fall Conference
Perform evaluations for entities external to ETP	➢ Existing programs: Codes & Standards, HVAC, Demand Response ➢ Energy efficiency programs ➢ Third-party funded activities (e.g., DOE projects for national labs subcontracted to TTC)
Support Workforce Education and Training	➢ Training material consulting (e.g., help enhance HVAC curriculum) ➢ Conduct training (e.g., occasionally design and teach a course at an energy education center [EEC])

[122] TTC Staff Interview conducted in October 2011.

Presentation and Coordination Efforts	Specific Activities
Connections with external organizations	➢ Lab Alliances o Fisher-Nickel o Pacific Gas & Electric (PG&E) HVAC labs o California Plug Load Research Center (CalPlug) o Intertek o Texas A&M ➢ Academic Partnerships o Caltech o Kettering University o University of Washington ➢ OEM partners ➢ Consultant partners o Navigant Consulting o Foster Miller ➢ Resource organizations o Water districts/organizations

6.3 SUMMARY OF RECOMMENDATIONS FOR TTC

There are no specific recommendations for TTC. Since TTC performs technology assessments, any of the recommendations provided in that section are relevant to the work performed by TTC staff when completing a Technology Assessment.

7. SCALED FIELD PLACEMENT

7.1 SCALED FIELD PLACEMENT DESCRIPTION

The Scaled Field Placement (SFP) element is an *in-situ* placement of a technology for the purposes of positively influencing end users or stakeholders (i.e., installers, builders, procurement officers) through their firsthand experience with the technology.[123] As currently deployed, the IOUs may place the same measure across several sites or several measures within a single site. The recipients do not pay for the technologies. According to the PIP[124]:

- Distinct from other activities within the ETP, Scaled Field Placements attempt to expose those with adoption influence to technologies to increase "market traction and possibly gain market information."
- "Influence of the participant stakeholder could stem from purchase decision power, high frequency of interactions with other potential adopters, or status as a thought leader."
- Scaled field projects are most effective when "the stakeholder gaining exposure has the potential to influence a large number of future purchases/uses."
- Projects may also "contribute to a market tipping point," where "large volume purchases… create a spike in market demand and exposure" to potential customers, "aiding EE programs in achieving energy and demand savings targets."

For purposes of this report, we introduce the term "market influencer" to define the type of person that SFPs attempt to influence.

ETP staff state they are interested in what choices are made after the installation (customer adoption of the measure and barriers faced). In addition, for some projects, the IOUs assess the energy savings of measures placed within a Scaled Field Placement, although they may not always choose to do so. An assessment of what should and should not be measured for SFP projects is provided within this chapter.

7.2 SCALED FIELD PLACEMENT METHODOLOGY

The Evaluation Team performed an assessment of this element using data on Scaled Field Placements that came directly from the IOUs in the form of interviews with ETP staff and files based on a data request made in October 2011. At the time of the initial data collection, three Scaled Field Placement projects were in progress and none were completed. The evaluation plan originally included obtaining

[123] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located on the ETP database: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; 15. SCE-SW-009 Emerging Technologies.doc pp. 780; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

[124] Ibid

information from other sources, i.e., interviews with participating customers and visiting *in-situ* sites. Due to the lack of completed projects at the time of data collection and in consultation with the CPUC, the Evaluation Team postponed these efforts. However, this report incorporates additional information from monthly status updates that the IOUs provided to the CPUC-ED as of March/April 2012, as well as the information in the ETP database through Q1 2012.

Table 36 provides the data collection activities used for the analysis.

Table 36. Data Collection Activities

Data Collection Activity	Description
In-depth Interviews	Conducted 3 in-depth interviews with the 4 IOUs
Program Material Review	Reviewed the following materials: • Program Implementation Plans • Sample of SFP proposals and scorecards • List of scored measures (PG&E, SCE) • List of internally-tracked variables (PG&E, SCE) • Budgeting information for SFP projects
ETP Database	Reviewed information on the projects as provided in the Q1 2012 update to this database.
Evaluability Assessment	Two workshops and ongoing in-depth interviews with the 4 IOUs to identify program theory and logic model as well as potential performance indicators.
Expert Panel	One expert panel was conducted to determine whether ETP is positioned[125] in California's RDD&D energy efficiency market to be able to meet the expected goals as articulated in CEESP. (This panel was not specific to Scaled Field Placement.)

7.3 CURRENT SCALED FIELD PLACEMENT ELEMENT STATUS (AS OF Q1 2012)

The program implementation plans for 2010-2012 set a statewide objective of implementing 15 projects. The ETP is currently developing 9 SFP projects, although some of these efforts are not scheduled for completion until 2014. Of these 9, the IOUs report that only one project has been completed, and eight projects are ongoing.[126] Notably, for Scaled Field Placements, three of the four IOUs have up to 4 years since the initiation of the project to complete the project.[127]

[125] "Positioned" is defined as where the ETP aims its activities in the RDD&D energy efficiency market to contribute to the CEESP goals.

[126] These numbers are different from the projects obtained in the Monthly Data Request primarily due to the update in PG&E's projects. Two projects previously listed as TAs have been categorized as SFP (ET11PGE3131 and ET11PGE3161). Additionally, two projects that were listed as SFP have been categorized as MBS (ET11PGE3191 and ET11PGE3241).

[127] This is according to the PIPs. We note, however, that PG&E does not have this stipulation within the PIP.

Table 37: Scaled Field Placement Objectives (as of Q1 2012)

IOU	2011 Program Implementation Plan Objectives	Completed	Ongoing	Total Completed or In-progress as of Q1 2012
PG&E	7	0	4	4
SCE	4	0	3	3
SCG	2	1	0	1
SDG&E	2	0	1	1
Statewide	**15**	**1**	**8**	**9**

Source: Q1 2012 ETP DB extracts

In total, approximately $2.9 million of the ETP program budget of $43 million (~7%) is targeted to the Scaled Field Placement element, although the exact number is unknown since SCG and SDG&E do not track budgets specifically for Scaled Field Placements.

For the Scaled Field Placement element, none of the IOUs have reached their PIP objective. SCE initiated three SFP projects, while spending 25% of their budget, but has not yet achieved their objective of four projects as of Q1 2012. SCG and SDG&E have initiated one project each and have not yet achieved their objective of two competed SFP projects each as of Q1 2012. PG&E initiated four projects and has not yet achieved their objective of seven projects initiated during the program cycle, while spending only 11% of their budget for this element as of Q1 2012. PG&E does have four ongoing projects with a committed budget of over $1,095,000 that is not included in the reported expenditures as of Q1 2012. This additional budget commitment would increase their total program expenditures to 123% of their budget by the close of the program cycle.[128] Similarly, SCE has three ongoing projects with a committed budget of over $297,000. This additional budget commitment would increase their total program element expenditures to 40% of their budget at the close of the program cycle.

Of the nine projects, budgets are known for eight; budgets range from $30,000 to $395,000, with the mean project cost of $196,500.[129] (See Table 47 for budgets by project.) However, project costs are not identical to expenditures as IOU labor costs and administration overhead are not included. Therefore, the actual budget for the element needs to account for labor and other aspects of implementing the element not covered specifically within project costs. If the labor costs are included in the next program cycle, the IOUs will have knowledge of actual project costs to better estimate a budget for this element. Additionally, due to the wide variation in possible activities for this element, it is difficult to accurately forecast an average budget per project.

The table below shows budget and expenditure information available for the evaluation.

[128] For ETP, PG&E budgets and makes expenditures within a calendar year. Therefore, any SFP must be completed within this calendar year to match the budget.

[129] The budget for one SCE project (ET11SCE3010) is listed as 'Unknown' in the ETP database and is thus excluded from these calculations. Additionally, PG&E's budgets were missing from the ETP database and have been obtained from the Monthly Data Request.

Table 38: Scaled Field Placement Element Budget and Expenditures by IOU as of Q1 2012

IOU	2010-2012 Program Revised Budget[a,b]	Program Expenditures (Inception-To-Date)	Percent of Budget Spent as of Q1 2012	Proposed Budgets for Projects[c]
PG&E	$974,675	$103,938	11%	$1,095,000
SCE	$1,994,020	$502,526	25%	$297,000[d]
SCG	SCG does not report expenditures by element in the ETP database.			$150,000
SDG&E	SDG&E does not report expenditures by element in the ETP database.			$30,000
Partial Total	**>$2,968,695** (does not include SCG and SDG&E)	**>$606,464** (does not include SCG and SDG&E)	**20%** (does not include SCG and SDG&E)	**$1,572,000**

[a] Element budgets reflect those reported in the ETP database Expenditure by Program file of March 2012. These are as follows: PG&E 3/12/2012 Monthly Report "PGE.MN.201112.3", SCE 4/2012 Monthly Report "SCE.MN.201203.1", SCG 4/2012 Monthly Report "SCG.MN.201203.1", and SDGE 4/2012 Monthly Report "SDGE.MN.201203.1" accessed here: http://eega.cpuc.ca.gov/ on 5/23/2012. Note that Sempra does not track their program by element.

[b] The 2010-2012 Program Revised Budget is consistent with the Fund Shift Report updated on April 12, 2012 and excludes rebalanced budget from AL 3235-G-3901-E.

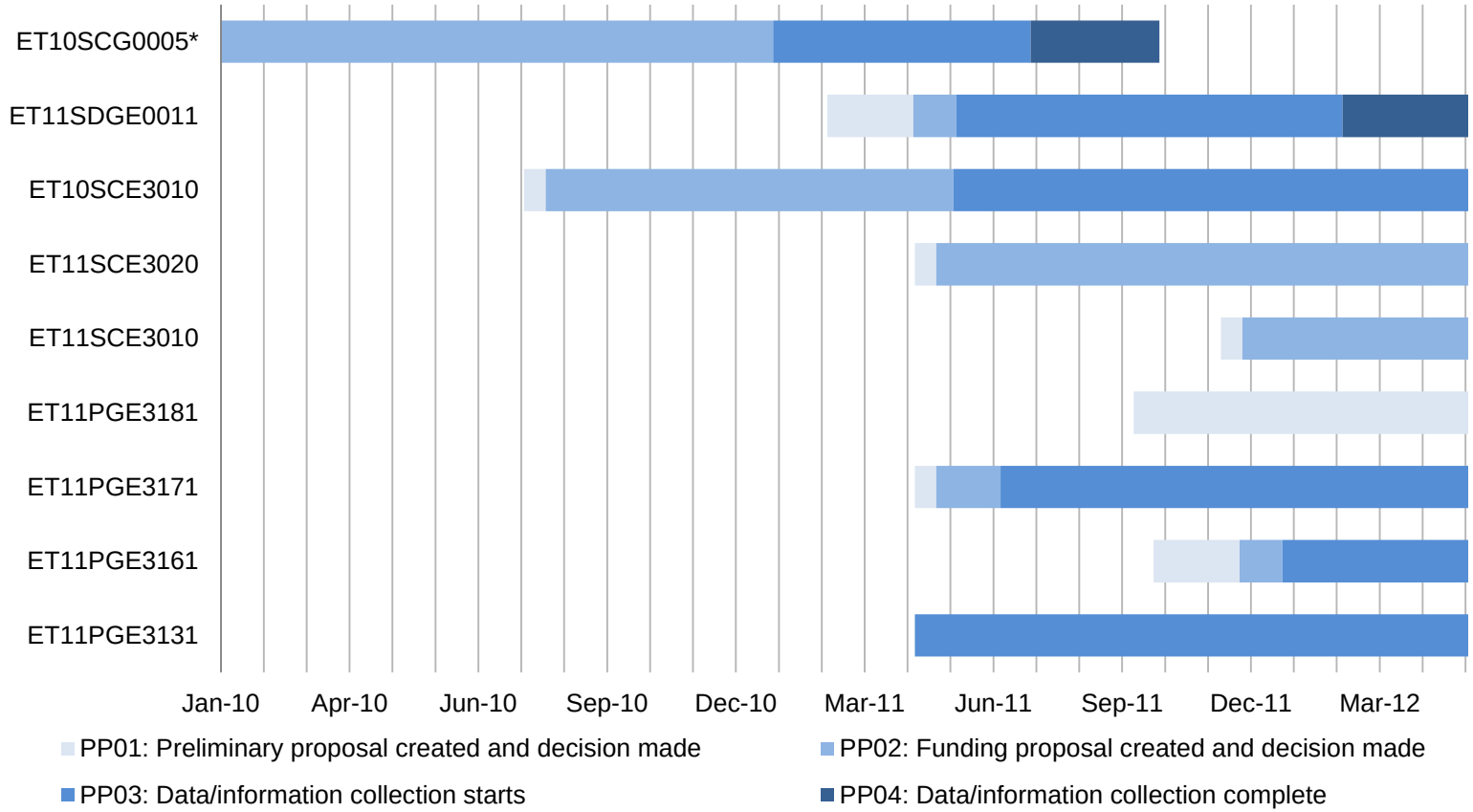
[c] Source: Q1 2012 Monthly Reports sourced from EEGA website and the Monthly data requests as of March 2012 for PG&E

[d] Excludes the budget for one project which was listed as 'Unknown' in the ETP DB.

Figure 22 below shows the nine projects with their timeline (by progress point[130]) by IOU. PG&E's projects were initiated between May 2011 and October 2011 and have durations between two and eight months. In comparison, SCE's projects have spread out the start date (from 2010 to 2012) and have slightly longer durations between eight and 22 months. SDG&E initiated one project that began in March 2011 and has a current duration of 11 months. The one completed project was initiated and completed by SCG with a much longer duration of 22 months.

[130] There are five progress points that are used in the ETP database to indicate the stage of the project, from initiation through completion or cancellation.

Figure 22. Timelines for SFP Projects from Progress Points



* SCG Project ET10SCG0005 was initiated in Feb 2009; however, the start date is too far back to show in this figure.
Note: for PG&E projects that were reclassified from TA to SFP (ET11PGE3131 and ET11PGE3161), the progress points were taken from the ETP DB using the previously used Project numbers (ET11PGE1131 and ET11PGE1161)

Table 39 provides details about each of the nine SFP projects through the first quarter of 2012. Notably, PG&E staff has revised the classification of projects across program elements over time. In particular:

- PG&E has revised two of the current program cycle projects that were originally classified as a TA to SFP. These include EMS Fault Detection Diagnostics (ET11PGE3131; which, according to the program-tracking database, tests the software's ability to find specific HVAC system faults. (Previously noted as ET11PGE1131), and Pulse Energy -Dashboard w/ Energy Mgr (ET11PGE3161; which according to the database, tests efficacy and energy savings potential facilitated through Pulse Energy EMS and energy coaching. Previously noted as ET11PGE1161).

- PG&E has revised two of the current program cycle projects that were originally classified as an SFP to MBS. These include Continental Automatic Building Association (CABA) Research Project (ET11PGE3191; which identifies North American consumer behaviors and attitudes surrounding the connected home) and EPRI-Coordinated Early Deployments of Efficient end-use Tech-Phase 1 (ET11PGE3241; report seeks to bridge the gap in development pipeline between field demos and utility programs with early deployments).

These findings indicate that greater focus is needed for selecting and identifying a project type for SFP. This will help to ensure that projects are aligned with the expected outcomes for this program element.

Table 39: Scaled Field Placement Description (as of Q1 2012)

IOU	#	ETP Project Number	Project ID	Residential	Commercial	HVAC	Lighting	Other	Controls	Expected Costs[a]	Status
PG&E	1	ET11PGE3131[b]	EMS Fault Detection Diagnostics		X	X				$310,000	Ongoing
PG&E	2	ET11PGE3161[c]	Pulse Energy -Dashboard w/ Energy Mgr.		X			X		$395,000	Ongoing
PG&E	3	ET11PGE3171	EMS Wireless Pneumatic Thermostat		X	X				$240,000	Ongoing
PG&E	4	ET11PGE3181	Follow Up Linear Panel and Controls Study (GSA)		X		X		X	$150,000	Ongoing
SCE	1	ET11SCE3010	LED Downlights	X			X			Unknown	Ongoing
SCE	2	ET11SCE3020	Climate Appropriate HVAC	X		X				$47,000	Ongoing
SCE	3	ET10SCE3010	LED Street Lighting	X			X			$250,000	Ongoing
SCG	1	ET10SCG0005	Raydronics	X			X			$150,000	Complete
SDG&E	1	ET11SDGE0011	Bi-Level LED Elevator Cab Lighting		X		X			$30,000	Ongoing

[a] Budgets for PG&E projects are taken from the Monthly Data Request

[b] PG&E's project ET11PGE3131 was initially classified as a TA, now classified as SFP (previous project number ET11PGE1131)

[c] PG&E's project ET11PGE3161 was initially classified as a TA, now classified as SFP (previous project number ET11PGE1161)

As shown in the table above, the projects equally target the commercial and residential sectors and are a mix of different end-uses. Projects have projected timelines from beginning of the selection process to completion of the report and have durations from 1 to 22 months, with a mean duration of 7 months.

7.4 ASSESSMENT OF DESIGN

This section examines whether the causal theory for the specific element, as described by the IOUs within the PIP and as agreed to through meetings, is plausible. In addition, this section also determines whether the impact goals and information needs are defined and obtainable at a reasonable cost.

Discussions with the IOUs and detailed meetings to document the theory behind this element revealed that there are currently two program theories, or program rationales, with associated program outcomes as expressed by ETP staff. Theory one has two similar components.

Theory #1 – Identification of Market Barriers:

> **1a. Customers:** Information on emerging technologies can be difficult to find and customers are uncertain that the potential savings provided by a new technology is worth the cost. Potential customers do not always trust the information that comes from a technology vendor regarding an emerging technology. Additionally, the customer may not know possible maintenance ramifications of emerging technologies (hidden costs). For these reasons, many customers do not readily accept new types of energy efficiency measures. Firsthand experience with a new technology reduces concerns over performance uncertainty and can alleviate concerns over hidden costs. When a trusted source such as the IOU provides the new technology, the customer is more willing to try it. Once the customer tries a new technology and finds it works well in their setting, they are likely to purchase more of the same measure in the future. Similarly, for under-utilized technologies in the energy efficiency portfolio, SFP can help identify additional market barriers that make customers reluctant to use the technology. The expected program outcome is to identify market barriers and increase market traction of a given technology through placement with influential customers.
>
> **1b. Market Actors:** Market actors, such as installers, specifiers, engineers, city planners, trade associations, and contractors, influence the types of equipment purchased by customers. Information on emerging technologies can be difficult to find, and these market actors are uncertain that the potential savings of a new technology is worth the cost. These market actors are likely to question information and marketing that comes from vendors of emerging technologies. Additionally, these market actors may not know possible maintenance ramifications of emerging technologies (hidden costs). For these reasons, many of the market actors do not readily recommend new types of energy efficiency measures to their customers. Firsthand experience with a new technology reduces concerns about performance uncertainty and can alleviate concerns over hidden costs. When a trusted source such as the IOU provides the new technology, the market actors are more willing to try it. Once a particular market actor tries a new technology and finds it works well in customer settings, they will have information to help sell future customers on the new technology as well as recommend the measure to other end-users. The expected program outcome is to identify market barriers and increase market traction of a given technology through placement with influential market actors.

Theory #2 – Additional Information on Energy Savings: Information from a single technology assessment is not always sufficient for energy efficiency program managers to add a new measure into their portfolio. Energy efficiency program managers sometimes need more evidence of savings and take comfort in the fact that customers do not find the new measure objectionable. Technology assessments can be costly. In some cases, having several customers use a new measure and provide

feedback regarding the measure will be more effective and less costly than conducting multiple technology assessments. The expected outcome for this theory is the verification of savings for a given technology.

The two theories show a split in purpose and distinct program outcomes for this element. While both theories are intended to help lead to increased adoption rates of technologies, the causal reasoning is different. Causal reasoning for theory one (where the ETP attempts to influence market influencers through placement of technologies across multiple sites) places the causal influence directly on the actions taken by the market influencer after the project. In this path, increased adoption is seen through choices made by those directly touched by the ETP. Not only is the market influencer expected to purchase additional equipment, there is also the assumption of information being disseminated through word of mouth by the market influencer.

Causal reasoning for program theory two (where the ETP staff bring *energy savings* information to the energy efficiency program managers about a technology and the technology is deployed into the energy efficiency portfolio) places the ETP causal influence on the energy efficiency program managers. The further causal assumption to increase adoption rates is that, once in the energy efficiency portfolio, the incentive mechanism will cause end-users to adopt the technology. Theory two arose from discussions with the IOU program managers and was not included in the PIP rationale for this element. Note that this theory is directly tied to assessing energy savings.

Having both types of outcomes within this element dilutes a clear expectation of how change occurs and expected short-term outcomes for each project. This lack of clarity complicates the IOU's ability to measure the success of the element. The IOUs should place projects attempting to measure savings within Technology Assessments as a "scaled" TA. One of the main differences noted within the PIP for SFP was that there were multiple sites embedded within a single project, while a Technology Assessment was a single site. This differentiation is not needed, as a Technology Assessment can include multiple sites. The main difference for an element should be the expected outcome.

For SFP projects, the focus should be on the actions taken by the market influencer after placement of the measures, including whether the market influencer is able or willing to adopt the measure in future projects. By focusing on this expected outcome , the selection of projects and technologies will become more straightforward.

The current PPM for this element is "Number of ETP measures that have undergone SFP and are adopted* into the EE portfolio. *"Adoption" means measure is available to end-use customers through IOU programs."[131] This PPM does not fit the original PIP design, although it aligns with using this element to move items directly into the energy efficiency portfolio.

The IOUs should consider revising the current PPM to reflect the expected outcome of understanding market barriers and influencing market influencers. A new PPM should reference the type of market influencer included in the program (i.e., that the chosen participants have several sites or have a large practice in serving customers) and be designed to measure the effects from influencing these

[131] PGE2108 ET SW PIP 01-2011 no redline.pdf; 19. SCE-SW-009 Emerging Technologies.doc pp. 773; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

individuals. Measuring adjusted project outcomes could be done at a reasonable cost (these are described more in Section 7.5.2).

7.5 ASSESSMENT OF IMPLEMENTATION

The PIPs contain four distinct action strategies to implement Scaled Field Placements[132]:

Table 40: Scaled Field Placement Action Strategies

Action Strategy	Action Strategy #
Scan a wide variety of sources for measures for Scaled Field Placements that could help IOUs to increase market understanding and traction for new and under-utilized measures.	1.3.1
Execute a screening process for Scaled Field Placements candidates designed to ensure that the ET team focuses its time and resources on measures most effectively.	1.3.2
Conduct Scaled Field Placements to increase market acceptance and traction for new and under-utilized measures.	1.3.3
Evaluate program activity to assess the market acceptance at one year and two years, and potentially at three years after the launch of a Scaled Field Placement. Review these findings with EE Program staff regarding potential improvement to both ET and EE program activities.	1.3.4

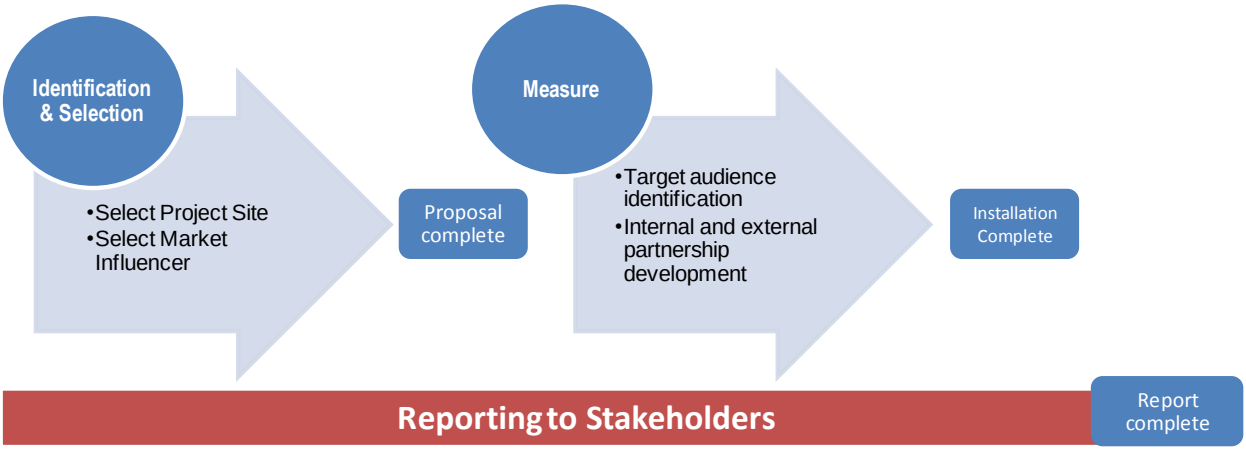
For ease of discussion, the assessment of implementation is divided into two discrete areas representing the first two action strategies and then the last two strategies.

1. Project Selection – identification and selection of projects falls under PIP Strategies 1.3.1 (scanning) and 1.3.2 (screening). This consists of selecting a site (which is closely tied to the choice of the market influencer) and selecting a technology.

2. Measuring Outcomes and Feedback to Energy Efficiency Program – PIP Strategy 1.3.3 is simply the installation of measures at a site while measuring outcomes and subsequent feedback occurs under PIP Strategy 1.3.4.

[132] PGE2108 ET SW PIP 01-2011 no redline.pdf; 19. SCE-SW-009 Emerging Technologies.doc pp. 773; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

Figure 23: Scaled Field Placement Implementation



Findings are described related to each of these areas.

7.5.1 PROJECT SELECTION

As with other elements, the selection of Scaled Field Placement projects varies across the state. There are scoring tools in place, but they vary across the utilities. As such, while the selection of SFP projects may be data-driven, not all of the tools focus on the intended outcome of identifying market barriers and increasing market traction through the selection of a market influencer.

The program element currently implements two types of projects that reflect the dual program theories. However, if in the future the element focuses specifically on understanding and reducing market barriers, then the projects should focus on technologies that have proven energy savings. SCE has formal selection tools tailored to SFP that align with this program theory. Note that PG&E's, SDG&E's, and SCG's scoring tools are not currently aligned with this program theory.

The next sections more fully describe evaluation findings on project selection.

Market influencer Selection

Eight of the nine projects reviewed had not selected a site (although the project itself has been selected). SCG had the only project where a site had been selected. Given the two program theories, all projects should target customers with multiple sites; however, under Theory 1, the market influencer would place technologies in a site and expand to other sites after being influenced, while under Theory 2, the host would place technologies in multiple sites immediately to confirm savings on a large scale.[133]

Table 41 describes the target customers (and host sites, if data is available) for the nine Scaled Field Placement projects. There is no formal documentation about why a specific site is chosen. Therefore,

[133] There is evidence that some studies under consideration may install multiple measures in one site with the intention to verify energy savings, rather than immediately scaling to multiple sites. These are described in the projects provided in Emerging Technologies Phase I Data Request #5, not in the ETP database, and are therefore not covered in Table 41.

an assessment cannot be made as to whether the market influencers and their associated sites chosen for the project have the ability to influence future purchase decisions or usage.

Table 41: Scaled Field Placement Target Customers (Q1 2012)

IOU	ETP Project #	Project Name	Target Customers
SCE	ET11SCE3010	LED Downlights	Technology stated it will be installed in commercial settings that are "high traffic areas" to increase market traction (Sites include Long Beach, Newport Beach, Pomona, Claremont*).
SCE	ET11SCE3020	Climate Appropriate HVAC	Target customer is HVAC Contractors and distributors, but it is unclear where the technology will be installed.
SCE	ET10SCE3010	LED Street Lighting	Target customers are cities, but it is unclear where the technology will be installed.
SCG	ET10SCG0005	Raydronics	Target customer is managers of multifamily residential complexes equipped with Raydronics combined central heating and hot water supply systems (estimated to be 2,000 customers in SCG territory). SCG has installed in over 30 sites, which the technology developer identified.
SDGE	ET11SDGE0011	Bi-Level LED Elevator Cab Lighting	Target customers are owners and operators of spaces with elevators but it is unclear where the technology will be installed.
PG&E	ET11PGE3131	EMS Fault Detection Diagnostics	Data not available
PG&E	ET11PGE3161	Pulse Energy -Dashboard w/ Energy Mgr.	Data not available
PG&E	ET11PGE3171	EMS Wireless Pneumatic Thermostat	Target customers are commercial customers but it is unclear where the technology will be installed.
PG&E	ET11PGE3181	Follow Up Linear Panel and Controls Study (GSA)	Data not available

* Site location taken from the Monthly Data Request

According to ETP program staff, finding potential customer installation sites is the most significant challenge in carrying out the SFP program element. In some cases, the vendor or manufacturer can provide assistance, but this is not always the case. Even when sites are identified, negotiating the contracts with building owners can also be problematic.

While the majority of projects have not selected sites, based upon a review of screening criteria, a few statements can be made regarding whether the selection of sites have potential to be systematic.

PG&E indicated that they choose sites that provide enough information about the industry or technology for an internal audience (which is in line with the second program theory). The vendor or manufacturer may provide the IOU with a list of customers, or customers may come directly to the IOU for consideration in future projects. The IOUs' service and sales representatives may also identify potential sites.

SCG and SDG&E use the same (ETPA) tool to help choose either a Scaled Field Placement or a Technology Assessment. The tool also includes a value proposition, which is identical to the value

proposition statement used by PG&E in their ETOS tool.

SCE's concept proposal incorporates a review of whether the market influencers have potential to influence a large number of future purchasers, installers, or recommenders, in addition to whether the site is available. However, SCE staff notes that potential sites are selected based on the site's visibility and the customer's leadership position in its industry, as well as the site's representation of its respective market—a clear tie to the use of a market influencer.

Technology Selection

The IOUs have developed tools that assess the technologies and appear to enable data-driven decisions. However, of the current tools, only one aligns with the selection of technologies with proven energy savings to measure market traction and market barriers (theory #1).

Currently, some of the tools in place are not tailored to the expected outcome for Theory 1; SCG and PG&E typically use completed Technology Assessment measures for Scaled Field Placements.

- SCE's scoring tool reviews market readiness by identifying whether the project is a proven technology that is commercially available, if there is a risk of performance failure, and if the performance can be monitored and measured. SCE has heavily weighted (at 30%) their criteria towards "market readiness": the fact that the measure is technically sound and commercially available with no risk of performance failure. The latter is a fundamental criterion for scoring projects, as measures with high-risk of failure may not achieve the intended goal of positively influencing customer influencers to purchase and use these technologies. The Evaluation Team notes that this recommendation may appear inconsistent with the recommended CEESP aligned efforts that allow increased technology risk as part of the scoring criterion. However, for Scaled Field Placement projects, the objective of achieving market traction is most likely achieved when the market influencer has access to a proven technology.

- SCG's tool is the same as that used for Technology Assessment and identifies technology risk and technical savings potential as criteria for selecting a potential technology. While technology risk should be considered, this misses the mark for a Scaled Field Placement as there are no criteria about the choice of market influencer or specific technology.

- PG&E's scoring tool assesses the technology status and maturity as well as time to market, but it is unclear how this criterion is assessed when scoring a new technology for a Scaled Field Placement. PG&E also incorporates their technology roadmaps within their selection process.[134]

According to the PIP, the IOUs select Scaled Field Placement projects to increase market acceptance and traction for new and under-utilized measures. Additionally, the PIP indicates that these measures will almost exclusively be measures already included in EE programs. While there is no explicit documentation of choices for specific technologies, the variety of technologies in SFP align with the

[134] The roadmap is a list of technologies identified by EE product managers as measures that they could potentially incorporate into their portfolio to fill gaps or to replace measures they are removing from the portfolio. See Volume II for each product roadmap.

CEESP BBEES, and the project source shows that the energy efficiency program managers were instrumental in helping to choose the project. Table 42 shows the projects, technology, and project source as stated in the ETP database.

Table 42: Scaled Field Placement Technology and Project Source (Q1 2012)

IOU	ETP Project #	Project Name	Technology	Project Source
SCE	ET11SCE3010	LED Downlights	LED downlights	National Laboratories
SCE	ET11SCE3020	Climate Appropriate HVAC	Hot/Dry HVAC	PIER
SCE	ET10SCE3010	LED Street Lighting	LED Street Light	Other
SCG	ET10SCG0005	Raydronics	The Energx controls for combined space heating and domestic water system	Energy Efficiency Program Managers
SDGE	ET11SDGE0011	Bi-Level LED Elevator Cab Lighting	LEDs and LED fixtures	Unknown
PG&E	ET11PGE3131	EMS Fault Detection Diagnostics	Fault detection and diagnostics software	Energy Efficiency Program Managers
PG&E	ET11PGE3161	Pulse Energy – Dashboard w/ Energy Mgr.	Energy Management System	Energy Efficiency Program Managers
PG&E	ET11PGE3171	EMS Wireless Pneumatic Thermostat	Wireless Pneumatic Thermostat	Energy Efficiency Program Managers
PG&E	ET11PGE3181	Follow Up Linear Panel and Controls Study (GSA)	LEDs and Lighting Controls	Energy Efficiency Program Managers

Given the current information, it cannot be determined if the technology is new or under-utilized. For under-utilized projects, the IOUs should include the measure number from the energy efficiency portfolio (using their specific nomenclature) associated with the specific project.

7.5.2 Measuring Market Acceptance

After a project is completed, PIP Action Strategy 1.3.4 is to evaluate program activity to assess market acceptance at one year and two years, and potentially at three years after the launch of a Scaled Field Placement. The ETP staff is expected to review these findings with energy efficiency program staff regarding potential improvements to both the ETP and resource-based energy efficiency program activities.

As there ere no projects completed earlier than the fourth quarter of 2011, the IOUs have undertaken no such studies and no documentation of any planned specific studies was found. However, Table 43 provides an overview of measurement efforts the IOUs state they will use for Scaled Field Placement projects.

Table 43: Scaled Field Placement Measurement Efforts

IOU	ETP Project #	Project Name	Type of Research*	Planned Measurement Effort

IOU	ETP Project #	Project Name	Type of Research*	Planned Measurement Effort
SCE	ET11SCE3010	LED Downlights	Secondary	Data not available
SCE	ET11SCE3020	Climate Appropriate HVAC	Primary	Survey of customers and testing at customer site(s)
SCE	ET10SCE3010	LED Street Lighting	Secondary	Data not available
SCG	ET10SCG0005	Raydronics	Primary & Secondary	Testing at customer site(s)
SDGE	ET11SDGE0011	Bi-Level LED Elevator Cab Lighting	Primary	Testing at customer site(s)
PG&E	ET11PGE3131	EMS Fault Detection Diagnostics	Primary & Secondary	Testing at customer site(s)
PG&E	ET11PGE3161	Pulse Energy -Dashboard w/ Energy Mgr.	Primary & Secondary	Testing at customer site(s)
PG&E	ET11PGE3171	EMS Wireless Pneumatic Thermostat	Primary & Secondary	Testing at customer site(s)
PG&E	ET11PGE3181	Follow Up Linear Panel and Controls Study (GSA)	Primary & Secondary	Testing at customer site(s)

* Note: the ETP database decribes primary research as performing one of the following activities; survey of customers, laboratory testing, or testing at customer site(s). The ETP database does not define secondary research.

The planned measurement efforts do not align well with the type of information required to determine market acceptance. According to the PIP, the data collection for SFP projects is "none to moderate" and does not track technology performance. SCE follows this design and tracks minimal information, including customer contact information, the measure, measure and installation costs, customer interview data, and any information on barriers. PG&E and Sempra collect performance data used to inform potential energy efficiency portfolios and track similar information to the Technology Assessment element.

Given the current CEESP goals, there is value in actively determining this market acceptance and disseminating the results of a project to a wide audience. This is particularly true if results indicate that barriers are too great for technology adoption by customers, indicating that broad adoption of the technology is not feasible. Information that denotes that a technology is not ready for scaled deployment can inform both energy efficiency program managers as well as external stakeholders.

The ETP staff should both measure and report short-term outcomes by disseminating case studies of barriers and factors around use and customer acceptance to help inform both program design and the external market. Measuring longer-term outcomes should incorporate tracking of additional adoption of technology by market influencers who are direct customers or by installation of technologies by market influencers who are contractors, and reporting these findings to external stakeholders.

7.6 SUMMARY OF RECOMMENDATIONS FOR SCALED FIELD PLACEMENT

The recommendations for Scaled Field Placements fall into three of the overarching categories, these include:

- **Focus outcomes: Projects should focus on market traction and targeting market influencers**. Focusing on intended project outcomes will help the ETP program staff to demonstrate the effects of the project and help to assess program impacts.

  The PIP indicates that the intended outcomes for Scaled Field Placements are to "increase measure awareness, market knowledge and reduced performance uncertainties," as well as to provide stakeholder exposure to "influence a large number of future purchases/uses."

  - To date, some SFP projects have focused on validating energy savings of a measure in multiple sites or in the field; these include SDG&E's Bi-level LED Elevator Cab Lighting project (ET11SDGE0011) as well as PG&E's Pulse Energy – Dashboard with Energy Mgr project (ET11PGE3161).

- **Coordinate and tailor scanning and screening: Tailor screening tool to select market influencer.** Enhancing screening and selection tools ensures that project selection will meet expected program outcomes.

  Currently, SCE is the only IOU with a tailored screening tool for projects that intend to increase market traction and understand market barriers through placement of technologies in sites. PG&E and Sempra use the Technology Assessment screening tool.

  SCE's tool considers whether the technology is proven, commercially available, and whether there is risk of performance failure. We recommend that the IOUs also consider incorporating the following items into the selection tool:

  - Identification of target audience
  - How the audience can increase market traction (i.e., purchasing decision power, frequency of interactions with potential adopters, ownership of sites, recommendations of purchases at other sites, status as a thought leader)
  - Rationale for why this technology should become a scaled field placement project rather than directly entering the IOU EE portfolio

- **Improve tracking: Project tracking should incorporate market influencer and contact information.** As part of assessing program outcomes, this information is valuable to the ETP staff to assess whether the project led to increases in market traction over time.

  The ETP database does not contain variables that permit the ETP program staff to describe the target audience for projects (i.e., market influencer) and their contact information.

8. DEMONSTRATION SHOWCASES

8.1 PROGRAM ELEMENT DESCRIPTION

The Demonstration Showcase (DS) element is intended to expose audiences to new measures in real-world demonstrations. Showcases include either one measure or a suite of measures. The ETP projects generally make this installation visible either passively (such as with a plaque) or actively (such as with a tour or class that visits the site).Different from the other activities within ETP, Demonstration Showcases provide a strong component of exposing the target audiences to the demonstrated technologies. According to the PIP:

- Demonstration Showcases are "large-scale projects [that] will expose measures to various stakeholders utilizing *in situ*, real-world applications and installations."[135]
- In addition, key attributes of a showcase include that it "is open to the public or to an interest group…, that many viewers are encouraged to visit, and that it may highlight a systems approach rather than an individual measure."[136] Some of the showcases include metering components to assess savings.

The PPM for this element is to transfer knowledge to stakeholders as shown by a self-reported increase in knowledge. As such, the visibility of either the technology itself or information discussing a hidden technology (e.g., a unique air handling system), are key components for this element.

8.2 DEMONSTRATION SHOWCASE EVALUATION METHODOLOGY

The Evaluation Team collected information on ETP's Demonstration Showcase program element through a variety of data collection activities. The purpose of these activities was to understand how the program element is currently implemented, describe any changes to program implementation, and provide recommendations for process improvements.[137] Data collection and analysis occurred in October 2011. The data collection instruments included a series of detailed research questions developed as part of the evaluation plan.[138]

[135] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; 10. SCE-SW-009 Emerging Technologies.doc pp. 775; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

[136] ibid

[137] For more information on the topics covered in the interviews, the data collection instruments are attached in Volume II.

[138] The evaluation plan is located here: http://www.energydataweb.com/cpucFiles/pdaDocs/749/PY2010-2012%20ETP%20Evaluation%20Plan_Final_2011_09_2.pdf

The original evaluation plan included interviews with individuals who attended the showcases, an analysis of the marketing and outreach for these showcases, as well as an assessment of the quality and effectiveness of outreach efforts, but because no showcases were completed at the time of the data collection in October 2011, these tasks were not completed in Phase I research. These evaluation activities may be revisited in the Phase II assessment (report due in June 2013, per the Evaluation Plan).

For the Phase I evaluation, an assessment of marketing and outreach was replaced with a literature review regarding Demonstration Showcases to provide context to the analysis. The literature review compiles information regarding what is known about how people react to seeing technology in settings such as the showcases. The literature review incorporates articles on how people interact with showcases to achieve changes in awareness, knowledge, attitudes, and behaviors, a focus based on the PPM of knowledge transfer. The literature review included an analysis of 23 relevant publications.

Table 44 provides an overview of data collection activities and a description of those efforts, including data sources.

Table 44. Data Collection Activities for Demonstration Showcase Program Element Assessment

Data Collection Activity	Description
In-depth Interviews	Conducted 3 in-depth interviews with the four IOUs ETP program managers and staff (SDG&E and SCG were interviewed at the same time)

Review of Program Materials	Reviewed the following materials as provided by the IOUs:
	• List of Demonstration Showcases as of 9/15/2011 with project information
	• Complete screening and scoring documents
	  ○ PG&E Emerging Technology Opportunity Summary (ETOS), and other materials regarding screening
	  ○ SCE Demonstration Showcase Scorecard, SCE ET Demonstration Showcase Concept Proposal, SCE Demonstration Showcase Project Funding Proposal
	• Documents supporting funding decisions
	• Demonstration Showcase marketing materials, where available
	• Cost data per project and timelines

Program Theory / Logic Modeling Discussions	• Reviewed and updated current program impact logic models in the January 2011 PIPs. • Set impact priorities and success criteria for logic model links. • Discussed proposed theories, models, and success criteria with CPUC and IOUs to create final memo of agreed upon program theory and logic models. These discussions were held on November 14, 2011 and February 24, 2012. • Discussed proposed theories and success criteria with CPUC to create interim memo. This discussion was held on March 7, 2012.

Data Collection Activity	Description
Literature Review	The literature review drew heavily on the goals, objectives, and PPMs outlined in the PIP. We used university, industry, and general search engines, and contacted industry experts and practitioners to inform search. Additionally, we searched on a variety of potentially relevant search terms such as "buildings with integrated design," "technology display," "green-" "energy efficient-," "ZNE-," "building tours," etc. to locate relevant articles. After reviewing the abstracts or other summaries of the sources, compiled 32 possible leads. Upon reading and reviewing these sources, determined 23 sources were relevant to this study; this bibliography is included in Volume II.

8.3 CURRENT DEMONSTRATION SHOWCASE ELEMENT STATUS (AS OF Q1 2012)

Program implementation plans for the 2010-2012 period set a statewide objective of implementing 14 demonstrations. The program is currently developing 23 showcases, although some of these efforts are not scheduled for completion until Q2 2014. Of these 23, the IOUs report that 3 are completed projects and 14 projects are ongoing[139], and 6 projects have been put on-hold[140], stopped[141], or have missing status updates. Notably, for Demonstration Showcases, three of the four IOUs have up to 4 years since the initiation of the showcase to complete the project.[142]

[139] Phase II research will determine how close these projects are to completion, and each project's stage of development.

[140] The ETP database defines 'on-hold' as "project work has been temporarily stopped, but is planned to resume. This may be due to resource limitations. It could also be due to something like technology unavailability or circumstances dictating a project task not be started until a future date."

[141] The ETP database defines 'stopped' as "project work has stopped and will not resume under same project number (screening process would be repeated if similar work was proposed.)"

[142] This is according to the PIPs. We note, however, that PG&E does not have this stipulation within the PIP.

Table 45: Demonstration Showcase Objectives (as of Q1 2012)

IOU	2011 Program Implementation Plan Objectives	Completed	Ongoing	Missing/ On Hold/ Stopped	Total
PG&E	5	0	1	0	1
SCE	5	1	5	2	8
SCG	2	0	0	3	3
SDG&E	2	2	8	1	11
Statewide	**14**	**3**	**14**	**6**	**23**

*Note that three of the four the IOUs have four years from the initiation to complete the project (PG&E completes their projects wtihin the program cycle).

Across the IOUs, SDG&E and SCE have initiated the majority of demonstrations (11 and 8, respectively), which exceeds their individual objectives for the program cycle. SCG has three projects planned, exceeding their goal of two showcases; however, all three projects have missing status updates (that is, nothing was noted in the ETP database). With one ongoing project, PG&E has not yet made significant progress towards achieving their goal of five projects. PG&E reports having spent about 1% of their budget as of Q1 2012 (budgets are shown in Table 46). Note that this does not include committed funds. When committed funds are also considered, PG&E has spent or committed 11% of their budget. We will explore the specific reasons for the relation between program expenditures and program activities in Phase II.

At least $5 million of the ETP statewide budget of $43 million (12%) is targeted towards Demonstration Showcases, although the exact number is unknown since SCG and SDG&E do not track budgets by element. Current projects range in budget from $20,000 to $1 million, with the mean project costs around $154,000.[143] However, project budgets are not identical to expenditures, as IOU labor costs and administration overhead are not included. Therefore, the actual budget for the element needs to account for labor and other aspects of implementing the element not covered specifically within project budgets.

The table below shows budget and expenditure information available to the Evaluation Team as of Q1 2012.

[143] The average does not include two projects which had a zero budget value (SCE's project ET11SCE2010, project is on-hold and SDG&E's project ET11SDGE0007, project has been stopped).

Table 46: Demonstration Showcase Element Budget and Expenditures by IOU (as of Q1 2012)

IOU	2010-2012 Program Revised Budget[a,b]	Program Expenditures (Inception-To-Date)	Percent of Budget Spent as of Q1 2012	Proposed Budgets for Projects[c]
PG&E	$ 1,546,620	$ 20,289	1%	$ 150,000
SCE	$ 3,522,112	$ 1,740,150	49%	$2,140,000
SCG	SCG does not report expenditures by element in the ETP database.			$ 350,000
SDG&E	SDG&E does not report expenditures by element in the ETP database.			$ 605,000
Partial Total	**>$5,068,732** (does not include SCG and SDG&E)	**>$1,760,439** (does not include SCG and SDG&E)	**35%**	**$3,245,000**

[a] Element budgets reflect those reported in the ETP database. Note that Sempra does not track their program by element.
[b] The 2010-2012 Program Revised Budget is consistent with the Fund Shift Report updated on April 12, 2012 and excludes rebalanced budget from AL 3235-G-3901-E.
[c] Source: Monthly data requests as of April 2012 for PG&E and March 2012 for other IOUs.

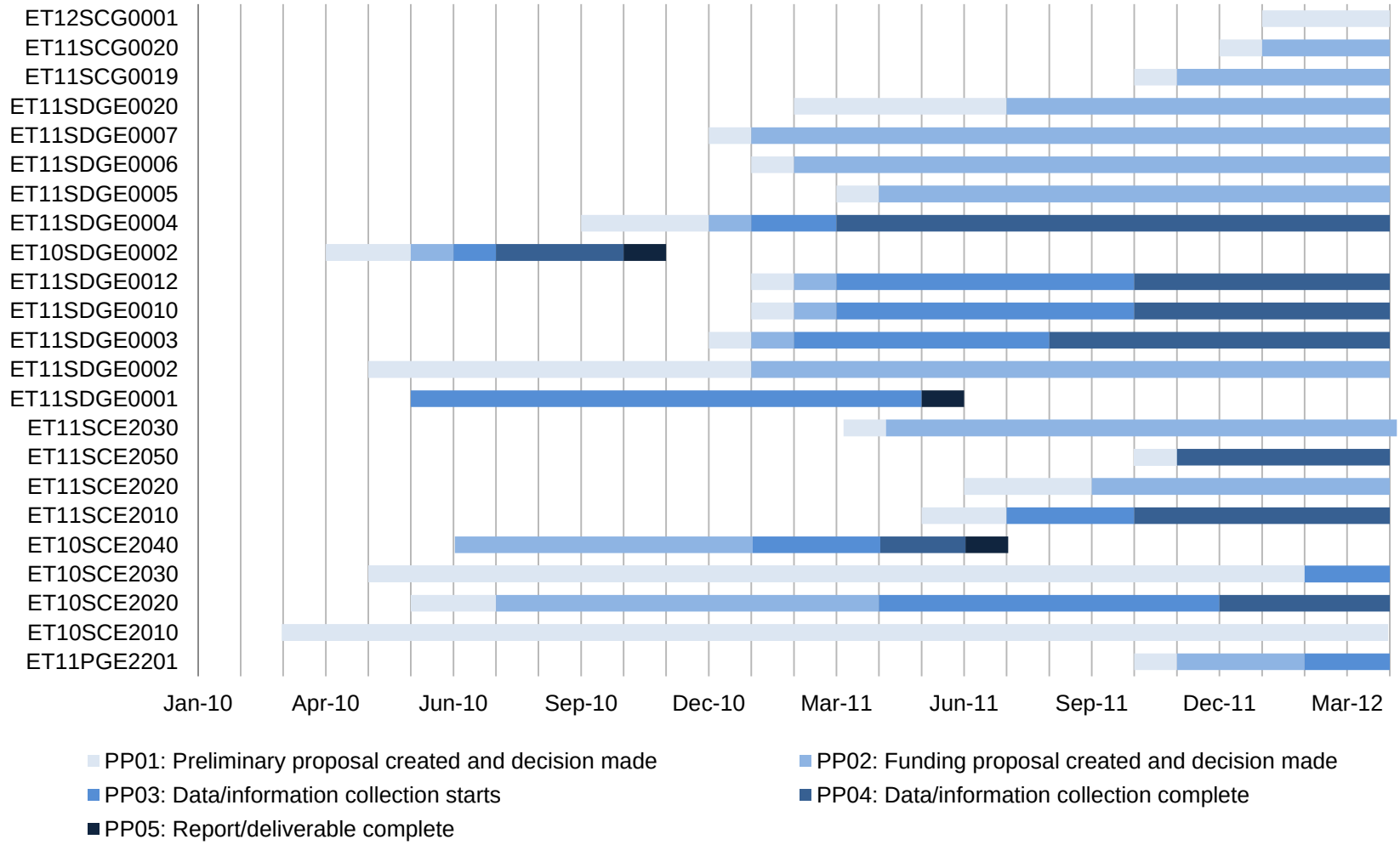
Figure 24 shows study types with their timelines (by progress point[144]) by IOU. SCE projects are evenly split in terms of their start date (four projects each were started in 2010 and 2011) and all have durations of 6 months or longer (average duration of about 15 months). Similarly, SDG&E projects are also spread out between 2010 and 2011 (six projected were started in 2010 and five in 2011) and all have durations of 8 months or longer (average duration of about 15 months). SCG initiated three projects all of which were started after October 2011 and are all ongoing. PG&E initiated one project, which was started in October 2011 and has a duration of 6 months.

The duration is from the beginning of the selection process to completion of the report and may not include the length of time that the showcase is actually open to stakeholders.[145] The showcase can continue after a report is completed, but the project is considered complete upon the completion of the report.

[144] There are five progress points that are used in the ETP database to indicate the stage of the project, from initiation through completion or cancellation.

[145] SCE includes a statement in their screening tool about whether the site is available for a two-year period, but this is not explicit for the other IOUs.

Figure 24: Timelines for Demonstration Showcase Projects from Progress Points*



*Note that project names, site locations, end-use details and budgets can be found in Table 47.

Table 47 provides an overview of the projects as of Q1 2012. The projects cut across residential and commercial sectors[146]; as well as retrofit and new construction projects. Thirteen of the projects focus on lighting and 12 of the project plans specifically state that they have a ZNE focus.

While it may be difficult to have a consistent number of showcases across all utilities due to the variation in levels of funding, there are best practices that can help to improve this element and enable a more strategic use of the program. These are discussed in the following sections.

[146] Nine projects are within the residential sector, 13 in commercial, and one is cross-cutting.

Table 47: Demonstration Project Description (Q1 2012)

IOU	#	Project ID	Project Name	Site Location[a]	Residential	Commercial	Retrofit	New Construction	ZNE	Lighting	Controls	Building Shell	Other	Expected Cost	Status
PG&E	1	ET11PGE2201	CLTC Lighting Demonstration Project	Technology Center		X					X			150,000	Ongoing
SCE	1	ET10SCE2010	ZNE Tract Home Retrofit	Tract Home, Irvine	X		X		X				X	1,000,000	Ongoing
SCE	2	ET10SCE2020	ZNE Home Retrofit	Single Family Home, San Bernardino	X		X		X				X	100,000	Ongoing
SCE	3	ET10SCE2030	ZNE Commercial Focused Retrofit	Recreation Center, University of California Santa Barbara		X	X		X			X		250,000	Ongoing
SCE	4	ET10SCE2040	ZNE New Home RFQ	Residential Tract Homes	X			X	X				X	250,000	Complete
SCE	5	ET11SCE2010	ZNE Inverter Grid Impact Study	Grid Study	X	X	NA	NA	X				X	-	On-hold
SCE	6	ET11SCE2020	ZNE Big-box Retail	Retail Store		X	X		X		X			400,000	Ongoing
SCE	7	ET11SCE2030	ZNE New Home Site 1	Brookfield Homes - Edenglen Community	X			X	X	X				100,000	Ongoing
SCE	8	ET11SCE2050	ZNE Residential Load Impact Forecast		X				X				X	40,000	Stopped
SCG	1	ET11SCG0019	Near Zero energy for existing home	Residential Home	X		X		X	X				100,000	Missing
SCG	2	ET11SCG0020	Smart Gas Home	Residential Home	X				X	X				100,000	Missing
SCG	3	ET12SCG0001	CEC Pier RFP for Community Scale Renewable & ZNE	Community Scale Project	X				X				X	150,000	Missing
SDG&E	1	ET11SDGE0001	Energy Innovation Center	Energy Innovation Center		X		X		X				200,000	Complete
SDG&E	2	ET11SDGE0002	Food Bank Office of the Future	Office, San Diego		X				X				100,000	Ongoing
SDG&E	3	ET11SDGE0007	San Diego Zoo HVAC	Gift Shop, San Diego		X				X				-	Stopped
SDG&E	4	ET11SDGE0010	Sports Arena Electronic HID Lighting	Sports Arena, San Diego		X				X				40,000	Ongoing
SDG&E	5	ET11SDGE0012	PUSD Electronic HID Lighting			X				X				20,000	Ongoing
SDG&E	6	ET10SDGE0002	High Ceiling Lighting Options			X				X				20,000	Complete
SDG&E	7	ET11SDGE0003	San Diego Zoo Gift Shop LED Lighting	Gift Shop, San Diego		X				X				40,000	Ongoing
SDG&E	8	ET11SDGE0004	Restaurant Ambient Lighting Demonstration Showcase	Restaurant, San Diego		X	X			X				30,000	Ongoing
SDG&E	9	ET11SDGE0005	LED Theater Stage Lighting	Theater, San Diego		X	X			X				30,000	Ongoing
SDG&E	10	ET11SDGE0006	Bi-Level LED Parking Structure Demonstration Showcase	Parking Structure, San Diego		X	X			X				25,000	Ongoing

SDG&E	11	ET11SDGE0020	Chula Vista Energy Showcase Home	Residential Home, Chula Vista	X				X				X	100,000	Ongoing

Data not Available or Unknown

8.4 ASSESSMENT OF DEMONSTRATION SHOWCASE DESIGN

Design of the ETP encompasses how the six different elements work together to reach overarching program goals. This section specifically discusses the design of the Demonstration Showcases. Per the research questions, this section examines whether the causal theory for the specific element, as described by the IOUs within the PIP and as agreed to through meetings[147], is plausible. In addition, it determines whether the impact goals and information needs are defined and obtainable at a reasonable cost.

Discussions with the IOUs and detailed meetings to document the theory behind this element revealed two program theories, or program rationales, expressed by the ETP staff.[148] The two program theories align with two types of demonstration efforts described in the literature: experimental and exemplary. The literature indicates that demonstrations perform two quite different functions: (1) experimental demonstrations, which are conducted to evaluate the effectiveness of an innovation under field conditions, and (2) exemplary demonstrations, which are conducted to facilitate diffusion of the innovation to other units (Moore, 2006). An exemplary demonstration is a persuasive event calculated to influence adoption decisions and thus increase the likelihood of diffusion. An exemplary demonstration is not staged to merely disseminate information; rather, its objective is to showcase an intervention in a convincing manner (Baer et al., 1977; Magill & Rogers, 1981). Currently, SCE and SDG&E have implemented projects that use both theories.

Program Theory #1: "Experimental Showcase"– Measuring energy savings/collecting data to understand savings potential. Information from a single technology assessment is not sufficient for EE program managers to add new integrated solutions into their portfolio. Often information regarding the interactive savings between a number of measures is needed to accept a new type of measure or solution. Energy efficiency program managers need more evidence of the viability and customer acceptance of these integrated solutions to request these measures. Having information about demonstrated new integrated solutions provides energy efficiency program managers with the additional knowledge needed to adopt or reject a new technology. The target of these efforts might be the EE Program Manager and the project does not need to be as publicly visible. Specifically, the outcome under this theory is understanding or validating energy savings. (The theory described as an experimental showcase is almost identical to that put forward for the Scaled Field Placement or Technology Assessment elements, with similar short-term and mid-term outcomes.)

Program Theory #2: "Exemplary Showcase" – Showing the targeted audience an example of a technology or system so they can "kick the tires." Firsthand experience with a new system reduces performance uncertainty and can identify hidden costs. When a trusted source such as the IOU demonstrates new technologies, the customer is more willing to consider purchasing it. Once the customer visits a Demonstration Showcase, their knowledge about the potential savings and integrated solutions is increased and they can make a more informed decision to purchase or tell their

[147] The Evaluation Team conducted two meetings with the IOUs and CPUC to discuss program theory, logic models, and potential success criteria.

[148] Note that here "program theory" is used to apply specifically to the theory behind the use of this element.

counterparts about the technologies. The visibility and transfer of knowledge to targeted customers (i.e., end-users or market actors) is the outcome for projects that fall within this program theory.

The Demonstration Showcase design is both plausible and valuable; however, our literature review suggests that the distinction as to whether a project is experimental or exemplary (at the outset of the project) is critical as a "lack of clarity about the purposes of demonstration is a frequent culprit in the non-diffusion of effective interventions."[149] As discussed earlier, we recommend that the IOUs focus Demonstration Showcases exclusively on exemplary projects (although it is possible to have a project that has two explicit outcomes). Activities intended to persuade energy efficiency program managers of the validity of savings should be explicitly aligned with the outcome of "understanding or validating savings" as is laid out and implemented through Technology Assessments. This is particularly important to ensuring the success of the projects since the two outcomes of "visibility" and "understanding/validating savings" require very different implementation. For more detailed information regarding Demonstration Showcase best practices, refer to the literature review in Volume II.

The IOUs should also consider limiting the number of showcases to allow sufficient time and effort to bring about and measure the desired outcomes.[150] It will not be the sheer number of demonstrations that occur that will result in diffusion of information, but the quality of each. The cost of each showcase may need to increase to accommodate this and more importantly, the IOUs may need to draw on staff with skillsets that are aligned with marketing, education, and outreach since the ability to create a "persuasive event calculated to influence adoption decisions and thus increase the likelihood of diffusion" takes considerably different skills than performing analysis to obtain savings. The IOUs should be sure that people with marketing, outreach, and education skills are involved at the start.

While it can take considerable time and effort just to create a Demonstration Showcase, that is only the preliminary work. The real part takes place after construction when stakeholders are viewing and learning from the demonstration. Phase II will assess the effectiveness of the IOUs in creating showcases that persuade people to take action. Measuring the transfer of knowledge must be a high priority or else the success of the demonstration remains unknown.

Currently, as discussed in the sections below, the plan for measuring knowledge transfer does not appear to be well defined in the project proposals. In addition, relevant performance data may be expensive to obtain, depending on the specific showcase. When a showcase is within a public space (as is the case for several of the showcases), measurement of knowledge transfer must account for the fact that people come and go all the time. Data collection for this type of a showcase may be more costly than that required of a more structured class or tour, such as the showcases that will be included in an Energy Center class.

Planning (ideally in coordination with internal Evaluation Measurement and Validation (EM&V) staff or contracted evaluators) must occur in advance to build in a structured method of data collection for all showcases. Because data collection of customer experience is so important for this element, it may be

[149] Dearing, J. W. "Applying Diffusion of Innovation Theory to Intervention Development." In Research on Social Work Practice 19 (2009): 503-518

[150] Note that while this should be considered, it is not an explicit recommendation of our evaluation.

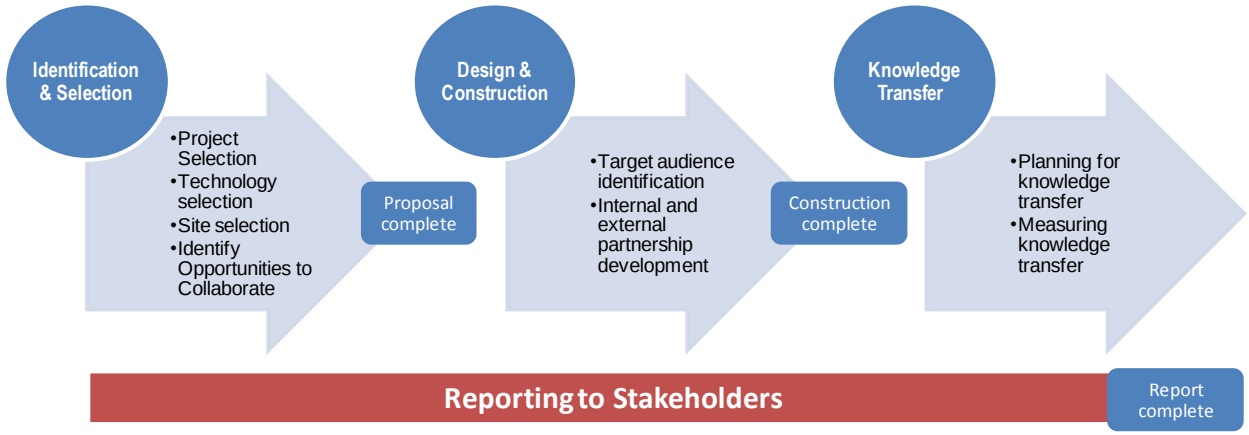
the central part of planning efforts, as it will determine cost of the EM&V. For showcases tied to Energy Center classes, the IOUs should plan for immediate feedback or keep detailed tracking of those attending the classes where trips to the showcase occurred for later surveys. For public showcases, the IOUs should consider alternative methods such as an interactive computer screen at the showcase where people can answer a few questions or through having researchers intercept people as they view the showcase information. Note that more findings on this area will be added following on-site observations of the showcases in Phase II.

As with any program, the effectiveness of design is closely coupled with the actual implementation. While design may be fine, if implementation is not successful, the ultimate expected outcomes may not arise. The next section describes the implementation of Demonstration Showcases as of Q1 2012 and provides early feedback items to consider, where relevant.

8.5 Implementation Assessment of Demonstration Showcases

For ease of discussion, assessment of implementation is divided into four discrete areas. The structure of this section follows the strategy and outcomes described in the PIPs: 1) Identification and selection, 2) Design and construction, 3) Knowledge transfer, and 4) Reporting. Identification and selection of projects falls under PIP Strategies 1.4.1 (scanning) and 1.4.2 (screening). Project design and construction, knowledge transfer, and reporting are all included under PIP strategy 1.4.3 (conducting the showcase).

Figure 25: Process Flow Diagram of Showcase Implementation



While findings for each of these areas are described, additional information on the effectiveness of the implementation will be collected during Phase II, since no projects were completed at the time of the early evaluation efforts (November 2011).

8.5.1 Interim Findings on Identification and Selection of DS Projects

The selection criteria for projects varied across the IOUs with only SCE having a screening process that is specific to the Demonstration Showcase element. The way the IOUs choose which technologies to demonstrate is also varied and is not always explicit.

Statewide, the current set of selection tools is not sufficient to ensure that the Demonstration Showcases will fulfill their planned outcomes because three of the four OUs do not have tailored tools. As a statewide program, all the IOUs should use clear and specific selection tools that consider visibility, audience, and the ability for knowledge transfer.

This section describes findings on the selection process for Demonstration Showcase projects and how the process could be designed and implemented more effectively.

Project Selection

SCE has the most robust selection process, using three separate efforts to collect information and score projects (i.e., a concept proposal, a funding proposal, and a scorecard) and uses multiple people within the scoring process (see details in Volume II).

PG&E has a tool (ETOS) that is not specific to Demonstration Showcase, although it gathers some useful information. PG&E staff works with multiple people to select a project. The other utilities (SCG and SDG&E) have an informal selection process. According to SDG&E, projects are selected based on needs communicated by account executives, program managers, and other entities. Note that SCE's tool does consider visibility in the criteria, and the other IOUs should consider the criteria in the SCE tool when revisiting their own selection process:

- For SCE, ETP staff are asked to fill out a concept proposal that incorporates a description of the project, and a funding proposal that assesses projects based upon internal resources, timing, and staffing levels. SCE then uses a scorecard to assess projects with scoring parameters including technology solutions, alignment with CEESP BBEES, sector and stakeholders[151], replicability, site, and fit with SCE goals. ETP staff as well as the ET Ideas Management Team[152] independently complete this scorecard. This is useful, as some criteria are known in greater detail by ETP staff rather than Steering Committee members and vice versa (e.g., ETP staff may be more familiar with the system of integrated measures, while Steering Committee members may have a better idea of the fit with SCE goals and alignment with Big Bold Strategies). These tools also include criteria for exposure and possibility of marketing strategies of a showcase. The tools consider the integration of measures, but are silent on specific end-uses. Volume II provides a detailed review of SCE's scoring tools.

[151] We define stakeholders as both internal to the IOUs and external audiences as both are needed for implementation of the showcase and transfer of knowledge.

[152] In 2009, SCE's EE Division developed the Idea Management team, which consists of a group of 12–15 EE program manager staff who, among other duties, review ET assessment candidates.

The other IOU tools and selection processes are described below:

- PG&E product managers fill out the ETOS tool. This tool incorporates an overview of the project background and estimated cost, a project plan that includes core idea and methods, start and end dates, project status, expected results, technology status and maturity, market and energy demand opportunity that includes market segments, product features, plausible energy and demand impacts, as well as the value proposition to California ratepayers. Notably, this tool is used for other program elements and is not tailored to the Demonstration Showcase program element. Therefore, it includes selection options that are not relevant to a showcase, such as energy impacts, and does not include options such as who is the audience for the showcase. For the one project reviewed, the ETOS was not completed for the Demonstration Showcase.

- SDG&E and SCG have no documented screening criteria. Discussions with the program managers indicate that projects are typically chosen based upon the following criteria: 1) leveraging other programs and internal stakeholders, 2) Zero Net Energy enabling technologies as applicable, and 3) payback period and energy savings potential for customers. Without a documented approach, selection criteria cannot be assessed specifically; only the choices made in the current suite of showcases can be examined. The choices made will be assessed in Phase II.

Within the current suite of showcases, the IOUs leverage existing internal and external partnerships and co-funding opportunities to facilitate site and project selection, as the PIP indicated would occur. In most projects that support ZNE, ETP staff identified opportunities to leverage funding for non-energy efficiency measures since energy efficiency funds cannot be used to support renewable measures.

- PG&E partnered with their ET Commercial and Lighting portfolios and Commercial Energy Efficiency commercial building, hospitality, and high-tech segment programs to provide additional funding support for the Intercontinental Hotel showcase. PG&E noted that they are working with their ZNE program to coordinate efforts on their ZNE Home project. (Note that these two PG&E projects are included as examples as they were originally provided to the Evaluation Team as example Demonstration Showcases; the Intercontinental Hotel Showcase was initiated in 2009 as per the ETP database and the ZNE project is not listed in the ETP database).

- SCE has partnered with a variety of home builders for two of their planned projects, the ZNE Tract Home and ZNE Residential Homes, as well as a big box retailer and EPRI for their Big-Box Retail project. SCE's ET staff is also working with the U.S. Department of Energy on their Single Family Home project in San Bernardino. Notably, they work with national research labs to coordinate their efforts with national research efforts.

- SDG&E partnered with an LED manufacturer to supply a free control board to the project site, offering incentives to site owners beyond what the program element can provide. SDG&E plans to co-fund the Energy Showcase Home project with the California Solar Initiative.

All the IOUs work with other stakeholders to select projects. Obtaining outside ideas for projects and leveraging other activities reduces costs to the program and the IOUs should continue this practice. However, ETP staff needs to establish strong and explicit selection criteria regarding project, site, technology, targeted market segment/end-use, and targeted audience selection to ensure that each

project is meeting the specific needs of ETP and the desired outcome. In the absence of strong criteria, there is a potential for diluting the focus. Moreover, the IOUs should be strategic in their selection, and should not pursue a Demonstration Showcase simply because others are actively pursuing the project.

Site Selection

As stated in the PIP, the objective of the Demonstration Showcase element is to "expose stakeholders to the performance of measures."[153] Demonstration Showcases are intended to be visible and public, disseminating results through short-term exposure and word of mouth to a large number of viewers.[154] Therefore, site selection is expected to be visible, scalable, and replicable. Each IOU considers these components, but to various degrees. Across the state, the selection of sites is not systematic although all IOUs do consider visibility.

According to PG&E, sites are selected that have greater potential for visibility, scalability, and replicability; however, the actual screening tool (ETOS) does not specifically have these criteria. PG&E's screening tool identifies market segments (specifically looking to do showcases in markets that represent a significant share of floor space and/or energy consumption within their territory). In the case of PG&E's Intercontinental Hotel project, lodging represented 12% and 15% of the distribution of commercial savings within PG&E territory and California, respectively. The choice of lodging as a Demonstration Showcase could potentially affect a considerable portion of the energy use in the state if the information from the site is diffused to market actors within the sector.

Interviews with PG&E ETP staff indicate that PG&E is developing a concept for ZNE model homes. The project sought "to influence not only the buyers, but also other builders" with PG&E initially paying for the model home, and in return, the builder agreeing to offer a zero net energy package as one of the home options. PG&E notes that production builders and hotels are scalable types of projects that can be replicated in similar buildings.

SCE's screening tools assess whether the host site aligns with ZNE goals among target building types, represents California's major electricity users, represents a prototypical building type, determines whether there is market evidence that the project is in a market segment that represents a high percentage of buildings in California, and identifies technologies as scalable or replicable via their screening tools. SCE's screening tools identify whether similar comprehensive EE strategies can be applied to other building types. In addition, SCE's tools assess whether the host site is visible and can reach the target audience and stakeholders. Its tools also assess whether the host site is a market leader that can significantly influence or reach the market, target audience, and stakeholders, incorporating aspects of visibility into the selection process. Further, SCE's tools incorporate whether the showcase will be in a climate zone where it is challenging to accomplish ZNE. For example, the ZNE Big-Box retail location project (ET11SCE2020) will be visible to a high degree of traffic. However, in some cases, the duration of visibility is limited. For example, one showcase retrofitted an existing, occupied low-income home to ZNE specifications. Due to privacy concerns and health issues related to

[153] PGE2108 ET SW PIP 01-2011 no redline.pdf; 24. SCE-SW-009 Emerging Technologies.doc pp. 788; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

[154] PGE2108 ET SW PIP 01-2011 no redline.pdf; 24. SCE-SW-009 Emerging Technologies.doc pp. 788; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

the homeowner, this site will have virtually no opportunities for passive knowledge transfer and only a few opportunities for active knowledge transfer in the form of a grand re-opening home tour. (However, SCE indicates they plan to disseminate information on this site using other forms of media.) Additionally, two of SCE's eight projects specifically documented that they targeted climate zones as part of their selection criteria (Tract Home, Irvine – ET10SCE2010; Single Family Home, San Bernardino ET10SCE2020).

SDG&E and SCG ETP staff commented that they try to leverage knowledge from staff that are customer facing and able to identify projects that can gain market traction. Given difficulties in selecting sites that are public for residential customers, SDG&E's restaurant showcase (ET11SDGE0004) demonstrates lighting that the utility plans to promote to residential customers, not restaurants. In this case, this may be an effective choice, because many more residential customers will visit the restaurant than would choose to go on a tour of a Demonstration Showcase in a home; however, based on the current documents provided, it is not clear which options they considered in advance. In general, looking for areas with high foot traffic allows the showcase to target customers who are not actively seeking information on energy efficient technology, but makes it more difficult to measure knowledge transfer.

Technology Selection

For the existing Demonstration Showcases, technologies were selected to a) meet goals as identified in the PIP, particularly ZNE, and b) consider proven technologies as found in EE and Demand Response (DR) portfolios. Overall, the IOUs aim to incorporate technologies that have recently been the subject of a Technology Assessment report, and/or incorporate proven technologies that are part of their IDSM programs to ensure that the technologies are proven technologies and can provide additional savings to the customer. However, as with the selection of sites, the IOUs do not explicitly document choices for specific technologies, but these choices can be inferred from choices made in the current set of showcases.

PG&E states they use their emerging technology roadmap as one of the guidelines in selecting technologies for Technology Assessments and Scaled Field Placement, which are later incorporated into potential Demonstration Showcase projects.[155] Of their projects as of Q1 2012, PG&E's Intercontinental Hotel project incorporates lighting, HVAC, solar, and other measures within its integrated solution of measures. The second PG&E project at the Technology Center focuses on lighting measures.

SCE's concept proposal also incorporates a question regarding packages of measures, asking whether "this package of measures highlight a systems approach solution rather than a series of individual measures." Further, the scorecard provides a 30% weight to a systems approach, asking, "Is this solution a comprehensive market-ready combination of EE measures that works on an integrated project level?" All of the eight proposed projects attempt ZNE or near ZNE, and bundle existing measures. For example, SCE's ZNE New Home RFQ showcase plans to incorporate passive design features, energy efficient appliances, heating, cooling, lighting, water heating, etc.

[155] The roadmap is a list of technologies identified by EE product managers as measures that they could potentially incorporate into their portfolio to fill gaps or to replace measures they are removing from the portfolio. See Volume II for each product roadmap.

As noted above, SDG&E and SCG use informal selection criteria when selecting technologies to incorporate in a project, including whether Zero Net Energy enabling technologies are applicable. Two of the three proposed projects for SCG incorporate ZNE technologies; however, information is limited regarding the technology choices for these projects. One of SDG&E's 11 projects incorporate bundled end-use measures; the Energy Innovation Center incorporates both lighting measures and solar. However, the remaining projects focus solely on lighting measures.

As shown in Table 47, the projects cut across residential and commercial sectors[156]; as well as retrofit and new construction projects. The PIP indicates that Demonstration Showcase projects can highlight a systems approach rather than an individual measure[157] and overall, 9 of the 14 reviewed projects (see Table 47) focus on the integration of several systems, and 10 of the project plans specifically state that they have a ZNE focus, which is in line with CEESP. Even without an explicit guide for technologies, the showcases are filling a needed role by making integrated design and lighting projects more visible, an area that experts indicate is needed to reach CEESP goals.

Showcase Content

Currently, the overall strategy of the mix of current projects across the IOUs is not explicit. To ensure prudent expenditure of ratepayer funds, project selection should ensure a complementary mix of projects across the state to ensure that the projects help to strategically advance knowledge throughout the state. Again, there may be reasons for multiple projects that deal with the same technologies if, for example, there is an attempt to target both Northern and Southern audiences or show various climate zones; but the targets and goals should be explicit.

The main tenet of this element is to expose multiple stakeholders to specific technologies. Without explicit designation of these choices at the beginning of a project, this purpose can easily be lost.

8.5.2 FINDINGS ON PROJECT DESIGN AND CONSTRUCTION

Once selected, the IOUs move into the project-specific design and construction phase. To be effective in the design of the project, the IOUs should be more explicit about the objective of the showcase, and who the target audience is. (Note that 8 of the 23 projects had 'none' or 'unknown' listed in the audience field in the ETP database, and the majority of these, 14 projects, indicated that the audience was the EE PMs.) Across the state, all IOUs should document the expected target audience during the screening process and then design and build the showcase specifically for this target audience.

A literature review was conducted to provide findings to support ongoing and future Demonstration Showcase projects so that activities relating to design and implementation could be performed more effectively. This review drew heavily on the goals, objectives, and the PPM outlined in the PIPs and used

[156] Eight projects are within the residential sector, ten in commercial, and two are cross-cutting. For two projects, data is not available to determine the market sector.

[157] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; 10. SCE-SW-009 Emerging Technologies.doc pp. 775; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

information from university publications, general search engines, and industry publications, experts, and practitioners. (See Volume II for the full literature review).

Designing Each Showcase

Discussions with the IOUs and detailed meetings to document the theory behind this element revealed that there are currently two program theories, or program rationales, expressed by the ETP staff.[158] These two types of efforts and theories are not conflicting and the same project can be used to achieve both outcomes, (although probably in sequence, not in parallel); however, it is important to be explicit about the types of efforts since the success metrics will vary based on the type of effort. There is a need to clearly consider the objectives and purpose of the site, as unproven/infeasible integrated design solutions in an experimental site should not be showcased as an exemplary demonstration. However, the same site can be used for both activities through a phased approach.

The table below draws on the literature review to offer specific ideas for knowledge dissemination that should be considered during the design phase of a project. However, there are some limitations with applying literature review findings. First, much of the literature encompasses knowledge dissemination to market actors, e.g., designers, architects, builders, etc. as opposed to end users. Second, much of the literature is focused on new construction projects as opposed to retrofits. Although these limitations exist, it is possible to extrapolate beyond them. Table 48 summarizes the topic areas and key findings that should be considered during the project design phase.

Table 48. Summary of Key Project-Design Based Findings from the Literature Review

While…	Consider the following…	Description
Designing for Knowledge Dissemination	Design each site as an experimental or an exemplary demonstration, but not both	There is a need to clearly consider the objectives and purpose of the site, as unproven/infeasible integrated design solutions in an experimental site should not be showcased as an exemplary demonstration. However, the same site can be used for both activities through a phased approach.
	Pre-survey to understand and properly target attendees	Pre-surveying attendees can help understand their existing levels of knowledge, professional role or position, and whether they are likely to adopt new technologies. As such, knowledge dissemination can be tailored to the particular target group.
	Emphasize process over prescription	Emphasizing the process for which decisions were made to get to the integrated design is more likely to capture market actor attention, as a clear decision process shows flexibility and scalability of the integrated solution for other

[158] Note that here "program theory" is used to apply specifically to the theory behind the use of this element.

While…	Consider the following…	Description
		integrated projects.
	Create and tell a story	A story of the design process and implementation provides a structure for all the technology details and helps the market actors gauge the flexibility and scalability of the integrated solution.
	Use key Diffusion of Innovations (DOI) defined players	Use of key DOI-defined players (i.e., those who are technically knowledgeable and understand integrated design, such as change agents, opinion leaders, paraprofessional aides, innovation champions, and early adopters) increases the adoption of innovative technologies and the flow of knowledge to market actors and end-users.
	Use case studies to capture context	Case studies that entail a thorough description of the design development process including the rationale and context for each decision, allow for a more informed approach to decision-making on integrating technologies.

Target Audience Identification

The table above also mentions using key DOI-defined players (i.e., those who are technically knowledgeable and understand integrated design, such as change agents, opinion leaders, paraprofessional aides, innovation champions, and early adopters) to increase the adoption of innovative technologies and the flow of knowledge to market actors and end-users. This speaks to the importance of the target audience.

For all showcases, the implementation staff should document whether the target audience is EE PM, a market actor, a commercial or residential end-user, or all of the above. Documenting this at an early stage will help ensure a strategic design (as well as the appropriate metrics, discussed further below).

The IOUs should take steps to more formally integrate audience selection and documentation into the design stage of their projects. SCE is the only IOU that incorporates a module within their concept proposal to determine whether the target audience has been identified, who the audience is, and the number of stakeholders that can be exposed to the project. SCE also assesses whether the host site will be available so that the target audience can be exposed for two years after project completion, which is essential for exemplary showcases. While PG&E includes a section to describe the host and whether they have agreed to participate, there is no indication of who is expected to see the showcase.

Management and Administration

Showcases require extensive management and administration, as well as buy-in from shareholders. This was borne out in discussion with the IOUs. PG&E stated that delays occur due to the many partners involved in projects, requiring extensive coordination between contractors, site owners,

external project partners, and manufacturers. According to interviews with ETP staff, project delays often occur during the design phase, predominantly regarding negotiating contracts, and can occur during construction as priorities change for site owners.

The literature review also provides other areas for consideration during the construction phase of the showcase, as detailed in the table below.

Table 49. Summary of Key Construction-Based Findings Based on the Literature Review

During…	Consider the following…	Description
Overall Demonstration Showcase Design and Creation	Expect that extensive management and administration will be required	Demonstration projects may consist of innovative elements that require buy-in from shareholders. This requires heavy investment in building cooperation and trust among the various shareholders.
	Bring all construction players on board to affect the industry network	The building industry network includes many actors (e.g., owners, financers, architects, engineers, contractors, etc.) and innovation by any of them is a direct challenge to the network itself. As such, for an integrated solution to gain momentum, a majority of market actors have to be reached simultaneously.
	Keep projects focused but flexible	Flexibility allows for accommodating the range of the needs of the stakeholders. Additionally, flexibility is needed for scalability and to accommodate user input on modifications to improve effectiveness.
	Expect resistance to innovation from the building industry	The building industry is especially innovation-resistant and consists of market actors who complete their work without regard to the larger vision of the project. This undermines both knowledge build-up and innovation implementation.

These difficulties are also seen within many of the elements for ETP as *in-situ* implementation of measures (as in Technology Assessment or Scaled Field Placements) requires project management that must deal with these same issues.

8.5.3 KNOWLEDGE TRANSFER

The primary performance metric for this element is the transfer of knowledge (i.e., self-reported knowledge increase). Expected short-term outcomes for the program element are 1) customers/ influencers have a better understanding of integrated solutions, and 2) energy efficiency program

managers have a better understanding of technical viability, customer acceptance, or cost associated with integrated solutions.

Because of the development period (no projects were completed in the first two years of the program cycle and the duration of projects range from 5 to 48 months), the transfer of knowledge during the 2010-2012 program cycle will be limited. Due to the length of time that the demonstrations will be available to their target audience, knowledge transfer will not occur during the cycle for those showcases not completed prior to the end of 2012.[159] The level of knowledge transfer that has occurred within the Demonstration Showcases has not yet been assessed, as that is part of the Phase II assessment. This section discusses what is planned. Note that Demonstration Showcases are allowed four years after initiation to complete the project.

Achieving Knowledge Transfer

During the design stage, the IOUs should explicitly lay out how they expect the target audience will obtain knowledge. Generally, the various types of knowledge transfer fall on a continuum from passive to active efforts. The most passive form of knowledge transfer would be simply having the target audience use the building as they would normally, with signage or handouts to help bring the showcase to the attention of passive visitors. More active forms of knowledge transfer include leading tours of a facility, conferences or seminars, or maintaining a blog to update the public on the status of the showcase.

For the projects where this information was stated, the IOUs appear to be using or planning to use both passive and active efforts. During interviews in 2011, 5 of the 14 projects in development were described as having some knowledge transfer activities.

- The Intercontinental Hotel project conducted by PG&E includes planned information displays in the hotel's public areas, information regarding the energy efficiency retrofits on the hotel's informational channel, and regular hotel guest updates over multiple public television screens throughout the hotel. In addition, in the future, there may be some lighting courses for market actors held at the Pacific Energy Center that will include a tour of the hotel.

- SCE plans to work with their target audience, homebuilders in the case of the ZNE Home, to market the effort to homebuyers and raise consumer awareness of ZNE to create demand for these homes. This project includes the full spectrum of potential communication channels including events at Energy Centers, social media, press releases and articles for trade/industry publications, industry and community meetings, and meetings with key market players.

- SDG&E intends to include targeted technology tours as well as signage and displays for their three projects –Restaurant (ET11SDGE0004), Theatre, and the Energy Innovation Center (ET11SDGE00001). The Energy Innovation Center project intends to market the showcase, and available tours, via its website.

[159] Four Demonstration Showcase projects are not expected to be completed by the close of 2012.

There are significant challenges relating to the dissemination of knowledge through networks. The building sector inherently has several factors that challenge innovative knowledge related to energy efficient design and implementation such as lack of long-term relationships between market actors, fragmentation of the building process involving multiple actors, a decentralized decision-making process, and an ad-hoc problem-solving process. Often sources of knowledge within this sector are implicit in nature (i.e., market actors build knowledge through experience) which makes knowledge transfer difficult. Some current showcases operate on an underlying assumption that an established network of communication exists through which the target audience will spread information delivered through the Demonstration Showcase. For example, the Theatre showcase is relying, to some degree, on information diffusing through the theater community by word of mouth. Another example is the showcase at the University of California Santa Barbara (ET10SCE2030) where ETP staff expects that information on the technologies incorporated in the showcase may spread to facility managers throughout the University of California system. These networks may exist in varying levels of effectiveness.

Measuring Knowledge Transfer for Each Project

As stated earlier, the PPM for the Demonstration Showcase program element is a "self-reported increase in knowledge by a randomly selected sample of targeted stakeholders who either 1) visited the DS [Demonstration Showcase], or 2) were informed about the DS in a workshop about benefits of the DS."[160]

Some ETP staff mentioned plans for collecting data when we asked them (e.g., one respondent mentioned seminars and exit surveys); however, a review of the projects indicates that the plans for collecting this information are not explicit or clearly documented. Notably, site selection can affect whether or not increased knowledge can be tracked, e.g., highly visible places such as theaters and hotels are more difficult to measure knowledge transfer given transient populations so an alternative plan (such as planned intercepts) needs to be in place.

8.5.4 REPORTING TO STAKEHOLDERS

Demonstration Showcase projects typically take a long time to get off the ground given the complexity of the projects/partnerships and the amount of money that may end up being invested in a project. As shown in Table 47, a given Demonstration Showcase project can account for up to $1 million dollars and take up to 48 months to complete. As such, there is a need for clear reporting over the program cycle to inform stakeholders on project status. Stakeholders need regular updates on status to understand progress within this element. The IOUs should be sure that the quarterly updates in the ETP database are performed each quarter.

At this point, interim reporting to stakeholders includes quarterly updates to the CPUC-ED on new projects and status via the ETP database, as well as monthly updates on budgets through an ongoing data request. These updates provide an overview of projects, but do not provide sufficient details for stakeholders to gauge whether the programs are being designed to meet performance metrics, nor do

[160] PGE2108 ET SW PIP 01-2011 no redline.pdf; 24. SCE-SW-009 Emerging Technologies.doc pp. 788; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

they indicate how success will be documented. Additionally, there is at least one form of interim reporting. SCE writes a blog that provides updates and showcase activities for an external audience.

The primary deliverable for showcase projects is a final report. While no showcases had been completed as of the analysis, the IOUs state they will incorporate data collected during the showcase into final reports on the projects. They plan to disseminate these final reports primarily to internal ETP staff as well as EE staff (email, presentations, etc.); however, they may also disseminate externally via the ETCC website[161], at an ET Summit, or through internal newsletters. These reports may include energy savings and costs to the customer (as a secondary outcome). While energy savings and costs to the customer are important, within this element the focus must be on passing along this important information to others. Any reporting must include this type of data. As such, it will take time to collect. There should be reporting that describes what occurred up to the point of completion and an addendum sometime later that reports back on the transfer of knowledge.

The IOUs and CPUC-ED should determine what information the CPUC desires that is not overly burdensome to provide. At the minimum, the screening tool that outlines choices may be useful to share. The current ETP database status variable provides some detail (i.e., proposal, choice made to fund, collecting information, completed data collection, and reporting complete), but some of the information is incomplete, and given the timelines of these projects, additional levels of information are necessary.

Because it is difficult to state all of the details of a project in advance and the details of implementation generally become clear as the project develops, there is a need to document progress at agreed-upon stages over the development of the project. SCE has developed a stage gate model with six stages that they use to track the progress of a project. Additional collaboration is needed to have the stakeholders discuss the various stages, and agree to the information that is needed at each stage; however, the SCE model serves as a good starting point for this effort.

8.6 Summary of Recommendations for Demonstration Showcases

The recommendations for Demonstration Showcases fall into five of the overarching categories, which are summarized below:

Focus outcomes: During the 2010-2012 cycle, the projects within this element seem to focus on two very different outcomes: (1) increasing the visibility of proven, but underutilized, or new technologies, and (2) testing measures or integrated suites of measures to understand and validate energy savings. These are aligned with two types of demonstration showcases in the literature: exemplary and experimental demonstration showcases.

Examples of exemplary showcases include:

[161] The Emerging Technologies Coordinating Council coordinates its members to facilitate the assessment of promising energy efficient emerging technologies that will benefit California customers. http://www.etcc-ca.com/

- SCE ZNE Big-Box Retail (ET11SCE2020; show feasibility and challenges of attaining ZNE in the Big-Box retail market segment)
- SDG&E Bi-level LED Parking Structure Demonstration Showcase (ET11SDGE0006; demonstrate the lighting performance and quality of LED lighting for parking structures)
- SCG Near Zero energy for existing home (ET11SCG0019; demonstrate feasiblity to achieve Near Zero energy home in retrofit application)

Examples of experimental showcases include:

- SCE ZNE Inverter Grid Study (ET11SCE2010; simulation to assess impacts)
- SCE ZNE New Home Site 1 (ET11SCE2030; new homes cost-effective solutions to achieve ZNE performance)
- SDG&E LED Theater Stage Lighting (ET11SDGE0005; determine the energy savings potential and installation cost for LED theatrical lighting)

Because these two outcomes require very different implementation, the outcome should be clear from the start. Generally, we suggest that Demonstration Showcases focus on exemplary showcases, or those that emphasize visibility of successful technologies and systems; while "experimental showcases" align with the outcome of validating energy savings, which in the 2010-2012 program cycle fell within Technology Assessments.

Coordinate and tailor scanning and screening: Incorporate visibility as criterion in selection tool. Statewide, the current set of selection tools is not sufficient to ensure that the Demonstration Showcases will fulfill their planned outcomes. As a statewide program, all the IOUs should use clear and specific selection tools that consider visibility, audience, and the ability for knowledge transfer. All IOUs consider visibility, but the tools do not all include visibility as a criterion. SCE has the most robust selection process, using three separate efforts to collect information and score projects (i.e., a concept proposal, a funding proposal, and a scorecard). SCE's scorecard collects information on (a) alignment with Big Bold initiatives, (b) whether the system of measures are comprehensive and market ready, (c) whether the DS encompasses a significant number of stakeholders, (d) whether the solution can be replicated, (e) whether the site chosen is optimal, and (f) whether the project fits well with SCE goals. All IOUs should consider incorporating visibility into their criteria for selection of Demonstration Showcases. One way to do this is to discuss with SCE the criteria from their tool, and whether it might also help to select the best projects for PG&E and Sempra.

Enhance reporting: For Demonstration Showcases, this includes explicitly identifying (and documenting) the target audience. Across the Demonstration Showcases listed in the ETP database, 15 of 23 initiated projects had defined a specific target audience. Most notably, for all except one, the target audience was identified as the EE PMs. Notably, the remaining 8 projects had "None" or "Unknown" as primary audience. The literature review suggests that staff that develop the showcases should have a clear understanding of the audience prior to design and implementation of a showcase for knowledge dissemination to tailor showcases to the intended audience; to help understand existing levels of knowledge, professional role or position, and into which Diffusion of Innovation theory adopter category they may fall. This is fundamental to ensuring that the project is implemented in the best possible manner. Most likely, while the EE PMs will ultimately be the recipient of the information gathered through the Demonstration Showcase, they are not the target audience of the showcase. The types of locations seem to support this. To enhance reporting for Demonstration Showcases, the target

audience should be explicitly identified and documented in the ETP database prior to project initiation.

Improve tracking: For Demonstration Showcases, updates should occur at multiple points in time given the long time frame for projects and project reporting. Demonstration Showcases can take a considerable amount of time to identify, construct, and complete. Moreover, additional time is needed to transfer knowledge through the showcase. Notably, the IOUS have four years after the initiation of a project to complete a project. As such, tracking should consistently occur at two levels: (1) projects as initiated, and (2) projects that are completed and recommended for transfer. Only SCE consistently updated their database (quarterly). Moreover, as noted above, the IOUs should clearly designate the target audience for the showcase in the ETP database "audience."

Further support CEESP: Further adjust screening criteria to support CEESP goals. To further support the CEESP, the selection tools and criteria for Demonstration Showcases could be further adjusted to incorporate items that would support the measures suggested in the CEESP. Specifically, this could include a preference for integrated suites of measures. In addition, the IOUs should work with the CPUC and stakeholders to find ways to leverage outside funds to support ZNE projects, since renewable measures cannot currently be funded through ETP (i.e., energy efficiency) dollars.

9. MARKET & BEHAVIORAL STUDIES

9.1 PROGRAM ELEMENT DESCRIPTION

The Market and Behavioral Studies (MBS) element involves performing targeted research to understand the market for emerging technologies. As per the PIP, MBS projects are studies to enhance market intelligence of customer needs and "decision triggers" to improve acceptance of new or under-utilized technologies in the energy efficiency portfolio."[162]

Distinct from other activities within ETP, Market and Behavioral Studies attempt to capture customer perceptions, acceptance, market readiness, or determine market potential for new or underutilized technologies.[163] This can be done through either primary or secondary research.

The PIPs contains four distinct action strategies to implement Market and Behavioral Studies[164]:

- **Action Strategy 1.5.1:** Perform primary IDSM related market and behavioral studies to enhance market intelligence of customer needs and "decision triggers" to improve acceptance of new or under-utilized energy efficiency technology.
- **Action Strategy 1.5.2:** Review and analyze secondary research as found, for example, from IOU subscription market research services such as E Source and Energy Insights, and from such organizations as Energy Information Administration, National Technical Information Services, and CALMAC, as well as in reports such as the Residential Appliance Saturation Survey and Commercial End-Use Survey.
- **Action Strategy 1.5.3:** Complete one or more of the following types of studies:
    - Perform a scoping study of the overall long-term market potential for Emerging Technologies
    - Investigate specific technology gaps for a given market segment

[162] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; 15. SCE-SW-009 Emerging Technologies.doc pp. 780; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

[163] Emerging technologies are new energy efficiency technologies, systems, or practices that have significant energy savings potential but have not yet achieved sufficient market share (for a variety of reasons) to be considered self-sustaining or commercially viable. Emerging technologies include early prototypes of hardware, software, energy design tools, or services. "Under-utilized" technologies are technologies with verified and documented low market penetration rates.

[164] PGE2108 ET SW PIP 01-2011 no redline.pdf; 19. SCE-SW-009 Emerging Technologies.doc pp. 773; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

- Conduct an Energy Technologies/RD&D gap analysis for agricultural EE as included in the Strategic Plan; identify and prioritize needed RD&D/ET projects
- Perform market research studies to assess the potential impact of and barriers to implementation of proposed measures
- Perform market research to identify approaches for accelerating the pace of deployment of new EE and IDSM measures and programs
- Perform customer research to identify approaches to making new measures more attractive to customers
- Perform usability studies to assess how easily customers can adapt to and benefit from new measures; for instance, in-home monitoring and display technologies
- Perform customer research on the potential impact of social network software and other behavioral tools in expanding the impact of EE programs
- Perform customer research to assess the need for an optimal design of Scaled Field Placements and Demonstration Showcases

➢ **Action Strategy 1.5.4**: Disseminate market and behavioral reports.

The expected outcome of the MBS program element is to "contribute to increased measure awareness, market knowledge and reduced performance uncertainties for ETP stakeholders (i.e., the energy efficiency program managers) and IOU customers."[165]

According to the PIPs, MBS efforts can be conducted before, after, or in parallel to a related program element effort.

9.2 Market & Behavioral Studies Evaluation Methodology

We used a variety of methods and activities to collect information regarding the MBS element. These activities included: 1) in-depth interviews with the four participating IOUs for the statewide ETP in May and October 2011, 2) a target audience survey conducted in November 2011, and 3) an in-depth review of program materials in the fall of 2011 that included Market and Behavioral studies completed by the IOUs in this program cycle. We collected data early in the program cycle and provided informal early feedback to the IOUs in December 2011.

The purpose of these data collection activities was to understand how the IOUs currently implement the program element, describe any changes to program implementation, and provide

[165] PGE2108 ET SW PIP 01-2011 no redline.pdf; 19. SCE-SW-009 Emerging Technologies.doc pp. 773; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

recommendations for process improvements.[166] The data collection instruments included a series of detailed research questions developed as part of the evaluation plan (see Volume II).[167] Table 50 provides an overview of the data collection activities employed for this effort.

[166] For more information on the topics covered in the evaluation efforts, the data collection instruments are attached in Volume II.

[167] The evaluation plan is located here: http://www.energydataweb.com/cpucFiles/pdaDocs/749/PY2010-2012%20ETP%20Evaluation%20Plan_Final_2011_09_2.pdf

Table 50: Data Collection Activities

Data Collection Activity	Description
In-depth Interviews	Conducted 3 in-depth interviews with the IOUs (PG&E, SCE, SCG, SDG&E)

Program Material Review	Reviewed the following materials:
	• PG&E
	  ○ Street Lighting Network Controls Market Assessment
	  ○ Scoring Tools
	• SCE
	  ○ Air Blower Market Assessment
	  ○ ZNE Buildings - Technical and Market Potential Review
	  ○ Scoring Tools: ET Market & Behavior Study Proposal Form, and Market & Behavioral Studies Scorecard
	• Sempra
	  ○ ACEEE National Water Heating Forum Presentation on SCG/SDG&E Water Heating Working Group Meeting [a]
	  ○ SCG/SDG&E Commercial Water Heaters & Boilers Working Group – Summary Report[a]
	  ○ Scoring Tools

Target Audience Surveys	Conducted a quantitative online survey of 51 IOU staff members that received the Technology Assessments reports, the Market and Behavioral Studies, or both.
ETP Database	Reviewed information on the projects as provided in the Q1 2012 update to this database.
Evaluability Assessment	Conducted two workshops and ongoing in-depth interviews with the 4 IOUs to identify program theory and logic model as well as potential performance indicators for each element.
Literature Review	Conducted literature review to understand best practices around timing for performing a study (process frameworks) and choosing the appropriate type of study (conceptual frameworks).
Expert Panel	Conducted one expert panel to determine whether ETP is positioned [b] in California's RDD&D energy efficiency market to be able to meet the expected goals as articulated in CEESP. (This panel was not specific to Market and Behavioral Studies.)

[a] These presentations were included in the materials provided by SCG/SDG&E, but are not considered to be an MBS effort. As such, a case study was not performed for these presentations.
[b] "Positioned" is defined as where the ETP aims its activities in the RDD&D energy efficiency market to contribute to the CEESP goals.

We performed qualitative analyses of the program manager interviews and program information. Additionally, using the information from data collection activities, we performed three distinct evaluation activities.

Table 51. Evaluation Activities

Evaluation Activity	Description
Content Analysis	Obtained the three Market & Behavioral Studies reports completed by ETP at the time of the assessment (September 2011). Reviewed the reports to determine clarity and relevance (see Volume II for more detail).
Review of Scoring Tools	Reviewed each IOU's scoring tools to provide a description of the process and recommendations to improve these tools (see Volume II for more detail).
Survey Analysis	Compiled statistics of the target audience survey responses (see Volume II for more detail).

9.3 Current Market and Behavioral Studies Element Status (as of Q1 2012)

Program implementation plans for the 2010-2012 period set a statewide objective of implementing four studies.[168] ETP is currently developing 21 MBS studies, although some of these efforts are not scheduled for completion until 2014. Of these 21, the IOUs report that 11 are completed, and 10 studies are ongoing. As such, the program element has exceeded its objective of completing four studies prior to the close of the program cycle.

Table 52: Market and Behavioral Studies Element Objectives (as of Q1 2012)

IOU	2011 Program Implementation Plan Objectives For 2010-2012 Timeframe	Completed	Ongoing	Total
PG&E	1	6**	4*	10
SCE	1	5	5	10
SCG	1	0	1	1
SDG&E	1	0	0	0
Statewide	**4**	**11**	**10**	**21**

Source: Q1 2012 ETP DB

* Note: one of the PG&E projects (ET11PGE5261) is likely not an MBS study. However, it is included in this table based on the information received from PG&E in July 2012.

** Note: one of the PG&E projects (ET09PGE0914) was initiated in 2009, but is included in this table as the data received from PG&E included this project. Additionally, we performed a case study on this project as it was received in the Data Request made in September 2011.

[168] The IOUs note that this was generally just intended to encourage each utility to do at least one study.

At least $1.7 million of the ETP statewide program budget of $43 million (4%) is targeted towards the Market and Behavioral Studies element, although the exact number is unknown since SCG and SDG&E do not track budgets for Market and Behavioral Studies.

Across all IOUs, current projects range in budget from $8,000 to $150,000, with the mean project costs around $58,100. Notably, budget information was not available for all of PG&E's MBS projects. As such, the range and median could change once all the budgets are available. However, project costs are not identical to expenditures as IOU labor costs and administration overhead are not included. Therefore, the actual budget for the element needs to account for labor and other aspects of implementing the element not covered specifically within project costs. If these aspects are included in the next program cycle, the IOUs will have knowledge of actual project costs to better estimate a budget for this element. However, due to the wide variation in possible activities for this element, it is difficult to accurately forecast an average budget per project.

The table below shows available budget and expenditure information. PG&E has a budget of $1.2 million, which is substantially larger than SCE's budget; however, as a percentage of their total budget, their expenditures as of Q1 2012 are lower than SCE's expenditures (as mentioned above, PG&E has spent 34% of their budget as opposed to 82% spent by SCE). Note that this does not include committed funds. PG&E has four ongoing projects with a committed budget of over $787,000. This additional budget commitment would increase their total program expenditures to 101% of their budget by the close of the program cycle.[169] Note that they have until the end of 2012 to complete their objectives.

The overarching objective of four MBS efforts appears to be extremely low given the number of emerging technologies, the various stages at which these studies could be conducted, and the types of research indicated by the Action Strategies (discussed in the introduction to this chapter). However, the program has adjusted and is conducting more research even in advance of the goals being revised. For the future, the IOUs should consider activities in this area and align the budget with the level of effort planned (i.e., either increase the objective for the number of studies, or decrease the budget allocated to studies).

[169] For ETP, PG&E budgets and makes expenditures within a calendar year. Therefore, any MBS must be completed within this calendar year to match the budget.

Table 53: Market and Behavioral Studies Element Budget and Expenditures by IOU as of Q1 2012

IOU	2010-2012 Program Revised Budget[a,b]	Program Expenditures (Inception-To-Date)	Percent of Budget Spent as of Q1 2012	Proposed/Actual Budgets for Projects[c]
PG&E	$ 1,175,743	$ 403,806	34%	$ 787,000
SCE	$ 523,520	$ 430,658	82%	$ 270,000
SCG	SCG does not report expenditures by element in the ETP database.			$ 105,000
SDG&E	SDG&E does not report expenditures by element in the ETP database.			$ 0
Partial Total	**> $ 1,699,263** (does not include SCG and SDG&E)	**> $ 834,464** (does not include SCG and SDG&E)	**49%**	**$1,162,000**

[a] Element budgets reflect those reported in the ETP database. Note that Sempra does not track their program by element.
[b] The 2010-2012 Program Revised Budget is consistent with the Fund Shift Report updated on April 12, 2012 and excludes rebalanced budget from AL 3235-G-3901-E.
[c] Source: Q1 2012 Monthly Reports sourced from EEGA website.

The types of studies being conducted by MBS can be grouped into two categories (Table 54):

1. Research to facilitate technology selection
2. Research to facilitate technology deployment (e.g., understanding consumer behaviors or market acceptance)

Using the description of each study provided by the IOUs, the Evaluation Team categorized each study into the different categories. As shown in the table below, across the IOUs, both types of studies—research projects for "selection" and research efforts for "deployment"—are being conducted. As the IOUs need both types of studies, this split is appropriate. The deployment- or customer-focused research studies tend to focus more on the residential sector (8 of the 11 deployment-focused studies are for residential customers) whereas the "selection" research projects are almost split between residential and commercial; four of the studies focus on both sectors.

Table 54: Market Behavioral Studies by Research Type

MBS Type	PG&E	SCE	SCG	Total
Research to Facilitate Technology Selection (Market Research)	4	6	0	**10**
Research to Facilitate Technology Deployment (Customer Research)	6	4	1	**11**
Total	**10**	**10**	**1**	**21**

The CEESP states that emerging technologies efforts should focus on four specific end-uses; climate appropriate HVAC, advanced lighting, plug-load and smart appliances, and integrated building design and operations. The MBS studies align with these end-uses. Of the 21 MBS studies, 19 directly align

with CEESP BBEES end-uses (90% of studies). The two projects that did not support CEESP strategic end-uses include compressed air, an end-use that can be a large user in industrial settings, and residential hot water (see Table 55).[170]

Table 55: Market Behavioral Studies by End-use

End-Use	Technology Selection	Technology Deployment
All End-Uses	3	5
HVAC	4	2
Lighting	1	1
ZNE	1	0
Controls	2	0
Other	1	1
Total	**12**	**9**

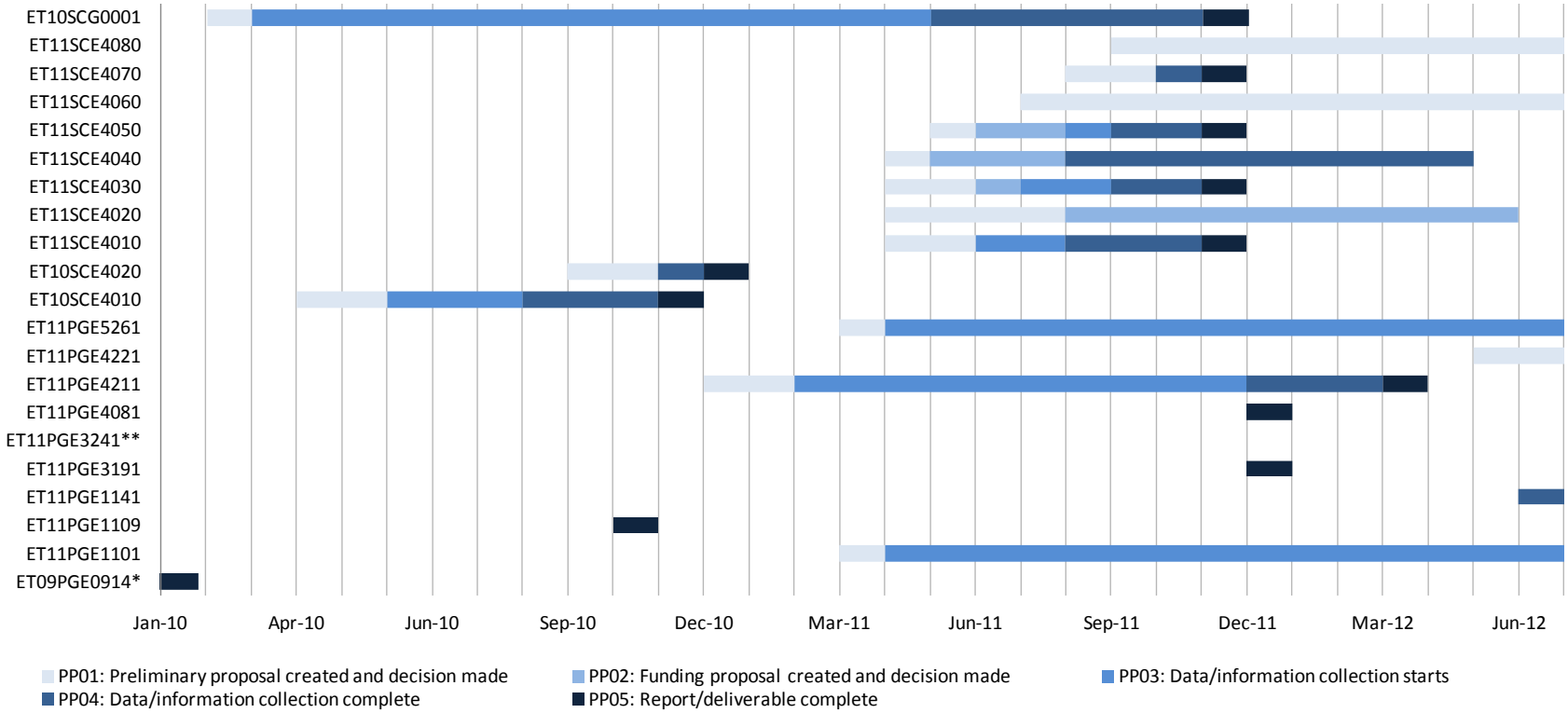
Figure 26 shows study types with their timelines (by progress point[171]) by IOU. PG&E's projects are spread out in terms of their start date (one project started in 2009, two projects in 2010, and three in 2011) and have durations of 7 months or longer (average duration of about 15 months).[172] Notably, project progress point information was not consistent with other variables in the ETP database for 4 of the 10 PG&E projects. These issues are described in the figure notes below. In comparison, most of SCE's projects were started in 2011 and have much shorter durations (average of about 7 months).

[170] More details about the projects can be found in Volume II.

[171] There are five progress points that are used in the ETP database to indicate the stage of the project, from initiation through completion or cancellation.

[172] Note the exclusion of projects that do not have initiation or completion dates from the average.

Figure 26: Timelines for MBS Projects from Progress Points



*ET09PGE0914 was begun in 2009, the project is included as it was provided in the September 2011 data request.
**ET11PGE3241 does not have a progress point, as the data provided by PG&E has a completed status date of November 2012.

Table 47 provides details about each of the 21 MBS projects through the first quarter of 2012. Notably, ETP staff has revised the classification of projects across program elements over time. In particular,

- PG&E has revised three of the current program cycle projects that were originally classified as an SFP or TA to MBS. These include ET11PGE3191, "Continental Automatic Building Association (CABA) Research Project" initially classified as an SFP; ET11PGE3241 "EPRI Early Deployment Efficiency End User Technologies" initially classified as an SFP; and ET11PGE1141 "EMS Data Translation (Pneumatic to Wireless)" initially classified as a TA.

- For Sempra, SCG originally listed project ET10SCG0001 "SF/MF WH data/survey" as a TA, but has now re-classified the project as an

MBS. In addition, SDG&E provided documents regarding a co-funded project with SCE entitled "Backlit Signs Market Study" as an MBS, but classified this project as a TA in the ETP database.

These findings indicate that there could be greater focus in terms of selecting and identifying a project type for both MBS and other elements. This will help to ensure that projects are aligned with the program theory and will lead to the expected causal outcomes.

Table 56: Market and Behavioral Studies Description (as of Q1 2012)

IOU	#	ETP Project Number	Project ID	Market Research	Customer Research	Residential	Commercial	HVAC	Lighting	Other	Controls	Cross-Cutting	Expected Cost	Status
PG&E	1	ET11PGE1109[a]	HVAC Quality Maintenance Standards Implementation Behavioral Study		X		X	X					*$150,000*	Complete
PG&E	2	ET11PGE4081[c]	Home Energy Management Insight Behavior Research Smart Homes		X	X						X	*$150,000*	Complete
PG&E	3	ET11PGE1101	Lighting MSB Conjoint Study		X	X	X		X				*$80,000*	In Progress
PG&E	4	ET11PGE4211	M&BS EMS Systems		X		X				X		*$75,000*	Complete
PG&E	5	ET11PGE3191[d]	Continental Automatic Building Association (CABA) Research Project		X	X						X		Complete
PG&E	6	ET11PGE1141[e]	EMS Data Translation (Pneumatic to Wireless)	X			X				X		*$70,000*	In Progress
PG&E	7	ET11PGE5261[a b]	Maintenance Standards Implementation Calibration and Diagnostic Protocol	X			X	X					*$60,000*	In Progress
PG&E	8	ET09PGE0914[f]	Street Lighting Network Controls Market Assessment		X		X				X		*$52,000*	Complete
PG&E	9	ET11PGE4221	M&BS Building Stock Study	X			X					X	*$100,000*	In Progress
PG&E	10	ET11PGE3241[g]	EPRI Early Deployment Efficiency End User Technologies	X		X	X					X	*$50,000*	Complete
SCE	1	ET10SCE4010	Air Blower Market Assessment		X		X	X					$18,000	Complete
SCE	2	ET10SCE4020	ZNE Technical Potential	X		X	X					X	$15,000	Complete
SCE	3	ET11SCE4010	Market Intelligence Gathering Process Evaluation	X		X	X			X			$28,000	Complete
SCE	4	ET11SCE4050	Pool Light Residential Usage Survey	X		X			X				$15,000	Complete
SCE	5	ET11SCE4070	Future Outlook for Residential Energy Management		X	X						X	$8,000	Complete

IOU	#	ETP Project Number	Project ID	Market Research	Customer Research	Residential	Commercial	HVAC	Lighting	Other	Controls	Cross-Cutting	Expected Cost	Status
SCE	6	ET11SCE4020	Residential Human Comfort Behavior Study for Low Energy Cooling		X	X		X					$70,000	In Progress
SCE	7	ET11SCE4030	Consumer Behavior Change via Online Integrated Demand-Side Management Leveraging Casual Social Games		X	X						X	$50,000	In Progress
SCE	8	ET11SCE4040	HVAC Technology Roadmap	X			X	X					$25,000	In Progress
SCE	9	ET11SCE4060	Commercial Buildings Simulation Based Deep Energy Reduction Potential Study	X			X					X	$25,000	In Progress
SCE	10	ET11SCE4080	Ground Coupled Space Conditioning Technical Potential	X		X	X			X			$16,000	In Progress
SCG	1	ET10SCG0001[h]	SF/MF WH data/survey		X	X				X			$105,000	In Progress

Indicates unknown information (not included in any of the sources).

* Note: Budgets and dates for PG&E projects shown in *italics* are taken from the Monthly Data Request as this information was unavailable in the ETP DB

a PG&E's project ET11PGE5261 was initially classified as a TDS, and is now classified as MBS. Also, PG&E indicated that it is has been combined with project ET11PGE1109

b This project was initially named "Technology SSE HVAC Quality Maintenance"

c This project was initially named "Home Energy Management Insight Behavior Research"

d PG&E's project ET11PGE3191 was initially classified as an SFP, now classified as MBS.

e PG&E's project ET11PGE1141 was also classified as a TA under the name "EMS Data Translation," but PG&E has confirmed that it is an MBS project.

f PG&E project ET09PGE0914 was initiated in 2009, but is included in this table as the data received from PG&E included this project. Additionally, the Evaluation Team has performed a case study on this project as it was received in the Data Request made in September 2011.

g PG&E's project ET11PGE3241 was initially classified as an SFP, now classified as MBS. Additionally, there are inconsistencies around the initiation data and progress points for this project. The Monthly Data Request lists the project time line as May 2011 - January 2011 (which could mean Jan 2012) and the ETP DB lists the project as "complete" with the end date as Q4 2012.

h SCG's project ET10SCG0001 is also classified as a TA project, but is included in this table as the data received from SCG lists this project as an MBS

** Note: SDG&E state that they co-funded a project with SCE, "Backlit Signs Market Study"—however, this project is listed under TA in the ETP database

9.4 ASSESSMENT OF DESIGN

The expected outcome of the MBS program element is to "contribute to increased measure awareness, market knowledge, and reduced performance uncertainties for ETP stakeholders and IOU customers."[173] During a workshop held on November 14, 2011, the following program theories were developed with the IOUs and CPUC.

Theory #1: Research to facilitate technology selection – At times, ETP staff needs additional information to determine whether a specific technology would be worthwhile to pursue through Technology Assessments or other activities. Some market potential or viability information will help the staff decide whether to assess a specific technology as well as provide information on viable adoption of technology once it passes the ETP screen. The outcome of this would be selection of a technology for further exploration by ETP (or the decision not to pursue).

Theory #2 - **Research to facilitate technology deployment** - Customers may perceive underutilized and/or newly emerging technologies differently, causing them to not accept the technology as readily as standard technologies. Energy efficiency program managers need assurance that customers do not find the new measure objectionable and that customers have a likelihood of adopting the measure if placed into the energy efficiency portfolio. Research that systematically gathers evidence around customer acceptance and perception of the new technology would assure energy efficiency managers that customers will likely adopt a measure coming from ETP. The outcome of this would be helping EE PMs understand customer acceptance of the technology (or evidence about barriers to adoption).

Following these two theories, Table 55 categorized the studies conducted by the IOUs into these two types of studies (i.e., technology selection or technology deployment) and show that both theories are being implemented equally.

As designed, the element is plausible and can bring about the outcomes listed above. The element also appears to help advance the overall goals of the ETP; but some small adjustments could help the element to better serve the larger CEESP goals. The element design could be broadened for a larger purpose. These are described next.

To help assess the design for this element, a literature review of the use of marketing studies was performed (see Volume II for full write-up of the literature review). To focus this literature review, the team drew heavily from the program element goals, objectives, and expected outcomes (as stated above). The literature review outlined frameworks that can be used by ETP to understand best practices around timing for performing a study (process frameworks) and choosing the appropriate type of study (conceptual frameworks). The process and conceptual frameworks relevant to MBS are outlined below:

- **Process Frameworks for New Products:** The literature was clear that new product designs need data early in the selection process to allow for clear choices as well as later in the process to assure customer acceptance. Based upon the literature review, there were three design processes that discuss the use of information about the market to support choices that facilitate selection of a

[173] Ibid.

product and/or deployment of that product. The specific designs themselves are included in Volume II.

- **Conceptual Frameworks for Increasing Market Share of New Products:** Regardless of the type of process framework used, the rate of adoption of new products is dependent on several factors—such as perceived benefits over alternative products, price and ongoing costs, ease of use, promotional effort, and compatibility with existing standards and values. The literature review findings lay out two conceptual frameworks that, if followed, help increase market share. The two conceptual frameworks are:

    - **Market Intelligence**: Makes use of focused qualitative and quantitative research to help determine market potential, add input to R&D, define buyer behaviors, and improve sales conversion rates

    - **Diffusion of Innovation**: Helps in understanding the communication channels needed to reach the right people to cause ideas to diffuse throughout a society

Findings from the literature review indicate that MBS as designed is following best practices for timing (i.e., early in the product development cycle) and study selection to understand the market (i.e., scanning for technologies in the market) and to support choices (i.e., should an assessment occur). Finally, the IOUs' choice of studies align with findings from the literature review; ETP has chosen studies that cover both market and customer research.

The conceptual frameworks (noted above) include two important ways of thinking about the market for new products that are complementary. Market intelligence[174] is a way of thinking about how to use research to increase market share while the second approach, diffusion of innovation, may use market intelligence to improve market acceptance of new ideas or products. The program implementation plan uses the words "market intelligence" and the Expert Panelists note that a key requirement for supporting the CEESP goals is to conduct market intelligence activities to identify and prioritize customer needs and behavioral drivers for emerging energy efficient technology adoption. Expert Panelists also suggested there was a need to understand and address behavioral economics, i.e., psychology that drives technology adoption choices. As such, both the IOUs and expert panelists acknowledge that ETP and other stakeholders involved with new products must understand what is going on within the emerging technology market and what the market may need in the future to enable proactive steps that support the CEESP. MBS currently enables ETP staff to prioritize technologies, approaches, and practices that have potential within the market, as well as understand market barriers and drivers for technology deployment. In this sense, the program element provides much needed support of the other ETP program elements, as well as the CEESP BBEES goals, as recommended by the literature.

However, many stakeholders in California could benefit from the market intelligence gained by MBS. Since the CEESP goals rely on many stakeholders, not just the IOUS, to enable MBS to be more valuable in reaching those goals, the IOUs should broaden the element design and outcomes to explicitly disseminate studies to external stakeholders. It is acknowledged that the ETCC is the current

[174] Market intelligence is decision-centric where there is an emphasis on gathering relevant information from a wide variety of strategically chosen sources (First Resource 2009).

platform for external dissemination. To actively meet the CEESP goals, there needs to be more active dissemination to a broader group of external stakeholders, which should start with the ETCC but may need to be expanded beyond that forum.

Similarly, broadening the program performance metric will help to meet the CEESP. The current metric is a "self-reported increase in knowledge among internal ET stakeholders about the technologies targeted by the M&B studies"[175]; thus, the audience is internal to the IOUs. Coupled with the expected short-term outcomes, the reports are expected to help ETP project managers determine if a technology should be included, and energy efficiency program managers to better understand markets' and customers' acceptance of energy efficiency products. While some dissemination occurs externally, the metric and outcomes focus on internal dissemination. If the audience for MBS studies is expanded, the metric should also expand to include "a self-reported increase in knowledge among internal and external ET stakeholders about the technologies targeted by the M&B studies."

Collecting data on the outcomes of this element as designed is cost-effective as both outcomes rely on surveys of those who have read the reports to determine if the reports provide the needed information to make choices and if the data improves understanding of the technology or market.

9.5 ASSESSMENT OF IMPLEMENTATION

As with other elements, there is variability in how the IOUs choose a study, with SCE having the only selection tool specifically targeted to MBS. Despite the lack of specific selection tools, all of the MBS reports appear to support the specific action strategies referenced in the PIP.[176] An early assessment of the usefulness and clarity of the reports showed that the reports were providing the information desired by readers, although there were only seven recipients of the three completed studies at the time of the data collection.[177]

9.5.1 SELECTION OF MBS

We assessed the selection process for MBS studies (see Volume II for details). Similar to the other elements, there is variability in how the IOUs choose studies[178], this selection is less systematic than other elements as SCG and SDG&E had no formal selection process in place at the time of the evaluation data collection (fall of 2011). SCE uses a targeted selection tool for MBS while PG&E uses the same tool for MBS as they do for technology assessments. The SCE tool supports the two program theories and use for MBS, as it includes a high weighting (30%) for studies that are targeted to enhancing market intelligence (Program Theory #1) and studies making choices for other elements are given a weighting of 25% (Program Theory #2). Generally, studies are selected in support of other

[175] Program performance metrics from Resolution E-4385: SCE AL 2476E, PG&E AL 3120G|3675E, SoCalGas AL 4114, SDG&E AL 2172E|1951G/cf1. Pp. 39-40

[176] Except for the PG&E project (ET11PGE5261) which is likely not an MBS project.

[177] The low number of recipients was due to there being three completed studies at the time of the data collection.

[178] When selection processes for MBS were discussed with the IOUs, only PG&E and SCE had begun any study.

program activities. The IOUs also select studies in line with the end-uses targeted by the CEESP 90% of the time (see Section 9.3 for details).

The levels of MBS studies vary in cost considerably from $8,000 to $150,000. Small budget projects do not really require a screening tool, but for projects expected to be over $50,000 (or a budget agreed upon by the IOUs as a "larger" budget), the IOUs should coordinate and utilize screening tools that are tailored specifically to the MBS program element for larger projects. In some cases, no screening tool was used to select a study. Without going through the process of using a selection tool, ETP cannot provide internal and external stakeholders with documented project selection rationale.

9.5.2 Dissemination of Information and Quality of Reports Disseminated

The IOUs stated in interviews that they will disseminate MBS findings using both internal and external channels such as:

- Reports
- Sharing at ETCC quarterly meetings
- Posting to ETCC Website
- Newsletter / E-Blast
- Disseminated internally – informal events (brown bag)
- Disseminated externally – Conferences, workshops, trade shows, presentations

As of the end of Q1 2012, the IOUs had completed 11 MBS reports and the ETP database indicated that 3 reports had been disseminated to energy efficiency program managers and 1 to a different audience, which was not specified in the database. Three reports were available to a broader audience, including other IOUs, CEC, CPUC, and other external stakeholders through the ETCC website.[179] As such, the MBS reports have not been broadly disseminated externally.

In December 2011, we conducted a quantitative online survey of IOU staff who could have received a Market and Behavioral Study.[180] The objective of our survey was to understand the dissemination of reports, awareness of MBS reports within this audience, and the quality of reports received. The IOUs provided us with a list of the appropriate targeted audience for Technology Assessments. This list included 147 IOU staff who may have received Technology Assessments and 20 IOU staff who may have received a Market and Behavioral Study. The ETP staff identified these 167 individuals as the targeted recipients for this survey. Of the 167 people in the sample frame, 51 completed the survey (including both Technology Assessment and MBS report recipients) with 7 of the 51 respondents who identified themselves as decision-makers and recipients of MBS reports.

[179] As of July 24, 2012, three reports were found on the ETCC website.

[180] Since the audience was the same for both the Technology Assessment and MBS elements, the same survey was used with separation of questions targeted to a Technology Assessment report or an MBS.

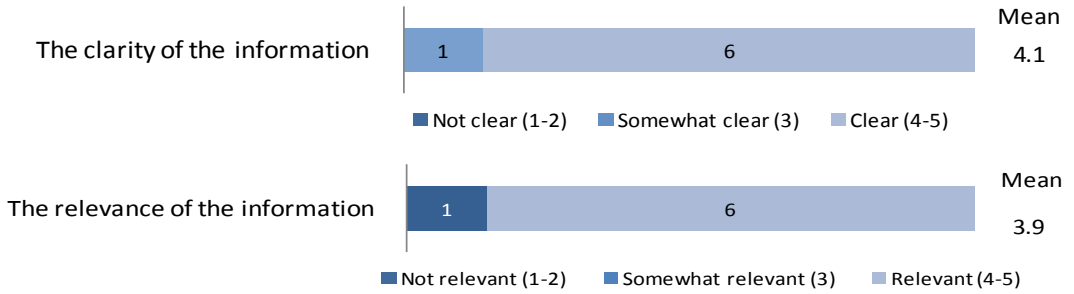
Given the small number of completed reports at that time (n=3), it is not surprising that few had heard of the reports (six of the seven respondents had received and read the reports and one respondent did not receive the reports but did receive information about the content through meetings/presentations).[181] However, the total number of targeted report recipients is expected to expand over time as more reports are completed.

All of the respondents noted that they use the MBS reports to help make decisions about whether and how to adopt a new technology into the program. Several respondents also noted that nearly all the time they use the MBS report to understand the market context and help determine which market to target with the new energy efficient technology. However, three of the seven survey respondents who received the information contained in the MBS reports also noted that they have received MBS information after they have selected a new technology for their program. While these MBS reports might not have informed decisions about whether to adopt the technology into the portfolio, the reports were still considered valuable for understanding the market context and promoting the new technology. Notably, respondents may have received more than one report.

Among those who received the report late, they still valued the report's examination of market and behavioral opportunities. One of the respondents noted, "The report was received after the technology had already been added to the program. Although feedback outside of the report and details of the Emerging Technology Program's Final Reports provided great detail on why the technology should be adopted." Notably, the amount of time it took to complete a project ranged from 3 months to 25 months (see Figure 26 for more detail).

To increase knowledge, the reports must be clear and relevant, and of high quality. The evaluation team reviewed the three available completed reports for these metrics (clarity and relevance) and survey respondents were also asked about them. The early set of reports was found to be clearly written and, for the most part, relevant.

Figure 27. Clarity and relevance of the information found in the Market and Behavioral Studies (n=7)

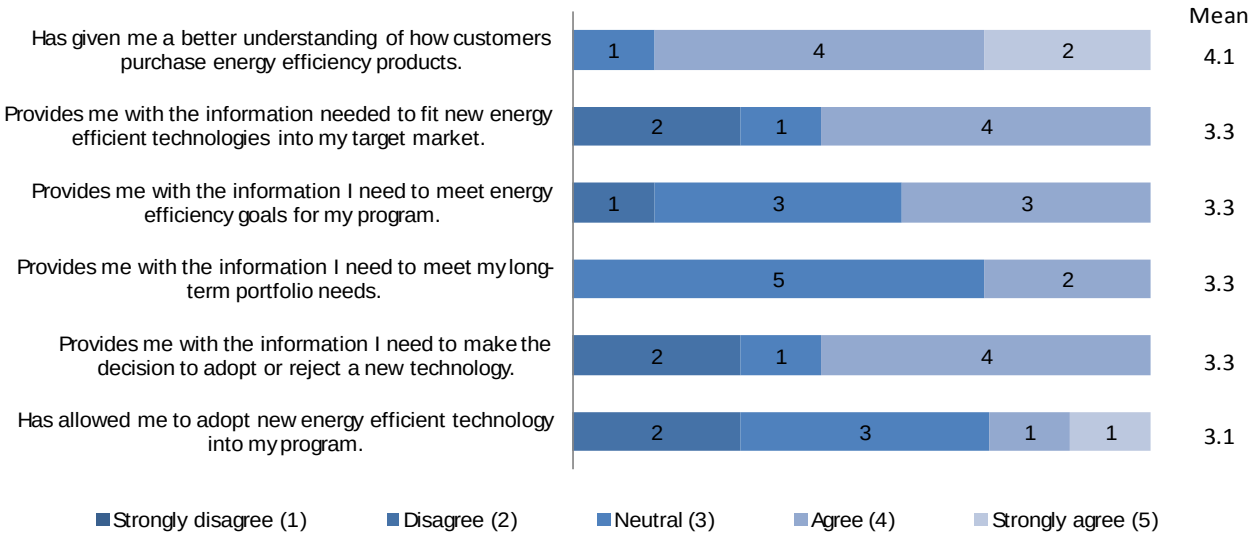


One respondent said that the reports do not "directly address the issues of core importance to program design and development. Of primary interest are market size, achievable potential, target segments, delivery channel, and replacement effect on existing measures." This is important feedback, especially for reports targeted to facilitate technology selection that is focused on market size and achievable potential.

[181] Note that immediate feedback from these surveys was provided with the IOUs to inform program processes.

Most respondents report that the MBS reports are beneficial in a variety of ways, as shown in Figure 28.

Figure 28. Benefits of the Market and Behavioral Studies (n=7)



The Evaluation Team conducted case studies of the three MBS reports received from the original data request in September 2011 (see Volume II for detailed case studies). While the IOUs have started several additional studies since data collection in the fall of 2011, we completed analysis in December 2011. The case studies document how the IOUs identified study, sources of information culled to develop the report, a review of report content, and dissemination activities that occurred once the report was finalized. These case studies help inform the recommendations described below.

9.6 Summary of Recommendations for Market & Behavioral Studies

The recommendations for Market & Behavioral Studies fall into six overarching categories, and are summarized below:

Align goals and budgets: Increase the objectives for the number of MBS studies, or decrease the budget for this activity. While the PIP objective generally sought to ensure that each IOU completed at least one study, the budgets allocated to this element were not aligned with the objectives. For the 2010-2012 cycle, the IOUs set aside $1,699,263 to complete a minimum of four studies. As of Q1 2012, the IOUs had completed 11 studies – nearly three times the objective – while spending only 49% of the budget. While the element is over budgeted statewide, this may be particularly true for PG&E which, as of Q1 2012, initiated 10 studies while committing about 60% of their budget (includes spent and committed budget). For the next program cycle, the IOUs should reconsider the amount allocated to the outcome represented by MBS.

Focus outcomes: Be explicit with the outcome for each study. The current MBS studies are intended to either help ETP program managers select technologies or help EE PMs with the deployment of technologies. Each study should be explicit in its outcome to help ensure that the report is clear and that the intended audience is known in advance.

Coordinate and tailor screening. The IOUs should coordinate and utilize a statewide screening tool that is tailored specifically to the MBS program element for larger projects (i.e., those over $50,000 or some value determined as "large" by the IOUs). Only SCE has a tailored tool and in some cases, no screening tool was used to select the studies. Without going through the process of using a selection tool, ETP cannot provide internal and external stakeholders with documented project selection rationale for larger projects.

Enhance reporting: For MBS, enhance timeliness of reporting to provide EE PMs with information prior to key decision-making. An online survey of IOU staff shows that the studies were not timely: 3 of the 7 respondents noted that they received MBS information after they have selected a new technology for their program. While this data was based on early implementation efforts, the IOUs should seek to ensure that key stakeholders receive the MBS reports (or the information that will be in the reports) early enough to inform decisions.

Further support CEESP: Broaden dissemination and the intended target of MBS. Only 3 of 11 completed MBS studies were posted as of July 2012. To share the valuable information collected through MBS efforts, all reports should be posted to the ETCC website, and the IOUs should also look for ways to proactively disseminate to targeted stakeholders outside of IOUs (e.g., email list serve groups by key end-use or targeted newsletters to identified stakeholders). Many stakeholders in California could benefit from the market intelligence gained by MBS. Since the CEESP goals rely on many stakeholders, not just the IOUS, to enable MBS to be more valuable in reaching those goals, the IOUs should broaden the element design and outcomes to explicitly disseminate studies to external stakeholders.

10. TECHNOLOGY DEVELOPMENT SUPPORT

10.1 PROGRAM ELEMENT DESCRIPTION

Technology Development Support (TDS) is one of two ETP elements specifically designed to intervene on the supply (push) side of emerging technologies (the other element is TRIO). As per PIP Goal#2, Technology Development Support can "contribute to EE/DR market transformation efforts by assisting technology developers and manufacturers to create technology supply with respect to emerging technologies, including supply for the Big Bold Initiatives, thereby increasing the number of EE measures that are available for adoption. The focus of this Goal is increased technology supply."[182]

This element consists of "taking an early-stage technology or concept and transforming it into a saleable product."[183] Further, the PIP notes that the Technology Development Support program element helps to bridge the gap between R&D and the market, by contributing to "increased readiness and availability of EE measures for customers and EE program managers and reduced uncertainties for program participants."[184]

TDS focuses on several disparate activities, each with a somewhat different focus on helping to support the technology development process. We binned the PIP Action Strategies into four avenues of support; (1) helping to create new product specifications or determine appropriate baselines, (2) developing and disseminating test protocols and standards, (3) providing access to specific IOU knowledge or capabilities, or (4) performing a study to provide market intelligence.

[182] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; 15. SCE-SW-009 Emerging Technologies.doc pp. 780; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

[183] Ibid

[184] Ibid

Table 57. Technology Development Support Activities from PIP

Avenues of Support	Action Strategy Description	Action Strategy Number
Product Specifications	Identify targeted opportunities to develop forward-looking product specifications, which could be used by a multitude of product developers. This may include development of an open source or proprietary product specification for entrepreneurs to build to—possibly with incentives. This may also contribute to competitions to develop new product concepts/meet specifications.	2.1.1
	Look for targeted opportunities to establish product baseline performance levels. This baseline information would serve as an input to product development efforts.	2.1.2
Standards and Test Protocols	Look for targeted opportunities to develop standard test protocols for energy efficient products, in support of statewide Codes & Standards Program.	2.1.3
Leveraged Resources	Look for targeted opportunities to provide customer contacts for testing and focus groups. Utilities may be in a unique position to help connect product developers with customers willing to participate in field tests of measures and provide feedback.	2.1.4
	Look for targeted opportunities to make expertise/knowledgeable personnel available as resources to product developers. Utilities may be in a position to advise on certain subject matter.	2.1.6
	Making testing facilities and other infrastructure available to product developers	2.1.7
Market Intelligence	Look for targeted opportunities to conduct market or behavioral studies and otherwise provide and/or collect market intelligence. Utilities may have access to or the ability to collect market intelligence that would help justify product development investment and guide product development targets.	2.1.5

10.2 TECHNOLOGY DEVELOPMENT SUPPORT METHODOLOGY

The Evaluation Team used data on Technology Development Support that came directly from the IOUs in the form of interviews and files based on a data request made in September 2011, as well as in-depth interviews with manufacturers and stakeholders with active projects as of September 2011. This report also incorporates additional information from monthly status updates that the IOUs provided to the CPUC-ED as of March and April 2012 and the information in the ETP database through Q1 2012.

Data Sources

Table 58 provides the data collection activities we used for our analysis.

Table 58. Technology Development Support Data Collection Activities

Data Collection Activity	Description

In-depth Interviews	• Conducted 3 in-depth interviews with the 4 IOUs
	• Conducted 4 in-depth interviews with project stakeholders for the following projects:
	  ○ Blower Test Standards, SCE
	  ○ Bi-Level Elevator Lighting, SDG&E
	  ○ LED Lights for Commercial Pools, SCE (2 interviews)

Program Material Review	Reviewed the following materials: • Program Implementation Plan • Sample TDS proposal and scorecards • Budgeting information for TDS projects • Presentations made by TDS staff (SCE) • Customer contact information (SCE)
ETP Database	• Reviewed information on the projects as provided in the quarterly updates to this database
Evaluability Assessment	• Two workshops and ongoing in-depth interviews with the 4 IOUs to identify program theory and logic model as well as potential performance indicators.
Expert Panel	• One expert panel was conducted to determine whether ETP is positioned[185] in California's Research, Development, Demonstration and Deployment (RDD&D) energy efficiency market to be able to meet the expected goals as articulated in CEESP.

10.3 Current Technology Development Support Element Status (as of Q1 2012)

Program implementation plans for the 2010-2012 period set a statewide objective of implementing six projects. Of these six, the IOUs report that five are completed, and one project is ongoing. As such, the program element is on track to fulfill their objective of completing six projects prior to the close of the program cycle.

[185] "Positioned" is defined as where the ETP aims its activities in the RDD&D energy efficiency market to contribute to the CEESP goals.

Table 59: Technology Development Support Element Objectives (as of Q1 2012)

IOU	2011 Program Implementation Plan Objectives	Completed	Ongoing	Total as of Q1 2012
PG&E	2	1	0	1
SCE	2	4	1	5
SCG	1	0	0	0
SDG&E	1	0	0	0
Statewide	**6**	**5**	**1**	**6**

Source: Q1 2012 ETP DB

In total, at least $800,000 of the ETP statewide program budget of $43 million (~2%) is targeted to the Technology Development Support element, although the exact dollar figure is unknown since SCG and SDG&E do not track budgets separately for Technology Development Support.

As shown in Table 59, SCE initiated the most projects (five) and exceeded their original objective while spending most of their budget (93%, see Table 60). PG&E initiated one project and has not yet achieved their objective of two projects (while spending only 30% of their budget). PG&E has a committed budget of $200,000. This additional budget commitment would increase their total program expenditures to 66% of their budget by the close of the program cycle.[186] SCG and SDG&E have not yet achieved their objective of one TDS each as of Q1 2012.

Across all IOUs, current projects range in budget from $1,000 to $200,000, with the mean project costs around $38,000. However, project budgets are not identical to expenditures as IOU labor costs and administration overhead are not included. Additionally, due to the wide variation in possible activities for this element, it is difficult to accurately forecast an average budget per project.

Table 60: Technology Development Support Element Budget and Expenditures by IOU as of Q1 2012

IOU	2010-2012 Program Revised Budget[a,b]	Program Expenditures (Inception-To-Date)	Percent of Budget Spent as of Q1 2012	Proposed Budgets for Projects[c]
PG&E	$548,199	$162,798	30%	$200,000
SCE	$249,188	$232,172	93%	$32,500
SCG	SCG does not report expenditures by element in the ETP database.			$0
SDG&E	SDG&E does not report expenditures by element in the ETP database.			$0
Partial Total	**> $ 797,387**	**> $ 394,970** (does	**50%**	**$232,500**

[186] For ETP, PG&E budgets and makes expenditures within a calendar year. Therefore, any SFP must be completed within this calendar year to match the budget.

IOU	2010-2012 Program Revised Budget[a,b]	Program Expenditures (Inception-To-Date)	Percent of Budget Spent as of Q1 2012	Proposed Budgets for Projects[c]
	(does not include SCG and SDG&E)	not include SCG and SDG&E)		

[a] Element budgets reflect those reported in the ETP database Expenditure by Program file of March 2012. These are as follows: PG&E 3/12/2012 Monthly Report "PGE.MN.201112.3", SCE 4/2012 Monthly Report "SCE.MN.201203.1", SCG 4/2012 Monthly Report "SCG.MN.201203.1", and SDG&E 4/2012 Monthly Report "SDGE.MN.201203.1" accessed here: http://eega.cpuc.ca.gov/ on 5/23/2012. Note that Sempra does not track their program by element.

[b] The 2010-2012 Program Revised Budget is consistent with the Fund Shift Report updated on April 12, 2012 and excludes rebalanced budget from AL 3235-G-3901-E.

[c] Source: Q1 2012 Monthly data request data.

Across the IOUs, there is variation in terms of the action strategies used to provide development support to manufacturers/upstream stakeholders. Overall, PG&E focuses on developing standard test protocols and making their expertise or knowledge available. SCE provides the broadest range of action strategies: developing product specifications, holding a competition in support of specifications, collecting market and behavioral intelligence, establishing baseline performance levels, and providing inputs to standards development. SCE has used multiple action strategies within a single TDS. Table 61 shows each of the action strategies from the PIP, binned by an avenue of support created by the Evaluation Team. We binned projects to avenues of support based upon a review of project materials provided by the IOUs.

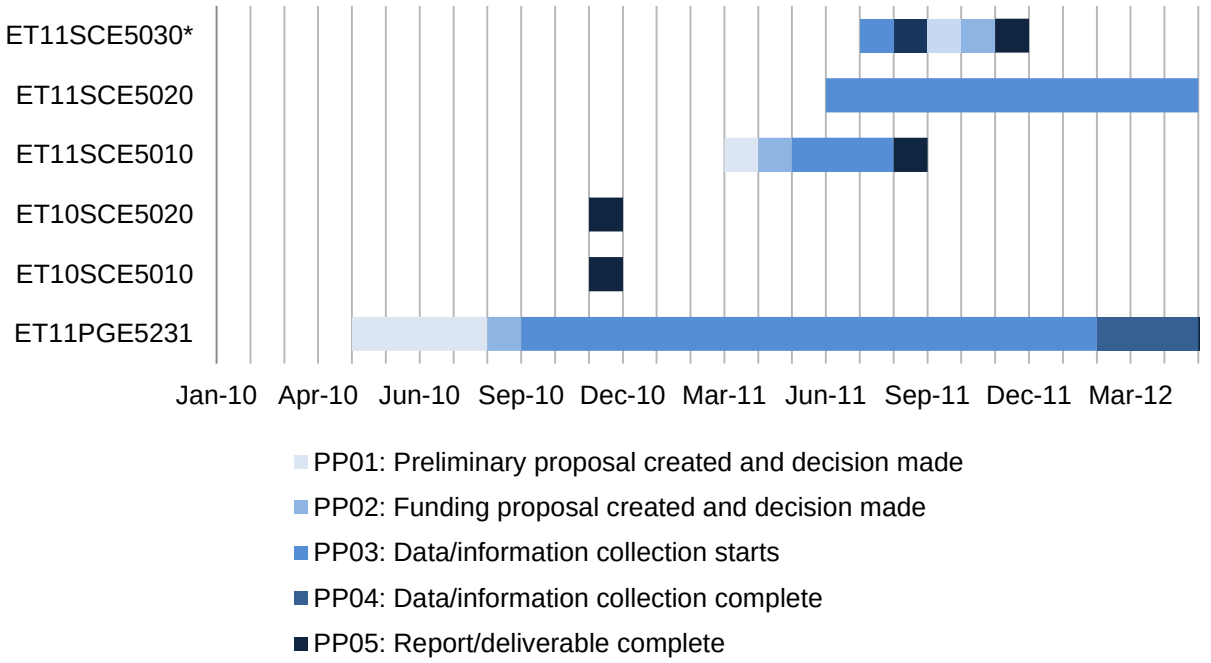
Table 61: Action Strategies Employed by IOUs as of Q1 2012

Avenue of Support	Action Strategy	PG&E	SCE	SCG	SDG&E
Developing Product Specifications and Baselines	Develop open source or proprietary product specifications; competitions may be used to support this strategy		X		
	Establish product baseline performance levels		X		
Testing Protocols and Standards	Develop and disseminate standard test protocols for EE products (support Codes & Standards program)	X	X		
Leveraged Resources	Provide customer contacts for testing and focus groups				
	Make expertise or knowledge available as resources to product developers	X	X		
	Make testing facilities and other infrastructure available to product developers		X		
Other	Collect market or behavioral studies/market intelligence		X		

Figure 29 shows study types with their timelines (by progress point[187]) by IOU. Most of SCE's projects were started towards the end of 2010 or beginning of 2011 and have durations between one to six months (only one project has a longer duration of 11 months – ET 11SCE5020 which is still ongoing). In comparison, PG&E's project began in early 2010 and has a much longer duration of 26 months.

[187] There are five progress points that are used in the ETP database to indicate the stage of the project, from initiation through completion or cancellation.

Figure 29: Timelines for TDS Projects from Progress Points



Source: Q1 2012 ETP DB
* As can be seen from the figure, SCE project ET11SCE5030 progress points do not follow the usual pattern (i.e., PP03 and PP04 occur before PP01)

As shown in Table 62, the projects are mostly concentrated in the commercial sector.[188] Technologies selected for support are predominantly lighting; two projects are for boilers and blowers.

Notably, PG&E staff has revised the classification of projects across program elements over time. In particular,

- PG&E has revised two of the current program cycle projects that were originally classified as a TDS to MBS. These include Commercial HVAC Quality Maintenance Standards Implementation Calibration and Diagnostic Protocol (ET11PGE5261; which, according to program-tracking data, develops an

[188] One project is cross-cutting with the residential sector.

accuracy and calibration specification for the measurement tools required for HVAC Quality Maintenance) and HVAC Quality Maintenance Standards Implementation Behavioral Study (ET11PGE1109; which, according to program-tracking data, is designed to support the successful launch and implementation of the (HVAC) products by providing necessary information on how to best engage customers.)

These findings indicate that there could be greater focus in terms of selecting and identifying a project type for both TDS and other elements. This will help to ensure that projects are aligned with the program theory and will lead to the expected causal outcomes.

Table 62: Technology Development Support Description (as of Q1 2012)

IOU	#	ETP Project Number	Project Name	Residential	Commercial	HVAC	Lighting	Other	Controls	Expected Cost	Initiation Date	Expected Completion Date	Duration in Months	Status
PG&E	1	ET11PGE5231	Partial-Load Boiler Efficiency Test Procedure		X			X		$200,000	Q2 2010	Q2 2012	26	Complete
SCE	1	ET10SCE5010	Internally Illuminated Menu Boards for Multiple Applications		X		X			$10,000	Q4 2010	Q4 2010	1	Complete
SCE	3	ET10SCE5020	Automatic Lighting Controls for Office Applications		X		X		X	$1,000	Q4 2010	Q4 2010	1	Complete
SCE	2	ET11SCE5010	LED Lights for Commercial Pools	X	X		X			$6,500	Q2 2011	Q3 2011	6	Complete
SCE	4	ET11SCE5020	Blower Test Standards		X			X		$5,000	Q2 2011	Q4 2012	1	Ongoing
SCE	5	ET11SCE5030	Hybrid LED/Fluorescent Bi-level Stairwell Lighting		X		X			$10,000	Q3 2011	Q4 2011	5	Complete

Source: Q1 2012 ETP DB and Monthly reports.

10.4 ASSESSMENT OF DESIGN

Per the research questions, this section examines whether the causal theory for the specific element, as described by the IOUs within the PIP and as agreed to through meetings, is plausible. In addition, the evaluation team determined if the impact goals and information needs are defined and obtainable at a reasonable cost.

Through discussions with the IOUs and detailed meetings to document the theory behind this element, the team found the following program rationale as expressed by the ETP staff.[189]

Program Theory: Emerging energy efficient products are limited (supply) in the market and in the energy efficiency portfolio, and technology developers have limited access to market intelligence, testing facilities, and customer feedback to develop their products. The IOUs developed the Technology Development Support element to provide feedback to both private product developers and organizations such as ASHRAE and AHRI. This feedback is intended to help develop performance specifications for new technologies or baseline performance levels for existing technologies as well as give one-on-one feedback regarding product development and market orientation. This will help reduce product and service unavailability by developing standard test procedures and establishing baseline performance levels for emerging technologies to appropriately verify potential energy savings. The expected program outcome is to help support technology development via product specifications, protocols, and standards, and by leveraging IOU support.

Overall, this program element consists of custom projects that employ multiple tactics. The program, as designed, focuses activities across the two specific areas of developing product specifications and testing protocols as well as collaboration or sharing of knowledge. Because of the multiple strategies, there is some difficulty assessing achievement of expected outcomes.

The plausibility of the current outcomes changes based on whether the IOUs work directly with a single market actor or a consortium. When working with a specific partner, the causal link between the short-term to mid-term outcomes is direct and plausible. It makes sense that both the IOUs and the partner are working towards a common goal that will lead to adoption of a more efficient product. The mid-term to long-term outcome causal link is less direct, and while plausible, is difficult to measure. Simply having an additional product available in the market does not mean that customers will adopt the technology, and this link relies on several other market actors taking action before there is an increase in adoption rate. The long-term outcome is dependent upon the transfer of measures from the ETP to the EE portfolio, which is not specifically stated in the theory. If this occurs, then measuring the long-term outcomes can occur if the IOUs track these measures once in the energy efficiency portfolio. Similarly, measuring short-term outcomes relies on the IOUs keeping track of their partner contacts so they are available at a later date for the evaluators to talk with. If this tracking occurs, the costs to assess the outcomes are reasonable.

When working with a consortium, the causal link between the short-term to mid-term outcomes is diffuse simply by the fact that several actors are working towards a common goal. The ability to determine what would have occurred absent the presence of the ETP staff in meetings is less direct.

[189] Note that here we use "program theory" to apply specifically to the theory behind the use of this element.

Evaluators can measure mid-term and long-term outcomes by gathering information about how the specification or baseline protocol is used. Determining if the protocol would have come to fruition relies on understanding how many meetings staff attended and talking with others in the consortium to learn what level of expertise the ETP staff brought to the meetings.

The element includes one other item—collecting market or behavioral studies/market intelligence. The effort has the same expected outcome as projects conducted under the Market & Behavioral Studies element. Because of this, it is recommended that this activity not occur within TDS.

The PPMs for this element cover only one avenue of support and do not fully support intended project outcomes. Because this element provides more support than just through specifications, the program performance metrics should be updated to align with the various development support activities provided through the program element

The current PPMs for PY2010-2012 are (with strikethroughs where we suggest revisions):

- "The number of new performance specifications ~~and/or Use Cases~~ produced as a result of TDS sub-program," where use cases describe the need for a technology or application.
- "The number of new performance specifications ~~and/or Use Cases~~ presented to manufacturers/private industry for possible action," where "possible action" means that the manufacturer/private industry considered TDS results in their product development efforts.

The current PPMs cover only one avenue for support: product specifications; however, this element provides more support than just specifications. We recommend five additional PPMs for consideration:

- Number of new performance specifications produced or underway as a result of TDS. Number of new performance specifications presented to manufacturers/private industry for possible action.
- Number of new protocols created and/or equipment test procedures produced or underway as a result of TDS efforts.
- The type of ETP measures where the IOUs work directly with a single market actor by end-use: a) advance HVAC technologies, b) High efficiency plug-loads and appliances, c) Advanced lighting technologies.
- The number and type of consortiums in which ETP staff members participate with the description of the link between the type of performance specifications ETP staff work on within the consortium.

The last recommended PPMs (type of measures, and number and type of consortiums) distinguish between how the ETP staff engage with single market actors versus consortiums. For single market actors, tracking can occur on a more granular basis (i.e., end-use type), whereas for consortiums this cannot always occur.

10.5 ASSESSMENT OF IMPLEMENTATION

Given the variety of activities employed across the IOUs as well as across projects, this chapter is

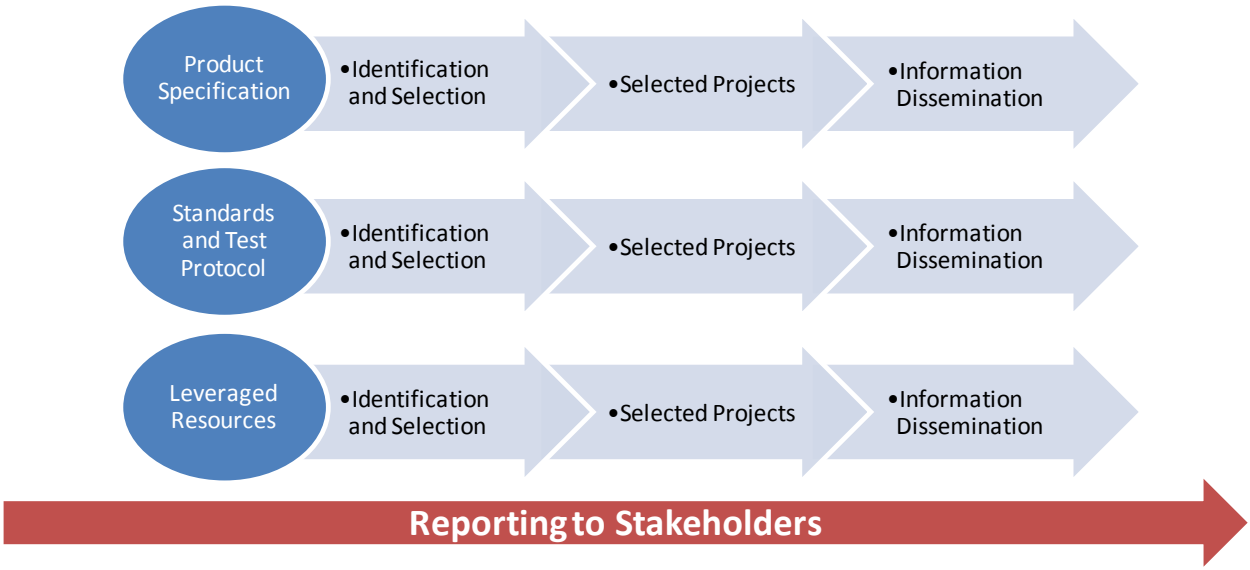
structured to align with the three overarching support avenues discussed above:

1) Product Specifications (Section 10.5.1),
2) Standards and Testing Protocols (Section 10.5.2), and
3) Leveraged Resources (Section 10.5.3)

Overall, the TDS element offers a flexible suite of services, but ETP staff have not utilized all of them. Technology developers may require a variety of support services. The TDS strategies documented in the PIP and provided by the ETP staff are flexible enough to support the goal of increasing technology supply.

While there are several broad categories of services, each IOU varies in the activities employed to provide technology development support. All four IOUs state that their current TDS projects do not use *all* of the action strategies provided in the PIP—a statement borne out by a review of projects. The strategies currently used by the individual utilities include Product Specifications and the Development of Testing Protocols.

Figure 30: Technology Development Support Implementation Approaches



Since many of the action strategies have not been employed across the IOUs, or at all, it is difficult to determine whether the implementation of these strategies has been effective. Early insights are provided below.

10.5.1 DEVELOPMENT OF PRODUCT SPECIFICATIONS AND BASELINES

Evaluation team research indicates that identifying and providing emerging energy efficiency performance specifications is an important area for helping to develop technologies, and that IOU support in this area is valuable.

There are three projects on which the evaluation team has detailed information[190] that focuses on developing product specifications and establishing product baseline performance levels; all are SCE projects. According to SCE, these efforts provide a means to work with manufacturers and vendors to develop specifications that provide improvements or a new design to a product that will save energy and ultimately be used by utility customers. The specifications created through the current projects cover lighting and municipal pumps and blowers. Lighting, in particular, is a key area within the CEESP, although one that is noted to already have several market actors involved. In addition to supporting product specifications, SCE's LED lights for commercial pools also worked with manufacturers to develop standards for the technology.

Specific to "establishing and distributing product baseline performance levels to targeted product developers and partner entities," the PIP does not clearly identify what baseline performance levels refer to, i.e., market baseline performance levels, or product-specific energy efficiency baseline performance levels. Given this lack of specificity, and a review of project documentation for the two projects that incorporate these efforts, we assume that this activity refers to product-specific baseline performance levels. These efforts align with PIP Action Strategies 2.1.1 and 2.1.2 and are employed only in the projects underway by SCE. As such, we review SCE's TDS projects and incorporate a review of their identification and selection process, support provided, and dissemination efforts as of Q1 2012.

Identification and Selection of Projects

According to SCE, the Technology Development Support element provides a means to work with manufacturers and vendors to develop specifications that provide improvements or a new design to a product that will save energy and ultimately be used by utility customers.

While scanning for technologies in need of product specification support ***could*** be broader at the market level, SCE's program manager finds that most opportunities or candidates for TDS are identified during the course of other efforts, such as an industrial customer working with SCE for other programs or incentives. According to their screening tools, TDS projects tend to originate internally after Technology Assessments[191] have been conducted and ETP staff has recommendations for product enhancements to identify a need for development of specifications. As such, while this is still a "push" tactic, it is further downstream than might be expected. Its use in conjunction with the Technology Assessments allows the IOUs to continue to improve on products that have been tested, and

[190] SCE did not include the fifth project in the September data request, as it appeared to begin after that request, so the Evaluation Team does not have details.

[191] For example, SCE's Commercial LED Pool lights project was originally a Technology Assessment. Once savings were verified, SCE developed a set of minimum criteria for application of this technology.

presumably need to be improved. This allows for a useful and interactive feedback loop between the product manufacturer/developer and the ETP staff efforts.

Once a potential project is identified, it is screened. Because SCE identifies projects through Technology Assessments, TDS efforts incorporate selection criteria from the Technology Assessment. SCE, however, has tailored the screening tools for TDS. The tools cover germane topics that help SCE choose relevant projects for TDS. SCE uses two screening tools to determine whether a technology qualifies for technology development support: ET Technology Development Support Proposal, and Technology Development Support Scorecard. The Technology Development Support Project Proposal asks SCE staff to provide a variety of information including a description of the project, expected improvement, market intelligence, and estimated demand/energy savings. For the expected improvement, staff must consider several concepts including SCE's role in technology improvement or product specification development, the deliverables, and if the effort will lead to a Technology Assessment, Scaled Field Placement, or Demonstration Showcase. SCE then uses a scorecard to assess projects with scoring parameters including the ability of the measure to have the potential to reduce energy on a "game changing" level, mitigation of adoption barriers through assisting with the development of technology, availability of infrastructure, and SCE customer involvement. Both ETP staff as well as the ET Steering Committee (Idea Management Team)[192] complete this scorecard independently. For TDS projects, SCE has heavily weighted their choices to the topics of "Big, Bold" and "Barriers to Adoption Mitigation."[193]

Selected Projects

Below is a summary of SCE's TDS projects as of Q1 2012.

[192] The Idea Management team consists of a group of 12–15 EE program manager staff who, among other duties, review ET assessment candidates. They run a clearinghouse process to prioritize potential measures. This process reviews potential measures and ranks them based on portfolio needs, such as residential, business, and program market actor needs.

[193] Specifically, "Does this technology align with the Big Bold Strategies?" and "Will there be adoption barriers mitigated by assisting with the development of this technology?"

Table 63: Product Specifications for TDS

ETP Project Number	Project Name	Effort
ET10SCE5010	Illuminated menu boards	• Commissioned the project to provide reliable and up-to-date market information to fulfill Title 24 requirements. • Created a baseline for current performance and test solutions offered by industry partners for cost-effective, energy savings solutions for replacements. SCE gathered information regarding the number of signs installed, typical hours of operation, and actual energy use. • Developed technical specifications shared with manufacturers and vendors. • Funded a new ET study to test innovative solutions for menu boards. The winning solution from a competition (put to nine industry players to develop product) will be tested in TTC's Lighting lab. • If energy savings are identified, the technology will be recommended for future inclusion in SCE's EE incentive programs.
ET10SCE5020	Advanced lighting controls for offices	• Conducted brainstorming sessions with industry stakeholders. Visited controls manufacturer plants to learn about products. • Performed proof-of-concept and field-testing on controls solutions. • Developed product specifications. • As per SCE, the project may result in Modifications of Title 24 language, particularly regarding controllable ballasts requirements. Adoption will take place in the 2011 code and will go into effect January 1, 2014. • Created utility incentive.
ET11SCE5010	LED Lights for Commercial Pools	• Provided funding for testing of LED pool light technology for a supplier of swimming pool, spa, and aquatic equipment, including energy savings, color rendering index, lumen output, and maintenance concerns, among others. • Developed technical specifications for the technology. • Worked with pool light manufacturers to develop baseline criteria required to allow these pool lights to become one of the measures to be included in their suite of EE rebate programs. • The project resulted in quantification of expected savings over incandescent bulbs, and codifying standards of efficiency for SCE rebate programs. Results are stated to be used to create new utility incentives.

The PIP notes that this type of effort could be "most effective if the opportunity exists to tie future

rebates or other incentives to the specifications."[194] One of the three projects is designed to lead to the development of utility incentives, and the others may be used as such.

Further, these specifications may also "contribute to competitions to develop new product concepts/meet specifications." SCE employed this effort, i.e., create competitions to meet specifications, via the Illuminated Menu Boards projects, which developed product specifications and had nine manufacturers develop products for selection of testing in lab facilities.

Information Dissemination

According to the PIP, the IOUs' outputs for these efforts include producing open source or proprietary disseminations, and distributing baseline level reports to targeted product developers and partner entities.[195] SCE developed an array of deliverables targeted to the product developer/manufacturer related to establishing product baselines and product specifications. These deliverables provide recommendations for product enhancements or development of specifications.

SCE actively supported projects through an ongoing commitment of resources and time. For the Illuminated Menu Boards project, SCE conducted at least five meetings from 2005 to 2010 with sign industry and major lamp ballast manufacturers. In addition, they developed a white paper that chronicles their efforts to support the technology.[196] For the Advanced Lighting Controls for Offices project, SCE conducted at least 20 meetings with lighting manufacturers, other utilities, government entities, and other industry partners. In addition, SCE developed another white paper that documents five years of efforts to develop lighting controls systems with industry partners. For the LED Lights for Commercial Pools project, SCE developed a report that provides minimum performance criteria for LED pool lights.

The reporting for this element is understandably less than other program elements. However, we suggest that documentation be formalized to include project results, participant/consortium contact information and project selection criteria. Formalizing documentation will provide consistent findings across projects, and will also support subsequent measurement of program impacts. If the specification is open source, the IOUs should disseminate the information widely; otherwise, this document would be used by the CPUC and the evaluation team to better understand activities in this element.

Currently, the IOUs update project data in the ETP database quarterly and provide monthly expenditures by project to the CPUC. The ETP database contains a substantial amount of information, but best supports counts of what is occurring. The IOUs should consider incorporating a field to describe the type of TDS project occurring by avenue of support (i.e., product specification, protocol development, etc.).

[194] PGE2108 ET SW PIP 01-2011 no redline.pdf; 25. SCE-SW-009 Emerging Technologies.doc pp. 790; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

[195] PGE2108 ET SW PIP 01-2011 no redline.pdf; 15. SCE-SW-009 Emerging Technologies.doc pp. 780; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

[196] It is unclear who the target audience is for the white papers that were developed.

10.5.2 DEVELOPMENT OF STANDARDS AND TEST PROTOCOLS

As with specifications, research indicated that testing products and practices in advance of Codes & Standards is a key area for IOU activity. PG&E and SCE have employed this strategy through Q1 2012 through three projects (see Table 64). While development of standards and test protocols is a long-term activity (it can take two years or more for any code change to move through the process at the California Energy Commission), the IOUs are well positioned to provide this type of support through this element.

Identification and Selection

SCE has a tailored approach to identifying and selecting projects for TDS. The SCE approach was documented earlier in Section 10.5.1 and is not repeated here. PG&E identifies TDS projects through their product managers and Codes & Standards group. Both PG&E groups scan for potential technologies (as well as gaps in existing technologies) to incorporate into an ETP project through Technology Assessment or Technology Development Support. PG&E uses its ETOS tool to score potential Technology Development Support projects. The ETOS selection tool was developed for Technology Assessments and has not been tailored to support the selection criterion and intended outcomes for the Technology Development Support program element. As such, the tool includes criteria that are not relevant to Technology Development Support. The choices within the tool appear to bias choices towards projects with low risk (meaning that technologies that are further upstream are less likely to be selected), yet these technologies may be the good candidates for standards or test protocols.

Support Provided

As of Q1 2012, PG&E and SCE have used the TDS element to help fill a need for new technology or standards that are not in the marketplace today. Overall, there has been one type of effort as of Q1 2012: efforts that encourage development of reach codes. For this effort, the IOUs can help lead the development of more efficient codes and standards through the development of EE testing protocols. Testing protocols provide information to codes and standards decision-makers regarding emerging technologies, as well as provide information to manufacturers to develop products that are more efficient than existing codes and standards.

The PG&E project focuses on developing protocols to encourage reach codes. For SCE, one of their five[197] projects focuses on developing test standards to encourage reach codes. As shown in the table below, one effort also used a Market & Behavioral study in support of standards and test protocols development. Table 64 provides a summary of projects in support of the development of standards and test protocols as of Q1 2012 by effort type.

[197] We discuss three of SCE's five projects in Section 10.5.1. For the remaining project, ET11SCE5030 "Hybrid LED/Fluorescent Bi-level Stairwell Lighting," the Evaluation Team does not have sufficient information from the ETP database to determine the avenue of support offered to the manufacturer.

Table 64: Development of Standards and Test Protocols for TDS

Effort Type	ETP DB Project Number	Project Name	Effort
Protocols to Encourage Standards & Codes	ET11PGE5231	PG&E's Part-Load Boiler Efficiency Test procedures	• PG&E initiated the Part-Load Boiler project to establish a test procedure to determine the part-load efficiency of commercial boilers, as the federal and state minimum efficiency standards are based on tests performed at full load capacity of the boiler. • Findings from the study will be used to draft a recommendation to the ASHRAE 155 committee to establish an approved test procedure. • Expected results include adoption of the procedure, and the development of a new efficiency standard for boilers implemented by US DOE and subsequently California's Title 20 and 24 standards.

Effort Type	ETP DB Project Number	Project Name	Effort
Protocols to Encourage Reach Codes	ET11SCE5020	SCE's Municipal water system blowers and pumps test standards	• SCE identified opportunities to develop product specifications towards the creation of a new test standard for blowers. SCE partnered with CEE to influence the Compressed Air and Gas Institute (CAGI) to develop a "wire-to-air" testing standard for blowers, through providing a utility perspective and technical assistance to develop the standards. The CEE is a consortium of efficiency program administrators from across the U.S. and Canada who leverage their expertise and funding to facilitate advancements and standards in energy efficiency. • In partnership with the private nonprofit Efficiency Vermont, and due to their involvement with ETP, SCE was able to use market data gleaned from the Market & Behavioral Study element to make a case to the CEE for the market opportunity for efficient municipal water system blowers and pumps. As a result of this effort, CEE then helped to support lab testing and collaboration with industry leaders to develop standards and protocols. • SCE also worked to verify partner technology specifications to be able to confirm product efficacy before potential inclusion in an SCE rebate program. SCE used this data to address the concerns of California EE stakeholders. • Because of their efforts, CEE brought a draft of reasonable standards (backed by MBS and TDS data) to the CAGI global trade group, who has further refined these efforts and should be releasing a global standard in early 2012. These standards can then in turn be used by SCE to inform their EE programs.

The first effort shown in the table above, PG&E's ET11PGE5231 "Part-Load Boiler Efficiency Test Procedures," encourages reach codes by assisting manufacturers to develop products that go beyond current energy savings benchmarks. This aligns directly with longer-term CEESP goals by increasing technology supply for energy efficient products. The measurement tool effort supports new standards through enabling the standard to be enforced.

Specific to developing testing procedures, encouraging reach codes through testing standards and protocols requires coordination and collaboration with a variety of entities, including Codes &

Standards programs, upstream partners/manufacturers, and entities involved in research and development. This type of coordination is occurring. PG&E coordinated with the Codes & Standards program and leveraged funding for the Part-Load Boiler Efficiency Test Procedures project; ETP dollars are being used to fund the testing and creation of the test method development and report. Additional funding was also provided from the Codes & Standards program. The project was initiated and developed under a contract managed by Codes & Standards, where the ETP was tasked with funding the testing and creation of the test method development and report.

Dissemination

As with the specifications area, the IOUs actively supported their projects through an ongoing commitment of resources and time, and disseminated their research to appropriate groups. PG&E developed a final report and presentation with recommendations to the ASHRAE 155 Committee for the Part-Load Boiler Efficiency Test Procedures project. SCE developed a variety of PowerPoint presentations that discussed the need for water pump and blower test standards. In addition, SCE attended at least seven meetings with CEE industry players for the project.

Information dissemination for encouraging reach codes or testing protocols is different from other areas as the group of market actors involved can be smaller and very targeted. Both reach code projects worked within different consortiums to help pass a code. The IOUs should continue to work with the codes and standards process at the CEC to assure that changes occur at the state level. This CEC effort should be shepherded through the process by the IOU Codes & Standards group, not the ETP.

As with the specifications area, there is variation in terms of final deliverables for TDS efforts, which is consistent with the variety of support provided. However, at the close of each project, documentation regarding efforts conducted, as well as contact information for entities involved in the project, should be required to educate stakeholders regarding the effort, to inform the CPUC-ED, and to support evaluation activities.

10.5.3 LEVERAGED RESOURCES

Providing access to IOU leveraged resources can support technology development, if targeted well. Leveraged resources is used to define the following Action Strategies: providing customer contacts for testing and focus groups, making expertise or knowledge available as resources to product developers, and making testing facilities and other infrastructure available to product developers.

While all IOUs are lending their expertise as part of any project that they perform, none of the IOUs have solely provided these Action Strategies. As such, there are no specific projects counted as "Leveraged Resources" within this report. According to the PIP, the Action Strategies provide a list of outputs that document efforts. If these action strategies were deployed by any of the IOUs within the remaining 2010-2012 period, the evaluation team would expect to see the outputs shown in the table below.

Table 65: Action Strategies and Related Outputs for Leveraged Resources

Action Strategy #	Strategy	Output

Action Strategy #	Strategy	Output
2.1.4	Provide customer contacts for testing and focus groups	A list of customers who have agreed to share contact information with technology developer
2.1.6	Make expertise or knowledge available as resources to product developers	Produce activity report for time charges incurred by ETP
2.1.7	Making testing facilities and other infrastructure available to product developers	Produce an activity report for testing and other infrastructure support

10.6 SUMMARY OF RECOMMENDATIONS FOR TECHNOLOGY DEVELOPMENT SUPPORT

The recommendations for Technology Development Support fall into four of the overarching categories, which are summarized below:

- **Focus outcomes: TDS projects focus on dual outcomes (development of product specifications and reach codes and standards development). Move market intelligence activities to Market & Behavioral Studies element (or projects)**. Focusing on intended project outcomes will help the ETP program staff to demonstrate the effects of the project and help to assess program impacts.

  The PIP indicates that the intended outcomes for Technology Development Support are to "contribute to increased readiness and availability of EE measures for customers and EE program managers and reduced uncertainties for program participants."

  Placing market intelligence activities under the MBS program element will allow efforts to be assessed for an increase in market knowledge, rather than the proposed PPMs, which is the number of performance specifications and protocols or test procedures developed and produced.

- **Coordinate and tailor scanning and screening: Incorporate program avenues of support in selection tools.** Enhancing screening and selection tools ensures that project selection will meet expected program outcomes.

  Currently, SCE is the only IOU that has a tailored screening tool for projects with these expected outcomes for TDS avenues of support. We recommend that the IOUs consider incorporating the following items into two unique selection tools that reflect the intended outcomes of TDS projects:

  - Product Specifications: Currently, the primary source for TDS projects having to do with product specifications are through Technology Assessments. The Product Specification tool should incorporate:
    - Other project identification strategies in addition to TA candidates. This could be consideration of technologies not planned for TA, but known to lack efficient specifications.
  - Protocols and Standards: The protocols and standards tools should incorporate:
    - Description of the need for testing protocols and updating standards
    - The target stakeholders/decision-makers who will support the new standards and testing protocols developed as part of the project
    - Value statement for how the effort will support the development of reach codes (we recommend providing greater weight to efforts that incorporate a group of stakeholders (i.e., work with a consortium of interested parties)) and provide open source testing protocols.

- **Enhance reporting: For TDS, formalize documentation to include 1) results from the project, 2) contact information, and 3) project selection criteria.** Formalizing documentation will provide consistent findings across projects, and will also support subsequent measurement of program impacts.

  Reporting already occurs for TDS projects; these include meetings, white papers, and reports. For example, PG&E's Partial Load Boiler Efficiency Test Procedure project (ET11PGE5231) will be used to draft a final recommendation to the ASHRAE 155 committee to establish an approved Test Procedure. SCE's Internally Illuminated Menu Boards for Multiple Applications project (ET10SCE5010) are distributed to the California Sign Association (CSA), the International Sign Association (ISA), and major lamp and ballasts manufacturers to encourage the development of more efficient signs.

- **Improve tracking: Project tracking should incorporate the TDS type, i.e. product specification, protocol development, or other.** As part of assessing program outcomes, this information is valuable to the ETP to assess whether the project led to increases in market traction over time. The ETP database does not contain variables that permit the ETP staff to describe the target type of TDS project.

11. TRIO

11.1 TRIO DESCRIPTION

The Business Incubation Support element, known as Technology Resource Incubator Outreach (TRIO), provides outreach and networking opportunities through events that offer information regarding the IOUs' demand-side management rebate and incentive processes, as well as the Emerging Technologies Program. The PIP identifies two goals for the TRIO program element:

- **Goal 1:** Contribute to the market transformation with efforts that accelerate the commercialization of energy-efficient measures. The objective for this goal is to "reach out to five universities, PIER, three investors, and other research organizations to solicit innovative EE concepts, then screen those measures and bring them in as potential program participants."[198]
- **Goal 2:** Provide transparency of each IOU's demand-side management rebate and incentive processes. The objective for this goal is to "provide three (3) workshops per year, rotating between IOUs, on 'how to' do business with utilities."[199]

This program element was originally designed "to accelerate the successful development of technologies through an array of engineering support, resources, and services, which are developed and orchestrated by TRIO and offered through both TRIO and its network of contacts."[200] Currently, TRIO does not provide training or engineering support. As implemented, TRIO is an outreach and educational effort designed to educate entrepreneurs and investors on how utility programs work, while allowing the IOUs to scan the marketplace for new technologies.

TRIO holds two types of events: symposiums and roundtables. The program has held nine events as of Q1 2012. The purpose of the symposium is to introduce the utility's energy efficiency and demand response programs to symposium attendees. The roundtable is intended to follow the symposium, providing a "deeper dive" into how an entrepreneur can work with IOUs. Participants are not screened in advance of events.

ETP program staff stated that TRIO contributes to the ETP by increasing the visibility of the IOU and the IOU's energy efficiency and demand response goals among entrepreneurs and investors. In addition, program staff state that the TRIO activities can result in the following outcomes:

- Development of partnerships between investors and entrepreneurs
- Contribute to shorter commercialization time for a new technology to reach the market

[198] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: OGE2108 ET SW PIP 01-2011 no redline.pdf; 15. SCE-SW-009 Emerging Technologies.doc pp. 780; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc

[199] Ibid.

[200] Ibid.

- Adoption of new technologies into the ETP, energy efficiency portfolio, and third-party programs

- Additionally, SCE began a pilot effort called Technology Research Incubation Pilot (TRIPP) late in 2011. This pilot, approved by the CPUC, helps find, fund, and foster innovative technologies through a competitive solicitation process. This open solicitation will quickly bring to market innovative technologies while leveraging the collaboration between entrepreneurs and private investors. TRIPP was not part of the evaluation described in this interim report

11.2 TRIO EVALUATION METHODOLOGY

We assessed this element using data provided by the IOUs. This information was provided through interviews and program materials requested in September 2011. This report incorporates additional information from the ETP database Monthly Reports[201] as well as event-cost budgets from the IOUs provided to the CPUC-ED as of April 2012. Table 66 describes other data collection activities.

[201] IOU Monthly reports are provided on the Energy Efficiency Groupware Application webpage: http://eega.cpuc.ca.gov/

Table 66. TRIO Data Collection Activities

Data Collection Activity	Description
In-depth Interviews	Conducted 3 in-depth interviews with the 4 IOUs in May 2011 and again in October 2011.
Program Material Review	Reviewed the following materials: • Attendance lists from symposiums and roundtables • Survey data collected by IOUs at TRIO events • Materials from TRIO events (presentations, handouts)
On-Site Observation	• Attended PG&E TRIO Round Table at Pacific Energy Center on August 30, 2011 • Attended SCG TRIO Symposium at SoCalGas Energy Resource Center on February 28, 2012
Evaluability Assessment	Two workshops and ongoing in-depth interviews with the 4 IOUs to identify program theory and logic model as well as potential performance indicators for each element.
In-depth Interviews with Investors and Entrepreneurs	Three interviews with investors and three interviews with entrepreneurs who work in the California energy efficiency market, to learn more about how they interact with funding sources and IOU energy efficiency programs. Through conversations, explored the role that TRIO plays in the market and searched for other organizations that do similar work. Using a snowball sampling approach, the Evaluation Team was put in touch with the first contact through a personal network and then asked each contact for a referral to another person in the field. Two of the 6 interviewees had attended a TRIO event.
Observation of I4E[a] conference	The Evaluation Team observed an I4E workshop on September 29, 2011 that presented ongoing energy research in the i4Energy Center research programs, funded by the CEC's PIER program. There were approximately 50-60 attendees.

[a] I4E is a collaboration between CITRIS, LBNL, and CIEE, focusing on research in the following areas: 1) facility loads that include clean local generation and storage; 2) a fully instrumented transmission (high-voltage) system that supports diverse supply, intermittent supply, and demand variations; 3) an automated distribution (medium-voltage) grid that automatically supports clean distributed energy resources (DER) and includes micro-grids and underground cable networks; 4) instrumented and controllable commercial and residential buildings.

11.3 DESCRIPTION OF PROJECTS AND STATUS AS OF Q1 2012

The TRIO PIP objective is to hold three events per year rotating between the IOUs. Although only two years have passed and six events were expected, TRIO has already met this objective by hosting nine events from January 2010 through March 2012. Three of these events occurred in 2010, five in 2011, and one in 2012 as of Q1 2012.

Table 67: TRIO Objectives

IOU	From the 2011 Program Implementation Plan Objectives	Hosted Events as of Q1 2012
PG&E	3 events per year rotating between IOUs	3
SCE		3
SCG		1
SDG&E		2
Statewide	**9 over three years**	**9**

In total, approximately $1.2 million of the ETP program budget of $43 million (~3%) is targeted to TRIO, although the exact number is unknown since SCG and SDG&E do not track budgets specifically for program elements. Based on the expenditure data on the EEGA website, the total spent on TRIO from March 2010 through March 2012 (May 1 for PG&E) on the nine events is >$462,732, a small fraction of the budget allocated to this effort. This element's current expenditures are substantially under the expected budget for the program cycle. Because the implementation of TRIO has shifted to focus primarily on event-based education and outreach, rather than screening, soliciting, and bringing in potential program participants, the budget for this effort should be revised downwards to reflect actual event costs. This is also supported by the fact that the program has exceeded its event goals, but has spent only 39% of the program budget. Table 68 shows the program expenditures as reported in the ETP database.

Table 68: TRIO Element Budget and Expenditures by IOU as of Q1 2012

IOU	2010-2012 Program Revised Budget[a,b]	Program Expenditures (Inception-To Q1 2012)	Percent of Budget Spent as of Q1 2012
PG&E	$282,312	$88,062	31%
SCE	$906,528	$374,670	41%
SCG	SCG does not report expenditures by element in the ETP database.		
SDG&E	SDG&E does not report expenditures by element in the ETP database.		
Partial Total	**>$1,188,840** (does not include SCG and SDG&E)	**>$462,732** (does not include SCG and SDG&E)	**39%** (does not include SCG and SDG&E)

[a] Element budgets reflect those reported in the ETP database Expenditure by Program file of March 2012. These are as follows: PG&E 3/12/2012 Monthly Report "PGE.MN.201112.3", SCE 4/2012 Monthly Report "SCE.MN.201203.1", SCG 4/2012 Monthly Report "SCG.MN.201203.1", and SDGE 4/2012 Monthly Report "SDGE.MN.201203.1" accessed here: http://eega.cpuc.ca.gov/ on 5/23/2012. Note that Sempra does not track their program by element.

[b] The 2010-2012 Program Revised Budget is consistent with the Fund Shift Report updated on April 12, 2012 and excludes rebalanced budget from AL 3235-G-3901-E.

Table 69 provides an overview of the events as of Q1 2012. Note that the total event costs ($172,807) are sourced from the program materials requested in September 2011 and do not include labor costs.

Average costs per symposium and roundtable are $28,045 and $10,860, respectively.

Table 69: TRIO Events Description

IOU	Event #	Event Type	Event Location	Total Event Cost by IOU	Event Date	# of Attendees - Symposium	# of Attendees - Roundtable
SCE	1	Symposium	UC Santa Barbara – Bren School of Environmental Science, Santa Barbara	$23,800	March 12, 2010	117	-
SCE	2	Roundtable	Wilson Sonsini's Law Offices, Palo Alto	$9,500	May 26, 2010	-	36
PG&E	3	Symposium	UC Berkeley – Banatao Auditorium, Sutardja Dai Hall, Berkeley	$23,800	September 12, 2010	94	-
SDG&E	4	Symposium	UC San Diego, La Jolla	$30,545	January 27, 2011	158	-
SDG&E	5	Roundtable	UC San Diego Faculty Club, La Jolla	$13,262	March 2, 2011	-	11
SCE	6	Symposium	UC Irvine – Calit2 Building, Irvine	$29,800	May 12, 2011	93	-
PG&E	7	Symposium	UC San Francisco – Mission Bay Conference Center, San Francisco	$32,282	July 12, 2011	168	-
PG&E	8	Roundtable	Pacific Energy Center, San Francisco	$9,818	August 30, 2011	-	30
SCG	9	Symposium	SoCalGas Energy Resource Center, Downey	NA[a]	February 28, 2012	NA[a]	NA[a]
			Total	**$172,807**		**630**	**77**

Data Source: Emerging Technologies Phase I Data Request #5; Monthly Data Request as of March 2012 or April 2012.
[a] Note that neither event cost nor attendee information for the latest Symposium held in February 2012 was provided to the Evaluation Team.

TRIO has successfully achieved program element objectives. TRIO has surpassed its objective of three events per year, holding nine events (six symposiums and three roundtables) in 2010-2012. Overall, 630 participants have attended the symposiums and 77 participants have attended the roundtables since 2010 (note that participant totals exclude the latest event).

11.4 ASSESSMENT OF DESIGN

This section examines whether the causal theory for the specific element, as described by the IOUs within the PIP and as agreed to through meetings with the IOUs, is plausible. In addition, we determine if the impact goals and information needs are defined and obtainable at a reasonable cost.

The IOUs articulated the following program theory[202] for the 2010-2012 program cycle. This language was arrived at through multiple meetings with the IOUs.

> **Program Theory:** *The marketplace of emerging technology entrepreneurs and investors lacks a comprehensive understanding of how to work with IOUs as well as how working with the IOUs could potentially increase the sale of their products. Entrepreneurs and investors are not aware of the IOUs' areas of interest or needs for innovative solutions in the effort to meet their energy efficiency goals. The IOUs could benefit from a greater understanding of the technologies entrepreneurs are working on that could fit into EE portfolios. Additionally, entrepreneurs lack access to investors interested in energy efficiency technologies. Further, the investor community may not be aware of the market created by the interest that IOUs have in bringing innovative emerging technologies into their EE portfolios and the effect this may have on their investment opportunities.*
>
> *TRIO encourages alternative program delivery methods by providing third-party implementers with the same support provided to entrepreneurs: education on the interests and needs of the IOUs, and networking opportunities with investors. TRIO provides a bridge to increase different program delivery methods and designs.*
>
> *One objective of the ETP is to scan for emerging technologies. TRIO acts as one of the links between emerging technology market actors (e.g., entrepreneurs and investors) to provide information to help to increase the number of potential emerging technologies of which ETP staff are aware. Furthermore, once entrepreneurs understand the program processes, they will see the advantage of participating in ETP and are more likely to consider submitting proposals and technology briefs to ETP at some point in the future. Increasing the pool of measures of which ETP staff is aware and increasing the number of proposals and technology briefs submitted by entrepreneurs may increase the number of measures available for Technology Assessments. As investors become more aware of the market created by IOU EE portfolios, they may see additional value in building relationships with entrepreneurs and/or third-party program implementers.*

In examining the design of this program element, there are two types of events: symposia and roundtables. Based upon interviews with program staff and observations of events, these two events are distinct in design, but redundant as implemented.

By design, within each type of event, the following activities occur—networking, education, and scanning. The causal outcomes for these activities are plausible, but they are weak and need to be strengthened to support the design. The table below summarizes activities and key findings.

[202] Note that here "program theory" is used to apply specifically to the theory behind the use of this element. The program theory is an *implicit* theory, that is, the current actions are presumed to accomplish their purposes and bring about change, but how the change occurs is not fully articulated by staff, nor have any changes been tested through evaluation methods.

Table 70: Activities Employed by TRIO

Activities	Description	Expected Causal Outcome	Who Benefits?	Finding
Networking with Investors	Provide networking opportunities for upstream market actors including, but not limited to, investors and entrepreneurs, to build relationships	Partnerships between investors and entrepreneurs will contribute to shorter commercialization time for a new technology through the provision of funding and support	Investors, entrepreneurs, other targeted market actors	Plausible design, but unlikely to get to expected causal outcome as implemented. Also redundant in current form. Suggest greater targeting by stage of development.
Education	Educate upstream market actors about how to do business with the IOUs	Market actors who work with the IOUs have shorter commercialization time for new technologies	Upstream market actors, ETP	Plausible design, but unlikely to get to expected causal outcome as implemented.
Scanning for New Technologies	Identify and scan for promising energy efficient technology candidates for incorporation into the IOU portfolio (via ETP, EE, or third-party programs)	Adoption of new technologies in ETP, EE portfolio and third- party programs	ETP, IOU EE portfolio, third-party programs	Plausible design, but should exist within existing ETP scanning efforts (i.e., ET Open Forum). Could be more targeted by stage of development and key end-use.

Next are more details about each activity.

Networking with Investors

Networking provides opportunities for investors to identify, and potentially finance or provide services to, promising energy efficient technologies. The targets of these efforts, therefore, are: investors, entrepreneurs, and other targeted market actors. The expected outcome is that partnerships between investors and entrepreneurs will contribute to shorter commercialization time for a new technology through the provision of funding and support. This activity may contribute to a shorter commercialization time for a new technology to reach the market. However, the type of investment often varies based on the stage of the technology within the product development cycle.

The networking component is plausible in its design, but unlikely to get to expected causal outcome as implemented as the type of investor and entrepreneur are not as linked as possible. It is also redundant with the efforts of other market players in its current form. As such, it needs to be more targeted by the specific stage of development to add value to the market. Additionally, it may be costly to determine the impact of this component due to small numbers involved and the expense and difficulty of tracking entrepreneurs over time. Private investment tends to follow a timeline consisting of the following:

- **Early Investment from "the three F's"**: friends, family, and fools. The entrepreneur receives small amounts of funds from those within their personal network for early business and technology development. Often well-connected entrepreneurs or entrepreneurs working within the context of a larger company that provides seed funding will skip this step. As the name states, this type of investment occurs early in the product development cycle.

- **Angel Investing**: Angel investors are often investing their own money in exchange for convertible debt or equity in the company. Angel investing typically occurs early in the product development cycle.

- **Venture Capital Funding**: Entrepreneurs may receive a larger amount of private investment in a venture round of funding. This funding typically is for near market-ready technologies and may come in several rounds (Series A, Series B, etc.) Generally, the amount of money increases in each round and represents less risk if the company is doing well.

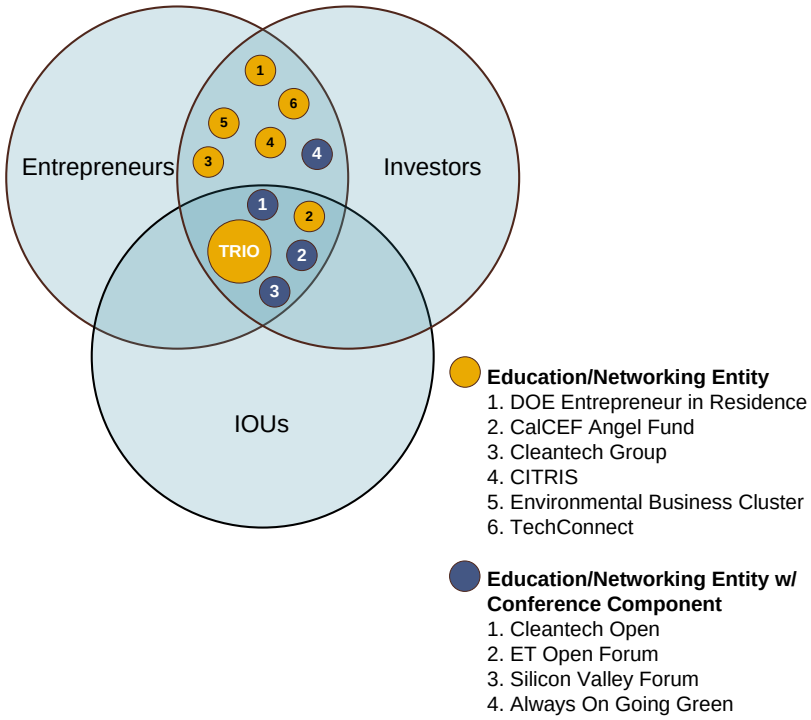
Private funding through investors is not the only source of support for new technologies. Interviewed entrepreneurs indicated that public funding was seen to play an important role, but was viewed more as a "parallel effort" to obtaining private funding.

Interviewed investors and entrepreneurs noted that the California Cleantech Open[203] already provides substantial networking opportunities, as well as assistance to funding-seekers (including writing business plans, quantifying the market, etc.) to the targeted market actors (i.e., investors and entrepreneurs). Online research revealed that at least 11 entities (including TRIO) in California bring entrepreneurs, investors, and/or IOUs together, in-person to provide education and networking opportunities focused on the energy efficiency or demand response market in California.[204] Figure 31 shows these 11 entities with the dark blue circle indicating entities that organize conferences as part of their educational activities.

[203] The California Cleantech Open is an entity whose mission is "to find, fund, and foster the big ideas that address today's most urgent energy, environmental, and economic challenges." They organize a competition in which competitors with business ideas that solve energy, environmental, or economic challenges can win over a million dollars to continue developing their business. (http://www.cleantechopen.com/app.cgi/content/about/index)

[204] Entities do not include individual investors, grant makers, entrepreneurs, or IOUs. The list also does not include entities working in the field of renewable energy, or entities that focus on education or networking that is not conducted in-person, such as online networking sites.

Figure 31. Map of Other Entities Providing Similar Services as TRIO



Not all investors rely on in-person networking (i.e., conferences) to identify new technologies; rather many rely on their existing network of contacts to find investment opportunities, or work with entrepreneurs with whom they have a working relationship. One investor noted he prefers not to attend conferences,

> *We get invited to a lot of conferences and we don't typically do many of those… In the first couple of years we went to a number of them, but again we just found that there was always a one-size-fits-all approach and it didn't work terribly well for us. We have enough deals to look at through recommendations and our own pipeline. -- Investor*

As such, reasons for investors to attend TRIO events may be limited, yet this is a key causal component that is supposed to help assure the shortening of the time to commercialization for these products. Additionally, interviews with ETP staff support this finding; staff noted that engaging the investor community is a key challenge for the program element.

As designed, the networking component of TRIO is redundant as several entities host events bringing together entrepreneurs, investors, and IOUs. If the IOUs were to adjust the design of TRIO to focus on networking activities by specific stages within the product development cycle, then the causal outcomes would likely improve and redundancies would diminish.

Measuring expected outcomes that result from networking can be difficult. It can be very hard to tease out and identify partnerships that resulted from networking and then attribute these relationships to events, as well as measure effects over time (i.e., funding or services can be received at any point in the future). Keeping lists of participants and following up through regular surveys is the most reasonable

approach for data collection around this outcome.

Education

TRIO events provide information about each IOU's demand-side management rebate and incentive programs through "providing three workshops per year, rotating between IOUs, on 'how to' do business with utilities." These workshops (currently called symposia and roundtables) provide information about IOU technology interests as well as steps to working with the IOUs to get access to rebates or incentives for a technology.

Based upon investor and entrepreneur interviews, the TRIO events are unique in that they provide significant detail regarding the IOUs. Other existing energy efficiency networking events in California do not typically provide this information. Interviews also indicate that both industry newcomers and those with extensive experience in the field want a better understanding of the process of working with IOUs, particularly because there is a perception that it is difficult to understand and navigate through this process (based either upon their own experience or upon what they have learned through word of mouth). In particular, investors and entrepreneurs noted that they were most interested in learning more about IOU Energy Plans, Technology Strategies, Technology Needs, and contact information.

The education component of TRIO is unique and useful. It is plausible, and follows accepted theory, that education (i.e., being introduced to the ins and outs of working with the IOUs) would increase the likelihood of an entrepreneur working with the IOUs. Other forms of communication aside from an in-person event such as a webinar or information on the ETCC website may be less costly and achieve the same educational objective. Hosting three events per year that rotate throughout the geographic regions in the state allows for parity. However, the IOUs should consider other options for increasing education, including the other forms of communication stated above.

Measuring expected outcomes from the education component is easier than for the networking component and involves conducting surveys of event attendees.

Scanning for New Technologies

TRIO symposium and roundtable events offer the IOUs an opportunity to scan for candidate technologies to incorporate into the IOU energy efficiency portfolio or third-party programs (if close to commercialization) or into the ETP (less dependent on commercialization due to multiple elements within ETP that work across technology development timelines). However, this opportunity is limited in the current implementation since the focus of events is to inform participants of how to work with the IOUs.

There are scanning efforts that already exist for the ETP; these include the Emerging Technologies Summit, the Emerging Technologies Open Forum on Energy Efficiency Innovations, and outreach to external stakeholders such as EPIC, national labs, U.S. Department of Energy, etc. (These scanning efforts are not through TRIO.)

- The *Emerging Technologies Summit* is a biennial conference on advanced technologies and implementation approaches sponsored and hosted by the ETP through the Emerging

Technologies Coordinating Council.[205] According to the website, the summit highlights recent developments and best practices to generate and validate new measures and practices for utility and government programs, with the intended audience being technologists, entrepreneurs, researchers, utilities, regulators, and investors.

- The *Emerging Technologies Open Forum on Energy Efficiency Innovations* or ET Open Forum, is an ETP scanning activity that occurs in person or via webinar twice a year. The goal is to use these forums as platforms for companies to meet and create synergies with their technologies. The agenda typically includes an introductory presentation of the ETP objectives, types of technologies likely to be included in the EE portfolio and their attributes (savings, scalable potential, focus on behavioral changes, and alignment with CEESP goals). The remaining presentations are from companies introducing their EE technologies to the ETP staff. ETP staff asks questions to determine whether a particular technology is worth considering for the ETP portfolio. Events like this could be used for scanning by other external stakeholders such as the Electric Program Investment Charge (EPIC)[206] or the national labs.

- IOU staff attends and judges Cleantech Open competitions with the opportunity to scan for potential technologies.

As such, TRIO events are one of many channels through which the ETP program staff currently scans for new technologies. Since there are several avenues already open for scanning, we recommend that the IOUs drop the expectation of scanning through any TRIO event and expand the ET Open Forum to meet this purpose. This is not to say that scanning opportunities may not arise from TRIO, only that there is no planned outcome related to scanning within TRIO.

The IOUs should hold events organized by end-use and technology development stage to focus the event and ensure success.

- Create events by technology development stage (i.e., proof of concept to market ready) as well as around end-use type. Once the IOUs identify the stage and technology type, then the range of investors, entrepreneurs, and external stakeholders can be better identified for outreach. Screening by technology type can help to ensure a focused event and recruitment of relevant external stakeholders (i.e., Sempra currently promotes gas technologies, and could recruit external stakeholders from the Gas Technology Institute and other market actors operating

[205] The Emerging Technologies Coordinating Council (ETCC) coordinates the efforts of member utilities to assess and implement cutting edge, energy efficient technologies. ETCC members include: Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric (SDG&E), Southern California Gas Company (SCGC), Southern California Edison (SCE), Sacramento Municipal Utility District (SMUD), and California Energy Commission (CEC). The ETCC is supported and advised by the California Public Utilities Commission (CPUC). The ETCC's efforts are driven by California's "Big Bold" Energy Efficient Strategies established by the CPUC and CEC in California's Long Term Energy Efficiency Strategic Plan for 2009 and beyond, and by California's commitment and aggressive schedule to reduce Carbon Dioxide emissions (AB32). http://www.etcc-ca.com/

[206] Electric Program Investment Charge (EPIC) established by Decision (D.) 11-12-035. The purpose of the funding is to provide public interest investments in applied research and development, technology demonstration and deployment, market support, and market facilitation, of clean energy technologies and approaches for the benefit of electricity ratepayers of Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Edison (SCE), the three large investor-owned utilities (IOUs).

within this space). The focus should be on the four key end-use areas discussed in the CEESP: 1) advanced lighting, 2) climate-appropriate HVAC, 3) plug-load and smart appliances, and 4) integrated building design and operations.

- Screen for and recruit applicable investors by stage of technology development, regardless of the specific end-use. As stated earlier, the types of firms providing private funding are different at different stages of product development. At earlier stages, angel investors are important. Additionally, the IOUs should invite entities with publicly available funding such as the national laboratories or CEC representatives. For near-market ready technologies, the IOUs should invite venture capital firms, third-party programs, EPRI or other similar firms, and technology deployment funding partners such as CEC through EPIC (in addition to energy efficiency program managers).

Measuring expected outcomes resulting from scanning activities would require tracking sources for ETP projects. The costs are not expected to be burdensome.

11.5 ASSESSMENT OF IMPLEMENTATION

The PIPs contain four distinct action strategies to implement TRIO.[207]

Table 71: TRIO Action Strategies

Action Strategy per PIP	Action Strategy #
Select a sufficient number of promising measures within these organizations that meet the screening criteria for a utility EE program. This utility interest in a specific energy efficient measure will leverage investor participation.	1.1.1
Score the selected measures with criteria that meet current EE requirements. An early score-based review of each measure will allow for incubation of measures that will meet program requirements in the future.	1.1.2
Reach out to investor deal flows to find potential energy efficient measures. Create a screening process for investors so they are aware of utility requirements for an energy efficient measure. Find out what technologies the market is demanding.	1.1.3
Workshop content to focus on "how to" do business with utilities covering measure selection, DSM integration, technical documentation, EE and DR definitions, and the California Solar Initiative.	2.1.1

The implementation of this element was altered over the program cycle to focus primarily on hosting events in support of Action Strategy 2.1.1. As such, this section assesses how the events are implemented. The section is divided into the components that make up a TRIO event: Coordination, Attendees, Content, and Results. This includes marketing and outreach efforts, coordination efforts, an assessment of attendees of events, a review of event content, and any information provided by attendees regarding events.

[207] The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program. The PIPs are located here: http://eega.cpuc.ca.gov/Main2010PIPs.aspx with the following names: PGE2108 ET SW PIP 01-2011 no redline.pdf; SCE-SW-009 Emerging Technologies.doc; SCG SW Emerging Technologies Final.doc; SDGE SW Emerging Technologies Final.doc.

11.5.1 EVENT COORDINATION AND OUTREACH

The IOUs coordinate with a variety of external entities to support producing event presentations and content, as well as to leverage existing outreach efforts to recruit targeted attendees. The outreach is appropriate based on the current design of an all-inclusion "cast a wide net" approach to the events (although changes in the design and outreach in the design section are recommended). The number and type of participants (shown later in Figure 33) show that the outreach has been successful in terms of the number of participants and moderately successful in terms of the types of participants (with 7% investors and 12% entrepreneurs in attendance).[208]

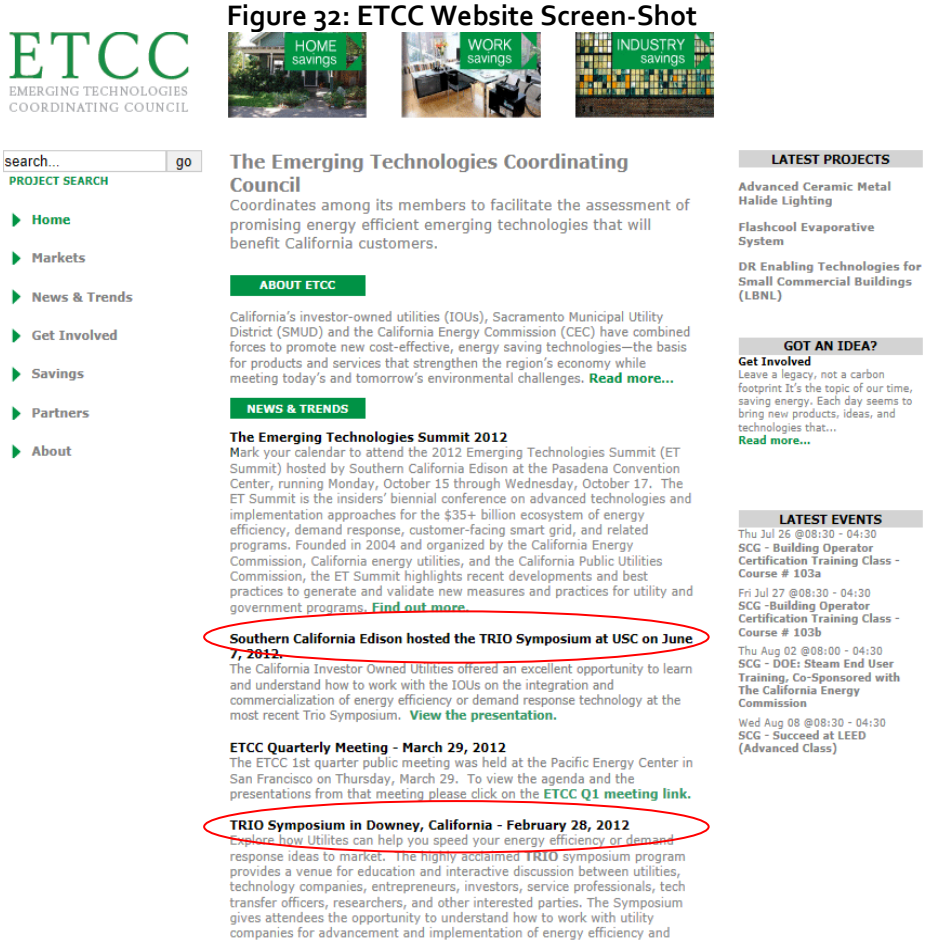
Some of the planned outreach efforts have changed. Originally, the TRIO program managers intended to market the program element through magazines and other communications and by creating a statewide website specific to TRIO. These have not occurred as the current focus has been on leveraging existing marketing channels with partner organizations and advertising the events via the ETCC website. TRIO program managers also advertise events by sending partnering organizations information about upcoming events. These partnering organizations include CalCEF, California Cleantech Open, host university websites, the ETCC website, and OnGreen.[209] TRIO works with these organizations to forward TRIO information to their mailing lists.

The ETCC website prominently features upcoming TRIO events and posts content provided during these events. These efforts appear to draw the targeted participant types to events, and are a cost-effective approach to recruitment as they leverage existing outreach channels to gain access to potential attendees. Figure 32 provides a screenshot from the ETCC website (accessed on 7/16/2012); areas circled in red are TRIO-related event information.

[208] The labeling of the participants was from the IOUs and is known to be imprecise, so there may be more entrepreneurs or investors in attendance than stated.

[209] According to their website, OnGreen drives money, expertise, and opportunities to the most promising green technologies. http://www.ongreen.com/

Figure 32: ETCC Website Screen-Shot



Source: ETCC Website as of 2011

The IOUs work collaboratively to implement TRIO. Each of the IOU service territories hosts an event, and the hosting IOU takes the lead in setting the agenda and inviting local entrepreneurs and IOU program managers to present. The hosting IOU obtains feedback from other IOUs on the agenda and speakers through the course of regular meetings.

TRIO is involved in a large number of coordination and integration activities, as planned. These include:

- Statewide coordination at the IOUs through internal meetings to refine event content.
- Coordination with statewide and local EE programs through inviting third-party program implementers as well as IOU energy efficiency program staff to present during events.
- Coordination with external organizations and entities, such as CalCEF, Cleantech Open, and others. According to the PIP, "TRIO will outreach by attending and judging innovative competitions at universities and Cleantech Open." In addition, the PIP notes that PIER should also be involved in addition to CalStart; it is unclear whether these organizations are included in

coordination efforts. SCE[210] sponsors the California Cleantech Open, and program managers often volunteer as judges. TRIO events are sometimes held at universities to encourage a relationship between TRIO and other emerging technology programs hosted by universities, such as i4Energy Center Research.[211] TRIO has also hired CalCEF[212], a subcontractor to the IOUs selected through a competitive bidding process, to provide consulting services to the IOUs to make presentations more investor-friendly. CalCEF representatives are also present at each event to help translate presentations into language that is more relevant to investors in real-time. In addition, TRIO program managers work with a consultant to help design presentations to reflect an entrepreneurial focus.

11.5.2 EVENT ATTENDEES

As stated earlier, the number and type of participants show that outreach has been successful in terms of the number of participants and moderately successful in terms of the types of participants (with 7% investors and 12% entrepreneurs in attendance).[213] If the targeted audience is expanded to include companies who self-report as technology companies, approximately 70% of non-IOU staff participants fall into the investor, entrepreneur or EE/DR technology company grouping.

However, there is variation in terms of the type of entrepreneur attending events (i.e., the technology's maturity). According to the PIP, "significant screening activity will be conducted by the IOUs to decide which entrepreneurs and companies will be provided with this training and networking assistance." No screening occurs for symposium attendees and entrepreneurs that attend events whose technology can be in any stage of product development. Entrepreneurs who attend an event vary, ranging from those with alpha technologies to technologies that are "market ready." According to one IOU, because TRIO is an outreach program, they do not solely invite entrepreneurs who are "program ready." They noted that the technology can be in the alpha stage of development and the program will aim to link up the entrepreneur with an angel investor.[214] With the exception of PG&E, no participant screening occurs for roundtables either. PG&E has held one roundtable and stated that they invited entrepreneurs that have "a working prototype or the product is ready to go to market."[215] According to PG&E, they screened

[210] SCE sponsors the California Cleantech Open; this sponsorship is not through the Emerging Technologies Program.

[211] i4Energy Center Research is funded by the Public Interest Energy Research (PIER) Program of the California Energy Commission. The i4Energy Center is a collaboration among CITRIS (U.C. Berkeley, Davis, Merced, and Santa Cruz); the California Institute for Energy and Environment (CIEE); and the Lawrence Berkeley National Laboratory (LBNL). The mission of the Center is to facilitate and promote research on system-integrated enabling technologies that will achieve better energy efficiency, improved demand response, and dramatic improvements in electricity delivery infrastructure for renewable integration. (http://i4energy.org)

[212] California Clean Energy Fund (CalCEF) was founded in 2004. It is an independent nonprofit corporation working to advance clean energy using tools from finance, public policy, and technological innovation (http://calcef.org)

[213] The categorization of participant types was provided by the IOUs and is known to be imprecise, so there may be more entrepreneurs or investors in attendance than stated.

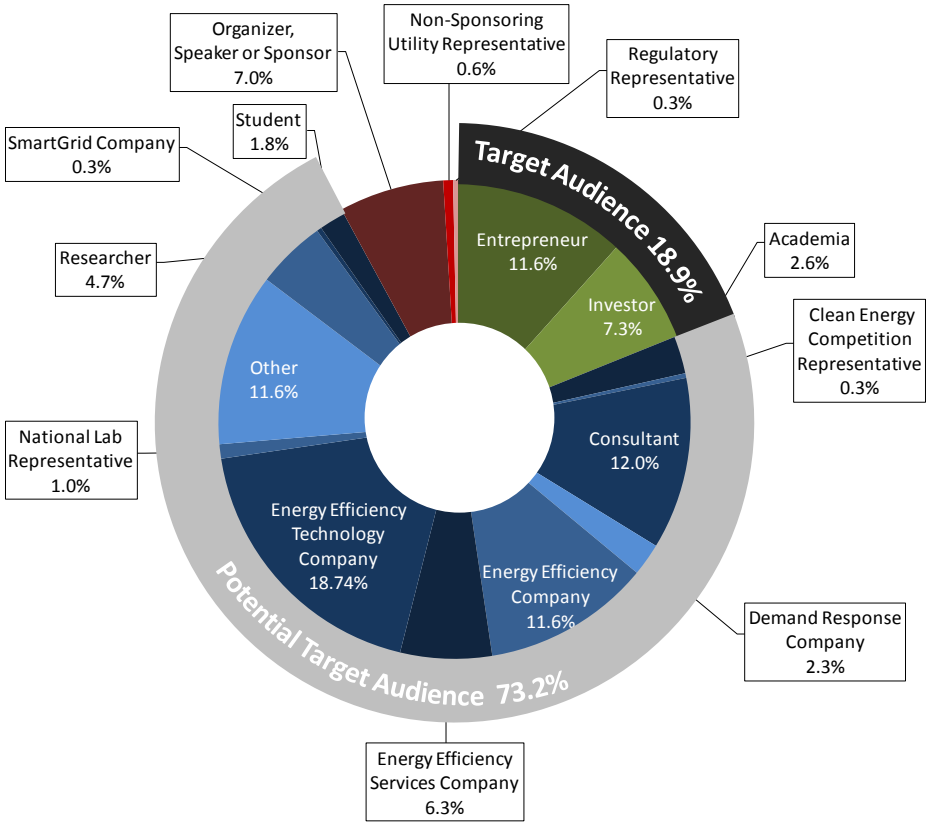
[214] IOU Program Manager in-depth interviews conducted in October 2011.

[215] IOU Program Manager in-depth interviews conducted in October 2011.

roundtable attendees using a questionnaire that asks the entrepreneur to describe their product. PG&E also seeks to limit the number of attendees from one company (to keep the event more intimate), and reviews the questionnaire to ensure that the technologies are applicable (e.g., does not include renewable technologies or storage devices). This type of screening makes a stronger causal link towards guiding entrepreneurs into the IOU programs As stated in the design section, the IOUs should focus an event in terms of what end-use is covered and who is targeted for outreach.

Symposium and roundtable sign-in sheets were available for about half of the participant population. These lists indicate a wide variety of attendees, including professors, students, business consultants, and regulatory representatives. TRIO also invites Cleantech Open winners and runners-up to the TRIO events (with at least one in attendance). Figure 33: shows the makeup of attendees at the PG&E Symposium in September 2010 and July 2011 and the SDG&E Symposium held in January 2011; other symposiums are assumed to be similar. The target audience includes entrepreneurs and investors, as well as other entities including EE and DR technology companies.

Figure 33: Attendance Composition for PG&E Symposiums, September 2010 and July 2011 and SDG&E Symposium, January 2011 (n=329)



Note: The IOUs produced the categories of attendees through their contact list files. Further research is needed to understand how these categories are developed and whether some of them reflect targeted participants.

At the July 2011 Symposium, PG&E found in its survey results that 23% of attendees had previously attended a roundtable. The fact that a participant would choose to attend more than one symposium in a different IOU territory (as the only roundtables before July 2011 were not in PG&E service territory), suggests that attendees are finding the information useful and appreciate the networking opportunities

these events offer.[216] Overall, the participants self-report a relatively high level of participant satisfaction.

Program managers noted that they encountered challenges engaging the investor community in terms of attendance as well as building relationships between entrepreneurs and investors. TRIO staff can work together to identify methods to engage investors through presentations/agendas that better reflect their interests and needs. During the August 2011 Roundtable, one investor was interested in receiving a list of all of the technologies that were submitted to the ETP program. This investor wanted to learn about these new technologies and noted that attending this event would not provide them with this information.

11.5.3 EVENT CONTENT

The symposiums include an explanation of why the IOUs are interested in emerging energy efficiency and demand-response technologies, the various programs being implemented by the IOUs and third parties, and an overview of the processes by which an entrepreneur could introduce their technology into one of these programs. The roundtable agenda covers similar topics to the symposium. The events are well planned, but could be streamlined in the information provided.

In general, event content provides attendees with an overview of how to do business with the specific IOU hosting the event. The events differ in each of the IOU territories, and change to reflect the needs of attendees. Event presentations are developed iteratively from feedback from event attendees.

Figure 34: Example TRIO Symposium Agenda (SCG, February 28, 2012)

Time	Event	Description
7:30 AM	**Registration and Breakfast**	
8:00 AM	**Welcoming Address**	➢ Welcome and recognition of organizing entities ➢ Introduction to TRIO Program ➢ Explanation of poster session and one-on-ones ➢ Speaker: Jeffrey Reed, PhD: Director, Market Development & Emerging Markets, Sempra Energy Utilities
8:20 AM	**Big Picture**	➢ Background on IOUs and energy efficiency focus ➢ What is the ETCC? ➢ Often used terms
	Speaker: Randy Wong – Emerging Technologies Program Manager, PG&E	
9:00 AM	**Incentive Programs**	➢ The role of incentives in promoting technology adoption ➢ What are the available programs for electricity and gas technology? ➢ How to obtain technology incentives
	Speaker: Gillian Wright: Director, Customer Programs & Assistance, SoCalGas	
10:00 AM	**Networking Break**	

[216] We may verify these findings in our impact evaluation efforts if we conduct interviews with participants.

Time	Event	Description
10:30 AM	**Role of Emerging Technology**	➢ How utilities work in California, the drivers for EE & DR ➢ Uniform, statewide PIP ➢ Discussion of importance of emerging technologies
	Speakers: Ahmed Abdullah: Emerging Technologies Program Manager, SoCalGas Edwin Hornquist: Emerging Technologies Program Manager, SCE Randy Wong: Emerging Technologies Program Manager, PG&E Bruce Baccei: Emerging Technologies Program Manager, Sacramento Municipal Utility District	
11:30 AM	**Engaging with the Emerging Technology Programs**	➢ How emerging technology companies can engage with the utilities
	Speakers: Susan Preston: General Partner, CalCEF Clean Energy Angel Fund (Moderator) Ahmed Abdullah: Emerging Technologies Program Manager, SoCalGas Edwin Hornquist: Emerging Technologies Program Manager, SCE Randy Wong: Emerging Technologies Program Manager, PG&E Bruce Baccei: Emerging Technologies Program Manager, Sacramento Municipal Utility District	
12:30 AM	**Networking Lunch**	
1:30 PM	**Third Party Programs and Solicitations**	➢ How third parties work with utilities and can support the introduction of new technologies. ➢ Experienced third party contractors discuss their experiences working with utilities and new technologies.
	Speakers: Andres Morrison, Ecova SoCalGas representative for Third Party Implementer Program	
2:30 PM	**Networking Break**	
3:00 PM	**Roadmap for Collaboration of Entrepreneurs, Investors and IOUs**	➢ Where do these stakeholders, with different priorities work together and mutually benefit? ➢ Where are the intersections for collaboration?
	Speaker: Robyn Zander: Manager, Contract Support Services, Customer Energy Efficiency & Solar, SCE	
3:30 PM	**Poster Session and One-on-One Discussions**	All companies, entrepreneurs and third parties are invited to display information on their company, as well as participate in brief, scheduled one-on-one sessions with utility representatives, third-party implementers looking for new technology and investors.
3:30 PM	**Networking Reception**	While the viewing company materials and in between your one-on-one sessions, enjoy general networking and beverages and appetizers.
6:00 PM	**Program Closes**	

The need for this type of information is high as shown by the feedback from surveys and interviews. In IOU-fielded surveys, feedback from several event participants noted that the most valuable part of the

day was "understanding the program offerings and process, and meeting utility program managers."[217] Other participants said that it was useful to receive "information on what the IOUs like to see when evaluating products and programs."[218] Additionally, the Evaluation Team interviews with entrepreneurs and investors revealed a certain level of frustration in understanding IOU processes, which TRIO's education effort may ameliorate:

> *"I have been frustrated with just how difficult it is to figure out what … is going on with EE programs in CA. … you need to know the secret handshake in order to have access to the money and the information…. But just getting simple information like how do you apply for your technology to get a rebate? How do you show the savings? All these things… it's an extremely complex process." –Entrepreneur*

The symposium and roundtable presentations provide a good overall framework of how to work with the IOUs' energy efficiency and demand-response programs. However, there are a few areas where the IOUs could refine and improve the event presentations and agenda to better suit attendee needs, including reducing jargon in presentations, increasing transparency of the ETP processes, and streamlining presentations.

ETP staff can continue to improve presentations to make them accessible to attendees who are not familiar with IOU vocabulary. There is still confusion regarding language used during the presentations. For example, based upon the Evaluation Team's observation, there was some confusion regarding "deemed" and "custom" measures. In other cases, the presentations provided too much detail regarding internal IOU processes that was not applicable to their audience. According to feedback surveys fielded by the IOUs during the events, attendees from several TRIO events asked for "more definitions for an industry novice" and "more simplistic explanations from a non-industry perspective."[219]

Each event includes significant time for networking. At the roundtable event in August 2011, attendees were actively networking during all of the scheduled networking breaks, with entrepreneurs clustered around the investors. IOU feedback surveys at the end of each event consistently show positive feedback on networking time.

All information presented at the events is accessible to the public through the ETCC website.[220] In addition, TRIO provides all attendees with electronic copies of the presentations and additional handouts via a flash drive.

[217] Attendee feedback from survey question "most valuable part of the program" fielded at TRIO Symposium on May 12, 2011 at the Calit2 Building, at UC Irvine, hosted by SCE.

[218] Ibid.

[219] Ibid.

[220] The TRIO presentations and handouts are available at http://www.etcc-ca.com.

11.5.4 EVENT RESULTS

Based upon the IOU-fielded survey data collected from event attendees, the events help to increase awareness of IOU processes, and bring investors and entrepreneurs together to build relationships. Further research is needed to determine whether TRIO is achieving intended results from the events.

The IOUs conduct surveys with symposium and roundtable attendees at the close of each event. The surveys help ETP to track its intended PPM[221] of the percent of attendees who self-report an increased understanding on how to do business with utilities through a voluntary survey at the end of the event. The current symposium and roundtable surveys ask attendees whether they had an increase in knowledge as a result of attending the event. Overall, the mean score for symposiums and roundtables is 4.3 out of 5. Table 72 shows results from a selection of survey questions.

Table 72. IOU Survey Results from Symposiums and Roundtables

Event Type	Overall impression	Useful information	Increase in knowledge	Networking opportunities	Recommend to others
	Score (1-5, where 1 is poor and 5 is excellent)				
4 Symposiums (n=203)	4.3	4.1	4.3	4.1	4.5
2 Roundtables (n=38)	4.4	4.1	4.3	3.5	4.3
Note that information is sourced from program materials requested in September 2011.					

TRIO program managers stated that they review survey feedback provided by participants to continuously improve event content and help ensure that each event incorporates suggestions and feedback from previous attendees. The surveys and survey review should continue as they are a best practice for events.

The program element is generally receiving high satisfaction scores in the IOU feedback surveys. Visual and verbal responses observed during the roundtable, as well as survey data provided by the IOUs, indicate that the program element provides value to attendees in terms of increasing awareness of IOU programs. One of the August 2011 San Francisco Round Table attendees commented that, from his perspective as an entrepreneur who has experience working with the U.S. Department of Energy across the country, TRIO provides a one-of-a-kind service to entrepreneurs compared to options in other regions of the country. Attendee feedback surveys indicated that there is still "a need for some part of the program specifically directed to the venture community."[222]

[221] Program performance metric from Resolution E-4385: SCE AL 2476E, PG&E AL 3120G|3675E, SoCalGas AL 4114, SDG&E AL 2172E|1951G/cf1.

[222] Attendee feedback from survey question "What topics did we not cover, or insufficiently cover which would have been helpful to you?" fielded at TRIO Symposium on July 12, 2011 at the Mission Bay Conference Center at UCSF, hosted by PG&E.

11.6 SUMMARY OF RECOMMENDATIONS FOR TRIO

The recommendations for TRIO fall into three of the overarching categories discussed in the main body of this report. The specific recommendations for TRIO are summarized below:

Align budget and activities: Implementation has shifted from the original design to focus on event-based education and outreach, rather than screening, soliciting, and bringing in potential program participants. The program surpassed the stated objective of 3 events per year, holding 9 events (6 symposiums and 3 roundtables) in the first 27 months of the program while only spending 39% of the budget. The IOUs should reduce the program element budget to reflect event costs and the associated labor costs.[223]

Focus outcomes: The events inform participants of how to work with the IOUs and provide networking between entrepreneurs and investors. Investors work across different areas within product development and currently the events are open to all types of attendees. Focusing the events by product development stage will increase the potential for useful networking to occur. Specifically, we suggest that the IOUs:

- Create events by technology development stage (i.e., proof of concept to market ready) as well as around end-use type. Once the IOUs identify the stage and technology type, then the range of investors, entrepreneurs, and external stakeholders can be better identified for outreach. Screening by technology type can help to ensure a focused event and recruitment of relevant external stakeholders (i.e., Sempra currently promotes gas technologies, and could recruit external stakeholders from the Gas Technology Institute and other market actors operating within this space).

- Screen for and recruit applicable investors by stage of technology development, regardless of the specific end-use. The types of firms providing private funding are different at different stages of product development. At earlier stages, angel investors are important. Additionally, the IOUs should invite entities with publicly available funding such as the national laboratories or CEC representatives. For near-market ready technologies, the IOUs should invite venture capital firms, third-party programs, EPRI or other similar firms, and technology deployment funding partners such as CEC through EPIC (in addition to energy efficiency program managers).

Additionally, an original activity of TRIO was to scan for new products. There are scanning efforts outside of TRIO that already exist for the ETP; these include the Emerging Technologies Summit, the Emerging Technologies Open Forum on Energy Efficiency Innovations, and outreach to external stakeholders such as EPIC, national labs, U.S. Department of Energy, etc. As such, TRIO events are one of many channels through which ETP program staff currently scans for new technologies. Since there are several avenues already open for scanning, we recommend that the IOUs drop the expectation of scanning through any TRIO event and expand the ET Open Forum to meet this purpose. This is not to say that scanning opportunities may not arise from TRIO, only that there is no planned outcome related to scanning within TRIO.

[223] The IOUs have flexibility to move budgets across elements, but are required to maintain an overall budget.

Improve tracking: All the IOUs track the participants of the TRIO events. However, the types of participant groupings available at the time of sign-in are not identical, making it difficult to accurately create descriptive statistics of attendee types (and a possible undercounting of entrepreneurs and investors). The IOUs should continue to track contact information from events, and work together to create clear and consistent grouping of attendee types that they would use at all events. If the IOUs begin to target events by development stage or end use, they should also track this information. A desired outcome of TRIO is for entrepreneurs who have attended TRIO to work with the IOUs, often within a Technology Assessment. To facilitate tracking of this outcome, the IOUs should work with the CPUC-ED to expand the ETP database variable that indicates the source of the technology assessment project to include the option "TRIO."

12. EXPERT PANEL METHODOLOGY AND FINDINGS

Opinion Dynamics conducted an Expert Panel[224] held on May 26, 2012. The panel was conducted as part of the evaluation efforts of the ETP. The section is divided into two major sections: Market Tactics to Support CEESP Goals, and Key Reflections on ETP efforts.

12.1 MARKET TACTICS TO SUPPORT CEESP GOALS

As part of the Expert Panel, panelists discussed what would be needed to reach the goals outlined in the CEESP. This discussion occurred early in the day—prior to receiving information on the Emerging Technology Program—and was broader than a discussion targeted towards IOU efforts.

When discussing market needs and gaps, one overarching finding from the panelists focused on the need to develop the path to the market for emerging technologies and a "minder" of that path. The group saw two things lacking: a path to market and a "market player" to watch the market and help connect emerging technologies with the market. Throughout the field of emerging technologies, the group noted that there was a lack of qualified people working on connecting the technology to the market. They also felt that the role of "watching the market" might be an area best suited for an organization like the CEC.

In general, panelists noted that to reach the goals of the CEESP, there would need to be efforts in several areas including:

- Research and Development
- Feedback
- Coalition Building
- Customer Education
- Investment and Financial Support

Overall, funding in the market should be distributed among all of these areas to bring emerging technologies to adoption.

The CEESP outlines the two main strategies[225] that should be used for achieving the Big, Bold Goals; Market Push strategy (i.e., market supply) and Market Pull strategy (i.e., market demand). Past research has shown that while improvements in technological capabilities and innovation that come from push strategies are necessary to support shifts in energy efficiency, there is an equally strong need

[224] The Expert Panel was divided into four sessions: (1) discussion of market pull tactics to achieve CEESP goals, (2) discussion of market push tactics to achieve CEESP goals, (3) presentation by the IOUs describing ETP, and (4) discussion about whether ETP should perform the tactics discussed in sessions 1 and 2 and areas of improvement.

[225] A strategy is a carefully devised plan on how to achieve a long-term objective/goal. It focuses on the "big picture" and helps give a program direction on what needs to be done in the long term. It helps in the allocation of resources and does not change over time.

for proper and efficient deployment of these technologies from pull strategies.[226] Consumers and users of innovative technologies act as catalysts for innovation by creating demand and facilitating the diffusion of innovation.[227] The literature suggests that demand-side innovation policies need to be matched and combined with adequate supply-side policies.

Through the panel discussion, the panelists arrived at 16 market push tactics[228] and 14 market pull tactics that could be employed to reach the CEESP goals. Additionally, panelists also rated each of these tactics on their importance to achieving the CEESP.[229] Notably, the tactics **that are rated lower are not necessarily tactics that should not be employed; rather, they are tactics that did not have as high a level of support among all the panelists.** This discussion applied to the market as a whole, and was not specific to IOUs or ETP. Table 73 and Table 74 list all the tactics identified, grouped, and scored by the panelists.

[226] Sagar, A. D., Zwaana, B. V. D. (June 2005). "Technological innovation in the energy sector: R&D, deployment, and learning-by-doing," Energy Policy 34 (2006) pp. 2601-2608.

[227] OECD (2011), *Demand-side Innovation Policies*, OECD Publishing. http://www.oecd.org/document/61/0,3746,en_2649_37417_48078845_1_1_1_37417,00.html

[228] Tactics are a series of actions taken to achieve the plan set forth by the strategy. Tactics help to operationalize the plan for measurable results as well as help in the application of resources. Tactics often change over time.

[229] Panelists were asked to respond to the following question: "On a 0 to 10 scale, indicate how important each tactic is towards supporting the availability of emerging energy efficient technologies, approaches and practices in the California market."

Table 73. Market Push (Supply) Tactics

Grouping		Push Tactic Number	Market Push Tactics Discussed by Expert Panelists	Mean Score by Panelists (stdev)	Rank by Score (30 Combined Push & Pull Tactics)
Feedback		A	Improve availability of and/or access to data on performance of existing systems from past pilots, assessments, and technology demonstrations in California and beyond.	9.1 (1.14)	3
		B	Disseminate knowledge captured through building relationships with upstream partners to encourage energy efficient product development and delivery through demonstration feedback to supply chain (all end uses).	8.9 (1.51)	6
R&D		C	Test products and practices in advance of Codes & Standards (including Reach Codes) development to determine feasibility and potential energy savings.	9.0 (1.10)	5
		D	Invest in directed emerging energy efficiency research and development (i.e., invest based on energy efficiency ideas rather than specific technologies – areas of research rather than a specific technology).	8.5 (2.42)	11
		E	Identify and provide emerging energy efficiency performance specifications.	8.5 (1.51)	11
		F	Establish metrics for non-efficiency benefits.	8.5 (1.97)	11
		G	Conduct market intelligence activities to identify and prioritize customer needs and behavioral drivers for emerging energy efficient technology adoption.	8.4 (1.75)	15
		H	Prioritize most effective information (create screening and modeling tools).	7.8 (1.32)	25
		I	Develop open source technology specifications and standards for communication among various equipment.	7.7 (2.83)	27
Feedback & Research		J	Develop codes and standards to achieve ZNE (these should be "socially equitable").	8.6 (1.29)	9
Education		K	Identify, promote, and incorporate best practices and success stories.	8.2 (1.62)	21
		L	Educate practitioners (i.e., engineers, architects, installers) to design and install (train supply chain).	8.1 (1.58)	22
R&D and Coalition Building		M	Identify and promote continuous Energy Management and improvement of operations.	7.8 (1.62)	25
Coalition Building		N	Build relationships with upstream partners to encourage increased energy efficient product development and delivery.	8.0 (2.72)	23
		O	Facilitate delivery of aggregated channels for energy efficiency.	6.4 (1.51)	28

Grouping		Push Tactic Number	Market Push Tactics Discussed by Expert Panelists	Mean Score by Panelists (stdev)	Rank by Score (30 Combined Push & Pull Tactics)
		P	Finance emerging energy efficient product development.	5.6 (2.46)	30

Table 74. Market Pull (Demand) Tactics

Grouping	Pull Tactic Number	Market Pull Tactics Discussed by Expert Panel	Mean Score by Panelists (stdev)	Rank by Score (30 Combined Push and Pull Tactics)
R&D	AA	Perform quantification, verification, and demonstration of technology performance and energy savings claims by a trusted third party for energy efficient technologies, approaches, and practices.	9.4 (1.50)	1
	BB	Understand and address behavioral economics. Drivers (psychology) i.e., the emotional side of choices.	8.6 (2.22)	9
	CC	Aggregate technologies for integrated delivery to the customer.	6.1 (2.81)	29
Education	DD	Disseminate successful application of energy efficiency from the research indicated in pull tactic AA.	9.2 (1.25)	2
	EE	Develop and provide information for consumers to understand energy efficient options (e.g., labeling, rating, and benchmarking).	9.1 (1.04)	3
	FF	Provide information to consumers and end users to increase awareness of the value of, and encourage adoption of, emerging technologies, approaches, and practices (and life cycle cost).	8.8 (1.08)	7
	GG	Increase visibility of emerging energy efficient technologies.	8.7 (1.35)	8
	HH	Educate up-stream/mid-stream/down-stream partners to apply, install, and maintain energy efficient practices and approaches—layered level of information.	8.4 (1.80)	15
	II	Use normative drivers to aggregate specific things at a building to a community level. Use normative drivers by end-use within a community.	8.4 (1.84)	15
	JJ	Develop and apply practices that actively use adoption theory.	8.3 (1.42)	18
	KK	Develop tools for consumers to understand who credible sources are.	8.3 (1.42)	18
Coalition Building	LL	Collectively choose a high profile collaborative activity.	8.3 (1.70)	18

Grouping	Pull Tactic Number	Market Pull Tactics Discussed by Expert Panel	Mean Score by Panelists (stdev)	Rank by Score (30 Combined Push and Pull Tactics)
Investments / Financial Support	MM	Provide incentives to reduce the first cost of emerging energy efficient technologies and best practice solutions.	8.5 (1.51)	11
	NN	Provide financing options.	8.0 (0.94)	23

As shown in the tables above, the panelists grouped tactics into conceptual bins.[230] When looking across these bins, regardless of whether the panelists considered the tactic best for push or pull, there is a clearly stated need for flow of information within the market as the top tactics (after quantification of energy savings) are Feedback and Education efforts (ranked as 2-5). Additionally, of the 30 tactics across push and pull strategies, 13 of them support education or feedback.

Recommended Market Tactics to Achieve CEESP Goals

As discussed by the panelists, the tactics that should be employed to reach CEESP goals (rated as a 9 or higher) are a mix between market push and pull, with three of these five top tactics on the pull side. Notably, these tactics cut across all entities engaged in this process and are not specific to ETP. These tactics are as follows:

1. Performing quantification, verification, and demonstration of technology performance and energy savings claims by a trusted third party for energy efficiency technologies, approaches, and practices. (AA Market Pull – mean score: 9.4)

2. Disseminate successful application of energy efficiency from the research indicated in pull tactic above #1. (DD Market Pull – mean score: 9.2)

3. Developing and providing information for consumers to understand energy efficient options (e.g., labeling, rating, and benchmarking) at different levels. (EE Market Pull – mean score: 9.1)

4. Improving availability of, and/or access to, data on performance of existing systems from past pilots, assessments, and technology demonstrations in California and beyond. (A Market Push – mean score: 9.1)

5. Testing products and practices in advance of Codes & Standards (including Reach Codes) development to determine feasibility and potential energy savings. (C Market Push – mean score: 9.0)

Panelists also expressed that the current frameworks for moving Emerging Technologies into the market tend to focus on the building level, rather than the community level. Discussions emerged around the idea of accomplishing efficiency across a larger scale. While each building must be efficient, looking at how people within communities interact with others to accomplish efficiency (somewhat

[230] The evaluation team differentiated between early research and development (R&D) and applied R&D by changing "R&D" to "Research" when included as a Market Pull tactic.

analogous to the theory of social normative change used by many of the current behavioral programs such as OPower) and also how buildings within the community are oriented, is a new and potentially "big, bold strategy" for new construction.

Recommended Market Areas for ETP Focus

Based upon these findings, we asked panelists to comment on key market areas for ETP efforts. The panelists indicated that there was a need for ETP to help with the demand or "pull" side, but not in customer financing since other energy efficiency programs perform this activity. The Expert Panelists also acknowledged that one of the strengths of the ETP is that IOUs are well positioned to reach customers. Table 75 provides specific comments on where panelists thought ETP should target its efforts.

Table 75. Areas Recommended by Panel for ETP Effort

Area	Panel Recommendation for ETP Focus	Details
Research & Development Reliable Savings	**Yes**	Panelists felt that ETP should focus on producing reliable savings numbers. Ensuring the reliability of savings was seen as critical and fitting in with current ETP efforts.
Research & Development Reach Codes	**Yes**	The panelists agreed ETP should be involved in providing information in support of reach codes through testing protocols.
Feedback	**Yes**	Panelists stated that ETP should provide the scientific and product development communities with useful feedback that will push products toward becoming more mature. The panelists generally agreed that ETP should focus on providing education and feedback early in the product development continuum. There is a wide spectrum of outreach and educational activities that ETP can undertake, from educating consumers to informing engineers and manufacturers. The panel distinguished between the need to develop feedback loops, which can disseminate information throughout the industry, and educational activities, which are aimed at the general public. The panel called for more seminars, webcasts, and interim reports to disseminate knowledge to the major players in the emerging technology industry.
Coalition Building	**Yes**	Panelists agreed that the market would benefit from collectively choosing a high-profile unifying activity to support an emerging technology.
Customer Education	**Some**	According to panelists, ETP should provide some customer education, because the IOUs know their customers well. There could be more seminars and training programs.

Area	Panel Recommendation for ETP Focus	Details
Investment & Financial Support Financing Product Development	**No**	Panelists thought that although there are some creative ways to leverage funding, it is too risky for IOUs to finance product development. There are other entities that perform this tactic on their own. The IOUs are not going to pay for product development because there are other entities that provide this function.
Investment & Financial Support Customer Financing	**No**	Comments from panelists indicated that pull side financing is less risky, but there are other customer financing programs such as PACE, on-bill financing, etc. Panelists noted that this area was not an appropriate use of ratepayer money.

Recommended Market Tactics for ETP Focus

Given that the IOUs are not in the right stakeholders to perform all the tactics listed above in Table 73 and Table 74, the panelists identified certain areas where the IOUs could have a major impact and could focus their activities (beyond what they are currently doing). In addition, the panelists helped identify the end uses as listed in the CEESP (climate-appropriate HVAC, advanced lighting, plug-loads, and integrated design) where these tactics would be best suited. Table 78 and Table 79 show the full list of tactics by grouping. The main tactics identified by order of importance are presented in Table 76 and Table 77.

Table 76. Panel-Recommended Market Push Tactics for ETP Focus

Area	Panel Recommendation for ETP Focus	Tactics
Research & Development	**Yes (score 9.0)**	Test products and practices in advance of Codes & Standards (including Reach Codes) development to determine feasibility and potential energy savings (all end-uses).
Research & Development	**Yes (score 8.5)**	Identify and provide emerging energy efficiency performance specifications (all end-uses).
Feedback	**Yes (score 9.1)**	Collect more and better information and data on performance of existing systems from past pilots, assessments, and technology demonstrations in California and beyond and disseminate the knowledge captured through demonstration feedback to supply chain (all end-uses).
Feedback	**Yes (score 8.9)**	Disseminate knowledge captured through building relationships with upstream partners to encourage energy efficient product development and delivery through demonstration feedback to supply chain (all end-uses).

Table 77. Panel-Recommended Market Pull Tactics for ETP Focus

Area	Panel Recommendation for ETP Focus	Tactics

R&D	**Yes (score 9.4)**	Perform quantification, verification, and demonstration of technology performance and energy savings claims by a trusted third party for EE technologies, approaches, and practices (with a focus on climate-appropriate HVAC).
Education	**Yes (score 8.7)**	Increase visibility of emerging energy efficient technologies (with a focus on advanced lighting and integrated design).
Coalition Building	**Yes (score 8.3)**	Collectively choose a high-profile collaborative activity (across all end-uses).

12.2 KEY REFLECTIONS ON ETP EFFORTS

During the discussion, the IOUs presented a brief (1-hour) overview of ETP to the Expert Panelists. After listening to the presentation, panelists provided informal feedback on the program in light of the CEESP goals. The panelists noted that ETP is using the tactics described, but could improve. Key findings fell into three areas:

Finding #1: Need to Broaden Intended Target of ETP Efforts and Expand Collaboration with Others Working Upstream

Based on the information provided by the IOUs to the panelists, ETP efforts focus on the IOU energy efficiency program managers and the IOU energy efficiency portfolio. In general, the panelists believe that ETP is not currently broad enough to assist the CEESP to a high degree. While some elements have potential to encourage market push and market pull outside of the energy efficiency portfolio, as currently designed, ETP plays a smaller role than anticipated outside of the EE portfolio. The current design of the program implementation plan limits ETP's reach beyond the IOU energy efficiency portfolios.

Panelists noted that there was a disconnect between the ETP and the CEESP regarding how program efforts are targeted. They noted that the ETP presentation clearly showed that ETP targets the IOU energy efficiency program managers, but that to support CEESP, ETP efforts would require a broader market-based focus.

Expert Panelists felt that the ETP program is "working in a vacuum" in that most people in the emerging technology field do not know what projects the IOUs are working on. While the program does partner with specific organizations on particular projects, the panel wanted to see the program create an environment that was more conducive to broader collaboration, by ensuring that other players in the field are aware of the work being performed through the program. Panelists would like to see increased visibility, more information provided to customers, and more transparency and feedback provided to industry and market actors.

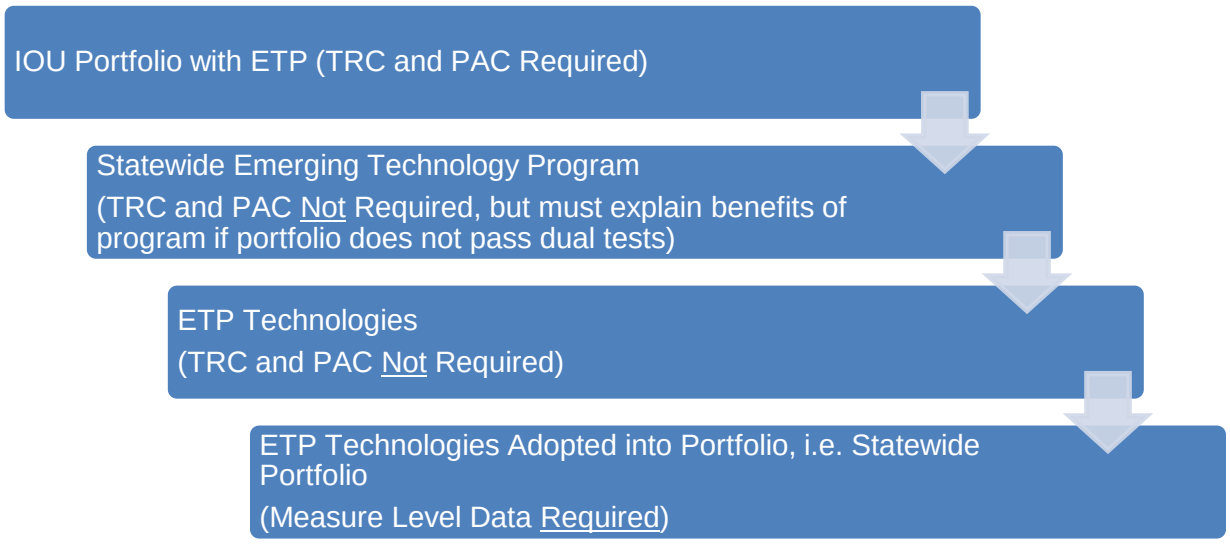
Finding #2: Need to Align Program Performance Metrics and CEESP Goals

ETP, as a program, is excluded from the cost-effective requirement at the service-territory wide program portfolios offered by each Program Administrator. However, ETP is included in the Statewide Dual Test calculation as it is calculated at the entire statewide portfolio of programs (i.e., including the

four IOUs portfolio) level.[231] If the Statewide portfolio does not pass the Dual Test, "program administrators must demonstrate that this threshold requirement is met on a prospective basis in their program funding applications to the Commission. If a prospective showing of cost-effectiveness for the entire statewide portfolio including emerging technologies programs does not also pass the Dual-Test, Program Administrators shall describe the benefits associated with these programs that are not reflected in the TRC or PAC tests, and describe how these programs are expected to produce benefits in excess of costs for California ratepayers over the long-term. Program Administrators must also demonstrate that the proposed level of electric and natural gas energy efficiency program activities are expected to meet or exceed the Commission-adopted electric and natural gas savings goals, by service territory."[232]

However, during the panel, there was some discussion around cost-effectiveness and a perceived need to align technologies assessed with ones that would ultimately be cost-effective. According to panelists, the ETP program selection of technologies appears to be driven in part by cost-effectiveness of those technologies due to the ultimate goal of technology adoption within the EE portfolio.

Figure 35. Cost-Effectiveness Requirements for ETP



Despite the fact that ETP is not required to meet the Dual Test, current cost-effectiveness metrics were perceived to be a problem in terms of how projects were selected. As one panelist said, "How you keep score drives the train." If the program has to be focused on equating success with adoption into EE programs (as per the program performance metrics [PPMs]), then certain metrics, such as the results of E3 calculations (e.g., the total resource cost test [TRC]), will prevent certain technologies from entering the program." Panelists noted that ETP is constrained by the PPMs, due to the need to meet IOU energy efficiency portfolio goals, and the cost-effectiveness metrics necessary for adopting new technologies into the energy efficiency portfolio. Note that the panelists were not provided with the current ETP PPMs (see Attachment C for ETP PPMs), but the IOUs made the claim during their

[231] The Dual Test is also calculated at a service territory level, but excludes ETP.

[232] Per D.04-09-060, savings from LIEE programs will also count towards these goals.

presentation that the "Current regulatory framework of cost effectiveness means many emerging technologies cannot be moved into utility programs until equipment costs drop or cost effectiveness framework changes."

Panelists mentioned that there needs to be a difference between the metrics used for incremental change and "big, bold change." The current metrics are very conservative to ensure that ratepayer money is not directed to high-risk projects. Based on comments by panelists, the requirements for ETP projects/technologies need to be less stringent, which creates more opportunity and more risk, but is the only way to move from incremental change to "big, bold change." In this way, some panelists saw the TRC and E3 calculations as "handcuffs," with a greater influence on steering the program than the CEESP.

Finding #3: Need to Focus on Specific End-Use Technologies

The panelists also discussed specific end-use technologies. The CEESP helped set a framework for focusing resources through the BBEES, specifically calling out the need to move to zero net energy in the new construction arena. In addition to the BBEES, the CEESP also strongly emphasizes targeting the much larger population of existing buildings. The CEESP states that a substantial proportion of commercial existing buildings should move down the path of zero net energy and that residential dwellings should integrate all cost-effective potential for energy efficiency, demand response, and clean energy production. Emerging technologies and the ETP are required to help California meet the ambitious agenda laid out in the CEESP. The needs for various tactics, by technology (i.e., HVAC, plug load, lighting, and integrated design) are also shown in Table 76 and Table 77.

Given these needs, overall, the Expert Panel provided the following guidance on which technologies to focus on:

- Efforts that encourage integrated design and whole building approaches rather than widgets. Other areas of interest mentioned for research included: daylighting, plug loads specific to Silicon Valley efforts, and system-based technologies and practices.
- "Game Changing Technologies." The goal should be to seek out technologies that represent profound improvements in energy efficiency, building materials, and building design. Some examples provided by the group include **systems and whole building approaches** and plug load technology.
- Technologies should be tested when technologies are at Department of Energy (DOE) Technology Readiness Levels of 6 (ready for demonstration in a high-fidelity laboratory environment or in a simulated operational environment) and 7 (demonstration in an operational environment). These technologies are beyond the early R&D stages and within a "more developed" stage. Table 80 provides the listing and definition of the technology readiness framework created by the DOE and Department of Defense.)
- California-centric technologies and technologies where there is less external (i.e., outside of California) research and development.[233] The panelists noted that a more targeted focus for

[233] We acknowledge that subsequent conversations with some Expert Panelists indicate that the focus should go beyond California centric efforts, and collaborate with entities across the nation and internationally. In addition, California –centric activities are better stated as climate centric activities.

research investments for California includes advanced and climate-specific HVAC, whole building envelope, integrated controls, and ZNE. The panelists indicated that products that others are developing on a global or national scale such as lighting and plug load technology needed less R&D within California. We note, though, that this is specifically regarding R&D on the market push side and not necessarily relevant for applied R&D or education efforts for these technologies on the market pull side.

MARKET PUSH AND PULL TACTICS BY GROUPING

Table 78. Market Push Tactics by Grouping

Grouping	Need for Activity Here				Push Tactic	Score by Panelists (stdev)	Marked by the Panelists as major places for useful ETP activity
	HVAC	Plug Load	Lighting	Integrated Design			
Feedback					Improve availability of and/or access to data information and data on performance of existing systems from past pilots, assessments, and tech demos in California and beyond.	9.1 (1.14)	Yes
					Disseminate knowledge captured through building relationships with upstream partners to encourage energy efficient product development and delivery through demonstration feedback to supply chain.	8.9 (1.51)	Yes
R&D					Test products and practices in advance of Codes & Standards (including Reach Codes) development to determine feasibility and potential energy savings.	9.0 (1.10)	Yes
					Identify and provide emerging energy efficiency performance specifications.	8.5 (1.51)	Yes
	●			●	Establish metrics for non-efficiency benefits.	8.5 (1.97)	No
	●	●	●	●	Invest in directed emerging energy efficiency research and development (i.e., invest based on energy efficiency ideas rather than specific technologies).	8.5 (2.42)	No
		●	●	●	Conduct market intelligence activities to identify and prioritize customer needs and behavioral drivers for emerging energy efficient technology adoption.	8.4 (1.75)	No
		●		●	Prioritize most effective information (create screening and modeling tools).	7.8 (1.32)	No
				●	Develop open source tech specifications and standards for equipment communication.	7.7 (2.83)	No
Feedback and Research		●			Develop codes and standards to achieve ZNE (these should be "socially equitable").	8.6 (1.29)	No
Coalition Building					Finance emerging energy efficient product development.	5.6 (2.46)	No
	●				Build relationships with upstream partners to encourage increased energy efficient product development and delivery.	8.0 (2.72)	No
					Facilitate delivery of aggregated channels for EE.	6.4 (1.51)	No

Grouping	Need for Activity Here				Push Tactic	Score by Panelists (stdev)	Marked by the Panelists as major places for useful ETP activity
	HVAC	Plug Load	Lighting	Integrated Design			
R&D and Coalition Building				●	Identify and promote continuous Energy Management and Improvement of Operations.	7.8 (1.81)	No
Education	●	●	●		Educate practitioners to install (train supply chain) (engineers, architects, installers) (design through install).	8.1 (1.58)	No

Note that blue-colored rows indicate areas marked by panelists as major places for useful ETP activity.

Table 79. Market Pull Tactics by Grouping

Grouping	Need for Activity Here				Pull Tactic	Score by Panelists (stdev)	Marked by the Panelists as major places for useful ETP activity
	HVAC	Plug Load	Lighting	Integrated Design			
Coalition Building	●	●	●	●	Collectively choose a high-profile unifying activity (collaborative activity).	8.3 (1.70)	Yes
Research	●				Perform quantification, verification, and demonstration of technology performance and energy savings claims by a trusted third party for EE technologies, approaches, and practices.	9.4 (1.50)	Yes
	●	●	●	●	Understand and address behavioral economics. Drivers (psychology) – the emotional side of choices.	8.6 (2.22)	No
	●				Aggregate technologies for integrated delivery to the customer.	6.1 (2.81)	No
Education			●	●	Increase visibility of emerging energy efficient technologies.	8.7 (1.35)	Yes
			●		Provide information to consumers and end users to increase awareness of the value of and encourage adoption of emerging technologies, approaches, and practices (and life cycle cost.)	8.8 (1.08)	No
		●	●	●	Disseminate successful application of energy efficiency from tactic "perform quantification, verification, and demonstration of technology performance and energy savings claims".	9.2 (1.25)	No
	●		●	●	Develop and provide information for consumers to understand energy efficient options (e.g., labeling, rating, and benchmarking) at different levels.	9.1 (1.04)	No

Grouping	Need for Activity Here				Pull Tactic	Score by Panelists (stdev)	Marked by the Panelists as major places for useful ETP activity
	HVAC	Plug Load	Lighting	Integrated Design			
	●		●	●	Educate upstream/mid-stream/down-stream partners to apply, install, and maintain energy efficient practices and approaches—layered level of information.	8.4 (1.80)	No
					Use normative drivers to aggregate communities. Use normative drivers by end-use within a community.	8.4 (1.84)	No
					Develop and apply practices that actively use adoption theory.	8.3 (1.42)	No
					Tools for consumers to understand who the credible sources are.	8.3 (1.42)	No
Investments / Financial Support				●	Provide incentives to reduce the first cost of emerging energy efficient technologies and best practice solutions.	8.5 (1.51)	No
	●	●	●	●	Provide financing options.	8.0 (0.94)	No

Note that blue-colored rows indicate areas marked by panelists as major places for useful ETP activity.

DOE TECHNOLOGY READINESS LEVELS

Table 8o. Technology Readiness Levels for the DOE

Technology Readiness Level	Description
TRL 1.	Scientific research begins translation to applied R&D – Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
TRL 2.	Invention begins – Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
TRL 3.	Active R&D is initiated – Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
TRL 4.	Basic technological components are integrated – Basic technological components are integrated to establish that the pieces will work together.
TRL 5.	Fidelity of breadboard technology improves significantly – The basic technological components are integrated with reasonably realistic supporting elements so they can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.
TRL 6.	Model/prototype is tested in relevant environment – Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment.
TRL 7.	Prototype near or at planned operational system – Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment.
TRL 8.	Technology is proven to work – Actual technology completed and qualified through test and demonstration.
TRL 9.	Actual application of technology is in its final form – Technology proven through successful operations.

Source: "*Technology Readiness Assessment Guide* (DOE G 413.3-4)". United States Department of Energy, Office of Management. October 12, 2009. https://www.directives.doe.gov/directives/archive-directives/413.3-EGuide-04. via Wikipedia.