PY2010-2012 CALIFORNIA STATEWIDE EMERGING TECHNOLOGIES PROGRAM PHASE II PROGRAM EFFECTS REPORT VOLUME I

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For the

California Public Utilities Commission

Energy Division

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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.

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INTRODUCTION

This is the first of two documents that comprise the evaluation results of the Phase II: Program Effects Evaluation for the PY2010-2012 Emerging Technologies Program (ETP).[1] The second volume contains a suite of appendices that document detailed methodologies, findings, data collection and survey results as well as data collection instruments.

[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).

1. EXECUTIVE SUMMARY

This document provides findings from an evaluation of the effectiveness of the PY2010-2012 Statewide Emerging Technologies Program (ETP).

As described in the Program Implementation Plans (PIPs), the mission of the 2010-2012 ETP is to support increased energy efficiency market *demand* and technology *supply*. This is achieved through the development and deployment of new and under-utilized energy efficiency (EE) measures — that include technologies, practices and tools. The program also seeks to increase demand for emerging technologies by facilitating their adoption as measures in the investor-owned utility (IOU) EE portfolios.

The ETP established three goals in support of its mission:

- **Goal 1)** Increased adoption of energy efficiency 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).

Determining the effectiveness of this program is complex, with few numeric values to track. Program staff have objectives for the number of projects they initiate or complete; and Program Performance Metrics (PPMs) agreed upon at the beginning of the program cycle provide some metrics to track achievements. We note that these metrics provide a way to track ETP activities and achievements, but may not capture how effective the activity is in meeting program goals. As such, this report is structured to outline the ETP PY2010-2012 program achievements in terms of objectives and PPMs metrics. It then explores program effectiveness based on findings from our evaluation research.

Methodology

The evaluation team collected information on select program elements through a variety of data collection activities. Primary data collection included in-depth interviews with ETP program managers, surveys of ETP and energy efficiency project managers, and surveys or interviews with program participants (end-users). Secondary data collection included a review of IOU program files and databases. The team performed data collection and analysis between March 2013 and July 2013.

Using the data collection efforts noted above, we assessed the achievement of PIP objectives and Program Performance Metrics. The evaluation effort explored program effectiveness through testing causal linkages from program logic models. Our effort included short-term and mid-term outcomes, as long-term outcomes were outside of scope. The evaluation team also explored whether program activities reduced market barriers for participants.[2]

[2] See Chapter 3 for additional details on findings.

Overarching findings

Our overarching findings from the evaluation are outlined below, beginning with the achievement of PIP objectives and PPMs, followed by an exploration of program effectiveness and opportunities for the future.

PIP Objectives and PPM Results

In PY2010-2012, ETP achieved program objectives, supported PPMs (where objectives and PPMs overlap) and generally met anticipated outcomes in support of PIP goals according to program theory.

- **PIP Objectives**: ETP staff met statewide objectives across all program elements. The overall number of projects initiated for each element exceeded statewide objectives, with 288 initiated projects and 14 TRIO events, achieving 250% of objectives.

From the PPMs developed by the CPUC and IOUs, the evaluation team created three categories to structure our findings; 1) adoption of measures (three PPMs), 2) technical potential (one PPM), and 3) increase in knowledge from target audience (three PPMs).[3] Notably, the PPMs have no success criteria and therefore we make no evaluative statement about the effectiveness of the program in achieving PPMs.

- **Adoption PPMs:** PPMs are related to adoption of technologies into the IOU energy efficiency portfolio. According to the IOU's PPM report submitted in June 2013, 19 projects and 58 measures were adopted into the IOU energy efficiency portfolio.

- **Technical Potential PPM**: The evaluation team will provide technical potential for measures adopted into the energy efficiency portfolio as an addendum to this report.

- **Increase in Knowledge PPMs:** We saw increases in knowledge where expected by program theory. Overall, responses from surveyed Demonstration Showcases, Market & Behavioral Studies, and TRIO participants indicated a self-reported increase in knowledge as a result of participating in showcases, receiving information or reports, or attending events, respectively.

The program tracking data is a key input for evaluation activities. In the case of ETP, data tracking issues limited the evaluation team's ability to draw conclusions regarding program activities, and achievement of metrics (see Section B.1). We received each IOUs ETP database and aggregated them together to report on PIP objectives and PPMs. We performed QA/QC on the ETP databases with several subsequent revisions of the data by the IOUs before analysis could be performed. After the final revision (July 2013), there were several data cells with incomplete or missing information.

Exploring Program Effectiveness

ETP staff conducted a variety of activities in support of the three PIP goals. Overall, these activities appear to support increasing technology supply as well as awareness and subsequent adoption of

[3] The evaluation team did not assess three Program Performance Metrics. Section 2.1.3 provides a description of the 10 PPMs and a rationale for why three of the PPMs were not assessed.

energy efficiency measures. Technologies included as ETP projects cover a range of the California Energy Efficiency Strategic Plan (CEESP) targeted end-uses and market segments.

- **Increasing technology supply:** TRIO events met expected outcomes for supporting entrepreneurs and investors in increasing energy efficient technology supply; 20 entrepreneurs (or one-third of surveyed event attendees) submitted technologies to IOU or ETP programs.

- **Increasing adoption of energy efficiency measures:** A range of program elements support the increased adoption of energy efficiency measures. Both internal and external target audiences were asked whether the ETP information they received, or the process of participating in the ETP project, helped support their decision to adopt a technology.

    - For the majority of recalled reports, IOU respondents indicated that they could more easily make the case for including or not including the technology in their program.

    - Surveyed Scaled Field Placement participants reported adopting technologies and advocating for these technologies to colleagues and peers. For example, eight of the nine interviewed participants influence technology purchases at a single site, while six of the eight influence technology purchases at multiple sites. Five of these eight had purchased the technology for their sites since participating in the ETP project.

    - We found variation in terms of meeting expected outcomes from Demonstration Showcase projects making it difficult to generalize findings. However, for two of the three projects where we collected primary data, the majority of respondents indicated that they had or would make changes to their practices (including installing demonstrated equipment).

    - We assessed whether the program activities led to a reduction in market barriers. Findings across the various program elements indicate that respondents agreed that barriers were reduced as a result of participating in the project (see Appendix B. for detailed results).

- **Support of California Energy Efficiency Strategic Plan (CEESP) and related solutions:** A review of end-use areas and market segments covered through ETP activities, indicates support of the CEESP and related solutions. Approximately three-quarters of the projects fell within the key "Big Bold Strategy" areas outlined in the CEESP.

Chapter 3 of this report provides integrated findings from our evaluation effort, as well as recommendations and considerations for the future.

2. INTRODUCTION AND METHODOLOGY

2.1 PROGRAM OVERVIEW

According to the Program Implementation Plans (PIPs),[4] the Emerging Technology Program (ETP) established three goals in support of its mission:

- **Goal 1)** Increased adoption of energy efficiency 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 Technology Resource Incubator Outreach (TRIO).
- **Goal 3)** Support of the CEESP and related solutions, including zero net energy. Within Goal 3, ETP plans to advance innovative measures or strategies and the Southern California Edison Technology Test Center will create a ZNE test facility.[5]

The mission of the 2010-2012 ETP, as described in the Program Implementation Plans filed with the California Public Utilities Commission, 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 measures — which includes, technologies, practices and tools — and by facilitating their adoption as measures in the investor-owned utility EE portfolio to help support California's aggressive energy and demand savings goals. In addition, as illustrated above, one of the three goals of the ETP is to "support the Strategic Plan and related solutions, including zero net energy [ZNE]."[6]

The IOUs developed 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 and budget, followed by a brief description of each program element.

Note that in PY2013-2014[7], the IOUs made changes to the ETP program design and implementation. Existing program elements (described below) were grouped into three sub-programs, 1) Technology

[4] 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.

[5] The SCE ETP program managers chose to discontinue the Residential ZNE Facility in 2012.

[6] Source: IOU Program Implementation Plans.

[7] 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/ with the following names: PG&E: 01_2013-2014 Emerging Technologies PIP Addendum_July2012.doc; 2013-2014 EE Application - Exhibit SCE-4B.pdf; 15 SCG SW ET PIP 7_2_12 FINAL.pdf; 6 SDGE SW ETP PIP Clean_7_2_12.doc

Development Support, 2) Technology Assessment, and 3) Technology Introduction Support. Within the new program design, each element within the PY2010-2012 program cycle operates as a program tactic.

2.1.1 Program Budget

The PY2010–2012 statewide ETP budget is approximately $43 million, a significant increase compared to previous program cycles.[8] Additionally, the PY2010–2012 ETP had an expanded focus. While earlier program cycles focused primarily on Technology Assessments, the PY2010–2012 program cycle was composed of program elements each with a specified budget as shown in Table 3. Staff designed these multiple program elements to work together to address the key market barriers that can prevent or delay new measure introduction and adoption of emerging technologies into the IOU EE portfolio.

Table 3: Emerging Technologies Program Budget by Element

ETP Program Elements	Program Implementation Budget				
	SCE	PG&E[a]	SCG[b]	SDG&E[b]	Total ETP
Technology Assessments	Evaluate new technologies for performance claims and overall effectiveness in reducing energy consumption and peak demand				
	$6,572,064	$9,719,749	$3,515,000	$4,050,854	**$23,857,667**
Scaled Field Placements	Placement of measures at customer sites to gain market traction and information				
	$1,694,020	$4,346,112			**$6,040,132**
Demonstration Showcases	Expose customers to new measures in 'real world' demos to create visibility and awareness				
	$3,257,954	$2,857,640			**$6,115,594**
Market & Behavioral Studies	Targeted research on customer behavior and decision-making to understand perceptions to speed adoption				
	$523,520	$526,488			**$1,050,008**
Technology Test Centers	Test facilities to evaluate performance of new technologies (SCE only)				
	$2,125,284				**$2,125,284**
Business Incubation (TRIO)	Generate innovative program ideas with outreach and 'non-traditional' approaches (training, workshops, mentoring).				
	$2,115,413	$161,446			**$2,276,858**
Technology Development Support	Transform early stage technology into marketable energy efficient products				
	$249,188	$884,443			**$1,133,631**
Program Mgmt & CPUC Reporting	$657,283				**$657,283**
Total	**$17,194,725**	**$18,495,877**	**$3,515,000**	**$4,050,854**	**$43,256,456**

[a] Notably, $104,000 of PG&E's budget was moved from ETP to the EE program.
[b] SCG and SDG&E programs include activities in all elements (except SCE's Technology Test Center). They do not have specific budgets for each element. We have included their budget under Technology Assessments.

[8] 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, though it 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).

2.1.2 Program Element Descriptions

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

Technology Test Center (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 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." The TTC, operated by Southern California Edison (SCE), is made up of 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 initiated plans to construct a ZNE Test Center. However, program managers chose to discontinue the Residential ZNE Facility in 2012.

Scaled Field Placement: Scaled Field Placement (SFP) coordinates technology placement 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 firsthand experience with the technology. 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 technologies to those with adoption influence to increase "market traction and possibly gain market information." ETP may collect information from customers regarding the installation (adoption of the measure and barriers faced).

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. Key features 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."

Market & Behavioral Studies: Market & Behavioral Studies (MBS) involves performing targeted research to understand the market for emerging technologies. As per the PIP, MBS projects aim to "enhance market intelligence of customer needs and 'decision triggers' to improve acceptance of new or under-utilized technologies in the energy efficiency portfolio." Market & Behavioral Studies attempt to capture customer perceptions, acceptance, market readiness or market potential for new or

[9] 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.

underutilized technologies.[10] This may be done through either primary or secondary research. As per the PIP, 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." According to program managers, MBS efforts are conducted before, after or in parallel to a related program element effort.

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 consists of "taking an early-stage technology or concept and transforming it into a saleable product." Further, the PIP notes that the technology development support program 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."

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. 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 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.

2.1.3 Program Objectives, Program Performance Metrics and Other Outcomes

The ETP PIP provides program objectives and program performance metrics (PPMs) from which to evaluate effectiveness. The evaluation team also incorporated other outcomes into our framework for evaluating effectiveness.

- Program Objectives: These element-specific quantitative values track program activities, including the number of projects initiated and completed, events hosted and measures adopted.
- Program Performance Metrics: PPMs vary across program elements, including adoption metrics, technical potential and anticipated outcomes from activities.
- Other outcomes: These are derived from program theory and logic models that provide expected outcomes from program element activities.

It is worth noting that objectives, PPMs and outcomes can overlap. For example, the number of Technology Assessment measures adopted into the portfolio reflects a TA PIP objective, TA PPM and is an expected outcome in the TA program theory and logic model. We outline each of these below.

[10] 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 those with verified and documented low market penetration rates.

Program Objectives

The PIP, as well as subsequent conversations with ETP program staff, provided element-specific objectives. As part of the evaluation effort, we conducted an analysis of the ETP database to assess if each program element achieved stated objectives. Table 4 below provides an overview of these objectives.

Table 4. PY2010-2012 Program Implementation Plan Objectives by Program Element

Objective	PG&E	SCE	SCG	SDG&E	Statewide
Assess technology assessment measures	28	30	7	8	73
Adopt technology assessment measures into energy efficiency programs	12	15	4	4	35
Initiate and/or complete scaled field placement	7	4	2	2	15
Initiate demonstration showcases					14
Initiate market & behavioral studies	1	1	1	1	4
Initiate technology development support projects	2	2	1	1	6
Hold TRIO events (3 events per year or 9 per program cycle)					9
Technology Test Centers (SCE)	Complete ZNE center (SCE only)				NA
Source: Program Implementation Plans for each IOU.					

Program Performance Metrics

On December 2, 2010, the Commission issued Resolution E-4385, approving program performance metrics[11] for the four IOUs for PY2010-2012 statewide energy efficiency programs. The evaluation team created PPM categories to organize our findings as illustrated in the table below.

Table 5: Emerging Technologies Program Performance Metrics

Program Element	PPM Category	Description
Program wide	Adoption	The number of new "proven" ET measures adopted* into the EE portfolio.
	Potential	Potential energy impacts** (energy savings and demand reduction) of the adopted ET measures into the EE portfolio.
Technology Assessment	Adoption	Number of ETP measures which have undergone TA that are adopted* into the EE portfolio, including but not limited to each of the following: (a) Advance HVAC technologies (b) High-efficiency plug loads and appliances (c) Advanced lighting technologies
Scaled Field Placements	Adoption	Number of ETP measures that have undergone SFP and are adopted* into the EE portfolio.

[11] These represent the approved PPMs and metric types for the Emerging Technologies Program (Resolution E-4385, Appendix A, pp. 39-40).

Program Element	PPM Category	Description
Demonstration Showcases	Knowledge increase	Self-reported increase in knowledge by randomly selected sample of targeted stakeholders who either 1) visited the DS or 2) were informed about the DS in a workshop about benefits of the DS.
Market and Behavioral (M&B) Studies	Knowledge Increase	Self-reported increased in knowledge among internal ET stakeholders about the technologies targeted by the M&B studies.
Technology Development Support (TDS)	n/a	Number of new performance specifications and/or Use Cases*** produced as a result of TDS sub-program.
	n/a	Number of new performance specifications and/or Use Cases presented to manufacturers/private industry for possible action.***
Business Incubation Support (TRIO)	Knowledge increase	Percent of attendees who voluntarily respond and self-report increased understanding on how to do business with utilities.
Technology Test Centers (TTC)	Adoption	Number of ETP measures evaluated at the TTCs in support of ET assessments sub-program that are adopted* into the EE portfolio (and/or available in the market).

* "Adoption" means measure is available to end-use customers through IOU programs. Adoption of a measure may be attributed to one or more ET sub-programs.

** Potential energy impacts to be reported based on ET project findings and estimated market potential (reported through quarterly ET database updates) via statistical overview of the ETP portfolio, including technical potential of measures recommended to the EE portfolio.

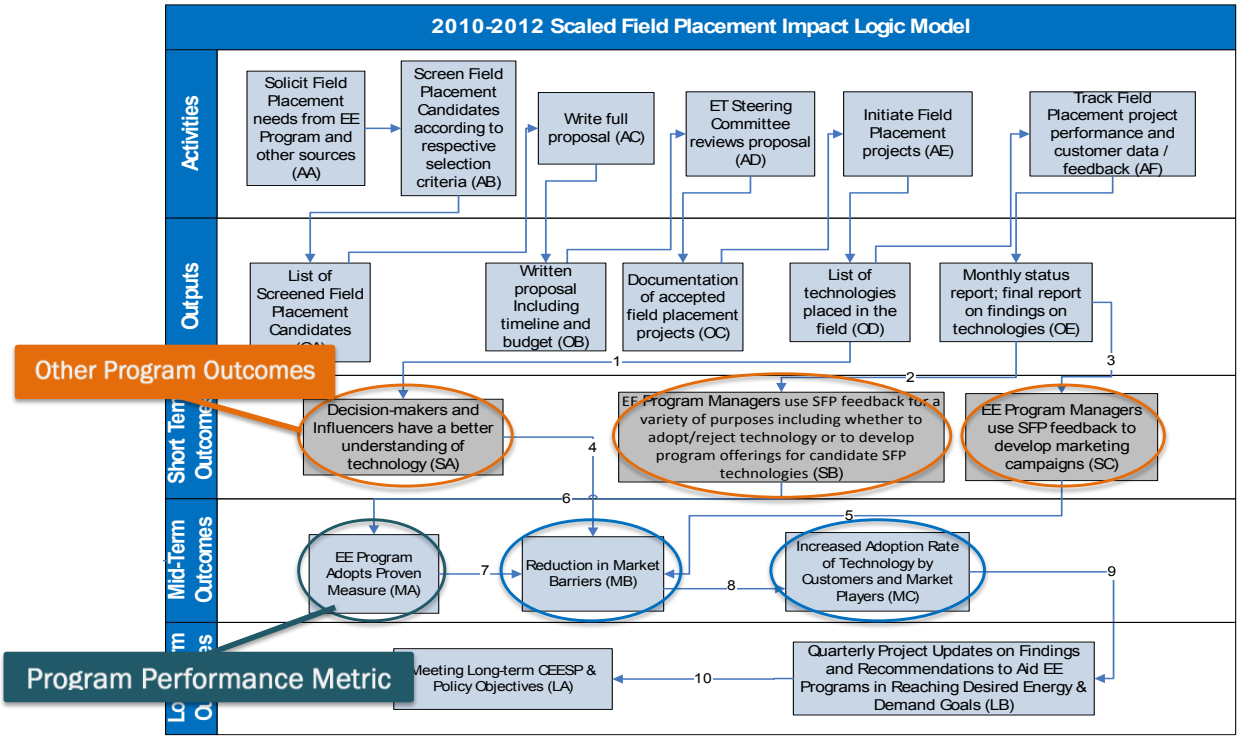
***Note that the evaluation effort did not assess TDS program performance metrics.

As part of this resolution, the IOUs were required to report on all PPMs. For ETP, this report was required at the end of the three-year portfolio cycle. The June 3, 2013 IOU report provided values or descriptions for the PPMs shown in Table 5. (Within our report, we include the values as shown in the June 3, 2013 IOU report. It was outside the scope of our evaluation to validate or verify the values within the IOU PPM report.) Numeric PPMs were available through the ETP database, but do not necessarily align with IOU PPM reported values due to lack of, or inconsistent, data.

Other Outcomes

Each program element has a logic model, and within those logic models there are short-term, mid-term and long-term expected outcomes. Many of these overlap with objectives and PPMs, but there are other outcomes that can be reviewed to assess program effectiveness. For example, Figure 1 provides an example of a program element logic model to illustrate how outcomes and PPMs can overlap. In the case of Scaled Field Placement, the PPM is the "number of ETP measures that have undergone SFP and are adopted into the EE portfolio," which overlaps with an anticipated element outcome of "EE Program Adopts Proven Measure" as well as the PIP program objective of "initiate and/or complete 15 Scaled Field Placements."

Figure 1: Scaled Field Placement Program Element Logic Model



Throughout this effort, we assessed objectives, PPMs and other outcomes as specified in the logic models. For more information on the program theories and logic models refer to the PY2010-2012 California Statewide Emerging Technologies Program Phase I Report.[12] Additionally, the logic models for all elements are in Appendix B.

[12] This report has been published as an interim report. Opinion Dynamics Corporation, Itron, Inc. 2013. PY2010-2012 California Statewide Emerging Technologies Program Phase I Report Volume I. Oakland: California Public Utilities Commission Energy Division.

2.2 PY2010-2012 Program Effects Evaluation Methods

The Phase II PY2010–2012 evaluation builds on the Phase I process evaluation and focuses on the impacts or program effects of the ETP. The evaluation was conducted in stages. In Phase I, which began in September 2011, the evaluation team focused on the first research area: the program design and implementation assessment. A summary of key findings and recommendations from the Phase I effort can be found in Appendix F. In Phase II, which began in 2013, the focus shifted to an effectiveness assessment. Activities performed in previous evaluations of ETP are included, such as aggregate analysis and targeted audience surveys (Appendix A contains a detailed methodology).

The evaluation team collected primary data for projects that were completed at the close of the PY2010-2012 program cycle. Resource acquisition programs spend dollars comparable to ETP and provide incentives to thousands, if not tens of thousands, of customers. Relatively, ETP reaches a smaller number of people. The full potential for the program is based on its ability to inform EE program managers, who can then reach many customers once a technology is included within the EE portfolio. The table below provides an overview of the total projects by element completed at the close of 2012, and the projects sampled for our data collection efforts.

Table 6: Emerging Technologies Program Element Completed Projects Sampled

Data Collection Instrument	Element	Unit	Project Sample Frame (N)[a]	Projects Where Data was Collected (n)	Approach
IOU energy efficiency and ETP staff survey	Technology Assessment	Reports	76	19	Random selection of up to 3 reports received by respondent; prioritizing non-TA reports
	Market & Behavioral Studies		18	8	
	Scaled Field Placement		15	9	
	Demonstration Showcase		18	8	
SFP participant interviews	Scaled Field Placement	Projects	14	9	Random sample of projects; Census for all participants listed within a project
Demonstration showcase attendee surveys	Demonstration showcase	Projects	19	3 primary data, 4 secondary data	Varied for two data collection efforts we used a census, for the third we used a convenience sample
TRIO event attendee survey	TRIO	Events	14	14	Census of event attendees in sample frame for all 14 events

[a] Represents projects completed as of data request on May 2013.

The evaluation team collected information on select program elements[13] through a variety of data collection activities. Primary data collection included in-depth interviews with ETP program managers, surveys of ETP and energy efficiency project managers, and surveys or interviews with program participants (end-users). Secondary data collection included a review of IOU program files and databases. The team performed data collection and analysis between March 2013 and July 2013.

Below we provide a summary of the methodologies used for data collection and evaluation activities for each of the ETP elements.

Data Collection Activities

In-depth interviews and target audience surveys: Seven data collection initiatives were conducted as shown in Table 7 and in Appendix A. The table below provides each data collection effort, the population sample frame and the number of completes.

Table 7: Data Collection Efforts by Element

N	Effort	Instrument Name	Element	Sample Frame[a]	Completes
1	Interview	ETP PM interviews	All	4	4
2	Interview	SFP program participant interviews	SFP	21	9
3	Interview	ZNE home retrofit project interviews	DS	3	3
4	Survey	Energy efficiency program manager survey	TA/MBS/DS/SFP	48	20
5	Survey	TRIO participant survey	TRIO	773	69
6	Survey	Energy innovation center-intercept survey	DS	Unknown	35
7	Survey	Food service technology demo kitchen survey	DS	58	11

[a] In some cases, the sample frame does not represent the full population.

ETP database: The evaluation team reviewed project information as provided in the Q4 2012 ETP database for all elements except TRIO.

Analytical Activities

Aggregate level of analysis: The aggregate level of analysis is part of the California protocols. The evaluation team developed descriptive statistics 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. This analysis was conducted from May to July 2013.

[13] Data was not collected for the Technology Development Support and Technology Test Center program elements.

Target audience survey analysis: The target audience surveys are part of the California protocols. Data collected through the surveys outlined above were analyzed by the evaluation team. We compiled and reported the relevant statistics of the target audience. The analysis was conducted from May to July 2013.

2.2.1 STUDY LIMITATIONS

Our evaluation, to the extent possible, serves as an indication of the effectiveness of ETP activities. This report documents the perceived value of the program as described by target audiences and a review of program activities. However, there are limitations to assessing program effectiveness given that success criteria for metrics are not present, available data is limited and, as with any evaluation effort, there are evaluation validity limitations. We document these limitations below.

Lack of success criteria for performance metrics

As noted above, the PPMs have no success criteria and therefore we make no evaluative statement about the effectiveness of the program in achieving PPMs. As such, the report provides a description of the results of data collection and analysis efforts. Without success criteria, there is no rubric from which to assess effectiveness.[14] Future program cycles should incorporate success criteria with metrics, and could use findings from our evaluation to benchmark program success. At the end of this report, we provide opportunities for future enhancement surrounding metric development.

To augment counts supporting the PPMs, the evaluation effort explored program effectiveness by testing causal linkages from program logic models.[15] This effort included only short-term and mid-term outcomes, and did not assess long-term outcomes, such as the adoption of technology in the market, increases in market traction, etc. However, these long-term outcomes are often of most interest in understanding program effectiveness.

Program tracking data limitations

Program tracking data is a key input for evaluation activities. In the case of ETP, substantial data tracking issues limited the evaluation team's ability to draw conclusions regarding program activities, and achievement of metrics (see Section B.1 for more detail).

We received each IOUs ETP database and aggregated them together to report on PIP objectives and PPMs. We performed QA/QC on the ETP databases with several subsequent revisions of the data by the IOUs before analysis could be performed. After the final revision (July 2013), there were several data cells with incomplete or missing information (see Appendix A, Section Appendix A.7 for more detail).

[14] The CPUC is aware that this is a global issue across all programs.

[15] Note that success criteria for program theory logic models were not arrived at, but results from this evaluation could be explored in the future using results from this evaluation.

Threats to internal and external validity

The ETP has a unique protocol within the California Energy Efficiency Evaluation Protocols.[16] There are no specific guidelines around how this study should address potential bias or uncertainty. For purposes of this evaluation, we borrowed the relevant areas of potential bias and uncertainty as outlined in the Sampling and Uncertainty Protocol and further described in the California Framework.[17] The following bullets outline how we attempted to alleviate some of these threats. For further details on evaluation bias and validity see Appendix A, Section A.8.

- **Non-response and other forms of selection bias:** We tested for non-response bias in one survey (TRIO) where there was sufficient population-level data to compare to the population and found none. For other efforts, the possibility of non-response bias is present.

- **Measurement error and response bias:** We alleviated this bias through careful design, review and pre-testing of survey instruments. Where multiple items are provided for choice, their order was randomly changed.

- **Sample frame error:** The evaluation team assessed the availability of email contact data and worked with the IOUs to improve population level contacts. We worked with the IOUs to ensure that we had the most complete sample frames available for each survey (i.e. appropriate EE program managers and all TRIO event attendees) and if email contact information was not complete, we noted where this occurs (Section Appendix A). Five respondents had previously responded to an ETP Phase I survey and also responded to the Phase II survey.

- **Reliability**: For internet surveys, the experience of the team was leveraged to create questions that, at face value, appeared to measure the idea or construct that they are intended to evaluate. We reviewed the questions to ensure that double-barrel questions (i.e., questions that ask about two subjects, but with only one response) and loaded questions (i.e., questions that are slanted one way or the other) were not asked. We checked the overall logical flow of the questions so as not to confuse respondents and thereby decrease reliability. In addition, to determine if the wording of the questions was clear and unambiguous, we pre-tested each survey instrument and reviewed the first set of survey completions. For our in-depth interviews and intercept surveys, reliability was assured through the use of professional analytical staff and training, where needed.

- **Construct validity:** Upon completion of the surveys, where multiple questions were planned to measure a single underlying construct, we performed statistical tests such as Cronbach's alpha to measure how well a set of items (or variables) measured a single uni-dimensional latent construct.[18] Ultimately, we found that our market barrier questions did not represent a single construct well and chose to present each question separately (Appendix A.7).

[16] California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals, California Public Utilities Commission, April 2006.

[17] TecMarket Works. The California Evaluation Framework. June, 2004.

[18] Cronbach's alpha is expressed as a function of the number of test items and the average covariance among the items.

- **Internal validity:** The evaluation team as well as the CPUC reviewed all drafts of the various surveys and interview guides. The IOUs were given an opportunity to review the near-final versions of each survey. The effectiveness of the ETP program can be considered as the sharing and building of information, and the development of an understanding of new or developing technologies. They are not energy impacts. Thus, our methods examine the effects of this program and its accomplishments, in non-energy terms.

- **External validity***:* This was not an issue where we incorporated a census for the survey efforts with a sufficient number of completes compared to the population of interest. For other efforts, we chose not to represent the population but rather to represent the projects examined. Notably, in many cases, the populations were typically small. In the case where a sample was drawn, it was drawn randomly to limit potential bias. All internet surveys employed best practices for this type of data collection, both in terms of anonymous responses and multiple reminders.

During the course of this evaluation study, we carefully considered likely threats to validity or potential bias. Generally, we believe that this study results are valid and not overly biased. However, there are two instances where the study design may display bias or threats to validity. These are:

1. The potential for non-response bias in the TRIO and SFP data collection.

    - For TRIO, the completed sample of respondents did not proportionally represent TRIO attendees who attended one event versus multiple events. Multiple event participants could provide the program with more favorable ratings than single event participants, and therefore could inflate or deflate the overall merit of the program. To test for potential non-response bias, we conducted several parametric and non-parametric statistical tests, comparing multiple and single event participants on various scalar items. Overall, the results showed a few items with significant differences. Importantly, there was no significant difference found among respondents for the PPM findings.

    - For SFP, out of the 9 completed projects there were 21 potential respondents. Although the evaluation team attempted to contact all of the program participants within the sample frame, we were only able to speak to one participant per project. There is no metric to test if non-respondents were different from respondents.

2. The external validity of the IOU energy efficiency and ETP program staff survey, SFP interviews and DS data collection findings may not be high.

    - The external validity of the IOU energy efficiency program manager survey is defined as the extent to which evaluation findings apply to the total population of EE program managers who received ETP reports. The evaluation team received a set of 48 energy efficiency and ETP program staff from the IOUs. Not included as part of our evaluation were any external stakeholders who may have downloaded or received project information from ETP. It may be useful to explore alternative avenues for identifying the population of report recipients in future evaluations.

For Scaled Field Placement, resources required a data collection sample design of 9 out of 14 completed projects.[19] The team was comfortable with this sample design as our understanding was that SFP projects are relatively similar and for this reason, the evaluation team planned to generalize results to the population of PY2010-2012 projects[20]. However, due to the small number of overall projects, future projects may not be represented by these results.

[19] A list of completed SFP projects can be found in Appendix B.

[20] The findings on Scaled Field Placement data collection efforts range from 5% to 15% precision at a 90% confidence interval.

3. INTEGRATED RESULTS

The 2010-2012 California Statewide Emerging Technologies Program (ETP) is implemented by the four investor owned utilities (IOUs); Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Electric & Gas (SDG&E).

ETP is designed and implemented differently than other energy efficiency programs. As a non-resource acquisition program, ETP performs project-based activities to provide information that enables each IOU to adopt energy efficiency measures within its portfolio. According to the Program Implementation Plans, the ETP has three goals in support of its mission:

1. Increase the adoption of energy efficiency measures
2. Increase energy efficiency technology supply
3. Support the California Energy Efficiency Long-Term Strategic Plan.

Determining this complex program's effectiveness is not straightforward – there are few numeric values to track. The PY2010-2012 metrics include PIP objectives for projects initiated and/or completed, as well as agreed upon program performance metrics (PPMs). These metrics provide a way to trace ETP activities and achievement, but may not capture how effective the program is in meeting the three goals above. As such, this Chapter is structured to provide the PY2010-2012 ETP program achievements in terms of objectives and PPM metrics, followed by an exploration of program effectiveness grouped according to these overarching goals and based on findings from the evaluation research.

3.1 PROGRAM IMPLEMENTATION PLAN OBJECTIVES AND PROGRAM PERFORMANCE METRICS FINDINGS

Our evaluation efforts show that ETP staff successfully met the program's PIP objectives. We also present all data available for PPMs in the section below. Many of the PPMs did not have success criteria metrics to benchmark performance. As a result, many of the findings presented here are descriptions rather than evaluative statements about the achievement of PPMs.

3.1.1 Program Objectives Results

ETP staff met statewide objectives across all program elements (Table 8). The overall number of projects initiated for each element exceeded goals, with 288 initiated projects and 14 TRIO events, thereby reaching 250% of objectives.[21]

Table 8. Emerging Technologies Program PY2010-2012 Objectives and Results

Element	Metric	Statewide Objectives	Statewide Results	%

[21] Notably, ETP objectives are based on the number of projects initiated, however, it is possible to initiate multiple projects for the same technology. Further, a single technology can result as a project across many program elements.

Element	Metric	Statewide Objectives	Statewide Results	%
Technology assessments	Assess measures	73	188	258%
Scaled Field Placement	Projects initiated and/or completed	15	30	200%
Demonstration showcases	Projects initiated	14	31	221%
Market and Behavioral Studies	Studies initiated	4	21	525%
Technology development support	Projects initiated	6	18	300%
TRIO	Events (3 events per year or 9 per program cycle)	9	14	156%
	Total Projects Initiated	121	302	250%
Technology Assessment	Adopted measures into energy efficiency programs	35 measures	9 projects and 56 measures[a]	Achieved
Technology Test Centers (SCE)	Complete ZNE center (SCE only)	According to SCE, ZNE Test Center construction was halted in 2012 and budget was reassigned to ZNE specific projects.		

[a] Source: IOU PPM Report submitted June 2013.

IOU and CPUC staff should consider whether the objectives for ETP efforts were appropriately set, and whether or not objectives could be increased in future program cycles.

The IOUs met these objectives within the allocated budget; seventy-five percent of their budget through 2012 was spent, and the remaining 25% of the budget is allocated for ongoing projects according to the IOUs (Table 9). Following the initiation of the project, the program has up to six years for project completion (and presumably to spend the allocated budget).[22]

Table 9. Emerging Technologies Program Budget, By Element and by Investor-Owned Utility

	2010-2012 Program Budget	2010-2012 Program Expenditures	% of Budget Spent
ETP Element			
Technology Assessments	$23,857,667	$21,076,220	88%
Demonstration Showcase	$6,115,594	$3,681,809	60%
Scaled Field Placement	$6,040,132	$3,372,124	56%

[22] 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."

	2010-2012 Program Budget	2010-2012 Program Expenditures	% of Budget Spent
TRIO	$2,276,858	$1,035,136	45%
Technology Test Centers	$2,125,284	$1,135,678	53%
Technology Development Support	$1,133,631	$845,730	75%
Market and Behavioral Studies	$1,050,008	$1,026,244	98%
Program Mgmt & CPUC Reporting	$657,283	$212,862	32%
Total	**$43,256,456**	**$32,385,803**	**75%**
IOUs			
PG&E	$18,495,877	$13,597,332	74%
SCE	$17,194,725	$12,219,014	71%
SDG&E	$4,050,854	$3,951,389	98%
SCG	$3,515,000	$2,618,068	74%
Total	**$43,256,456**	**$32,385,803**	**75%**

3.1.2 Program Performance Metrics Results

For ease of discussion, we categorized the PPMs into three groups: technology adoption, technical potential, and increased knowledge as a result of participating in the program. For a complete list of PPMs see Table 5. We present our findings within these three groupings. Technical potential results will be provided in an addendum to this report.

Technology Adoption Metrics

As noted in Chapter 2, there are four PPMs related to technology adoption.

Table 10: Technology Adoption Program Performance Metrics

Program Element	PPM Category	Description
Program-wide	Technology Adoption	The number of new "proven" ET measures adopted* into the EE portfolio.
Technology Assessment	Technology Adoption	Number of ETP measures which have undergone technology assessment that are adopted* into the EE portfolio, including but not limited to, each of the following: (a) Advance HVAC technologies (b) High-efficiency plug loads and appliances (c) Advanced lighting technologies
Scaled Field Placements	Technology Adoption	Number of ETP measures that have undergone SFP and are adopted* into the EE portfolio.
Technology Test Centers	Technology Adoption	Number of ETP measures evaluated at the TTCs in support of ET assessments sub-program that are adopted* into the EE portfolio (and/or

Program Element	PPM Category	Description
		available in the market).
* "Adoption" means measure is available to end-use customers through IOU programs. Adoption of a measure may be attributed to one or more ET sub-programs.		

Notably, there are various terms used to describe ETP activities, which are used differently by each utility; these include "project", "technology", and "measure". We provide one way to differentiate these terms below:

- **Project:** ETP is project based, there were 288 projects conducted within the PY2010-2012 program cycle, representing multiple technologies.
- **Technology:** A technology is an equipment, practice or approach that can cover any end-use. One technology could be assessed by multiple projects. For example, there were multiple projects assessing LED technology in this program cycle.
- **Measure:** A measure is an application of a technology that may ultimately have a different incentive level, potential market sector, etc. For example, the LED technology could subsequently result in multiple measure codes within the energy efficiency portfolio.

The ETP database[23] tracks program activities by project. However, the PPMs represent measures adopted into the portfolio. Currently, the ETP database does not systematically track technologies to measures, or projects to measures. Given the missing data, we have provided a description of adoption metrics from a variety of sources.

Four of the Emerging Technologies Program's PPMs are related to adopting technologies into IOUs' energy efficiency portfolios. According to the IOU's PPM report submitted in June 2013, 19 projects and 58 measures were adopted into the EE portfolio.[24] No other information on adopted measures is available as this information is either not comprehensively tracked in the ETP database or reflects the timing of the transfer process.

The table below outlines the values submitted by the IOUs (Table 11). We also provide information sourced from the ETP database. Our analysis shows that the ETP has completed 155 projects (other projects are either on-going or stopped/cancelled) and recommended 61 of those projects for transfer into the IOU energy efficiency portfolio.

[23] The ETP database was created to provide greater insight into ETP program activities by activity. For more information on the ETP database, please refer to the Phase I PY2010-2012 report; Volume II.

[24] Note that the IOUs do not comprehensive track measure adoption in the ETP database filings. Of the 61 projects recommended for transfer, 10 have the EE program measure number. Of the 34 completed Technology Assessment projects recommended for transfer, only 8 have the EE program measure number they were transferred to.

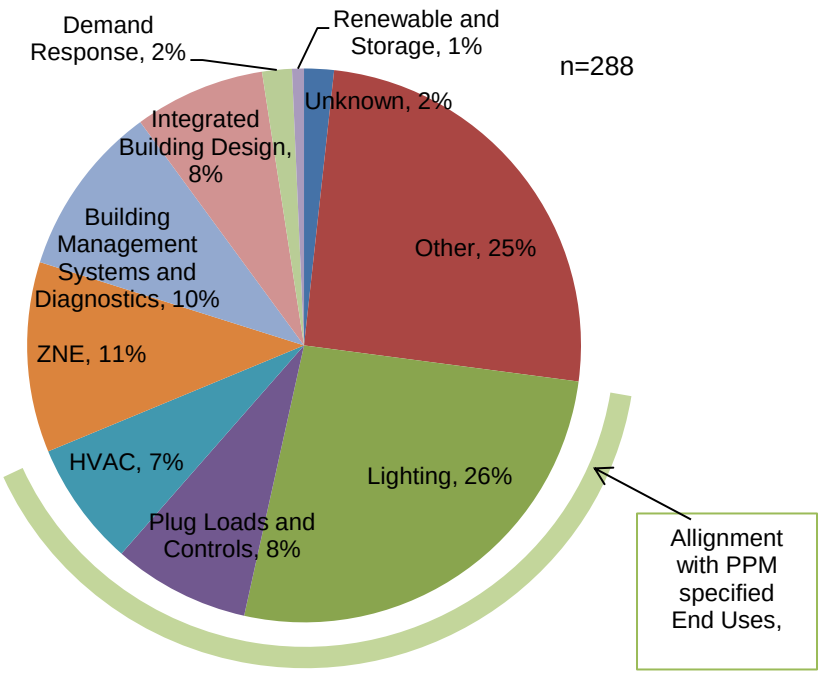
Table 11. Overall Summary of Adoption Program Performance Metrics

ETP Elements	Adoption Objective[a]	Projects Recommended for Transfer	Projects with Recommendation Decision Pending	Projects Not Recommended	Projects Not Applicable for Transfer[c]	Adopted[b]
Data Source	*PIP*	*ETP Database (total 155 projects)*				*IOU PPM Report*
Overall (all elements)	None	61	29	51	14	19 projects and 58 measures
Technology assessment	35 measures	34	17	35	2	9 projects and 56 measures
Scaled Field Placement	None	11	4	2	0	5 projects and 3 measures
SCE's technology test center	None	Not tracked				12 measures

[a] There are no adoption objectives for SFP or the overall portfolio.
[b] "Adoption" means measure is available to end-use customers through IOU programs. Adoption of a measure may be attributed to one or more ET sub-programs. Note that the ETP program database filings do not track complete data.
[c] Those projects meant for verification and/or helping other projects that cannot necessarily be adopted into a portfolio are classified as "not applicable for transfer" by the evaluation team.

An additional ETP PPM states that ETP projects support three specific technology types: advanced HVAC technologies, high-efficiency plug loads and appliances, and advanced lighting technologies. Approximately 40% of ETP projects cover these technology types (Figure 2).

Figure 2. Emerging Technologies Program Projects by End-Use



Other technologies include water heating, cooking, food processing and others.

Technical Potential

Technical potential results will be provided as an addendum to this report.

Knowledge Increase from Participation

There are three elements with program performance metrics related to increasing knowledge: Demonstration Showcases, Market & Behavioral Studies, and TRIO. Findings from data collection efforts related to these three elements are outlined below.

Table 12: Knowledge Increase Program Performance Metrics

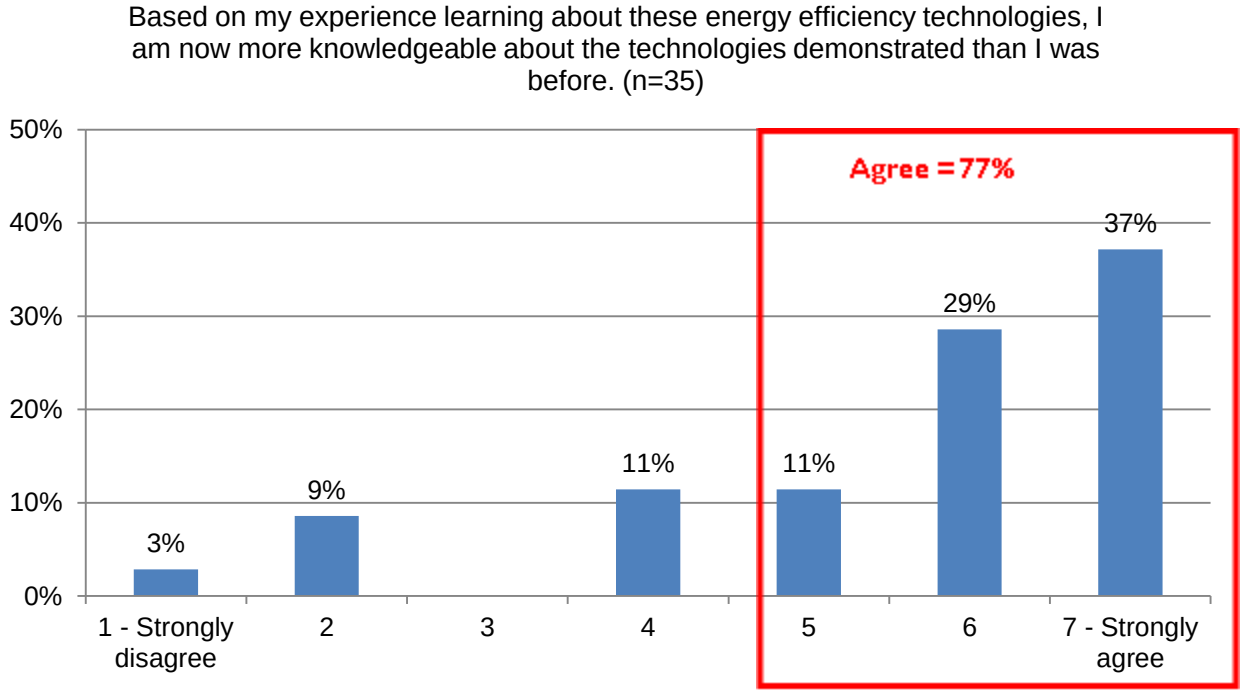
Program Element	PPM Category	Description
Demonstration Showcases	Knowledge increase	Self-reported increase in knowledge by randomly selected sample of targeted stakeholders who either 1) visited the DS or 2) were informed about the DS in a workshop about benefits of the DS.
Market and Behavioral (M&B) Studies	Knowledge increase	Self-reported increased in knowledge among internal ET stakeholders about the technologies targeted by the M&B studies.
Business Incubation Support (TRIO)	Knowledge increase	Percent of attendees who voluntarily respond and self-report increased understanding on how to do business with utilities.

Demonstration Showcases

The PPM relating to Demonstration Showcase (DS) projects is a self-reported increase in knowledge determined by a randomly selected sample of targeted stakeholders who either 1) visited the DS or 2) were informed about the DS in a workshop about benefits. To assess this PPM, we reviewed each DS project to determine the best sampling approach given substantial variation in project scope, target audience, and intended outcome (see Appendix A.4 for a detailed methodology). Primary data was collected for three DS projects and therefore cannot be generalized to the 19 completed projects.

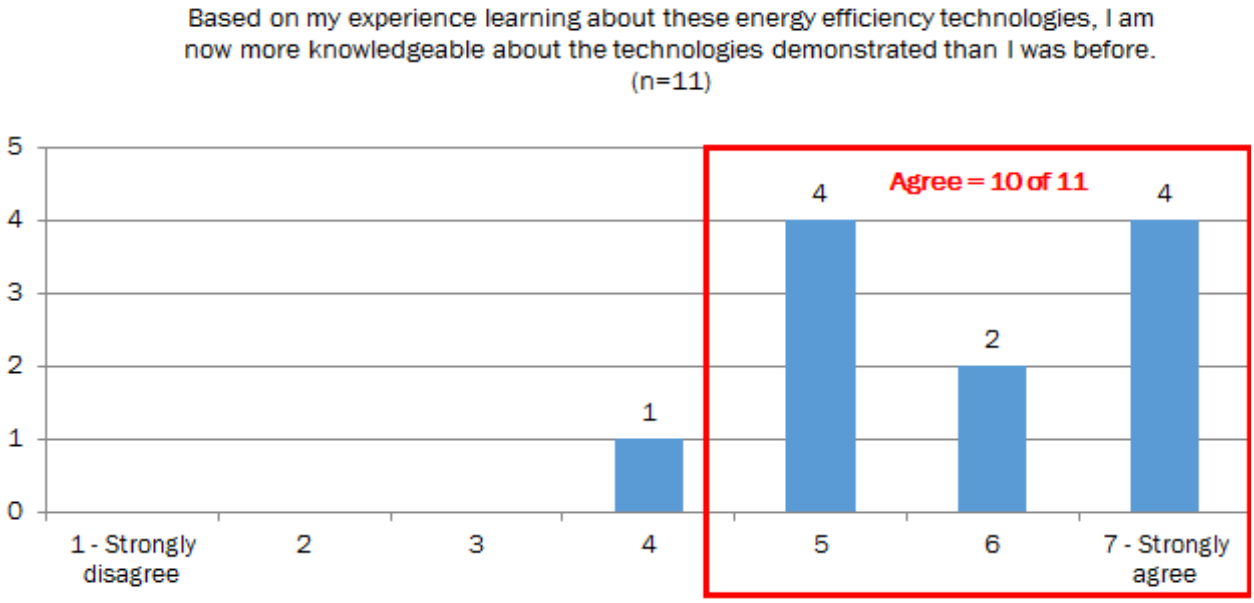
Findings show substantial variation across the PPM. Results from one survey illustrates that nearly three-quarters of respondents reported increased knowledge on the technologies demonstrated by ETP at SDG&E's Energy Innovation Center.

Figure 3. Knowledge about Technologies Demonstrated by Emerging Technologies Program, Demonstration Showcase Project



Results from a second project that demonstrated cooking technologies in three restaurants showed that 10 of the 11 surveyed respondents reported increased knowledge about the technologies demonstrated.

Figure 4. Knowledge about Technologies Demonstrated by Emerging Technologies Program, Demonstration Showcase Project 2



On the third project, a ZNE Home Retrofit, there was not a population where awareness could increase. According to interviews with local stakeholders involved in the project, planned dissemination and outreach efforts did not occur. However, according to the IOUs, a second phase is planned for this project where marketing and outreach efforts will take place.

Market & Behavioral Studies

The Market & Behavioral Studies PPM is a self-reported increased knowledge among internal, emerging technology stakeholders about the technologies targeted by the MBS studies. We fielded an internet survey to a contact list provided by the IOUs of IOU staff who received ETP reports. Responses were gathered from 18 energy efficiency program managers and 2 ETP staff.

Of these 20 respondents, 7 respondents provided comments on 8 MBS reports. For six of the eight reports, respondents said that the reports provided them with a better understanding of the level of customer acceptance and target market for the energy efficient technologies (Figure 5 and Figure 6).

Figure 5: Increased Knowledge from Market and Behavioral Studies Reports Regarding Target Market

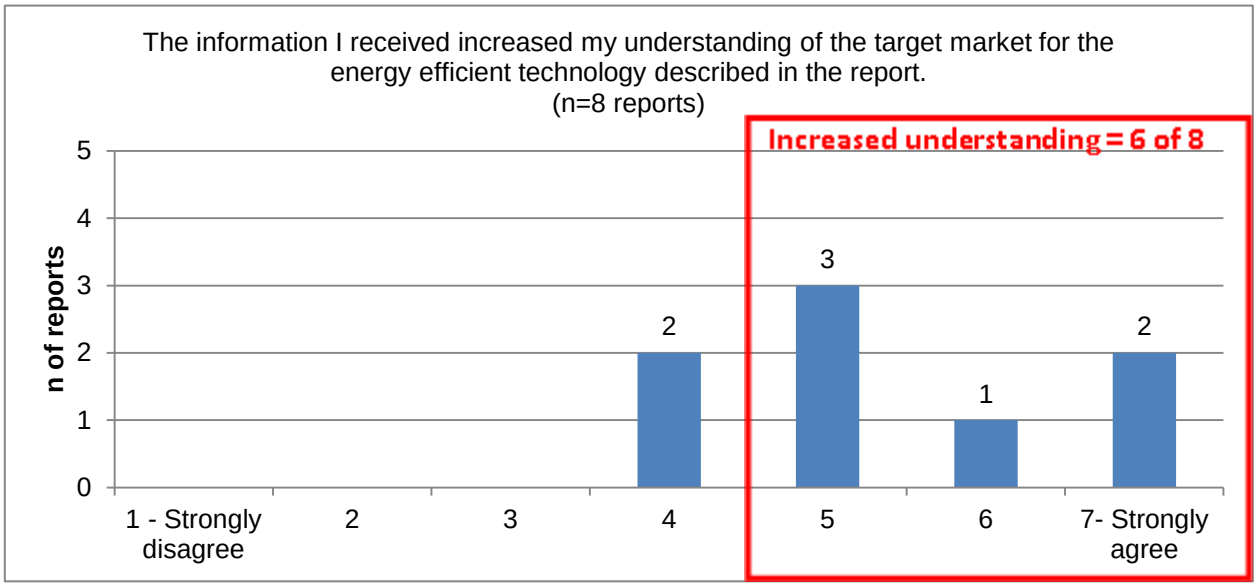
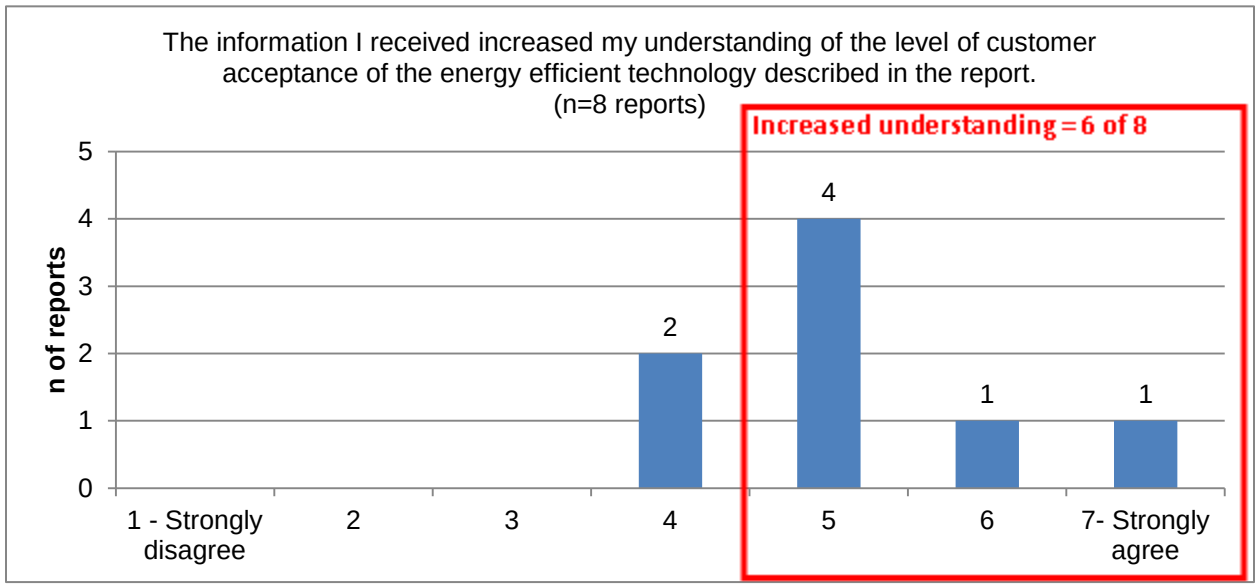


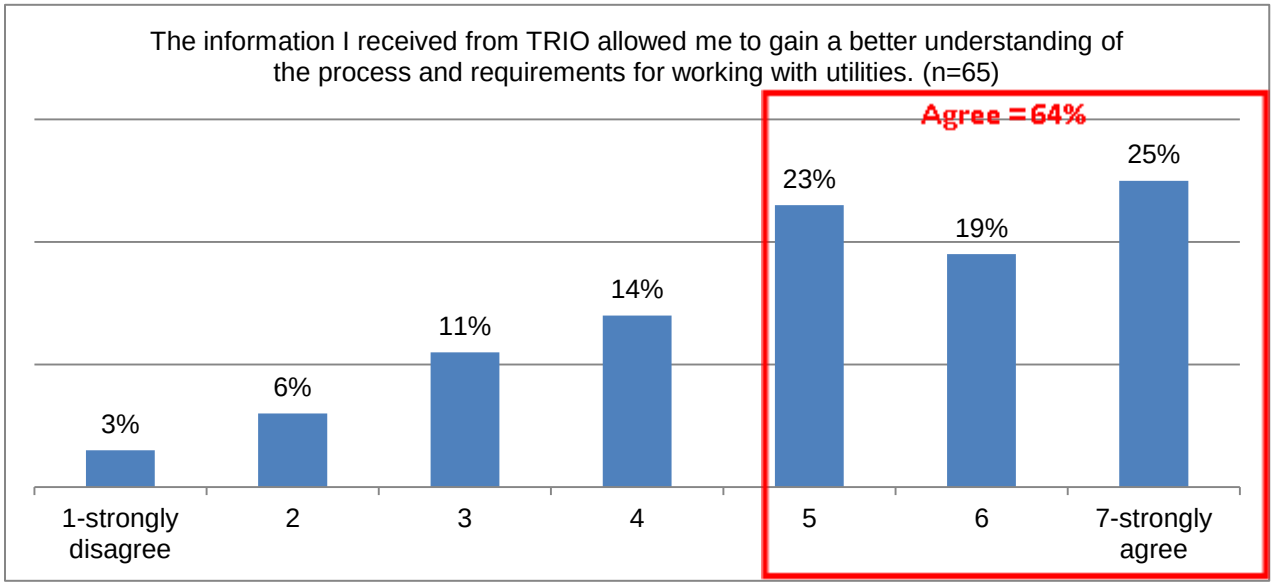
Figure 6: Increased Knowledge from Market and Behavioral Studies Reports Regarding Customer Acceptance



Technology Resource Incubator Outreach

The Technology Resource Incubator Outreach (TRIO) PPM is the percent of attendees who voluntarily respond and self-report increased understanding on how to do business with utilities. We fielded an internet survey to 773 TRIO attendees who attended an event in the 2010-2012 program cycle. The result was 69 completed surveys. Respondents were asked whether they gained a better understanding of working with the utilities. Over two thirds, or 64%, of respondents agreed that they gained a better understanding of the process and requirements for working with utilities (Figure 7).

Figure 7. Better Understanding of Utility Process by TRIO Attendees



Other Program Performance Metrics

As noted earlier, there are two PPMs related to Technology Development Support (TDS).

Table 13: Technology Development Support Program Performance Metrics

Program Element	PPM Category	Description
Technology development support (TDS)	n/a	Number of new performance specifications and/or Use Cases* produced as a result of TDS sub-program.
	n/a	Number of new performance specifications and/or Use Cases presented to manufacturers/private industry for possible action.*
*Note: The evaluation effort did not assess TDS program performance metrics.		

The IOUs self-reported TDS PPM results in the IOU PPM Report from June 2013 (Table 14).

Table 14: IOU Self-Reported Technology Development Support Program Performance Metrics Results

	2012 Progress for Metric Type 2a 2010-2012 Progress for Metric Type 2b			
Metric	**PG&E 2012**	**SCE 2012**	**SDG&E 2012**	**SCG 2012**
Number of new performance specifications and/or Use Cases[14] produced as a result of TDS sub-program.	3 performance specifications and 2 use cases	6	0	0
Number of new performance specifications and/or Use Cases presented to manufacturers/private industry	3 performance specifications and 2 use cases	6	0	1

	2012 Progress for Metric Type 2a 2010-2012 Progress for Metric Type 2b			
for possible action. [a]				

[a] "Possible action" means that the manufacturer/private industry considered TDS results in their product development efforts.

3.2 Exploration of ETP Effectiveness Beyond Program Performance Metrics

In the preceding section, we presented findings related to the PIP objectives and PPMs. As noted earlier, although ETP has met or exceeded its PIP objectives, these metrics may not sufficiently indicate whether the ETP is effective in achieving program goals. In this section, we synthesize our evaluation findings (see detailed findings in Appendix B.) to explore the effectiveness of ETP. This section is intended to provide a description of ETP activities to inform stakeholders of program activities and to inform future program design and implementation efforts. In addition, findings may also help to inform success criteria for evaluating ETP going forward, identifying outcomes that could be measured, and if measured, appropriate baselines for performance. Most of the findings presented here result from assessing whether the efforts associated with ETP activities support program theory and intended outcomes.[25]

This program has several program elements to support energy efficiency technologies, practices and tools along their path from research and development to commercial adoption. The PIPs associate specific elements with the overarching goals. For our purposes, we grouped ETP activities to align with the three PIP goals:

- **Increasing technology supply**: ETP facilitates research to increase supply of energy efficiency technologies, practices or tools (aligns with PIP Goal 2).
- **Increasing adoption of energy efficiency measure**s: ETP supports adoption of EE measures through two tactics: 1) assessing the validity of savings from technologies, practices or tools, to increase internal IOU awareness and adoption; and 2) increasing awareness, and potentially adoption, of external stakeholders regarding new or under-utilized commercially available technologies, practices or tools (aligns with PIP Goal 1).
- **Supporting CEESP and related solutions**: In PY2010-2012 ETP revised the program design to explicitly support the CEESP and related Big Bold Strategies (aligns with PIP Goal 3).

[25] In the Phase I evaluation effort, the evaluation team worked with the CPUC and IOUs to develop program theory and update the current logic models for each program element, and to describe activities, outputs and short-term, mid-term and long-term outcomes associated with these efforts. Data collection efforts assessed achievement of short and mid-term outcomes from these models, where possible.

Next, select findings are presented to provide an integrated description of program effectiveness in support of PIP goals. Additional details by program element are outlined in Appendix B.

3.2.1 Increasing Technology Supply

ETP supports increasing technology supply via two program elements, Technology Development Support (TDS) and TRIO. TRIO has two primary activities: working with entrepreneurs and investors to help bring new technologies to market, and supporting relationship building through networking between entrepreneurs and investors. The IOUs do both of these through TRIO, which according to the PIP, seeks to contribute to market transformation with initiatives that accelerate the commercialization of energy-efficient measures, and that provide transparency of each IOU's demand-side management rebate and incentive processes.

In addition, TDS assists developers in support of increasing technology supply by "taking an early-stage technology or concept and transforming it into a saleable product." TDS assessments were outside of the scope of this phase of our evaluation.[26]

Bringing new technologies to market

TRIO events are designed to support energy efficiency technology entrepreneurs by providing access to, and networking opportunities with, IOU staff and investors. In addition, events are designed to educate entrepreneurs on how to conduct business with the IOUs (i.e., submitting a promising technology to IOU programs, ETP staff, or third party implementers). An expected outcome of these efforts is that entrepreneurs will submit technology briefs and proposals to the IOUs. To understand the effectiveness of TRIO, we tested causal links[27] through conducting an internet survey with TRIO event attendees.

As measured against the expected outcomes, TRIO is positively affecting responding entrepreneurs:

- Almost two-thirds (64%) of TRIO survey respondents have gained a better understanding of the process of working with utilities.
- Close to one–third (20 entrepreneurs) of survey respondents have submitted a technology for consideration with either ETP or an IOU energy efficiency program directly.
- Of 27 technologies submitted, 8 were accepted.

[26] For more information on TDS, the PY2010-2012 California Statewide Emerging Technologies Program Phase I Findings Report provides a discussion of the design and implementation of this program element. Opinion Dynamics Corporation, Itron, Inc. 2013. PY2010-2012 California Statewide Emerging Technologies Program Phase I Findings Report Volume I. Oakland: California Public Utilities Commission Energy Division. http://www.calmac.org/publications/PY2010-2012_Phase_I_ETP_Statewide_Evaluation_Report_Volume_I.pdf

[27] TRIO causal links include: (1) events provide third-party implementers and entrepreneurs access to investors; (2) events increase entrepreneur and third-party implementer awareness of the process and requirements for working with the IOUs; (3) events increase investor awareness of process and requirements for working with IOUs (not assessed as no investors were reached during evaluation effort); (4) entrepreneurs and third-party implementers submit proposals and technology briefs; (5) technologies enter market directly.

- Many of the responding entrepreneurs attending TRIO events were working on and submitting products that aligned with the CEESP technologies of advanced HVAC, plug-loads, advanced lighting or integrated design (Table 15).[28]

Table 15: Technologies Submitted by TRIO Attendees

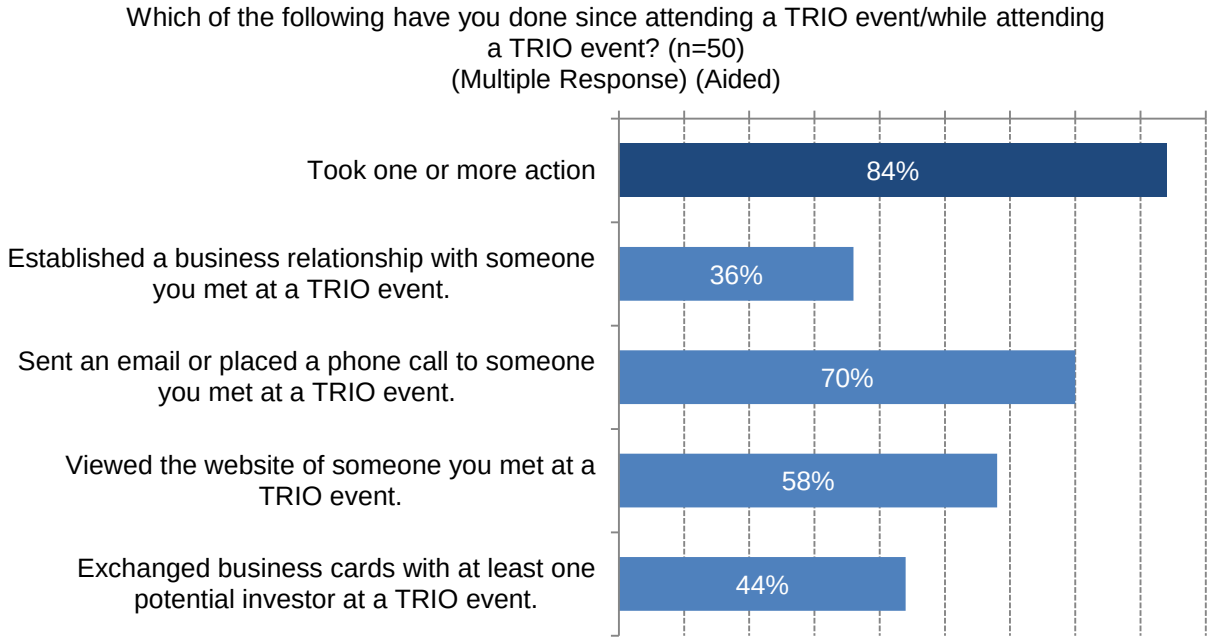
CEESP End-Use Area	Category of Technology Submitted to ETP or IOU EE Program or Third-Party EE Program	Entrepreneurs who Submitted Technologies (n=20), Multiple Response
X	Advanced HVAC	35% (n=7)
X	Integrated building design and operation	20% (n=4)
X	Plug-loads and /or smart appliances	15% (n=3)
	Demand response	15% (n=3)
	Behavioral	15% (n=3)
X	Advanced lighting	10% (n=2)
	Water-energy nexus	5% (n=1)
	Energy storage	5% (n=1)
	Other	10% (n=2)
Source: TRIO Attendee Survey.		

Building relationships

We also explored networking actions that entrepreneurs have taken since attending a TRIO event. As shown in Figure 8, TRIO events appeared to facilitate different actions, including the creation of business relationships.

[28] The 8 accepted technologies fell within the Advanced HVAC, Advanced lighting, Integrated building design and operations, plug-loads and smart appliances, behavior, demand response and energy storage categories (note that respondents could select multiple end-use categories for their technologies).

Figure 8. Networking Actions Since Attending a TRIO Event



In our earlier assessment of the design of TRIO, we stated that measuring expected outcomes from networking can be difficult and costly and suggested that surveying participants over time is a reasonable approach to assessing long-term outcomes of TRIO networking sessions. The 36% of entrepreneurs who indicated establishing a business relationship are good candidates to follow-up with in future evaluations to determine if these relationships led to commercialized technologies.

3.2.2 Increasing Adoption of Energy Efficiency Measures

ETP program staff use two primary tactics to support the increasing adoption of energy efficiency measures: 1) increasing awareness within the IOU (or internally); and 2) increasing awareness with early adopters and other market actors (or externally). Technology Assessments, Market & Behavioral Studies, Scaled Field Placements and Demonstration Showcases are expected to increase awareness of emerging technologies both internally and externally, which according to intended program outcomes will influence subsequent adoption of measures.

Increasing IOU staff awareness

We explored the effectiveness of increasing IOU staff awareness by fielding an internet survey to IOU energy efficiency and ETP program managers. The survey focused on information recalled from reports and other communication materials on completed ETP projects. For IOU staff, reports and project information are expected to create a better understanding of a technology and support decision-making to adopt or reject a technology.

We fielded a survey to 48 IOU program staff that received information on completed ETP reports. Respondents included 18 EE and 2 ETP program staff, respectively. Respondents were roughly proportional to the coverage of IOU program staff provided in the sample frame. Respondents reported

that they worked with multiple technologies with the most frequent including HVAC, lighting and thermostats. In addition, most respondents worked across multiple sectors (Table 16).

Table 16: Investor-Owned Utility Staff Respondent Sector

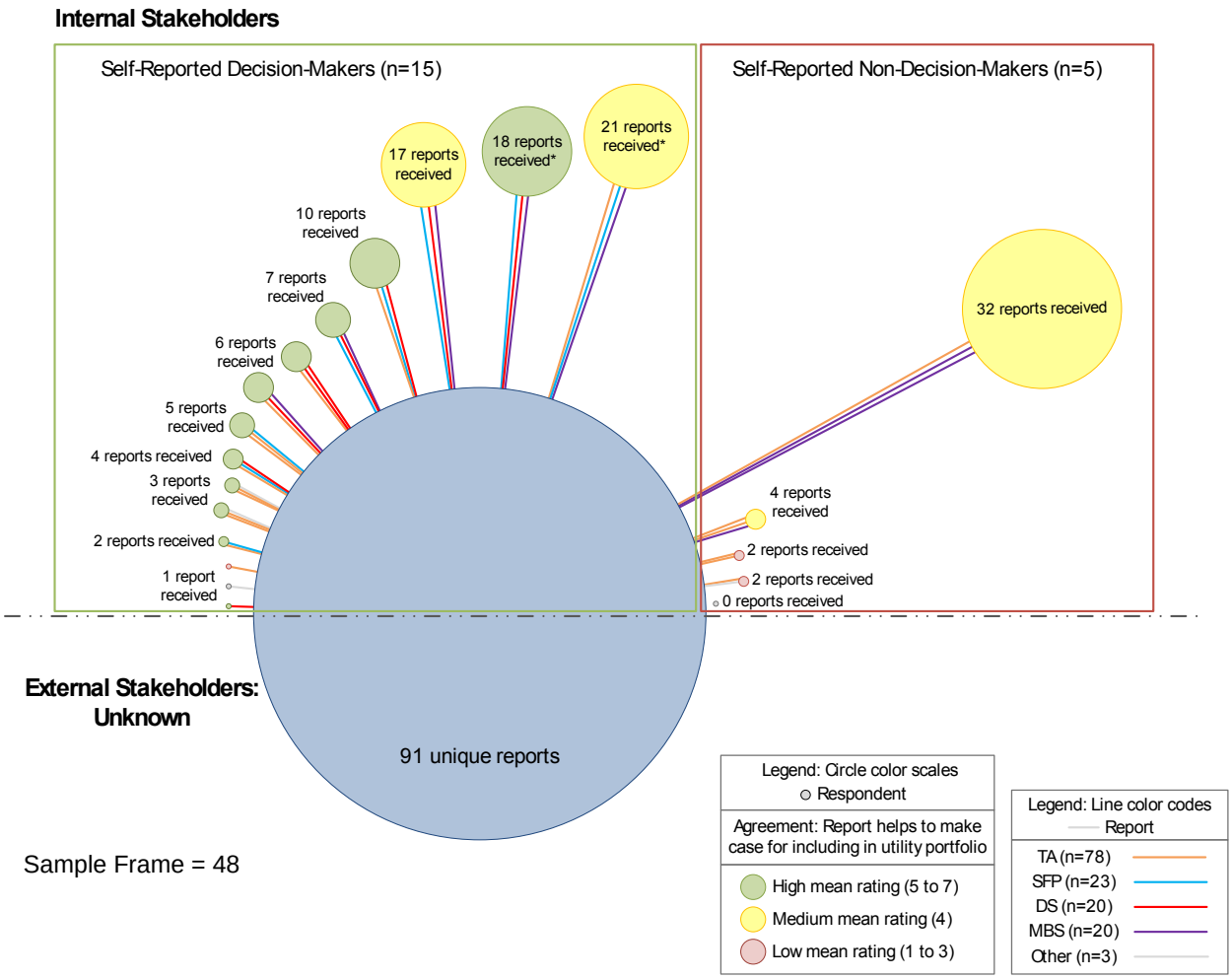
Sector area	% of Respondents (Multiple Response, n=20)
Commercial	15
Residential	13
Industrial	10
Agricultural	6

Below we provide an overview of the ETP reports that were distributed to IOU staff indicating whether these respondents were decision makers, and the level of influence these reports had in their decision making. Figure 9 provides an overview of the distribution of ETP reports to surveyed respondents.[29] The figure shows that of the IOU staff that receive reports, most are decision makers[30] and there is variation in the number of reports received. Additionally, just over half of the respondents stated that the reports were influential in their decision-making. Notably, our results exclude any external/internal stakeholders who received reports, but were not included in contact lists provided by the IOUs.

[29] To reduce respondent burden, we asked respondents to provide detailed information on up to three ETP reports.

[30] IOU energy efficiency decision-makers are those who self-report making a decision about whether to adopt a technology into their program.

Figure 9: Distribution of Sampled Emerging Technologies Program Reports to Investor-Owned Utility Surveyed Staff



Note: A circle indicates one survey respondent. The circle size indicates the total number of reports the respondent reported receiving. Respondents answered detailed follow-up questions about up to 3 reports that were randomly selected among reports received. The reports included in the follow-up questions are represented by the colored lines. Respondents reported receiving a total of 143 reports, as multiple respondents may receive the same report.

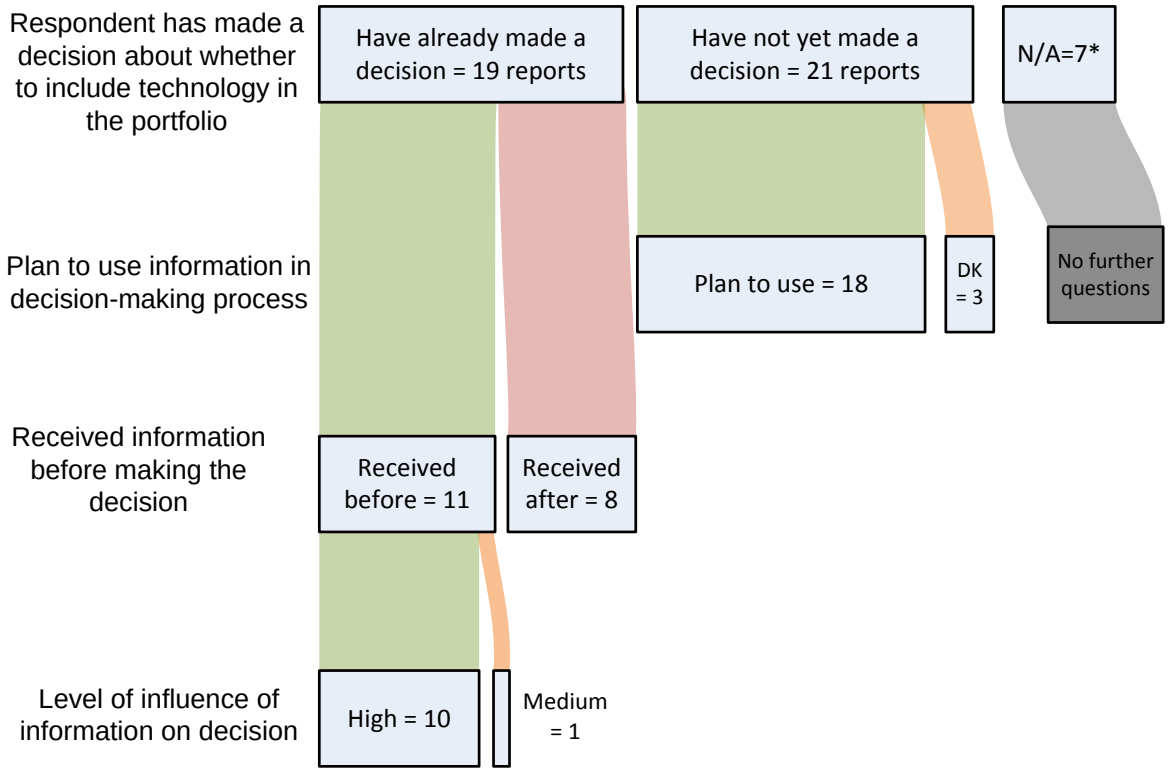
The timing of when ETP reports are received is critical. Nineteen reports covered a technology where a decision had been made to adopt or reject the technology into the portfolio. Of these, 11 of the reports were received prior to making a decision regarding the technology, and 10 of the 11 were rated highly in terms of having an influence on the decision (Figure 10). For the remaining 8 reports, information was received about the technology after a decision was made.[31]

Moreover, there is the potential to affect more decisions. 21 reports reflected technologies where a decision had not yet been made. For these reports, respondents indicated that they plan to use

[31] The survey asked whether the respondent had received any information (including informal communications, memo, or final report) prior to making a decision about adopting or rejecting a technology.

information in 18 of the reports for their decision-making process. These results reflect a preponderance of evidence across elements that reports are increasing IOU energy efficiency and ETP program staff awareness.

Figure 10. Decision to Adopt or Reject Technology, All Reports



***Respondent indicated they are not decision-makers for the technology.

Below we provide specific findings for TA, MBS, SFP and DS program elements.

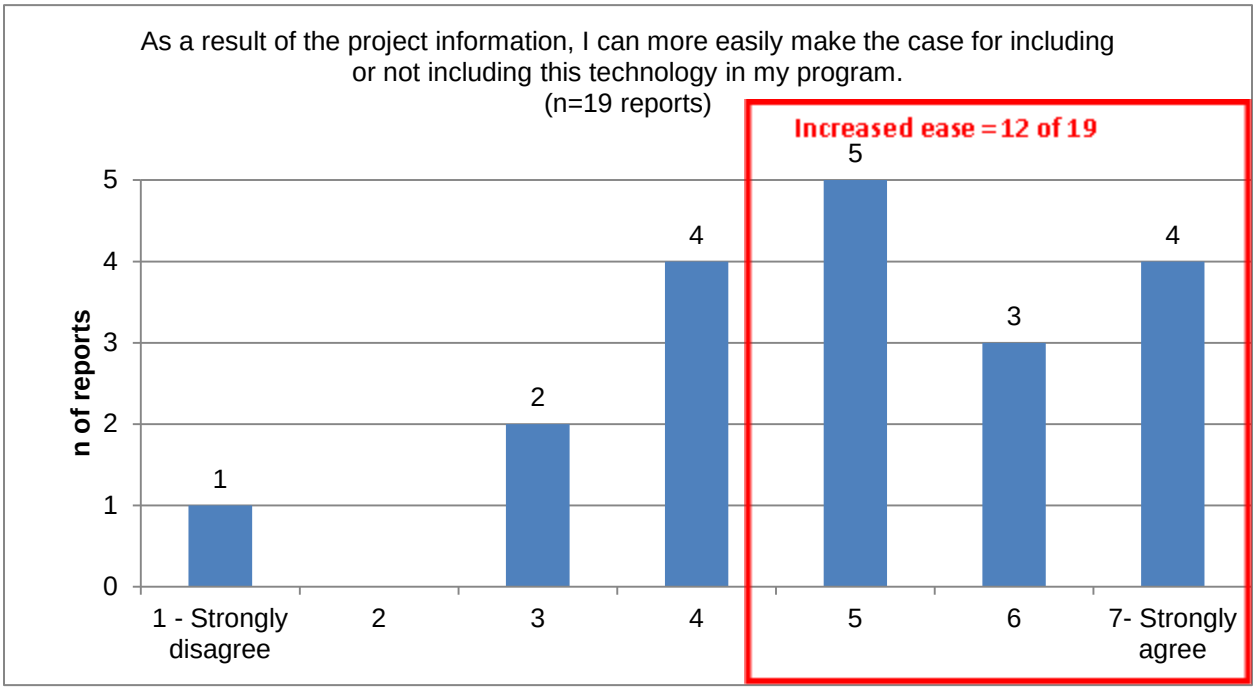
Technology Assessments

IOU energy efficiency portfolio staff requires proof of savings prior to adopting technologies into their portfolio of program offerings. According to the PIP, projects within the TA element evaluate "energy

efficient measures that are new to a market or under-utilized for a given application for performance claims and overall effectiveness in reducing energy consumption and peak demand."[32]

To best support the IOU energy efficiency portfolio, TA's should enable program managers and others to make decisions around the validity of savings from specific technologies. According to 14 survey respondents who received TA reports, almost all of the recalled reports provided information relevant to their target markets. Moreover, respondents stated that nearly two-thirds out of 19 recalled TA reports helped "make the case" for a technology's inclusion into a program (Figure 11).

Figure 11. Technology Assessment Reports Ease of Making Case for Adoption



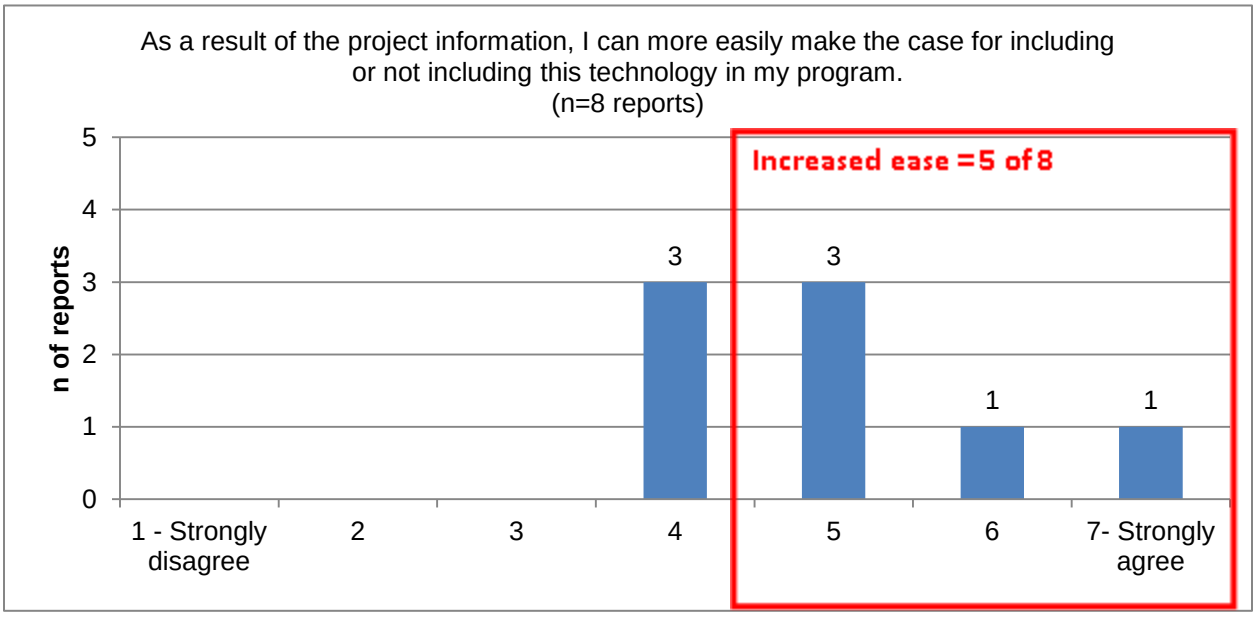
Market & Behavioral Studies

According to the PIP, MBS projects focus on "targeted research on customer behavior, decision making, and market behavior to gain a qualitative and quantitative understanding of customer perceptions, customer acceptance of new measures, and market readiness and potential for new measures."[33] Based on the seven respondents who recalled receiving MBS reports, these reports increased energy efficiency program managers' understanding of markets' and customers' acceptance of EE products. In addition, five of eight recalled reports helped "make the case" for a technology's inclusion into the program (Figure 12).

[32] TA causal links include: (1) EE project managers have a better understanding of assessed technology and make a decision to adopt or reject; (2) energy efficiency program adopts proven measure; (3) reduction in customer market barriers; (4) increased adoption rate of technology by customers.

[33] MBS causal links include: (1) ETP program managers use M&B report findings to help decide if a technology is included as an assessment; and (2) EE program managers have a better understanding of markets' and customers' acceptance of energy efficiency products.

Figure 12. Market & Behavioral Studies Reports Ease of Making Case for Adoption



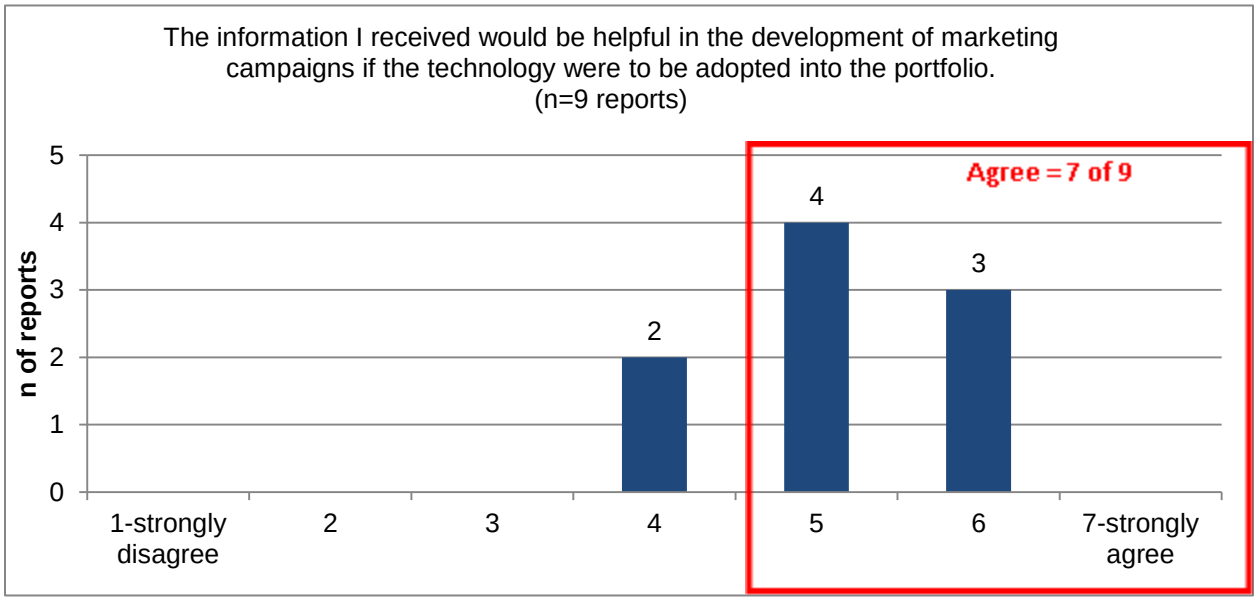
Scaled Field Placements

According to the PIP, Scaled Field Placements bring emerging or under-utilized technologies to market influencers to "gain market traction and possibly gain market information" of technologies in the field.[34] Additionally, project information is provided to IOU energy efficiency program staff to leverage development of marketing campaigns and support decision-making for the adoption of the technology into the IOU energy efficiency portfolio. According to the nine survey respondents who recalled receiving SFP reports,[35] respondents agreed that for seven of the nine reports recalled, the information received would be helpful in developing marketing campaigns.

[34] SFP causal links include: (1) decision-makers and influencers have a better understanding of technology; (2) EE program managers use SFP feedback for a variety of purposes, including whether to adopt/reject technology; (3) EE program managers use SFP feedback to develop marketing campaigns; (4) EE program adopts proven measure; (5) reduction in market barriers; (6) increased adoption rate of technology by customers and market players.

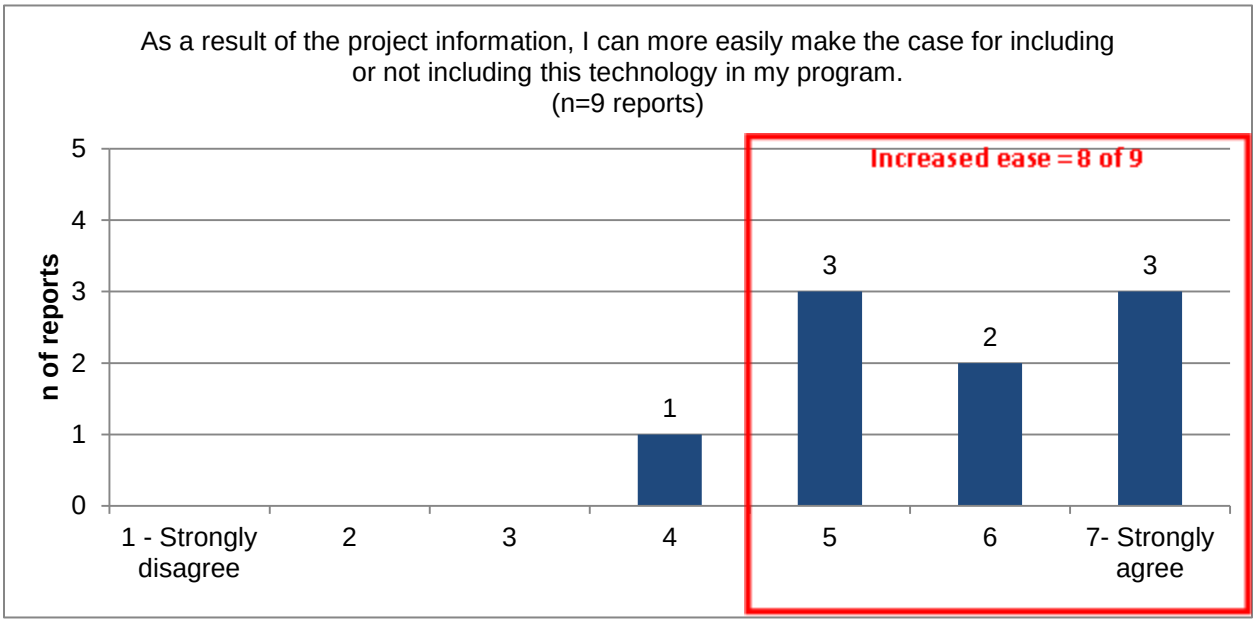
[35] Note that SCE does not use the SFP program element to transfer technologies into the IOU energy efficiency program. None of the reports included in our survey were received by respondents from that IOU. All respondents for this question were for PG&E projects. No responses were captured from Sempra.

Figure 13: Scaled Field Placement Helpfulness in Developing Marketing Campaigns



Additionally, eight of nine SFP reports we asked about were stated to have helped "make the case" for a technology's inclusion (or not) into a program (Figure 14).

Figure 14: Scaled Field Placement Reports Ease of Making the Case for Adoption

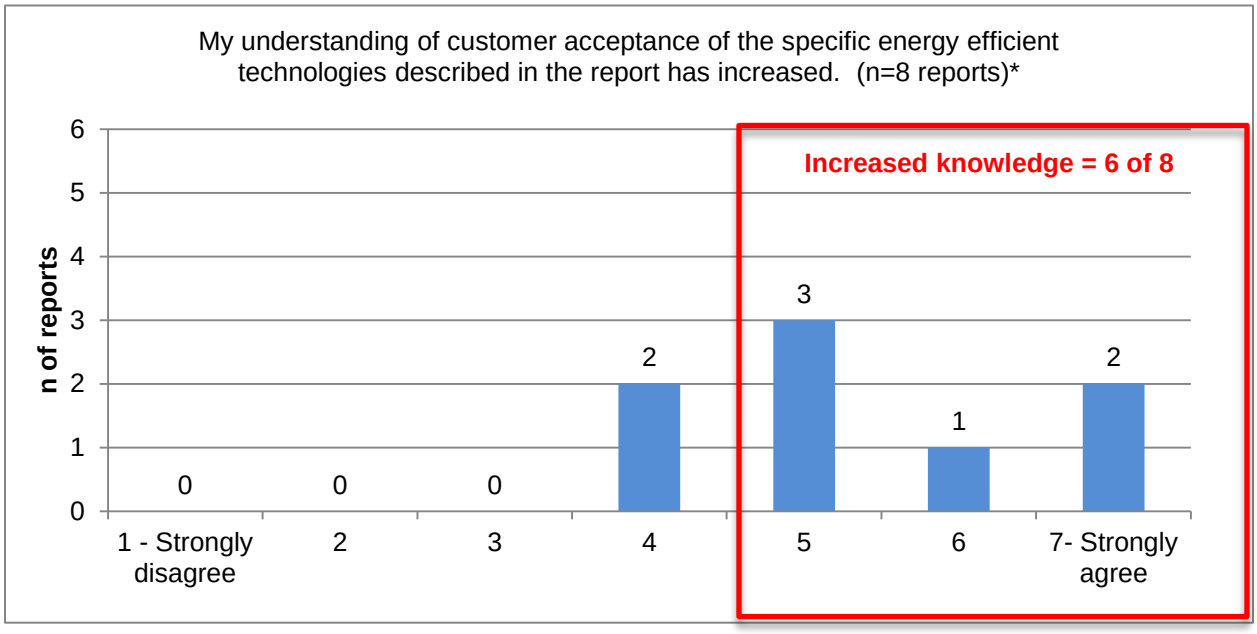


Demonstration Showcases

Demonstration Showcases (DS) are designed to provide "broad exposure, and for numerous visitors to 'kick the tires,' or at least experience the measure in an informal, real-world setting."[36] For Demonstration Showcases, the seven IOU staff respondents who recalled receiving reports indicated that for six of eight reports, their understanding of customer acceptance of the energy efficient technology increased.

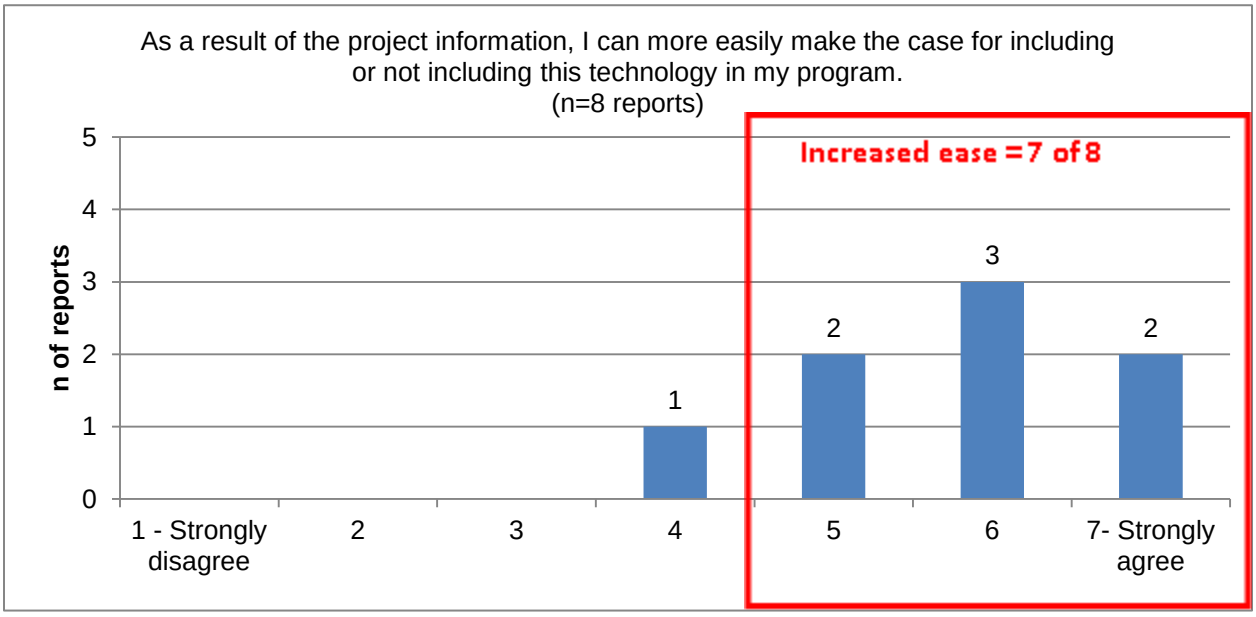
[36] DS causal links include: (1) customers/influencers have a better understanding of integrated solutions; (2) EE PM's have a better understanding of technical viability, customer acceptance or cost associated with integrated solutions; (3) customers pass word-of-mouth recommendations to their peers about integrated measures; (4) EE program adopts proven measure; (5) reduction in market barriers; and (6) increased adoption rate of technology by customers.

Figure 15: Demonstration Showcases Increased Understanding of Customer Acceptance



Moreover, respondents stated that seven of eight DS reports helped "make the case" for a technology's inclusion (or not) into a program (Figure 16).

Figure 16: Demonstration Showcase Reports Ease of Making Case for Adoption



Results from our evaluation efforts indicate that ETP activities met anticipated program theory and logic model outcomes related to increasing internal IOU energy efficiency technology awareness. In the

PY2010-2012 California Statewide Emerging Technologies Program Phase I Findings Report,[37] we stated that knowledge transfer inside and external to the IOUs was needed to achieve Big Bold Strategies. It was outside the scope of our evaluation to assess the full dissemination of these reports to external audiences, but we did find that there were 29 out of 88 completed reports on the Emerging Technologies Coordinating Council (ETCC) website.[38] At this point, it is unclear who is reading reports downloaded from the ETCC website or how they use the information. Future effectiveness evaluations should assess dissemination effectiveness to both internal and external stakeholders through the Emerging Technologies Coordinating Council (ETCC) website.

Increasing external stakeholder awareness

For proven and under-utilized[39] technologies, practices and tools, ETP program staff attempt to increase adoption of, and demand for, energy efficiency measures via the Demonstration Showcase and Scaled Field Placement programs. The anticipated outcomes of these elements are to increase knowledge of the performance or benefits of the technology, as well as to spread word of mouth recommendations to peers, reduce market barriers to technology adoption, and ultimately increase adoption of the technology by market actors, influencers and customers. As described earlier, our evaluation aimed to gather data on specific causal links to determine if the expected outcomes were occurring.

Scaled Field Placements

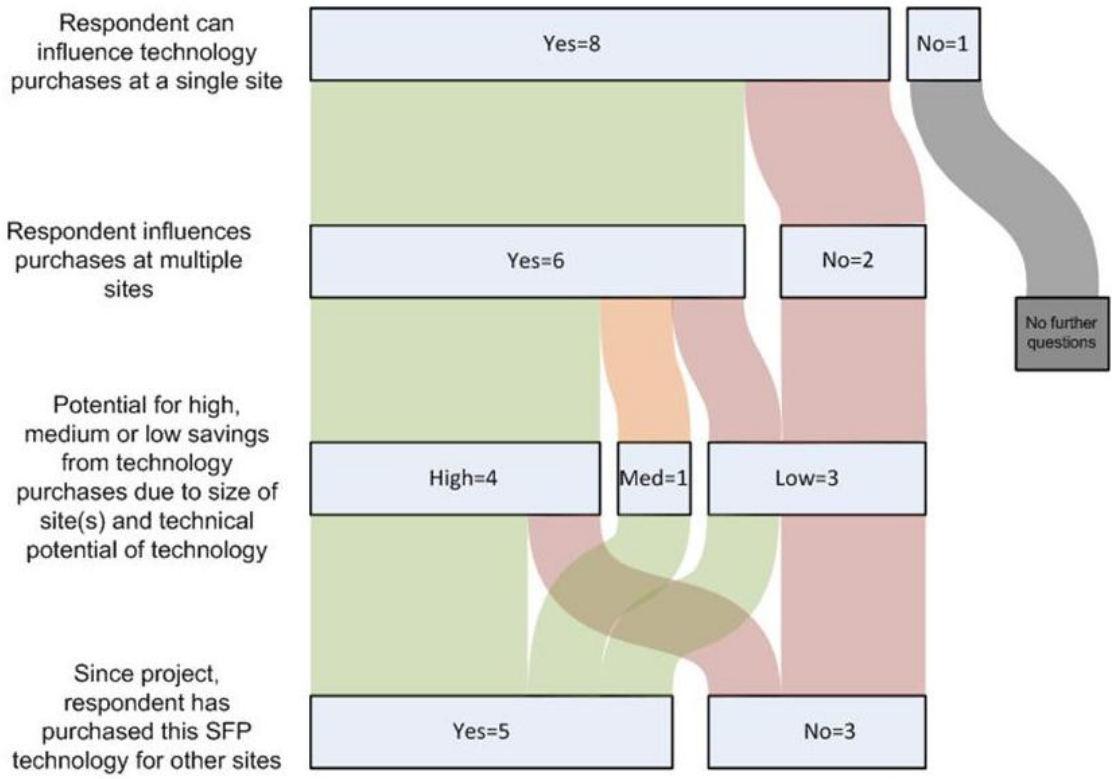
We found that the suite of projects sampled for SFP targeted market influencers. As shown in the figure below, often these same participants adopted the technology – an expected outcome of the ETP project. Overall, eight of the nine respondents were found to influence technology purchases at a single site, while six of the eight influenced multiple sites. Five of these eight had purchased the technology for their sites since participating in the project.

[37] Opinion Dynamics Corporation, Itron, Inc. 2013. PY2010-2012 California Statewide Emerging Technologies Program Phase I Findings Report Volume I. Oakland: California Public Utilities Commission Energy Division.

[38] ETCC website access on June 10-11, 2013. The ETCC website provides access to completed ETP project reports.

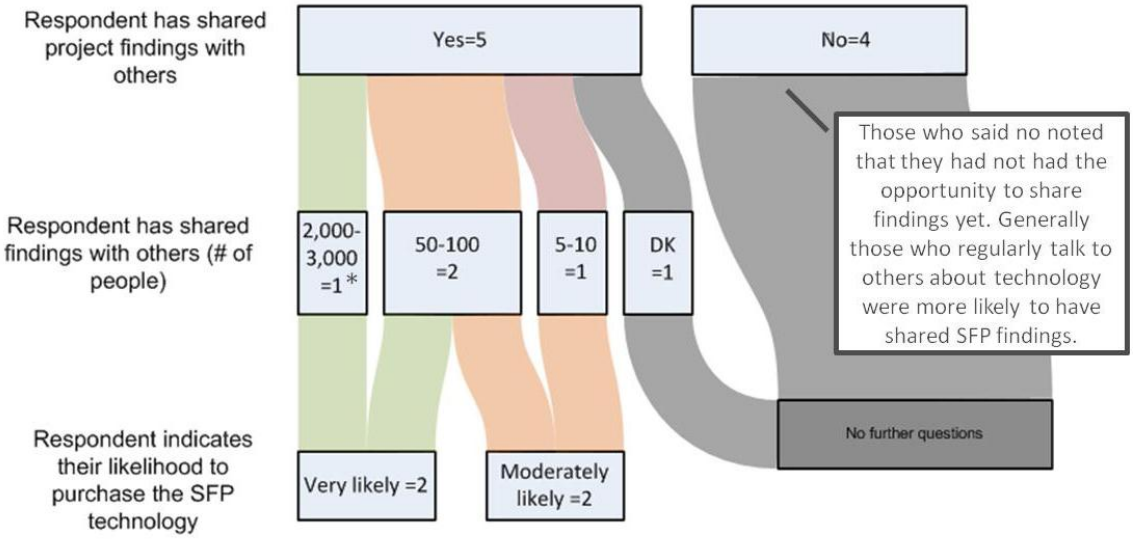
[39] While not defined within the IOU PIP, discussions with ETP staff indicate that under-utilized means low uptake within the energy efficiency portfolio of measures.

Figure 17: Scaled Field Placement Participant Characterization (n=9)



Over half of SFP respondents identified themselves as technology advocates, actively disseminating results from the project. One participant that frequently presented at conferences, estimated speaking with up to 3,000 people about the technology since participating in the project. More commonly, though, were respondents who discussed the project with fewer people (see the figure below). Notably, these results are limited by potential non-response bias. In-depth interviews were conducted with participants from a random sample of 9 out of 14 completed projects at the time the sample was received. Within each project, there were multiple potential respondents (up to 21), but the evaluation team was unable to reach more than one respondent per project.

Figure 18: Scaled Field Placement Participant Dissemination of Project Findings (n=9)



* This respondent spoke about the technology at several conferences and webinars.

Results from our data collection efforts also indicate that SFP project participants' knowledge of the technologies increased. One example of the knowledge gained is illustrated in the text box to the right. Overall, SFP projects (with a few exceptions) are reaching market influencers with substantial influence for purchases or recommendations.

We also assessed whether SFP activities led to a reduction in market barriers. Findings across the various program elements indicate that respondents agreed that barriers were reduced as a result of participating in the project. For example, in the case of SFP participants, 6 out of 7 respondents agreed that it was easier to find information about the technology and easier to evaluate claims about the technology as a result of participating in the project (see Appendix B.1.2 for detailed results).[40]

Demonstration Showcases

Audiences from Demonstration Showcases can range from market actors to residential customers. Our evaluation covered 16 of 19 completed projects and collected primary data for three. Findings from these three cannot be generalized given the variation in project type and the ability to collect data from targeted participants. Additionally, 3 of the 19 completed projects were not evaluated as they built towards future showcases, but were not evaluable with current metrics. These projects included RFQ's and paper studies. According to project documentation, one of these projects focused on applying "research to find cost-effective solutions to achieve zero net energy (ZNE) performance for new residential construction. The scope of this project was directed towards identifying and implementing optimum solutions for creating a ZNE offering for homebuilders."

[40] Respondents were asked to agree with statements on a scale from 1 to 7 where 1 was strongly disagree and 7 was strongly agree. We determined that respondents agreed if they rated their response as a 5 or higher on the scale.

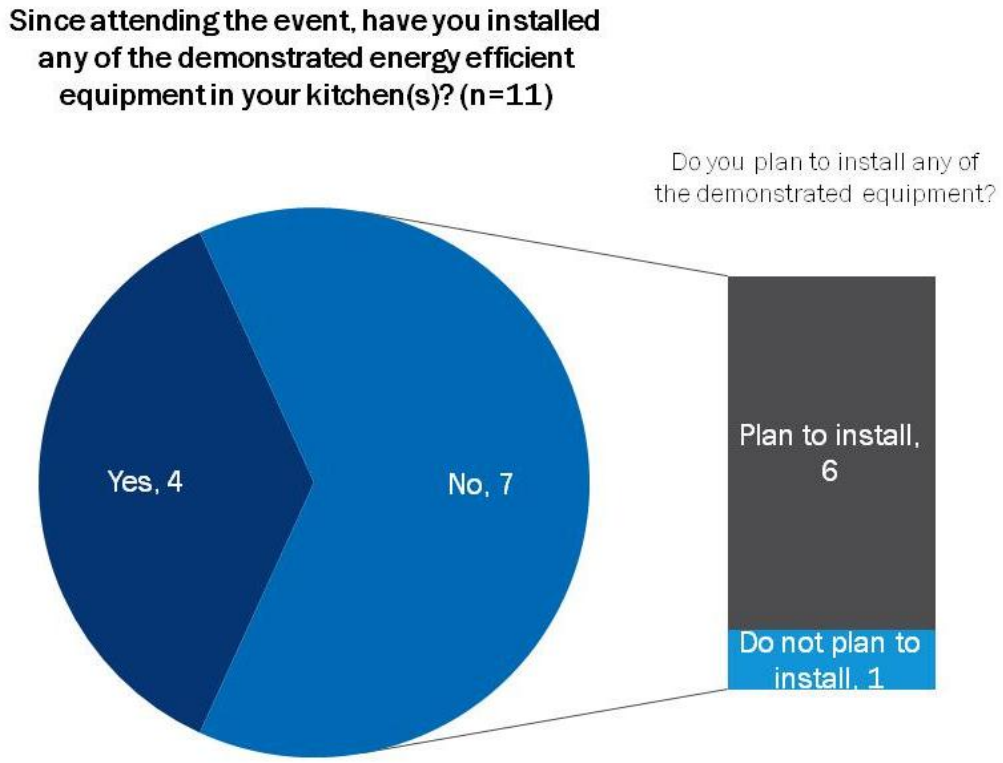
Consistent with the PY2010-2012 California Statewide Emerging Technologies Program Phase I Report,[41] DS projects showed variation, particularly related to identifying opportunities to focus outcomes. As noted in the report, while some of the listed DS projects appeared to focus on increasing visibility once a technology was proven, other Demonstration Showcases appeared to align themselves more with validating savings. Next, we provide findings from the three DS projects where we performed primary data collection to illustrate variability within this small sample.

SFP Respondent Comment

"[The project has] been very helpful in quantifying the light pattern on the ground and the energy consumption and monitoring the energy consumption in a detailed fashion. Showing us what the vampire load on the system is. [The project helped] us better understand the economics of the system and the durability of the system."

DS Project 1: The first project was a demonstration showcase where ETP brought together different restaurant decision-makers to introduce energy efficient foodservice products. These items were displayed at booths set-up in three separate locations. Since attending the showcase, 10 of 11 surveyed respondents indicated that they had installed or planned to install the demonstrated equipment in their facility (Figure 19).

Figure 19. Findings from Demonstration Showcase: Project 1

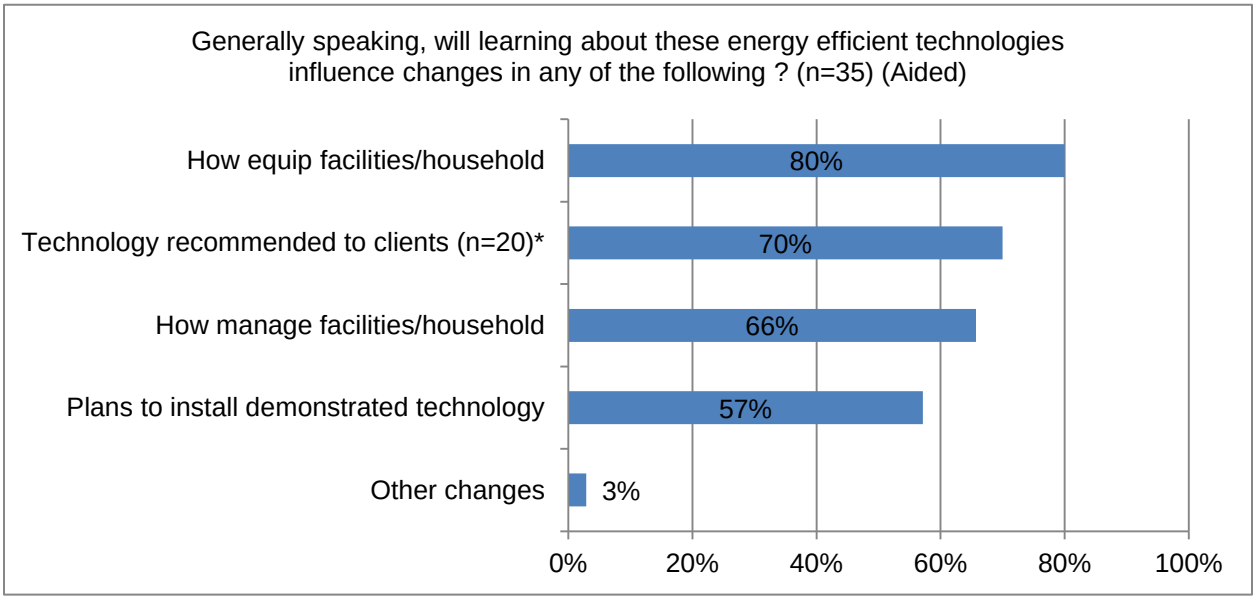


[41] Opinion Dynamics Corporation, Itron, Inc. 2013. PY2010-2012 California Statewide Emerging Technologies Program Phase I Findings Report Volume I. Oakland: California Public Utilities Commission Energy Division.

In addition, 5 of 11 showcase attendees indicated that they had recommended the technology to others.

DS Project 2: The second project installed and showcased a variety of energy efficient products at the Energy Innovation Center (EIC) at SDG&E. Technologies showcased included lighting, daylighting, HVAC and thermal storage. The evaluation team fielded an intercept survey to EIC visitors who had viewed these technologies. All of the surveyed respondents indicated that learning about the technologies would influence at least one change in their practices, such as equipping their facilities/household, recommendations to clients and/or plans to install demonstrated technologies (Figure 20).

Figure 20: Findings from Demonstration Showcase: Project 2



In addition, 86% of respondents planned to recommend the technologies to others.

DS Project 3: The third showcase project was for a low-income, residential, single-family home. Here, ETP staff worked with stakeholders to retrofit a site to achieve as close to zero net energy as possible. Ultimately, the retrofit created deep savings (38% above 2008 Title 24), but few if any people saw the demonstration showcase home. IOU staff indicated that this showcase will enter a second phase, where project results will reach a broader audience. As stated earlier, ETP staff have up to six years to complete a project. While demonstration showcase results can also be viewed through dissemination of the reports, this particular report is not on the ETCC website, nor have stakeholders disseminated any information. Table 17 summarizes these findings.

Table 17. Findings from Demonstration Showcase: Project 3

PIP Parameter	Intended Design	Project 3 Finding
Purpose	Visibility	Low
Theme	Exposure	Low
Visibility	Public	Some visibility on home exterior, but generally low
Duration	Duration of public interest/impact	Unclear

PIP Parameter	Intended Design	Project 3 Finding
Dissemination mechanism	Short-term exposure and word of mouth	Very low. Possibly some word-of-mouth, exposure for those involved only.

We assessed whether the program activities led to a reduction in market barriers. Findings across the various program elements indicate that respondents agreed that barriers were reduced as a result of participating in the project. For example, in the case of one Demonstration Showcase project 76% of respondents agreed that they were better informed about the performance of the technology and that it was easier to make purchasing decisions as a result of participating in the showcase. See Appendix B. for detailed results).[42]

In summary, the expected SFP program outcomes related to external stakeholders are being met. We found that SFP projects tend to target market influencers who adopt and disseminate findings to their peers. Considering the substantial variation in DS projects, we cannot make definitive statements about the overall effectiveness of this element with regards to increasing external stakeholder awareness.

3.2.3 Support of CEESP Goals and Big Bold Strategies

ETP's third PIP goal is to support the California Long-Term Energy Efficiency Strategic Plan (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 that covers government, utility and private sector actions, and that identifies energy efficiency as the highest priority resource for meeting California's energy needs.[43] 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.

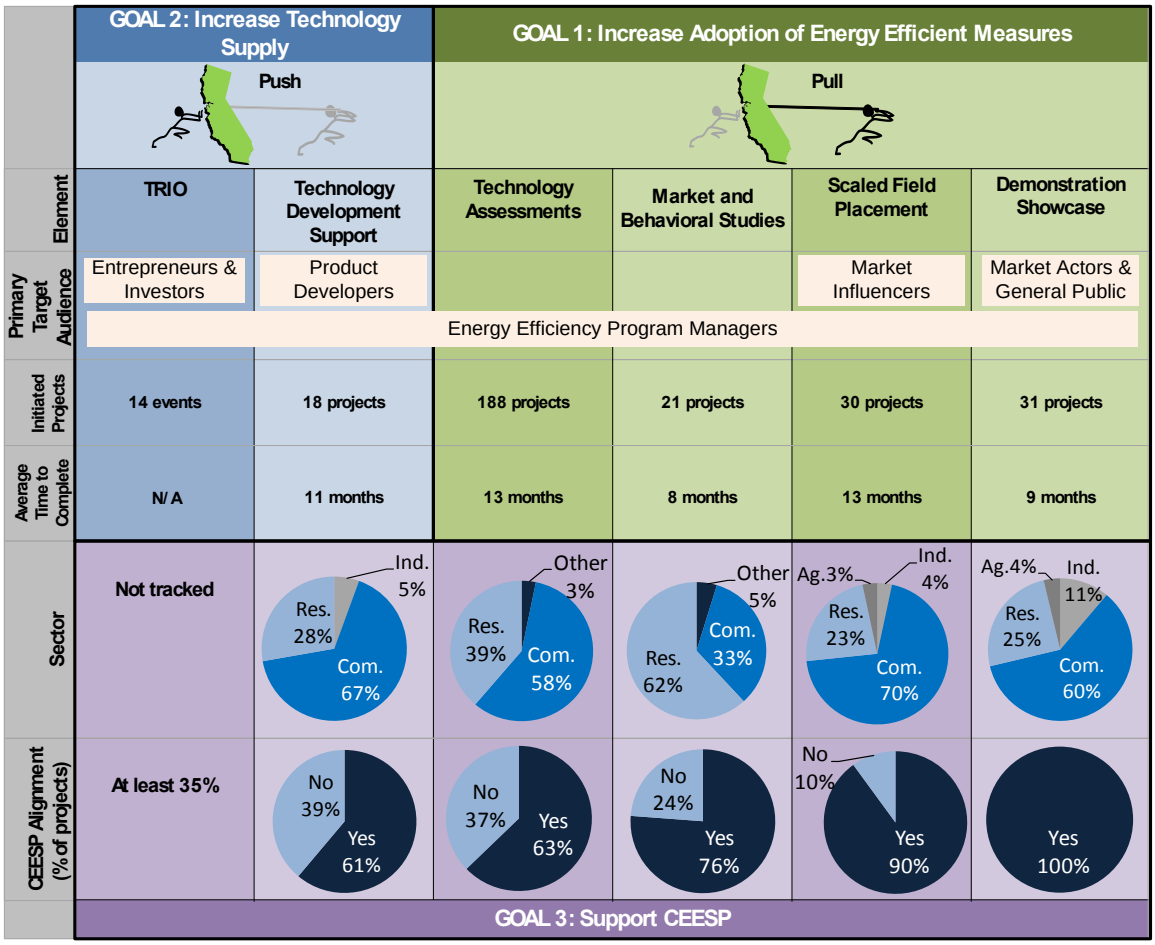
One of the difficulties with assessing the ETP's support for the CEESP is that there is not a common understanding of how the ETP should support the CEESP. As such, there are no universal metrics by which to assess the ETP's progress towards the third PIP goal of "Support of the California Strategic Plan and related solutions." Moreover, 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. Therefore, we provide a description of ETP activities in terms of stakeholders involved, technology types supported, and sectors covered. Below is a snapshot of the complex and inter-related activities that

[42] Respondents were asked to agree with statements on a scale from 1 to 7 where 1 was strongly disagree and 7 was strongly agree. We determined that respondents agreed if they rated their response as a 5 or higher on the scale.

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

ETP conducts to support IOU portfolio objectives, as well as California energy efficiency strategies (Figure 21).

Figure 21: Ecosystem of Emerging Technologies Program Efforts



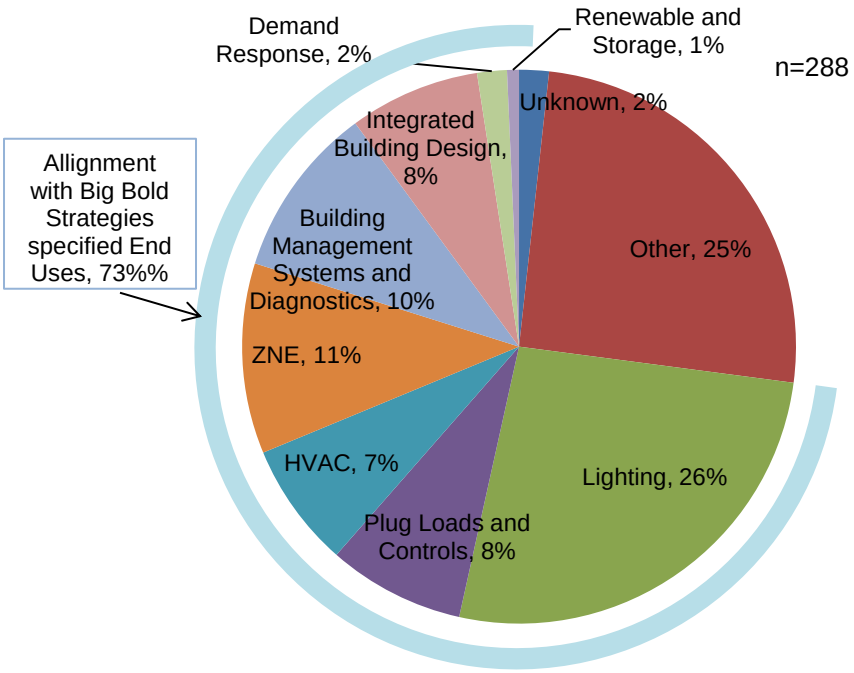
Source: TRIO CEESP Alignment data is from TRIO Participant survey, all other data is from the ETP database.

As illustrated in the figure above, ETP supports technology supply, adoption and support of CEESP through a wide-range of program activities with varying magnitudes. There were 188 initiated Technology Assessments projects in the PY2010-2012 program cycle, while TRIO efforts covered 14 events. Each element has different primary target audiences as well, ranging from investors and entrepreneurs to market actors and customers. However, across all efforts, IOU energy efficiency and ETP program staff were key audiences to support the adoption of energy efficiency measures within the IOU portfolio.

To analyze end-use alignment, we categorized ETP projects by the end-uses specified within the Big Bold Energy Efficient Strategies of the Research and Technology (R&T) Chapter of the CEESP. The R&T chapter outlines actions 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. Based on this categorization, approximately three

quarters of PY2010-2012 ETP projects fall within the key R&T framework to support California's Big Bold Strategies – the broad majority are in the commercial sector (Figure 22).

Figure 22. Emerging Technologies Program Projects by End-Use



Conclusions, Recommendations and Considerations

Overall, we found that ETP program staff performed a variety of activities in support of the three PIP goals. These activities appear to support increasing technology supply, awareness and subsequent adoption of energy efficiency measures, and cover a range of CEESP targeted end-uses and market segments.

Below we provide recommendations and considerations for the future from our effectiveness evaluation of the PY2010-2012 ETP program. The Phase I effort also produced recommendations on ETP program design and implementation. For more information on these recommendations refer to Appendix F.

This report marks the first time that the PPMs have been measured. The following are PPM specific recommendations and considerations.

- **Recommendation 1. Ensure the appropriateness of PPMs:** Overall, the PPMs provide guidance on assessing program performance; however, there are some cases in which the current PPMs do not provide enough information to truly understand how the program is performing. As such, stakeholders should review the findings of this report (with the current PPMs) and explore what additional information may be needed to more fully understand the effectiveness of the program.

- **Example - Assessing Knowledge PPMs:** The PPMs require assessing increases in knowledge for Demonstration Showcases, Market & Behavioral Studies and TRIO. These PPMs (with associated success criteria) can help to inform an assessment of program element effectiveness. However, we suggest incorporating additional metrics for increases in knowledge related to external dissemination of ETP project reports, particularly through the Emerging Technologies Coordination Council (ETCC). Future impact evaluations should assess dissemination effectiveness to both internal and external stakeholders.

- **Example – PPM No Longer Relevant:** In addition, we recommend that the CPUC and IOUs revise the PPMs for TDS as they are no longer consistent with how the program element is implemented (see PY2010-2012 California Statewide Emerging Technologies Program Phase I Report for more details). Additionally, for PY2013-2014 we suggest aligning the PPMs with each sub-program, rather than tactics within each sub-program.

➢ **Recommendation 2. Track necessary data to support all future PPMs**: Once the stakeholders agree upon the appropriate PPMs, it is important to ensure that the data is tracked, and is of high quality, to be able to report on these PPMs.

- **Example - Tracking of Adoption PPMs:** The current ETP database does not contain sufficient information to verify adoption[44] of, and energy savings potentials,[45] from measures moved into the EE portfolio from ETP. The values currently tracked are measures recommended for transfer, and the quality of the data are inconsistent. We understand that the CPUC and IOUs are in the process of putting in place ways to map achievement of adoption, which will support future effectiveness evaluations.

➢ **Considerations**. While not a formal recommendation, there is one other item related to the PPMs that the CPUC could consider:

- *Set success criteria and baselines for PPMs:* The PPMs do not have any associated success criteria. As a result, it is difficult to provide evaluative statements surrounding program effectiveness through PPM results. We acknowledge that this is a global issue across programs. However, we believe that identifying success criteria for PPMs, while difficult to do, can help inform and enhance program design and implementation. We suggest that the CPUC and IOUs consider incorporating findings from this evaluation, and other sources, to help set baselines for assessing performance in future program cycles. While our sample sizes are limited in many cases, the insights provided in this report do give guidance on what might be expected from the various ETP efforts. However, if the project mix or design differ substantially in the future, findings from this evaluation may not be application to future projects.

[44] According to the PPMs, "'Adoption' means measure is available to end-use customers through IOU programs. Adoption of a measure may be attributed to one or more ET sub-programs." Resolution E-4385, Appendix A., pp. 39-40.

[45] According to the PPMs, energy savings potentials are defined as "to be reported based on ET project findings and estimated market potential (reported through quarterly ET database updates) via statistical overview of the ETP portfolio, including technical potential of measures recommended to the EE portfolio." Resolution E-4385, Appendix A., pp. 39-40.

Additional recommendations and considerations for the program are as follows.

- **Recommendation 3. Improve general data tracking within the ETP database:** Program tracking data is a key input for evaluation activities. In the case of ETP, substantial data tracking issues limited the evaluation team's ability to draw conclusions regarding program activities, and achievement of metrics. We suggest that the ETP staff continue to improve data tracking comprehensiveness and quality to support program oversight in addition to future evaluation efforts.

- **Recommendation 4. Set success criteria and baselines for non-PPM expected outcomes:** To augment counts supporting the PPMs, the evaluation effort explored program effectiveness by testing causal linkages from program logic models. Success criteria for program theory logic model outcomes were not arrived at, but results from this evaluation could be applied in the future to assess achievement of outcomes, where applicable.

- **Considerations**. While not formal recommendations, there are two other items that the CPUC could consider:

  - *Consider assessing effectiveness of external dissemination efforts*: In the PY2010-2012 California Statewide Emerging Technologies Program Phase I Findings Report,[46] we stated that knowledge transfer inside and external to the IOUs was needed to achieve Big Bold Strategies. It was outside the scope of this evaluation to assess the external dissemination of these reports. We suggest that future effectiveness evaluations should assess dissemination effectiveness to both internal and external stakeholders through the Emerging Technologies Coordinating Council (ETCC).

  - *Consider following up with entrepreneurs who established business relationships during TRIO events to measure long-term networking outcomes*: Measuring expected outcomes from networking can be difficult and costly. However, ETP could consider surveying participants over time to assess long-term outcomes from TRIO networking. The 36% of entrepreneurs who indicated establishing a business relationship are good candidates to follow-up with in future evaluations to determine if these relationships led to commercialized technologies.

[46] Opinion Dynamics Corporation, Itron, Inc. 2013. PY2010-2012 California Statewide Emerging Technologies Program Phase I Findings Report Volume I. Oakland: California Public Utilities Commission Energy Division.