PY2013–2014 EMERGING TECHNOLOGIES PROGRAM TARGETED EFFECTIVENESS STUDY REPORT

Prepared by

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Introduction

This is the first of two documents that comprise the evaluation results of the PY2013-2014 Emerging Technologies Program[1] Targeted Effectiveness Study. The second volume contains a suite of appendices that document greater details regarding methods, approach, and findings, 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 research study looks at the effects and accomplishments of targeted aspects of the PY2013-2014 Emerging Technologies Program. The Emerging Technologies Program is a non-resource program run and operated by each of the four investor owned utility companies (IOUs) in California for the purposes of (1) feeding the energy efficiency portfolio with emerging technologies, and (2) supporting market demand, such as customer interest and acceptance, supplier capabilities, costs, and other issues that ultimately influence technology's uptake in the marketplace.

The study has three targeted research objectives, including:

1. Providing a summary description of the ETP portfolio and evaluate the effectiveness of ETP measures adopted into the IOU EE portfolio by identifying savings within the EE portfolio;
2. Evaluating the effectiveness of ETP Assessment Activities, and;
3. Evaluating the effectiveness of ETP external dissemination efforts via ETCC website subscribers.

The findings for each of the three evaluation objectives draw on data collected through in-depth interviews with ETP Program Managers (n=4) and Emerging Technology (ET)-like program peers (i.e., managers of similar ET programs through a peer review) (n=10); a quantitative survey with ETCC website subscribers (n=113); and a review of secondary data in the ETP database. Importantly, our assessment of ETP activities was based on specific technologies the evaluation team selected for review. As such, these findings provide trends, but are not generalizable to the entire suite of ETP activities.

Findings

Findings by evaluation objective are documented below.

Objective #1: Summary of ETP Portfolio and Measures Adopted into IOU Portfolio

In the 2013-2014 program cycle, the ETP worked on 273 projects, initiated 164 projects, and transferred 122 measures into the EE portfolio, across a variety of end-uses. Our analysis of the ETP data demonstrated that the IOUs have met their Program Implementation Plan (PIP) objectives and are contributing to both the EE portfolio and the broader California Energy Efficiency Strategic Plan (CEESP) goals in alignment with the PIP Program Performance Metrics (PPM).

- **The ETP met program objectives within the allocated budget**. Over the past three program cycles, the IOUs have consistently overachieved their ETP PIP objectives; the ETP achieved 141% of its goal of number of projects initiated, and 176% of its goal for measures transferred into the EE portfolio in PY2013–2014, while spending 48% of the 2013-2014 budget.[2] The ETP allocated the remainder for ongoing projects. Despite this consistent overachievement, no effort has been made to align objectives with prior achievements. As such, the PIP objectives are not specified to effectively measure outcomes as IOU efforts have consistently exceeded objectives over time.

[2] The program has up to 6 years following project initiation to spend the allocated budget. For PG&E, project budgets are developed and spent within the program cycle. SCE, SDG&E and SoCalGas develop project budgets with funds from a program cycle, but the expenditures can occur beyond the program cycle (e.g., a 2010-2012 initiated project uses 2010-2012 funds, but can expend this budget over the next 6 years).

- **The ETP activities align with CEESP end-uses, with 86% of 2013-2014 adopted projects aligning with the Research & Technology Framework to support California's Big Bold Strategies.** Additionally, about two-thirds (73%) of adopted projects align with technology end-uses that are specified within the program PPM. These include advanced HVAC technologies, high-efficiency plug loads and appliances, and advanced lighting technologies.

- **Current data tracking systems, and poor data quality, hampers the ability to quantify savings from Emerging Technologies assessed by ETP in the EE portfolio.** Although there are no specified success criteria for the PPM, current data tracking hampers the ability of the evaluation team to ascertain the value of projects adopted as measures into EE portfolio programs. For example, issues with measure tracking from the ETP database to the IOU EE savings database likely reflect an incomplete assessment of emerging technology savings in the EE portfolio as the evaluation team was unable to match many of the measures across databases.

- **Despite limited data, ETP is making contributions to the EE portfolio.** The current suite of 122 mapped measures from ETP projects adopted into the EE portfolio from 2010–2014 provides about 2% of the 2013–2014 statewide *ex-ante* claimed electric savings and slightly less therm savings. Notably, this represents projects adopted into the portfolio between 2010-2014, reflecting a snapshot in time, rather than a cumulative assessment of ET savings in the EE portfolio.

Objective #2: ETP Assessment Activities

The peer review evaluation activity assessed how the IOUs are targeting their activities (i.e., what tactics the IOUs select as they review technologies).[3] Overall, the evaluation team found that ETP is a looked-to leader in its approach to assessing emerging technologies. They use a variety of tactics such as lab and field evaluation, demonstration showcases and test standard development. This review garnered key insights regarding the type of tactics ETP uses to support their mission and goals, as well as opportunities for program enhancement. These purposes correspond to the tactics available within the program to support a technology's "technical readiness," or its maturity level with regards to its energy performance and feasibility, and "market readiness," or its maturity level with regards to the marketplace's willingness and ability to adopt the technology. For emerging technologies to succeed once moved into the energy efficiency portfolio, they must be in both technically ready as well as being available and acceptable to the market. The ETP operates within the larger California policy context—supporting both regulatory and utility needs through their two key functions (see Chapter 2 for an overview of these needs).

- **The ETP focuses on technical readiness.** ETP effectively uses program tactics to support the decision for measure transfer based on "technical readiness" factors, such as technology and savings maturity, and does an effective job at identifying these criteria and deploying appropriate tactics within that context. From 2010 through June 2014, the time segment used for this study, 67% of all projects were lab evaluations, field evaluations, and scaled field placements, which are typically used by ETP to validate or accelerate technical readiness.

[3] "Technology" refers to an equipment, practice, or approach used for a particular application and customer segment. The word as used here is more narrowly defined than an end-use such as lighting, and is analogous to a "product category" or a collection of products which are more similar than dissimilar. An example of this would be smart thermostats, which is more specific than HVAC or even temperature controls, but can contain a number of different products that are subject to similar marketplace barriers. The evaluation team chose to focus on the technology level as it is the most natural unit of analysis for facilitating information sharing across jurisdictions and it provides transparency into the ways that ETP projects attempt to address the barriers a technology faces.

- **Market readiness activities are less prevalent.** ETP is not the only entity within the IOUs that can or should address market readiness, and reasonable questions can be raised about how best to allocate resources across different IOU entities to address market barriers. However, ETP is well positioned to provide market readiness information as they consider measure transfer to the EE portfolio.

- **The ETP has a broad array of tactics compared to peers.** The number and types of tactics used by other ET-like programs throughout the nation vary. Those programs that focus on only technical readiness tend to use fewer tactics, and those tactics tend to fall in the Technology Assessment (TA) category (i.e. lab evaluations, field evaluations, and scaled field placements). Those programs that go beyond technical readiness to include market readiness employ a larger and more diverse set of tactics. Compared to other ET-like programs, the ETP has the most tactics available to deploy and the greatest number of non-TA tactics. Notably, ETP also has a much larger operating budget than the other ET-like programs reviewed, with the exception of the national labs. However, we found little correlation between budget and number of available tactics.

- **The ETP tactics differ by technology.** ETP's tactics do differ by technology, suggesting there is no one-size-fits-all approach. For example, ETP's ten projects for advanced lighting controls spanned eight tactics, which indicates that there are a number of different barriers at play that the projects may target. The fact that the suite of project tactics differ across the technologies indicate that ETP is reacting to the particularities of the technology and the market context.

- **California ETP is generally recognized by its peers as a nationwide leader in most emerging technology research.** While the ETP tactic selection process involves a review of existing resources, the program often finds itself breaking new ground. As a result, peers indicate that the program provides relevant information for their programs and projects.

- **The ETP could benefit from greater strategic focus when choosing tactics.** Although ETP is seen as a leader on many emerging technologies studies, the evidence indicates that ETP may suffer from a lack of strategic focus when choosing projects to address barriers. The frequent appearance of "one-off" projects targeting a narrow technology context, the lack of clear relationships among projects within a technology, and the lack of explicitly sequenced projects all point to a less focused approach. A counter example of, and exception to, this finding is a four-phase set of projects used for smart thermostats that could serve as a model for a more strategic approach going forward. This may be a symptom of ETP actually comprising four separate utilities, but it does raise a question of whether the current approaches lead to the most effective allocation of ETP resources.

Objective #3: Assessment of ETCC Dissemination Efforts

Providing information on emerging technologies to an audience broader than the IOUs may change how others consider a technology. The evaluation team assessed the effectiveness of ETP external dissemination activities specific to the Emerging Technologies Coordinating Council (ETCC) website, which is a primary channel for external ETP information dissemination.

- **The ETCC dissemination is useful for respondents, with opportunities for improvement.** Survey results indicate that the ETCC dissemination efforts reached the intended audience, encouraged engagement with ETP information, and promoted emerging technology actions. We found moderate use of the website (56% visit the ETCC website a few times a year, 53% occasionally learn something new), but found that respondents took a variety of actions after receiving information from the ETCC, including recommending, using and purchasing a technology. Overall, respondents found the dissemination efforts to be useful, with minor opportunities to improve website content and navigability. Respondents

indicated that they had difficulties finding the technology proposal submission link and searching for reports.

Recommendations

In addition to gathering information on the three objectives above, this evaluation sought to assess whether the information available to the Commission was enough to allow them to guide ETP towards achieving both program and policy objectives. Our team found that the current PPMs are insufficient for the CPUC Energy Division to assess achievement of regulatory objectives (such as the California Energy Efficiency Strategic Plan and AB 32), as well as progress towards achieving these objectives. Further, given ETP's focus on technical readiness activities (as well as achievement of program objectives), additional effort is needed to align objectives and metrics with ETP's regulatory and legislative guidance (e.g., market readiness efforts). ETP currently has a suite of tactics in support of accelerating both technical readiness and market readiness for its technologies, but the current data tracking and metrics do not enable comprehensive assessment of long-term policy achievements.

Integrated recommendations derived from the targeted effectiveness evaluation are documented below. We provide specific recommendations for implementation drawn from considerations offered within Chapters 4, 5 and 6.

Recommendation #1: Adjust PPM and PIP Objectives to measure program effectiveness

Some of the current PPMs are misaligned with current program design and do not provide metrics against which to determine if the program is performing as expected or not. Technology, rather than project focused, metrics may better support CPUC guidance. In many cases, metrics are tracked at a project-level, such as number of initiated projects, alignment with CEESP end-uses, and adoption into the IOU EE portfolio. However, in many cases, multiple projects could be conducted for one given technology (e.g., a lab evaluation, scaled field placement or demonstration showcases). Due to this, the same technology could be accounted for in multiple projects. Additionally, some metrics may be better used for internal project planning, rather than assessing program effectiveness. One example is technical potential. Actual savings from measures adopted into the portfolio may be a better proxy for program effectiveness rather than technical potential. However, technical potential may be useful internally to assess projects against each other. Additionally, PIP objectives are substantially overachieved year over year. For example, ETP has consistently overachieved objectives since 2010-2012. These include number of projects initiated, by sub-program, and end-use area, etc.

Revising metrics to align objectives with past achievements and incorporate more useful assessments of achievement will support program oversight. The evaluation team suggests that the IOUs and CPUC work collaboratively to:

- Agree on objectives of the program and how to document and track outcomes
- Shift objectives and metrics to reflect technology, rather than project, activities
- Identify and implement adjustments to track achievements

Once established, the evaluation team recommends that the IOUs propose metrics and how they will track them moving forward. Metrics and objectives should align with anticipated program outcomes, be measurable, follow CPUC guidance, and support program oversight by the CPUC.

Recommendation #2: Improve tracking of three program parameters of interest– project status, project adoption, and measure transfer

The ETP data tracking and reporting quality continues to limit the CPUC's ability to provide oversight on ETP activities or evaluate program effectiveness. In support of improving tracking, the evaluation team recommends four efforts:

- Improve ETP data tracking and reporting quality for status variables. For example, the ETP database has eight variables regarding the status of a project. These variables are frequently internally inconsistent. We recommend revising these fields (e.g., status, progress point) within the ETP database to clarify project status, support CPUC oversight, and enhance tracking.
- Clarify annual and cumulative reporting to enable tracking of adoption to EE portfolio. Currently, the IOUs report on all PPMS at the end of the program cycle, but for most PPMs the PIP does not provide a description of the time frame for analysis. The timing of measuring metrics and objectives becomes more important as we move to a rolling program cycle, where time frames for program cycles vary and a calendar year may be the best differentiation point. We recommend systematizing annual and cumulative reporting moving forward.
- Assure measure codes are in place within the ETP database and accurately match measure codes in the savings database.
- Investigate the benefits of capturing measure codes and savings associated with custom projects to support savings assessments.

Recommendation #3: Launch a moderate-length pilot initiative within ETP to create and execute a statewide "strategic technology plan"

Consistent with regulatory guidance, ETP could benefit from shifting from a project-level to a technology-level focus, increasing statewide coordination, and increasing the use of tactics that investigate and address market readiness. However, this approach first needs to be tested out to be sure it is a workable solution for California. The evaluation team recommends that the pilot be performed for a technology of sufficient interest to warrant multiple projects, which will allow for full implementation of this type of approach – perhaps a technology whose projects would cover 5% of the overall ETP budget for two years. As part of this effort, the evaluation team recommends that:

- The IOUs work with the CPUC to define and set annual goals for outcomes of the pilot
- For a specific technology, we recommend:
  - Methodically determining all barriers for that one technology by explicitly identifying technical and market barriers as part of a coordinated tactic selection process.
  - Collaborating across the four IOUs to address barriers that can be cost-effectively and feasibly addressed.
  - Collectively identifying appropriate technical- and market-readiness projects and distributing them to one or more IOUs for execution, as interest, budget, climate, and other IOU-specific characteristics allow.

Recommendation #4: Increase attention paid to market barriers

ETP's current approach emphasizes projects that target barriers to technical readiness (e.g., projects that reduce savings uncertainty), and there may be missed opportunities to address market barriers. IOU decision makers inside and outside of ETP will be more likely and better able to address market readiness if an effort is made to gather more information on market barriers. As an entity that scouts and assesses new technologies, ETP is well placed to identify market barriers, investigate them, address some, and share information on them within the IOUs. ETP already takes some actions to understand market barriers, but those practices are not consistent across the IOUs and are not applied systematically. The evaluation team believes that expanding these practices in a consistent and systematic way represents a "no-regrets" option that can increase confidence that ETP – and the other entities within each IOU – are optimally addressing market readiness within the existing framework. We recommend:

- Explicitly identify technical *and* market barriers as part of the tactic selection process and articulate them in planning documentation (e.g., scanning and screening tools). As appropriate, ETP can respond to market barriers by investigating them further or referring them to other entities within the IOUs.
- Survey market participants (i.e., customers and suppliers) during field evaluations and scaled field placements, on their interest in, experience with, and ability to deploy the technology being studied, when reasonable.
- For all performance validation projects (lab evaluations, field evaluations, and scaled field placements), explicitly articulate opportunities (such as surveys) for gathering information on market barriers in the planning documentation and include a section on market barriers in all performance validation project reports to encourage the gathering and reporting of that information.

Recommendation #5: Make improvements to the ETCC website navigability and content to support ETP dissemination efforts

The PIP objectives cite the importance of external dissemination to increase market knowledge of products. However, the ETCC website, despite being useful for respondents, could improve some aspects related to content and navigability. The evaluation team suggests:

- Enhancing website navigability, particularly by improving users' ability to find/search for reports and to sort reports by categories. In addition, make it easier to find the technology proposal submission link.
- Improving website content specifically related to IOU technology priorities, case studies and testimonials, as well as offer links to more current or relevant technology websites.

2. Overview of the Emerging Technologies Program

This section provides a description of the Emerging Technologies Program (ETP) and the policy context within which the program fits.

2.1. Program Description

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

- **Goal 1:** Increase energy efficiency (EE) technology supply through supporting technology development and conducting technology developer outreach
- **Goal 2:** Increase the number of measures offered by EE programs through performing technology assessments and transferring measures into EE programs
- **Goal 3:** Support technology introduction and whole-building deep-energy reduction strategies through conducting field deployments, technology demonstrations, and Technology Resource Innovation Program (TRIP) solicitations

The mission of the 2013–2014 ETP, as described in the PIPs filed with the California Public Utilities Commission (CPUC) is to support "increased energy efficiency market demand and technology supply (the term supply encompassing breadth, depth, and efficacy of product offerings) by contributing to development, assessment, and introduction of new and under-utilized energy efficiency (EE) measures (that is, technologies, practices, and tools), and by facilitating their adoption as measures supporting California's aggressive energy and demand savings goals."[5]

Note that in PY2013–2014, the Investor-Owned Utilities (IOUs) made changes to the ETP design and implementation. Program elements were grouped into three core subprograms—Technology Development Support, Technology Assessments, and Technology Introduction Support—in which "elements" from the 2010–2012 program cycle are now called "tactics" that can be utilized to address more than one ETP goal.[6]

Table 1. 2013–2014 ETP Subprograms and Goals

Subprogram	Goal
Subprogram #1: Technology Development Support	Increased EE technology supply (support for the development of new technologies)
Subprogram #2: Technology Assessments	Increased number of measures offered by EE programs (identification of promising technologies for EE programs)
Subprogram #3: Technology Introduction Support	Support for technology introduction and whole-building deep-energy reduction solutions ("seed" market demand among targeted end-users)

[4] The PIPs of each of the individual Investor-Owned Utility (IOU) submissions are virtually identical as this is a statewide program. The PIPs are located at: http://eestats.cpuc.ca.gov/, with the following names: 13-14_PGE2106_Emerging Technologies_PIP_4—23-13-CLEAN.pdf; Exhibit 4B – 23 May 2013-FINAL-Clean.docx; 5 SW – SCG SW ET PIP 5_24_13.pdf; 6 SDGE SW ETP PIP Clean_1_14_13.doc.

[5] 5 SW – SCG SW ET PIP 5_24_13.pdf, p. 1.

[6] Ibid.

The PY2013–2014 statewide ETP budget is approximately $38 million.

Table 2. 2013–2014 ETP Program Budget, by Subprogram and Investor-Owned Utility

Subprogram	PG&E	SCE	SCG	SDG&E	Statewide
Technology Development Support[a]	$869,270	$3,684,510	$125,757	$405,000	$5,084,537
Technology Assessments	$5,934,095	$8,284,797	$1,006,034	$1,458,079	$16,683,005
Technology Introduction Support	$5,448,009	$9,216,123	$1,384,936	$837,000	$16,886,068
Total	**12,251,374**	**$21,185,430**	**$2,516,727**	**$2,700,079**	**$38,653,610**

PG&E = Pacific Gas and Electric Company; SCE = Southern California Edison; SCG = Southern California Gas; SDG&E = San Diego Gas and Electric

[a] Called "Technology Deployment Support" by SDG&E.

Source: EESTAT Report September 2014, 2013–2014 Program Revised Budget.

The ETP leverages a variety of tactics within each subprogram to support the goals and objectives. Below we provide a description of each tactic as described in the PIP.[7]

- **Technology Assessment**: The IOUs conduct technology assessments to assess energy savings or, as per the PIP, to "contribut[e] to the transfer of promising measures into the utility portfolio." Technology assessments are conducted via in situ testing, laboratory testing, or paper studies. The information provided in the assessments may be used by IOU EE program managers to construct work-papers that estimate energy and demand savings over the life of a measure. 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.

- **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. SFPs 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) tactic is intended to expose target audiences to new measures in real-world applications and installations and, as such, to increase

[7] All quotations in the following bullets are from 5 SW – SCG SW ET PIP 5_24_13.pdf. Note that in the ETP database there are 10 tactics recorded – lab evaluations, field evaluations (which are considered Technology Assessments), scaled field placements, demonstration showcases, market studies, behavioral studies, paper studies, tool development, test standard development, and training programs. Short definitions of each tactic can be found in Volume II, Appendix D.

visibility and awareness of emerging technologies. DSs 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 and Behavioral Studies**: Market and Behavioral Studies (MBS) involve 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." MBS attempt to capture customer perceptions, acceptance, market readiness, or market potential for new measures. 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 and IOU customers."

- **Technology Development Support:** Technology Development Support seeks to look for targeted opportunities to support EE product development. "The ETP will look for targeted opportunities to support energy efficiency product development. Product development is the process of taking an early-stage technology or concept and transforming it into a saleable product… Product development is best performed by private industry. There are opportunities, however, where the IOUs are well qualified or in a strong position to undertake targeted, cost-effective activities which provide value in support of private industry product development efforts." Further, the PIP notes that the Technology Development Support subprogram helps 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."

- **Business Incubation Support:** The business incubation support effort focuses on "providing training and networking for entrepreneurs and companies providing energy saving technologies." As per the PIP, "TRIO [Technology Resource Incubation and Outreach] is designed to accelerate the successful development of technologies through an array of engineering support, resources and services, developed and orchestrated by TRIO and offered both through TRIO and its network of contacts."

- **TRIP Solicitations:** The TRIP effort was implemented in 2012 by SCE only, and is a new tactic for the ETP in 2013–2014. TRIP will issue a competitive solicitation to fund EE projects that leverage innovative EE and/or integrated demand-side management (IDSM) technologies. The awarded TRIP projects will be funded through TRIP initially and may be recommended for transfer to the utility's EE portfolio group once they have been deemed viable.

2.2. Policy Context of the Program

The ETP operates within the larger California policy context – helping to support both legislative and regulatory, as well as utility, needs. As per the PIPs, the ETP supports California's energy and demand savings targets defined by the following regulatory and legislative documents:

- **R.09-11-014, the Energy Efficiency Policy Rulemaking for the 2013–2014 program portfolios:** D.12-05-015,[8] issued May 18, 2012, provides extensive direction to the utilities for their 2013–2014 ETP PIP filings. Guidance includes direction to the utilities to include behavioral and market research

[8] http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/166830.PDF.

findings, coordinate with CPUC and California Energy Commission (CEC) codes and standards efforts, and develop residential and commercial roadmaps for retrofit and new construction opportunities. Specifically, R.09-11-014 indicates that,

> *"The Emerging Technologies Program plays a critical cross-cutting role in technology development and deployment that spans all major market sectors and end uses. The Emerging Technologies Program should be designed to strategically balance the selection of projects and execution of program activities through a defined timeline to ultimately meet the Commission's energy efficiency savings goals as well as long-term Strategic Plan goals. This will require careful planning of resources and activities. Key factors that we consider are prioritization of the different combination and distribution of technologies suitable for California's market sectors and end-use applications while considering the technologies' market and technical potential. The IOUs should leverage findings from existing research, as well as findings from current valuation and the Commission Potential and Goals studies, to obtain robust market potential estimates on targeted technologies and systems. The IOUs should also utilize enhanced market behavioral research to address customer and end-users acceptance and adoption of new technologies, in particular for technologies that are being considered for transfer into the energy efficiency portfolio."*

- **A.08-07-021, the consolidated applications for the 2010–2012 IOU EE program portfolios:** D.09-09-047,[9] the October 1, 2009, decision approving 2010–2012 EE portfolios and budgets, accepts the IOU ETP applications with minor modifications. Modifications include refining the program theory logic models, establishing performance metrics for subprograms, and solidifying the quantitative program targets. The CPUC also directs the utilities to "work with other entities, particularly those in the Pacific Northwest, which have similar emerging technology efforts to leverage funding and expedite driving new measures, technologies, systems and practices to the market." The decision also approves funding for Zero Net Energy Pilot activities and reiterates the definition for Emerging Technologies.

- **The California Energy Efficiency Strategic Plan (CEESP)[10]:** The CPUC adopted The California Energy Efficiency Strategic Plan (CEESP). CEESP, adopted in 2008 and amended in 2011, presents a roadmap for achieving maximum energy savings across all major groups and sectors in California through the year 2020. It "articulates a long-term vision and goals for each economic sector and identifies specific near-term, mid-term and long-term strategies to assist in achieving those goals." The CEESP acknowledges that obtaining GHG emission reductions through emerging technologies is not solely the role of the IOUs, but does include them as a needed component to support the GHG goals. The

[9] http://docs.cpuc.ca.gov/PublishedDocs/PUBLISHED/GRAPHICS/107829.PDF.

[10] The January 2011 version of the CEESP can be found at: http://www.cpuc.ca.gov/NR/rdonlyres/A54B59C2-D571-440D-9477-3363726F573A/0/CAEnergyEfficiencyStrategicPlan_Jan2011.pdf. The implementation plan provides specific milestones for achieving the R&T chapter goals. California Energy Efficiency Strategic Plan, January 2011 Update. 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 2009–2020 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. 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. The ETP plays a role in helping meet goals, although many other entities are involved as well. The use of emerging technologies as one of the five policy tools acknowledges the importance of work in this area, and specifically the significant role of the IOUs' Statewide Emerging Technologies Program. The 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 is addressed in the Research and Technology (R&T) chapters and in the sections on residential and commercial zero net energy (ZNE) buildings, HVAC industry transformation, and lighting innovation. The R&T chapter strives to create market pull and deployment of emerging technologies via two long-term goals:

- **Goal 1:** Refocus utility and CEC EE R&T support to create demand pull and set the research agenda for both incremental and game-changing EE technology innovations.
- **Goal 2:** Conduct targeted emerging technologies R&D to support California's Big, Bold Strategies and integrated energy solutions goals.

In D.09-09-047, the commission confirms that the "utilities' statewide ETP and subprograms will advance Strategic Plan goals, objectives, and strategies" and that the program objectives are in "clear alignment with the Strategic Plan."

- **AB 32, the California Global Warming Solution Act of 2006[11]:** With the passage of AB32 (the California Global Warming Solution Act of 2006[12]), state agencies were alerted to begin activities to meet the State's ambitious GHG reduction goals. This bill highlights the role innovation will play in achieving the required reduction targets: "investing in the development of innovative and pioneering technologies will assist California in achieving the 2020 statewide limit" to GHG emissions.[13] AB 32 requires California to reduce its greenhouse gas (GHG) emissions to 1990 levels by 2020. The legislation covers emissions from numerous stationary and non-stationary sources, including the existing building sector, via electricity and natural gas reductions. The act is a key policy driver in California that has established strict reduction targets from the IOU EE program portfolios in aggregate—and is a significant factor in the creation of the CEESP. The bill requires the state to pursue achievement of "the maximum technologically feasible and cost-effective greenhouse gas emission reductions," as outlined in the bill; establishes reporting of emissions from all identified sectors; and calls for a scoping plan for reaching the emissions reductions targets.
  - Section 38501e highlights the role innovation will play in achieving the required reduction targets: "investing in the development of innovative and pioneering technologies will assist California in achieving the 2020 statewide limit" to GHG emissions.
  - Section 38591d calls for the creation of an Economic and Technology Advancement Advisory Committee to "advise the state board on activities that will facilitate investment in and implementation of technological research and development opportunities, including, but not limited to, identifying new technologies, research, demonstration projects, funding opportunities, developing state, national, and international partnerships and technology transfer opportunities, and identifying and assessing research and advanced technology investment and incentive opportunities that will assist in the reduction of greenhouse gas emissions."

[11] http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf.

[12] http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf.

[13] According to the CPUC Energy Efficiency Primer PowerPoint presentation (http://www.cpuc.ca.gov/PUC/energy/energy+efficiency/), energy efficiency is expected to provide 15% of the overall GHG savings.

This brief description above ties ETP to the broad and overarching energy efficiency goals for the state. The utilities description of the ETP mission in their PIPs demonstrates they engage with the broad vision outlined in AB32, and other regulatory documents. Specifically, the PIP mission for ETP states that:

- ETP activities will support "increased energy efficiency market demand and technology supply (the term supply encompassing breadth, depth, and efficacy of product offerings)…"
- ETP will support this increase "…by contributing to development, assessment, and introduction of new and under-utilized energy efficiency (EE) measures (that is, technologies, practices, and tools), and by facilitating their adoption as measures supporting California's aggressive energy and demand savings goals."[14]

This language suggests that the regulatory guidance provided to ETP, as well as the current policy context in California, underscores a broader objective than solely supporting technical readiness, incorporating efforts to seed the market for new technologies, systems and practices.

[14] 5 SW – SCG SW ET PIP 5_24_13.pdf, p. 1.

3. Study Overview

This document provides findings from a targeted study to assess the effectiveness of California's IOUs ETP. The ETP is composed of the utility-specific ETPs operated by four IOUs: Pacific Gas and Electric (PG&E), SCE, Southern California Gas (SCG), and San Diego Gas and Electric (SDG&E). The ETP is a non-resource acquisition program and the impacts are not energy impacts in the near-term. Thus, our methods look at the effects of this program, and the accomplishments of the program, which are typically in non-energy terms.

This is a targeted effectiveness study, which limits the scope of potential evaluation areas. This report builds on prior evaluation efforts and takes advantage of new opportunities to evaluate the program given new data tracking by the IOUs. However, we acknowledge that there are other areas that merit future review, including ETP's role in increasing technology supply, introducing technologies, screening out unpromising technologies, and enhancing existing underutilized measures in the IOU EE portfolio.

3.1. Evaluation Objectives

This Energy Division-led 2013–2014 study produced a targeted effectiveness assessment for the IOU ETP. This study has the following objectives to assess effectiveness:

1. Provide summary descriptions of the ETP portfolio and evaluate the effectiveness of ETP measures adopted into the IOU EE portfolio by assessing claimed savings within the EE portfolio
2. Evaluate the effectiveness of IOU assessment activities, and
3. Evaluate the effectiveness of ETP external dissemination efforts via Emerging Technologies Coordinating Council (ETCC) website subscribers.

We show the tasks associated with this effort by ETP protocol in Table 3.

Table 3. 2013–2014 ETP Targeted Effectiveness Evaluation Objectives by Protocol

#	Research Objective	Aggregate Level of Analysis	Measure Tracking	Detailed Analysis of Key Performance Indicators	Peer Review	Target Audience Surveys
1	Provide summary description of the ETP portfolio and the effectiveness of ETP measures adopted into the IOU EE portfolio by assessing claimed savings within the EE portfolio	✓	✓	✓		
2	Effectiveness of IOU assessment activities				✓	
3	Effectiveness of ETP external dissemination efforts via survey of ETCC website subscribers			✓		✓

3.2. Evaluation Protocols

The ETP has a unique protocol within the California Energy Efficiency Evaluation Protocols.[15] The PY2010–2012 evaluation was a larger effort and included six of the eight protocol activities. The 2013–2014 study has a smaller budget and draws on five of these protocols to evaluate program effectiveness.

Table 4. Relevant ETP Evaluation Protocols, by Program Cycle

Protocol Activities	2010–2012 Study	2013–2014 Study
Verification of Basic Achievement	✓	
Program Theory and Logic Model	✓	
Aggregate Level of Analysis	✓	✓
Implementation Analysis	✓	
Measure Tracking		✓
Detailed Analysis of Key Performance Indicators[a]	✓	✓
Peer Review[b]		✓
Target Audience Surveys	✓	✓

[a] Includes knowledge created, knowledge disseminated, number of projects, barriers overcome, etc.
[b] While we conducted a peer review for this program cycle, our peer review differs from prior evaluation efforts by reviewing overall activities, rather than specific projects. Please see Section 3.3 for a full description of these evaluation activities.

3.3. Study Methods

The evaluation team performed six distinct tasks within this study, shown in Table 5.

Table 5. 2013–2014 ETP Targeted Effectiveness Evaluation Tasks

#	Research Objective	Evaluation Task
1	Provide summary description of ETP portfolio and effectiveness of ETP measures adopted into the IOU EE portfolio by assessing claimed savings within the EE portfolio	1. Conducted aggregate analysis to provide summary of projects that began, are ongoing, or were completed in 2013–2014, as well as projects adopted into the IOU EE portfolio. 2. Matched ETP database measure codes to IOU EE claimed savings database.
2	Effectiveness of IOU assessment activities	1. Technology Categorization 2. Peer Program Selection 3. Peer Interviews (n=10) conducted in Q1 2015 4. ETP staff interviews (n=4) conducted in May-June 2015
3	Effectiveness of ETP external dissemination efforts via ETCC website subscribers	1. Fielded Internet survey to the ETCC mailing list of 2,103 contacts, completing 113 interviews; survey was fielded from November 2014 through January 2015.

[a] As defined in the protocols, the aggregate analysis involves the analysis of the ETP program databases for all of the projects in each utility's ETP portfolio to provide a statistical overview of the ETP portfolio.

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

Below we provide a summary of the methods used for data collection and evaluation activities for the evaluation effort.

3.3.1. Data Collection Activities

In-depth interviews and target audience surveys: Three data collection initiatives were conducted as shown in Table 6. The table below provides each data collection effort, the population sample frame, and the number of completes. We provide data collection instruments in Volume II, Appendix A.

Table 6. 2013–2014 ETP Targeted Effectiveness Evaluation Data Collection Efforts

N	Effort	Instrument Name	Sample Frame	Completes
1	Interview	ETP-Like Program Peers	10	10
2	Interview	ETP Program Staff	4	4
3	Survey	ETCC Subscriber Survey	2,103	113

ETP database: The evaluation team reviewed project information as provided in the Q3 2014 ETP database, in addition to some updates provided by the IOUs.

3.3.2. Analytical Activities

Peer Review: The California Energy Efficiency ETP Protocols are by their nature flexible and meant to evolve to the changes and needs of each evaluation cycle.[16] The assessment of activities effort, which includes sampling ETP technologies and associated projects for peer review, falls within the peer review activity as documented in the protocols. The peer review is typically used for technical review to "evaluate the quality of the research process and output (e.g., whether the design of the study was sound, whether the project provided any new insights on the assessed technology)." [17] Our focus for this evaluation is still to assess quality of the process, but instead of a technical focus, we evaluate the focus of assessment activities. Efforts were taken to ensure the technologies selected represent the broader portfolio of ET projects. First, the tactic distribution – which is key in the analysis – is similar. The set of projects used in the analysis contained 67% Technology Assessment projects (consisting of lab evaluations, field evaluations, and scaled field placements), while the overall data set also contains 67% Technology Assessment projects. Therefore, from a tactic perspective, this study's projects are representative of the overall universe of ETP projects. Second, the technologies chosen represent a broad cross-section of end uses indicative of the diversity of technologies that ETP works with. Third, the technologies chosen represent a broad cross section of IOU participation, with at least two and up to four of the IOUs conducting projects for each technology. For these reasons, the results present findings and trends that give a useful perspective on ETP's work.

Aggregate level of analysis: The aggregate level of analysis is part of the California protocols. The evaluation team developed descriptive statistics for the program. 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 lengths, etc. This analysis was conducted from September 2014 to May 2015. The aggregate analysis effort incorporates measure tracking and analysis of key performance indicator protocols.

[16] Paraphrased statement in State of California Public Utilities Commission: California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals, April 2006, pp. 65.

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

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 on the relevant statistics of the target audience. The analysis was conducted from January to May 2015.

We provide detailed descriptions of our approach in each relevant chapter.

3.3.3. Unit of Analysis

Importantly, ETP tracks efforts by project. However, what project means may be unclear to stakeholders. As such, we differentiate project, technology, and measure below to ensure consistency across terminology employed in this report.

- **Project:** The ETP is project based; for example between 2010-2014 we identified 273 projects (e.g., line items) in the ETP database, of which 164 were initiated in 2013 and 2014.
- **Technology:** A technology is an equipment, practice, or approach used for a particular application or customer segment. In this study, technology is analogous to a "product category" or a collection of products which are more similar than dissimilar, rather than an end-use.[18] An example of a technology would be smart thermostats, which is more specific than HVAC or even temperature controls, but can contain a number of different products that are subject to similar technical or marketplace barriers. Another example is troffer LEDs; these are not the same technology as screw-in LEDs as they are applied to different use cases and customer segments. Note that one technology could be assessed by multiple ETP projects.
- **Measure:** A measure is an application of a technology that may ultimately have a different incentive level, potential market sector, etc. For example, a technology could subsequently result in multiple measure codes within the EE portfolio. For example, the LED technology could subsequently result in multiple measure codes within the energy efficiency portfolio.

3.4. Limitations of the Study

Our study, by design, is targeted in focus. As such, the primary limitation of our study is external validity (e.g., the extent to which the results of our study can be generalized to other projects or respondents). There are no specific guidelines for how the study should address potential bias or uncertainty. For the purposes of this effort, we borrowed areas of potential bias and uncertainty outlined in the Sampling and Uncertainty Protocol described in the California Framework.[19] We document limitations by study objective below.

Objective 1: Summary of the ETP Portfolio

For this objective, we provide a summary description of the ETP portfolio and an analysis of the effectiveness of ETP measures adopted into the IOU EE portfolio by assessing claimed savings within the EE portfolio. Our analysis is subject to limitations given the data availability described below:

[18] We define end-use as a large technology category based upon the CEESP definitions; these can include HVAC, Lighting, ZNE, etc.

[19] TecMarket Works. 2004. The California Evaluation Framework.

- **Captures projects through only Q3 2014:** Given the timing of the effort, the evaluation team used the Q3 2014 database as a source for conducting the aggregate analysis. As such, our efforts do not incorporate Q4 2014 efforts and represent a potential underestimate of ETP achievements.

- **Inconsistent reporting across IOU and ETP database records:** The evaluation team identified discrepancies between the number of adopted projects from the IOU Q4 2014 Quarterly Dashboard Report compared to the ETP database. Accounting for projects that may have been adopted in Q4 2014, there were still variations in terms of projects adopted. As such, ETP databases and internal IOU tracking are not always consistent.

- **Excludes activities initiated prior to 2010:** The evaluation team made a choice to capture all current activities beginning in 2010 for the analysis. This decision was made to ensure equivalency in terms of any comparisons across IOUs. The IOUs have different levels and comprehensiveness of information regarding projects initiated in cycles prior to 2010–2012.

- **Provides only a snapshot in time:** The aggregate analysis captures both "initiated" (i.e. projects initiated in 2013 through Q3 2014) and "current" projects (i.e., those projects that were initiated after 2010 that are reported in the 2013 through Q3 2014 ETP database). However, this analysis does not provide an "annual" picture of activities (the analysis provides a snapshot of 2013 through Q3 2014 efforts). As such, we provide recommendations for future analyses moving forward.

- **Reflects an incomplete assessment of Emerging Technology savings in the EE portfolio:** Our evaluation attempted to identify the emerging technologies that were assessed by ETP and transferred into the IOU EE portfolio. As part of this assessment, two factors contribute to an incomplete assessment of ET savings. The first is that not all adopted measures in the ETP database have an associated measure code (meaning that not all projects are able to be cross-referenced to the claimed savings database). As a result, no SCG projects have associated claimed savings. The second is that not all measure codes match measure codes available in the claimed savings database. For example, none of SDG&E's adopted projects map to the claimed savings database.

Objective 2: Evaluation of Assessment Activities

The evaluation team made every effort to design a robust analysis that could assess the effectiveness of the activity selection process. Nonetheless, there are limitations to the approach:

- The technologies chosen are not a statistically representative sample of the technologies that ETP deals with, or the ones with which it has done the most projects. The evaluation team selected them based on the grouping having an easily digestible number of projects for the respondents to look at a glance, a balance of technology types, end-use sectors, electric and gas, and a few other factors.

- The barriers listed are not a comprehensive list, but are rather limited to the ones the peers identified. While in most cases the fact that multiple peers gave unaided lists of barriers independently would lead to a more comprehensive sample than just a single person's perspective, there is a possibility that ETP identified barriers that the peers did not. Note, however, that peers commonly identified the same or similar barriers.

- The ETP data used for the study is from 2010 through June 2014, when the dataset was pulled from ETP's overall database, meaning the study provides a historical view based on what ETP has done. The 67 ETP projects used for the study spanned the four and a half years from 2010 through June 2014. Notably, the program design shifted from 2010-2012 to 2013-2014, shifting from distinct program elements to sub-programs. However, because the 2013-2014 projects followed similar tactic

patterns to 2010-2012 efforts (for example, percent of technology assessments) to older projects there should not be dramatic impacts on the results due to project timing.

While the limitations mean that statistically the results here may not be representative of the entire ETP portfolio, they present findings and trends that give a useful perspective on ETP's work.

Objective 3: Evaluation of the Effectiveness of ETP External Dissemination via ETCC Website Subscribers

As with any survey effort, we assessed whether the results were subject to the following biases:

- **Sample frame error:** We worked with the ETCC to ensure that we had the most complete sample frames available for our survey. The evaluation team assessed the email contact data and found email addresses for all contacts, meaning that there was no sample frame error.

- **Non-response bias and other forms of selection bias:** The evaluation team tested for non-response bias where there was sufficient population-level data to compare to the population (i.e., the 79 respondents who had subscribed to the website mailing list after January 8, 2014; these respondents answered questions about their profession and interest in the ETCC as part of subscribing to the website). The possibility of non-response bias among people on the mailing list prior to that date exists, but we have no specific information to compare against other than what we asked on the survey. Focusing on the 79 people for whom we had population-level data, the evaluation team tested for two sources of bias: program affiliation and technology areas of interest. Program affiliates accounted for similar portions of the sample and the population (11% and 7%, respectively). Similarly, technology areas of interest did not appear to be different between the two groups. Given these results, we did not weight the survey data, but acknowledge that non-response bias may yet be present.

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

- **Reliability:** We leveraged the experience of the team to create Internet survey questions that, on their face, appeared to measure the idea that they were intended to evaluate. We reviewed the questions to ensure that double-barreled questions (i.e., questions that ask about two subjects, but that have 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 whether the wording of the questions was clear and unambiguous, we pre-tested the survey instrument and reviewed the pre-test survey results.

- **External validity:** Our Internet surveys employed best practices for this type of data collection, in terms of both anonymous responses and multiple reminders. Because this effort is a census, external validity is not an issue given the total number of completes achieved. We acknowledge that non-response bias may occur and noted above when it may interfere with our ability to generalize the results. However, it is important to note that the findings from this study are intended to be generalizable to the population of people on the ETCC mailing list, which is a subset of the full population of external stakeholders that receive ETP information. In this way, our effort was a targeted assessment of one of many external dissemination activities that the ETP performs. Because the characteristics of the full population are likely to be different from the characteristics of the ETCC mailing list, the results are generalizable only to our sample frame.

3.5. Organization of the Report

Given the targeted nature of this study, we have organized this report by evaluation objective, providing detailed methods, findings, and recommendations (where relevant) within each chapter.

This study provides a targeted effectiveness study for the 2013–2014 ETP. Within this study, we:

- Describe the ETP program, including the program and policy context (Chapter 2)
- Provide an overview of the targeted effectiveness study, including the protocols that guide the evaluation effort and the evaluation goals, methods, and limitations (Chapter 3)
- Provide a summary description of the ETP portfolio and an assessment of claimed savings within the EE portfolio for projects adopted in 2013–2014 (Chapter 4)
- Examine the effectiveness of IOU assessment activities (Chapter 5)
- Evaluate the effectiveness of ETP external dissemination efforts via ETCC website subscribers (Chapter 6)
- Present study conclusions and recommendations across the three evaluation objectives (Chapter 7)
- Provide study appendices for each evaluation task (including more detailed methods where appropriate) (Volume II).

4. Summary of the ETP Portfolio

Consistent with the California Energy Efficiency Evaluation Protocols, the evaluation team conducted an aggregate analysis[20] of the ETP database. This effort counts the emerging technologies measures the IOUs show as adopted into the EE portfolio and summarizes information on projects that began, are ongoing, or were completed in 2013–2014. The aggregate analysis is designed to achieve two objectives:

1. To describe, for each utility, the basic components that make up the ETP and provide the necessary broader context for assessing the performance of the ETP
2. To determine, for each utility, the extent to which the overarching program and policy objectives have been met

While this evaluation counts the number of measures adopted into the portfolio, that number is not the sole measure of success. The ETP plays an important role when identifying technologies that are not appropriate for incorporation into the IOU EE portfolios, although our evaluation does not discuss this part of the program, except to note that there are projects that ETP staff do not recommend for adoption. It is the PPM and PIP objectives set by the CPUC and the IOUs that are the main guides for assessing the program through this aggregate analysis (see Volume II, Appendix B for PPM and PIPs). Therefore, the aggregate analysis provides several descriptive statistics on measures assessed within the ETP and compares values only against numbers from the PIP objectives.

4.1. Detailed Methods

Below we provide a discussion of the projects included in our universe for conducting the aggregate analysis and calculation of ET savings approach, including the data sources used and data cleaning steps. Associated limitations with our approach are discussed in Section 3.4.

4.1.1. Aggregate Analysis Approach

The ETP database and Q4 Quarterly Reports serve as the data sources of our analysis. The CPUC worked with the IOUs to put the database in place during the previous cycle (2010–2012). The database contains 541 projects, with data from 2006 through 2014. However, data prior to 2010 are spotty and were gathered during earlier evaluations. (The IOUs were not required to go back and fill in the database.) Therefore, the evaluation team needed to set specific parameters regarding which projects to include in the aggregate analysis.

The aggregate analysis in this report includes projects that began, are ongoing, or were completed in 2013 and 2014—what we term "current" projects. The evaluation team used the following criteria to select the appropriate projects to include in the 2013–2014 program cycle evaluation:

- All projects started in the 2013–2014 program cycle
- Projects initiated in 2010–2012 that have a progress point[21] date of 2013 or later

[20] As defined in the protocols, the aggregate analysis involves the analysis of the ETP databases for all of the projects in each utility's ETP portfolio to provide a statistical overview of the ETP portfolio.

[21] The seven "Progress Point" variables are: 1) Preliminary proposal created and decision made, 2) Project funded/initiated, 3) Data/information collection starts, 4) Data/information collection complete, 5) Report/deliverable complete, 6) Measure development stage initiated, and 7) Measure development complete.

- Because of the spotty data prior to 2010, exclusion of projects started in the 2006–2008 or 2009 program cycle, regardless of end date.

Table 7. ETP Projects, by Program Cycle

Program Cycle	Number Included in "Current" Projects	Number Excluded	Total in ETP Database
2006–2008	0	26	26
2009	0	31	31
2010–2012	109	211	320
2013–2014	164	0	164
Total	**273**	**268**	**541**

In addition, the aggregate analysis in this report also includes analysis for projects initiated in 2013 and 2014 – what we term "initiated" projects. The table above shows that 164 projects were initiated in 2013 and 2014.

Data Sources

The IOUs are required to update the ETP database each quarter by providing the CPUC with Excel data files. The specific information for the aggregate analysis in this report is based on the following files received in October 2014 and updated in December 2014 or February 2015. Our analysis does not include projects and their associated updates from the last quarter of 2014 (which we noted in the limitations discussion in Section 3.4):

- PG&E ETP database received October 2014, and revisions received in December 2014
- SCE ETP database received October 2014
- SCG ETP database received October 2014, and revisions received in February 2015
- SDG&E ETP database received October 2014, and revisions received in December 2014
- Each IOU's Q4 2014 Quarterly Dashboard Report
- Each IOU's Energy Efficiency Monthly Reporting: September–October 2014

In addition, the team conducted ad hoc interviews with IOU program staff to understand the data found in the ETP database.

4.1.2. Calculation of Emerging Technology Savings in EE Portfolio Approach

The CPUC maintains a large database of savings claimed by the IOUs and updates it quarterly. This database is a relational database with many variables. Our evaluation attempted to identify the emerging technologies that were assessed by ETP and transferred into the IOU EE portfolio. For our analysis, we assessed ETP effectiveness using a set of variables that identify a specific measure and the information on ET savings in the portfolio for the record associated with that measure.

For this effort, we assessed savings for ET measures adopted in 2013–2014. We sourced primary data from the following databases:

- Q3 2014 ETP database for all projects indicated as adopted in 2013–2014 with an EE portfolio measure code
- 2013–2014 IOU EE portfolio savings database through Q4 2014. Itron compiles this database incorporating IOU inputs, into a post-processed database. Specifically, we summed the gross claimed savings with the realization rate applied.[22]

Calculation of ET savings is a two-step process. The first step uses the same data sources as the aggregate analysis to determine which ETP projects the IOUs have shown as adopted and the specific measures associated with an adopted project. The second step uses the measure codes identified in the first step and matches them to data in the EE portfolio savings database. These two steps are discussed in more detail below.

Step 1: Identify ETP Measures Adopted within the EE Database

Within the ETP database, a project includes the status of "adopted," meaning that ETP staff have formally recommended the measure for adoption and it has gone through the needed processes to be included in the EE portfolio. For adopted projects, an ETP project may have one or more measure IDs associated with it. Each IOU has its own unique EE portfolio measure code approach, using different combinations of numeric and alphabet values. Table 8 provides examples of these measure IDs.

Table 8. Examples of IOU-Specific EE Portfolio Measure IDs

IOU	EE Portfolio Measure Codes Examples
PG&E	HA47, LD1010-LD113, F203, F190
SCE	LT-19877 (E), PR-10295, FS-88864 (C)
SCG	Not applicable [a]
SDG&E	L-S51, L-S61

[a] SCG adopted projects had no associated measure codes in the ETP database.

Currently, the ETP database has eight variables regarding the status of a project. The variable "Status" is a categorical value that has six different options. The seven "Progress Point" variables are dates along a continuum of a project. The "Status" and "Progress Point" variables are frequently internally inconsistent (e.g., "Status" says complete/recommended for transfer, while "Progress Point" indicates project is active). In our analysis, there were 20 projects indicated as adopted under the "Status" variable, with an additional 15 projects indicated as "recommended for transfer," which is the step prior to adoption. Of these 35 projects, 31 had an associated EE program and 15 had an associated measure ID.

The ETP program staff are required to provide the CPUC with the number of ETP projects adopted into the EE portfolio on an annual basis. The evaluation team reviewed the IOU's Q4 Quarterly Dashboard Reports and found that the 35 projects within the ETP database (of projects "adopted" or "recommended for transfer," but with measure IDs) did not match the 50 projects the IOUs had indicated as adopted. After discussion with the IOUs, and obtaining the list of ETP project IDs associated with these 50 projects, we were able to determine which projects were part of the IOU list, which were part of the ETP database list, and which overlapped. Table 9 provides the unique number of adopted 2010–2014 ETP projects from both sources.

[22] In the claimed savings database, we calculated claimed savings using the variable "SavingsFirstYearGrossTherms/kW/kWh," which applies a realization rate to the value.

Table 9. 2013–2014 ETP Adopted Projects into the EE Portfolio, by IOU

IOU	EE Portfolio Adopted ETP Projects		
	Adopted in IOU PPM Report	Adopted in the ETP Database [a]	Unique Projects across Both Sources
PG&E	16	21	22
SCE	25	1	26
SCG	4	9	11
SDG&E	5	4	5
Total	**50**	**35**	**64**

[a] Includes projects either "adopted" or "recommended for transfer" that included a measure code.

While there were 64 adopted projects across both sources, not all had associated measure codes, as shown in Table 10.

Table 10. 2013–2014 ETP Adopted Projects and Associated Measure IDs

IOU	Unique Adopted Projects	Count of Adopted Projects with Measure IDs	Number of Unique Measure IDs
PG&E	22	14	165
SCE	26	24	52
SCG	11	0	0
SDG&E	5	2	5
Total	**64**	**40**	**222**

Ultimately, we based the next step on measure IDs from 40 ETP projects with their 222 associated measures IDs.

Step 2: Cross-Reference ETP Measures Adopted within the EE Database

We used the savings database with information for the eight quarters of the 2013–2014 period. Five of the variables within the database could be associated with an ETP measure ID ("Measure ID," "Implementation ID," "Measure Name," "Measure Group,"[23] and "Measure Category"). Our team wrote code to match the ETP ID to one or more of these EE portfolio savings database IDs, with most matches occurring for "Measure ID" and "Implementation ID."[24] However, we were unable to match a substantial number of ETP measures IDs. Table 11 provides the count of matched measure codes and the percent included in the analysis by IOU.

[23] Energy Division consultants develop this field based on other inputs by the IOUs ("Measure Name," "Program Sector," etc.).

[24] Within the code, we made multiple versions of the measures with and without hyphens to increase the probability of a match (for example, we took measure code LT-19877 (E) and removed the hyphen and (E), to match to the code in the EE claims database). The evaluation team performed a text match in the five possible measure ID variables to identify any matches.

Table 11. 2013–2014 ETP Measure Codes and Matched Implementation IDs (n=64 projects)

IOU	Unique Measure IDs in the ETP Database (64 Projects)	Matched IDs in the EE Portfolio (40 Projects)	Percent Measures Matched
PG&E	165	88	53%
SCE	52	34	65%
SCG	0	0	NA
SDG&E	5	0	0%
Statewide	222	122	55%

Measures may not match the ETP database for two reasons:

1. There may have been no uptake of the measure within the EE portfolio.
2. The unique measure ID from the ETP does not map to any of the five different measure codes in the EE portfolio.

There is uncertainty around whether we were unable to match measure IDs because of the first or second specified reason. For example, SDG&E measures did not map to the savings database, as there was no correlation between the measure IDs in the ETP database and those found in the EE portfolio. It is possible that some measures IDs were correct, but that consumers had not yet purchased the measure and as such no savings were claimed in the database. We expect that, over time, measure IDs will increase as consumers purchase more measures.

Custom control codes typically reflect broader "grouping" of tech that are not application specific. PG&E does not always track new custom measures as the codes tend to be generic across the measure, but ETP efforts may be specific to their application. For example, in the case of lighting controls there is one measure code in the EE database. However, ETP may have transferred a measure for lighting controls specific to school applications. As such, the EE database is unable to distinguish ET related efforts for lighting controls for schools as opposed to office applications. This could result in an overestimation of ET efforts making it difficult to measure the contribution of ET to these specific measures. This is a problem for tracking savings from the ETP, but any solution may be more effort than it is worth. In our review, we found four ETP projects indicating adoption to a custom program with 19 associated measure IDs. We were able to match some of the measure IDs, but these were for projects that were adopted into more than just a custom program (i.e., deemed prescriptive programs) and as such likely matched to those programs, rather than a custom program. Given that custom programs adopt many of the ETP projects, this inability to match to custom projects may reflect an incomplete assessment of ET savings contributions to the EE portfolio.

There are also several possible savings variables in the EE savings database. We provide the savings for our analysis from the gross claimed savings without a realization rate set of variables.[25] After matching the measures IDs, we summed the savings associated with each record.

4.2. Detailed Findings

The evaluation team categorized findings into four groups: 1) initiated projects, 2) adopted projects, 3) technical potential, and 4) claimed savings results. We document success by comparing ETP efforts to PPM

[25] "SavingsFirstYearGrossTherms/kW/kWh," which does not apply a realization rate to the ex ante value.

and PIP objectives.[26] Below we provide EE portfolio savings results related to ETP program efforts in 2013–2014.

4.2.1. Initiated Projects

In this section, we characterize the ET portfolio by illustrating the 2013-2014 cycle initiated project achievements of the PIP objectives and PPM related to the number of projects screened, selected, and assessed by various criteria, including by subprogram, IOU, budget, sector and end-use.[27] We found that the ETP met, and achieved substantially more, than its PIP objectives. Table 12 provides a summary of 2013–2014 ETP project achievements by PIP objective. 164 projects were initiated in 2013–2014, reaching 141% of objectives.

Table 12. 2103–2014 Initiated ETP Statewide PIP Objectives and Program Achievements, by Subprogram

#	Subprogram	Metric	PIP Objectives	PIP Achieved	% PIP Achieved
1	Technology Assessment	Assess EE measures, including IDSM measures	74	97	131%
2	Technology Development Support	Screen, select, and implement targeted technology development support projects to benefit EE measure development	24	38	158%
3	Technology Introduction Support	Conduct technology introduction activities	18	29	161%
Total projects initiated			**116**	**164**	**141%**

Source: ETP Program Database as of Q3 2014.

For now, the IOUs met these objectives within the allocated budget, spending 48% of the 2013–2014 budget, with the remainder allocated for ongoing projects.[28]

[26] Volume II, Appendix B provides an overview of the ETP 2013–2014 PPM and PIP objectives.

[27] Notably, we provide achievements for PPM and PIP objectives as tracked in the ETP database. This means we exclude the following PPM and PIP objectives from the analysis: number of Technology Resource Innovation Program (TRIP) solicitations carried out for 2013–2014, self-reported increase in knowledge among audiences or participants of demonstrations or showcases open to the public, gather baseline data for self-reported increase in knowledge among audiences or participants of scaled field placements, percent of attendees who voluntarily respond and self-report an increase in understanding on how to do business with the IOUs, conduct technology developer outreach through workshops, and conduct TRIP solicitations. For a full list of PPM and PIP objectives, see Volume II, Appendix B.

[28] The program has up to 6 years following the initiation of the projects to complete the project and spend the allocated budget. For PG&E, project budgets are developed and spent within the program cycle. SCE, SDG&E and SoCalGas develop project budgets with funds from a program cycle, but the expenditures can occur beyond the program cycle, (e.g., a 2010-2012 initiated project uses 2010-2012 funds, but can expend this budget over the next 6 years).

Table 13. 2013–2014 Initiated ETP Program Budget and Expenditures, by Subprogram and IOU

	2013–2014 Program Budget	Program Expenditures (Inception to Sep 2014)	% of Budget Spent	Average Cost per Initiated Project (standard deviation reported in parentheses)
ETP Subprograms				
Technology Development Support	$5,084,537	$4,776,901	94%	$83,874 ($95,049)
Technology Assessments	$16,683,005	$9,191,222	55%	$120,867 ($112,853)
Technology Introduction Support	$16,886,068	$4,636,423	27%	$169,679 ($126,522)
Total	**$38,653,611**	**$18,604,547**	**48%**	**NA**
IOUs				
PG&E	$12,251,374	$6,355,330	52%	$163,358 ($119,989)
SCE	$21,185,430	$8,328,534	39%	$111,775 ($122,955)
SCG	$2,516,727	$2,367,984	94%	$91,763 ($98,054)
SDG&E	$2,700,079	$1,552,699	58%	$111,364 ($70,585)
Total	**$38,653,611**	**$18,604,547**	**48%**	**NA**

Note: The IOUs have the ability to allocate 2013–2014 funding for projects that last up to 6 years. Therefore, not all budget needs to be spent during the program cycle. At the time of the evaluation, approximately $25 million is allocated for ongoing projects.

Each of the IOUs have met or exceeded PIP objectives for initiated projects (Table 14), except for PG&E for their Technology Introductory Support projects (7 of 8 achieved). However, as noted previously, the data does not incorporate Q4 2014 efforts and thus there is a potential underestimate of ETP achievements.

Table 14. 2103–2014 Initiated ETP PIP Objective Achievements Through Q3 2014, by IOU

#	Subprogram	Metric	PG&E		SCE[a¥]		SCG		SDG&E	
			Objective	Achieved	Objective	Achieved	Objective	Achieved	Objective	Achieved
1	Technology Assessments	Number of technology assessment projects conducted[a]	22	32	34	37	10	12	8	16
2	Technology Introduction Support	Number of technology introduction support projects conducted[b]	8	7	6	7	2	11	2	4
3	Technology Development Support	Number of technology development support projects initiated each year	2	2	18	26	2	8	2	2

[a] The PIP metric for Technology Assessments reads "Number of technology assessment projects conducted", however, for the purpose of keeping the analysis consistent, the metric against which the projects are assessed is "initiated" projects.

[b] The PIP metric for Technology Introduction Support reads "Number of technology introduction support projects conducted", however, for the purpose of keeping the analysis consistent, the metric against which the projects are assessed is "initiated" projects.

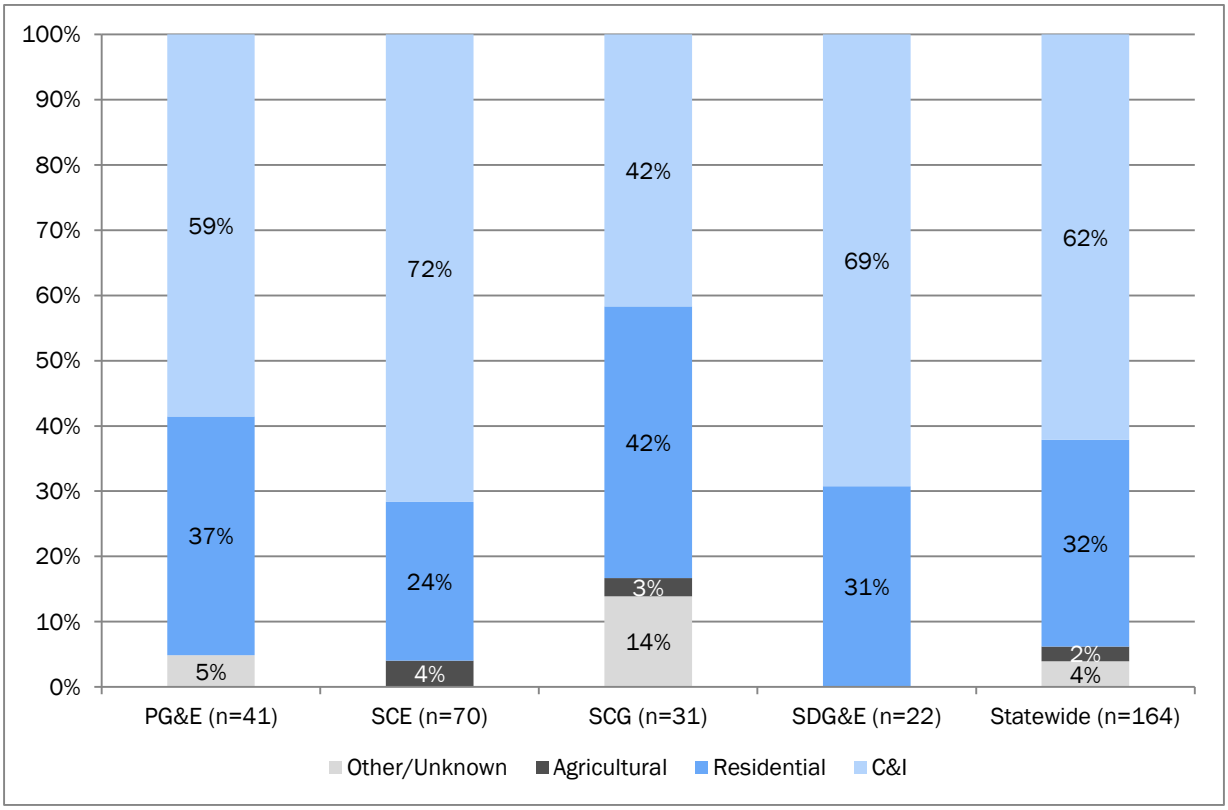
ETP objectives are based on the number of projects initiated. However, the IOUs can (and do) initiate different projects for the same technology. Because many people think about assessment of a technology end-use rather than a project, we provide examples of the various projects associated with two specific end-uses in Table 15.

Table 15. Examples of Different Technology within an ETP Project

IOU	Technology	Project Type	Project Name	ETP Project Number
PGE	Smart Thermostats	Technology Assessment (paper study)	Smart/Learning Thermostats EM&V Study	ET13PGE1461
		Technology Assessment (lab evaluation)	Smart Thermostats Lab Testing	ET13PGE1462
		Technology Assessment (scaled field placement)	Optimization Thermostats EM&V Study	ET13PGE1463
SCG	Smart Thermostats	Technology Assessment (scaled field placement)	NEST Thermostat Scaled Field Testing with PoF Navigant	ET13SCG0017
		Technology Assessment (scaled field placement)	Advanced Thermostat Scaled Field Testing with EPRI	ET13SCG0018
SDG&E	Advanced Lighting Controls	Technology Assessment (field evaluation)	Dynamic CCT Lighting for Classrooms	ET14SDG1011
		Technology Assessment (field evaluation)	Efficient Classroom Lighting Options	ET14SDG1021

ETP projects generally focused on the commercial and industrial (C&I) sectors, except for SCG, which focused equally on the residential and the C&I sectors (Figure 1).

Figure 1: 2013–2014 ETP Project Type, by Sector, by IOU (Multiple Response), n=164



Our review identified 55 projects with potential gas savings initiated in 2013 and 2014.[29] SCG initiated a total of 31 projects in PY2013–2014 that have potential for gas savings. PG&E and SDG&E also initiated 16 and 8 projects, respectively, that could have potential for gas savings (Table 16).

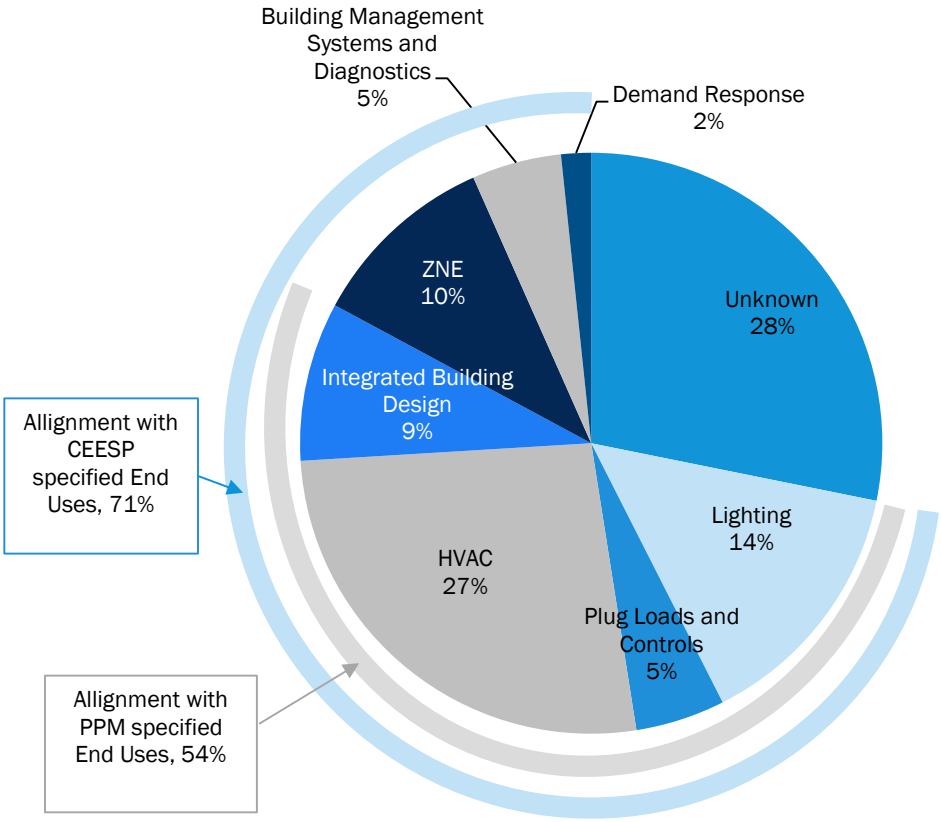
Table 16. 2013–2014 ETP Projects with Gas Potential, by Status

Project Status	PG&E	SCG	SDG&E	Statewide
Adopted	0	0	0	**0**
Complete, recommended for transfer	0	0	0	**0**
Active/planning stage	11	27	8	**46**
Complete, not recommended for transfer at this stage	0	1	0	**1**
On-hold/stopped	5	1	0	**8**
Total	16	31	8	55

[29] The evaluation team used the following criteria to select the appropriate projects that have the potential for gas savings in the 2013–2014 program cycle evaluation: included all SCG projects; included all projects that have therm technical potential calculations in the ETP database; and excluded all electric-only projects, for example, lighting end-use projects.

Approximately, three-quarters of the projects are within the specified R&T Framework to support CEESP (Figure 2). One of the ETP PPM states that ETP projects support three specific technology types: advanced HVAC technologies, high-efficiency plug loads and appliances, and advanced lighting technologies.[30] A little over half (54%) of projects align with PPM-specified end-uses. Notably, projects may be categorized into many end-use areas.

Figure 2: 2013–2014 Initiated ETP Statewide Projects, by End-Use (n=164)



The following tables present results for projects initiated in 2013–2014. Table 17 shows that, although projects cut across several of the CEESP categories and different subprograms, ETP projects tend to focus on HVAC and other/unknown technology categories, followed by lighting and ZNE.

Table 18 provides the average initiated project budget by end-use area. This analysis indicates that there appears to be consistency across end-use areas in terms of average project cost, while project costs tend to be larger for PG&E and SCE than for the Sempra utilities, consistent with their overall program budgets.

[30] The PPM specifies: Number of ETP measures that have undergone TA that are adopted* into the EE portfolio, including but not limited to each of the following: (a) advanced HVAC technologies, (b) high-efficiency plug loads and appliances, and (c) advanced lighting technologies. * "Adoption" means measure is available to end-use customers through IOU programs.

Table 17. 2013–2014 Initiated ETP Projects, by Subprogram and CEESP Category (Multiple Response)

Subprogram	Total Statewide Projects Initiated	HVAC	Lighting	ZNE	Integrated Building Design	Plug Loads and Controls	Building Mgt Systems and Diagnostics	Demand Response	Other/ Unknown[a]
Technology Assessment	97	24	14	14	6	6	3	0	30
	% of Subprogram	25%	14%	14%	6%	6%	3%	0%	31%
Technology Development Support	38	18	2	3	7	0	4	2	11
	% of Subprogram	47%	5%	8%	18%	0%	11%	5%	29%
Technology Introduction Support	29	6	10	2	3	3	2	1	9
	% of Subprogram	21%	34%	7%	10%	10%	7%	3%	31%
Statewide (n=164)		**29%**	**16%**	**12%**	**10%**	**5%**	**5%**	**2%**	**30%**

[a] "Other/Unknown" represents any project that is: "Process" related (could be in HVAC, food service, pumps, pool pumps, lighting, plug loads, ventilation, whole building), refrigeration, motors, cooking, and data center cooling.

Table 18. 2013–2014 Initiated ETP Average Project Budget, by End-Use Area (Multiple Response)

2013–2014 Projects	Average Budget (standard deviation reported in parentheses)							
	HVAC	Lighting	ZNE	Integrated Building Design	Plug Loads and Controls	Building Mgt Systems & Diagnostics	Demand Response	Other/ Unknown
PG&E (n=41)	$176,667 ($92,916)	$204,125 ($132,876)	$97,505 ($56,676)	$253,667 ($172,338)	$228,000 ($223,316)	$237,500 ($53,033)	--	$110,600 ($36,719)
SCE (n=70)	$95,098 ($65,942)	$137,144 ($94,847)	$147,575 ($148,025)	$95,031 ($7,071)	$160,000 (NA)	$93,163 ($44,546)	$202,052 (NA)	$147,768 ($177,142)
SCG (n=31)	$136,178 ($146,048)	--	$100,000 (NA)	$55,000 ($33,166)	--	--	--	$73,848 ($77,814)
SDG&E (n=22)	$116,667 ($49,160)	$71,667 ($43,205)	--	$138,333 ($141,097)	$153,333 ($100,664)	$150,000 ($70,711)	--	$72,500 ($3,536)
Statewide (n=164)	**$131,152**	**$137,645**	**$115,027**	**$135,508**	**$180,444**	**$160,221**	**$202,052**	**$101,179**
Overall Average Budget per project								**$145,404**
No Budget Provided (project counts)	5	1	0	0	0	0	0	1

4.2.2. ETP Efforts across Program Cycles

Evaluation teams have performed aggregate analyses of the ETP for the last three cycles. The implementation of the ETP database provides, for the first time, a set of comparable data across all projects to enable looking across multiple cycles using the ETP database information. Additionally, there is information available from the 2006–2008 aggregate analysis for a limited number of variables. Overall, ETP efforts were consistent over each funding cycle in terms of number of projects initiated and end-use areas (Table 19).

Table 19. 2013–2014 ETP Project Metric Achievements, by Program Cycle

Metric	2006–2008 (3yrs)	2010–2012 (3yrs)	2013–2014 (2yrs)
Total projects initiated	251 (no objective)	288 (250% of objective)	164 (141% of objective)
Total Technology Assessment projects initiated	166 (no objective)	188 (258% of objective)	97 (131% of objective)
% of overall projects aligned with PPM end-uses	~49%	41%	54%
% of overall projects aligned with CEESP goals	No objective	73%	71%
Total Program Budget Cycle	$30,000,000	$43,256,456	$38,653,611
Average Annual Budget	$10,000,000	$14,500,000	$13,000,000
Budget spent	62%	75%	48%[a]
Projects adopted into EE programs	16 projects	9 projects; 56 measures[b]	44 projects; 175 measures
Technical potential GWh	13,486	351,437	77,933
Technical potential GW	2	65	22
Technical potential million therms	132	504	415

[a] Reflects budget expenditures by Q3 2014.
[b] Sourced from IOU PPM Report submitted June 2013. Notably, IOUs reported either projects or measures, making the results non-equivalent to other program cycles.
NOTE: Funds were authorized for 2015 in 2014 but out of scope of this report.

Snapshot of ZNE Projects over Program Cycles

The availability of information in the ETP database for close to 4 years (and two program cycles) provides the evaluation team with the ability to begin to see trends. For example, one area where there appeared to be differences across program cycles was for ZNE projects. Table 20 provides a review of ZNE projects by funding cycle, subprogram, tactic, and sector. Our primary conclusion is that, in 2010–2012 funding cycle, most ZNE projects were Demonstration Showcases and in the 2013–2014 program cycle are Technology Assessments with "field evaluations."

Table 20. Review of ZNE Projects, by Funding Cycle

	2010–2012		2013–2014	
Number of projects that are classified as ZNE in CEESP classification column of AA	32		19	
Subprogram	**n**	**%**	**n**	**%**
Technology Assessment	14	44%	14	74%
Technology Development Support	NA		3	16%
Technology Introduction Support	NA		2	11%

	2010–2012		2013–2014	
Demonstration Showcase	16	50%	NA	
Market and Behavioral Studies	2	6%	NA	
Tactic	**n**	**%**	**n**	**%**
Field Evaluation (Field study)	12	38%	12	63%
Demonstration Showcase	16	50%	5	26%
Lab Evaluation (paper study)	2	6%	1	5%
Design Assistance	0	0%	1	5%
Market and Behavioral Studies	2	6%	0	0%
Sector	**n**	**%**	**n**	**%**
Residential	21	66%	15	79%
Commercial	11	34%	4	21%
Average Duration	**18 months**		**19 months**	
Average Budget	**$193,508**		**$131,174**	

4.2.3. Projects Adopted into the EE Portfolio in 2013–2014

Table 21 provides the total number of adopted 2010–2014 ETP measures. The evaluation team identified 20 projects adopted[31] into the EE portfolio and 15 recommended for transfer based on a review of the ETP database. However, the IOUs also provided a quarterly Dashboard Report (Q4 2014) that documents progress toward the achievement of their PPM. This report indicated that the IOUs had adopted 50 projects from the ETP in 2013–2014. However, we excluded any projects that were initiated prior to 2010 to ensure equivalency across the IOUs and, thus, six SCE projects were excluded. As such, we report findings based on 44 ETP projects into EE programs. In some cases, we found projects in both files; in other cases, projects were unique from each source.

For the remainder of this section, we provide detailed analysis of the 44 adopted projects as reported by the IOUs. The PIP objective is to transfer 25 measures, in this case projects, from the ETP into the EE programs, with the goal of producing energy savings and/or demand reduction. The IOUs adopted 44 projects, representing 175 measures, a substantial overachievement of the PIP objective.

[31] The adoption metric is the cumulative number of new ETP-recommended measures that are adopted each year into the EE portfolio. "Adopted" means measure is available to end-use customers through IOU programs with a unique portfolio ID. Adoption of a measure may be attributed to one or more ET subprograms.

Table 21. 2013–2014 ETP Adopted Projects, by Source

IOU	Adopted ETP Projects		
	Adopted in IOU PPM Report	Adopted in ETP Database [a]	Unique Projects across Both Sources
PG&E	16	21	22
SCE	19[b]	1	20
SCG	4	9	11
SDG&E	5	4	5
Total	**44**	**35**	**58**

[a] The ETP database also has 15 projects that have a status of "Completed, Recommended for Transfer."
[b] We removed 6 SCE projects from our analysis that were initiated prior to 2010, resulting in 44 total projects adopted.

We believe that the difference seen in the number of adopted projects is due to the more restricted universe of projects to count within our aggregate analysis.[32] This is not an ideal situation, as it leads to uncertainty about both sets of numbers. As can be seen, some projects listed as adopted in the IOU Q4 2014 Quarterly Dashboard Report were not listed as adopted in the ETP database and vice versa. Within the aggregate analysis, we used three sets of variables in the ETP database to determine the population of adopted projects. Specifically:

- **Program Year**: As stated before, our universe of projects in the aggregate analysis excluded projects initiated in the 2006–2009 cycle given that there is limited comprehensive data from this time frame. However, because the IOUs have up to 6 years to complete a technology assessment, our analysis would not include any project begun prior to 2010.
- **Progress Points**: We excluded projects initiated in 2010–2012 that did not have a progress point date within 2013 or 2014. That is, at least one progress point must have indicated activity during 2013 or 2014 to be included in our aggregate analysis. This choice may also have excluded projects counted by the IOUs as adopted.
- **Status**: We checked this variable, along with the progress points, to help us determine if the project was completed or not.

We provide recommendations for correcting this issue moving forward in Section 4.3.

Table 22 provides a summary of the adopted projects by IOU and subprogram; the majority of the adopted projects are Technology Assessments, followed by Technology Introduction Support.

[32] These differences arrive for two reasons: 1) the ETP database does not cover Q4 2014, and 2) projects are not part of the scope in terms of timelines (prior to 2010).

Table 22. 2013–2014 ETP Adopted Projects, by IOU and Subprogram

Subprogram	PG&E	SCE	SCG	SDG&E	Statewide
Technology Assessment	6	15	2	2	**25**
Technology Development Support	0	1	1	2	**4**
Technology Introduction Support	10	0	1	1	**12**
Demonstration Showcase[a]	0	2	0	0	**2**
Scaled Field Placement[a]	0	1	0	0	**1**
Total	**16**	**19**	**4**	**5**	**44**

[a] Notably, these are old ETP elements and were not labeled in the ETP database using the new subprograms.

The average budget and completion time is shown in Table 23. Technology Introduction Support tend to have a higher cost, but are completed in less than a year compared to projects in other subprograms.

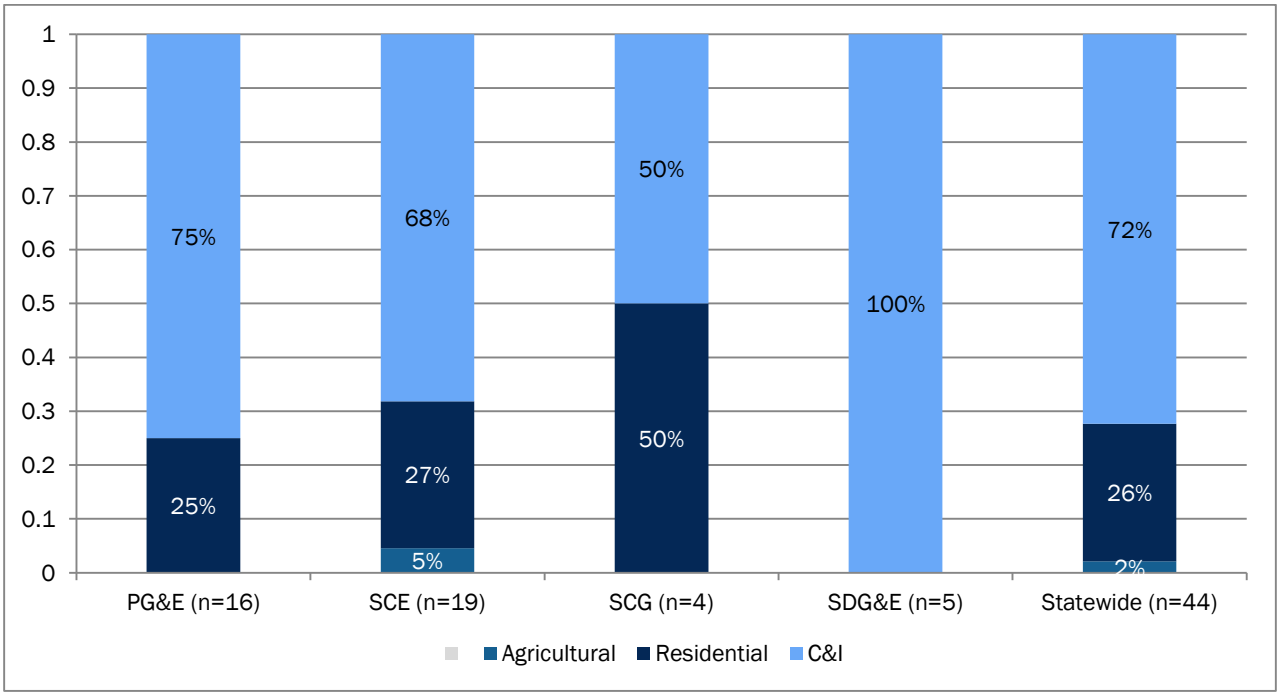
Table 23. 2013–2014 ETP Adopted Project Average Budget and Completion Time, by Subprogram[a]

Subprogram	Average Cost	Average Time to Complete (in months)
Technology Assessment	$53,485	10
Technology Development Support	$44,500	14
Technology Introduction Support	$157,393	9

[a] Notably, we excluded projects that were labeled in 2010–2012 as "elements" that were not categorized under the current suite of subprograms.

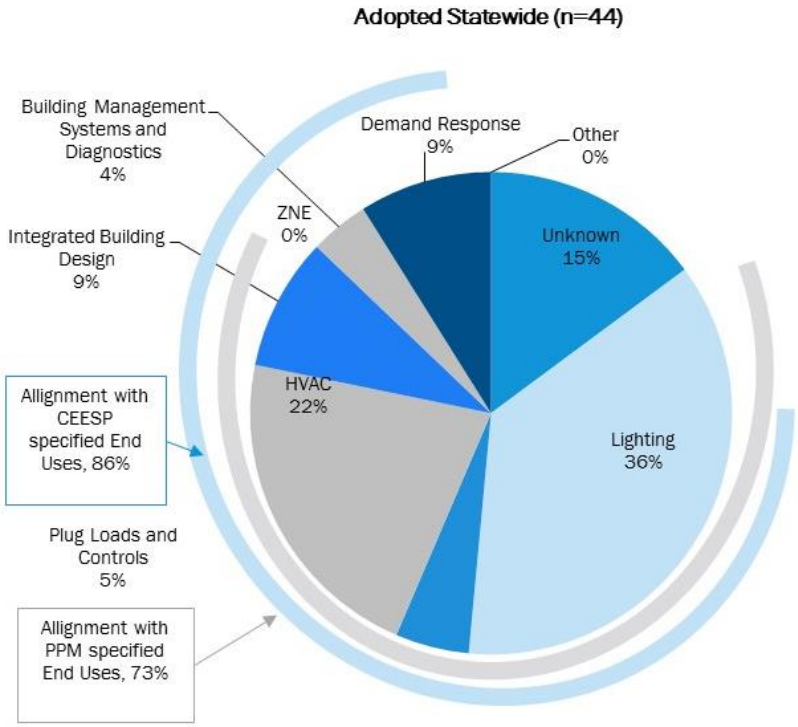
Adopted projects generally focused on the C&I sectors, except for SCG, which was split between C&I sectors and the residential sector (Figure 3).

Figure 3: 2013–2014 ETP Adopted Projects, by Sector (Multiple Response), n=44



Overall, adopted projects align with CEESP-specified end-uses; 86% of the adopted projects are within the specified R&T Framework to support California's Big, Bold Strategies and about three-quarters (73%) of projects align with PPM-specified end-uses (advanced HVAC technologies, high-efficiency plug loads and appliances, and advanced lighting technologies) (Figure 4).

Figure 4: 2013–2014 ETP Statewide Adopted Projects, by End-Use (n=44)



The ETP provides a select number of inputs when other IOU staff members consider whether the IOUs will adopt a measure into the EE portfolio. Additionally, CPUC staff is involved through the workpaper process. While the ETP staff recommends measures for adoption, and there typically is a "champion" at the IOU who desires the measure to be included, ETP staff has an indirect ability to influence the ultimate choice of adoption. Regardless, moving emerging technologies into the EE portfolio is one of the key purposes of the ETP, and an evaluation of the program would be incomplete without knowing how many and what types of measures are included in the EE portfolio.

4.2.4. Technical Potential for Adopted Projects

Technical potential refers to the energy savings potential that would be captured if all EE measures were installed in all applicable and feasible applications. Within the ETP database, the IOUs provide the three inputs to calculate first-year technical potential as shown in Equation 1.

Equation 1. Annual Technical Potential Algorithm for a Measure

$$Technical\ Potential = N\ Sites * \%\ Sites\ where\ Technically\ Feasible * kWh/kW/Therm\ Savings$$

Additionally, the IOUs provide an estimated effective useful life of the measure, which allows for a lifetime savings calculation.

Equation 2. Lifetime Technical Potential Algorithm for a Measure

$$Technical\ Potential = EUL * \ N\ Sites * \%\ Sites\ where\ Technically\ Feasible * kWh/kW/Therm\ Savings$$

The evaluation team leveraged information collected by the IOUs in the ETP database to calculate technical potential. The variables used from the ETP database are described in Table 24.

Table 24. ETP Database Variables Used to Calculate Technical Potential

Variable Name	Variable Description and Use
Site type or other unit of measurement (UoM)	Provides the general type of site (e.g., office, single-family dwelling) if the UoM is a single building or the UoMs if not a single building (i.e., square foot of building).
N Sites or units in the IOU service territory (A)	**Estimate based on assessment:** This value is the total of whatever unit provided as UoM (variable above) within the IOU service territory (e.g., 3 million SFD or 1.2 million MFD or 1,800 office buildings or 2.8 billion square feet of commercial space).
Percent of population in the IOU service territory who could use this technology (B)	**Estimate based on assessment:** This is the percent who could use the technology, regardless of the cost-effectiveness or if they wanted to do so. This is not always 100%.
Annual kWh/site or unit (C)	**Estimate based on assessment:** This is the kWh savings for a single UoM (technical potential = A * B * C).
Peak kW Savings/site or unit (D)	**Estimate based on assessment:** This is the kW savings for a single UoM (technical potential = A * B * D)
Annual therm savings/site or unit (E)	**Estimate based on assessment:** This is the gas savings for a single UoM (technical potential = A * B * E)

The energy community separates potential energy savings into three types: technical, economic, and market. Starting at technical potential, each type has the potential for a progressively smaller amount of savings. Technical potential is the savings achievable if every possible instance of an inefficient measure was replaced with the new efficient measures, regardless of whether it was cost-effective or if a consumer desired the change. Economic potential is what is cost-effective, and market potential is both what is cost-effective and what consumers will adopt. All these values can be difficult to estimate, and the ETP is required to estimate only the technical potential for measures moving into the portfolio.

For the 44 adopted projects, the annual technical potential is 77,933 GWh, 22 GW, and 415 million therms. Some projects have technical potential but are unable to assign a specific number and, as such, these technical potential estimates are likely underreported. Table 25 and Table 26 show the annual technical potential for the adopted projects by IOU and subprogram, respectively.

Table 25. 2013–2014 ETP Adopted Projects Annual Technical Potential, by IOU

IOU	IOU Reported Adopted Projects			
	Number of Projects	GWh Potential	MW Potential	Million Therm Potential
PG&E	16	55,576	13,375	323
SCE	19	22,054	8,591	–
SCG	4	260	–	92
SDG&E	5	42	2	0.2
Statewide	**44**	**77,933**	**21,968**	**415**

Table 26. 2013–2014 ETP Adopted Projects Annual Technical Potential, by Subprogram

Subprogram	IOU Reported Adopted Projects			
	Number of Projects	GWh Potential	MW Potential	Million Therm Potential
Technology Assessment	25	57,299	19,635	11
Technology Development Support	4	3	0.4	65
Technology Introduction Support	12	20,631	2,333	339
Other (DS/SFP for SCE)	3	–	–	–
Statewide	**44**	**77,933**	**21,968**	**415**

Overall, we see a decrease in annual technical potential savings from 2010–2012 to 2013–2014.

Table 27. ETP Annual Technical Potential Achievements, by Program Cycle

Program Cycle	Number of Projects	Number of Measures	GWh Potential	GW Potential	Million Therm Potential
2006–2008	16	Unknown	13,486	2	132
2010–2012	9[a]	56[a]	351,437	65	504
2013–2014	44	175	77,933	22	415

[a] Sourced from IOU PPM Report submitted June 2013. Notably, IOUs reported either projects or measures, making the results non-equivalent to other program cycles. As such, there could be more measures transferred in 2010–2012 from the nine projects or 56 measures.

For the 44 adopted projects, the lifetime technical potential is 524,882 GWh, 121,491 GW, and 4,507 million therms. Some projects have technical potential but are unable to assign a specific number and, as such, these technical potential estimates are likely underreported. Table 28 and Table 29 show the lifetime technical potential for the adopted projects by IOU and subprogram, respectively.

Table 28. 2013–2014 ETP Adopted Projects Lifetime Technical Potential, by IOU

IOU	IOU Reported Adopted Projects			
	Number of Projects	GWh Potential	MW Potential	Million Therm Potential
PG&E	16	423,705	120,431	3,127
SCE	19	97,061	1,049	–
SCG	4	3,901	–	1,379
SDG&E	5	215	11	1.3
Statewide	**44**	**524,882**	**121,491**	**4,507**

Table 29. 2013–2014 ETP Adopted Projects Lifetime Technical Potential, by Subprogram

Subprogram	IOU Reported Adopted Projects			
	Number of Projects	GWh Potential	MW Potential	Million Therm Potential
Technology Assessment	25	375,604	90,138	164
Technology Development Support	4	19	2.2	973
Technology Introduction Support	12	149,259	31,351	3,370
Other (DS/SFP for SCE)	3	–	–	–
Statewide	**44**	**524,882**	**121,491**	**4,507**

The evaluation team performed no separate estimate of annual or lifetime technical potential, but reviewed inputs and discussed them with the IOUs where they seemed different from what we expected. Even with this limited review, the annual technical potential values are too high. For example, California's energy use by the IOUs in 2013 was approximately 191,000 GWh and approximately 11,000 million therms,[33] while the California Energy Commission forecasts a demand for the full state (including areas outside of the IOUs) between 60 and 65 GW.[34] The first-year technical potential from the 44 measures included in the analysis is 77,933 GWh (40% of 2013 use), 22 GW (33% of demand), and 415 million therms (4% of 2013 use). It is difficult to see how 44 projects alone could reduce the electric energy and demand use by the levels indicated in the annual technical potential, although the therm reduction is more plausible. To obtain a better level of technical potential and reduce this level of disparity will take additional effort (and perhaps research) on the part of ETP staff. We recommend that the CPUC consider whether it is worth this effort to obtain values that are more reasonable. For the evaluation team, this information is a good indication of the relative level of savings among the multiple ETP projects to be used in prioritizing technologies, although we do not use the absolute values to assess effectiveness.

4.2.5. Calculation of Emerging Technology Savings in EE Portfolio Results

As discussed in the previous sections, the technical potential provides a very high and rough estimate of saving if every single household or business in California with a relevant measure replaced it with the more efficient measure. However, this is not realistic for multiple reasons (such as cost or a disinclination to purchase a measure if renting). The EE portfolio incentivizes consumers to purchase measures available in the market and so provides information regarding what consumers will purchase when there is a program intervention in place. Therefore, understanding how many consumers purchase measures that came into the EE portfolio through the ETP helps provide one metric of the value of the ETP as California strives to reach ever-increasing efficiency goals.

The IOUs consider measures within the ETP as "emerging" or "underutilized." Once a measure moves into the EE portfolio, consumer purchases may take off, languish, or be slow and steady based on the efforts of other IOU program staff outside of the ETP. However, absent monitoring of the cumulative effect of ETP measures within the EE portfolio, the CPUC is missing a key piece of knowledge about the ETP and the merit of this non-resource program.

The PY2006–2008 evaluation team performed a review of ETP project savings within the EE portfolio through laborious cross-checking of the then-current EE portfolio and matching past ETP projects by name and measure, as well as measure ID (where available).[35] This assessment identified close to 140 projects transferred to the EE portfolio from projects spanning a 10-year period from 1998 to 2007. This team experienced similar difficulties matching measures from the ETP in the EE portfolio, although that team thought that they might have provided too high of an assessment for some of the lighting savings found in the EE portfolio to the ETP. This assessment found ex ante gross savings of slightly over 250,000 MWh, although it did not benchmark that value as a percent of the overall portfolio.

Since that previous evaluation, the CPUC has instituted a structured data collection of ETP project information whereby the IOUs provide quarterly information on ETP projects within their respective programs. This is the first evaluation with sufficient data to directly link EE portfolio measures (and their associated counts and

[33] Sources: http://ecdms.energy.ca.gov/elecbyutil.aspx *and* http://ecdms.energy.ca.gov/gasbyutil.aspx.

[34] Source: http://www.energy.ca.gov/2012publications/CEC-200-2012-001/CEC-200-2012-001-CMF-V1.pdf.

[35] Final Report: Evaluation of the California Statewide Emerging Technologies Program, Summit Blue Consulting, LLC. Prepared for the CPUC Energy Division, February 3, 2010.

savings) to ETP projects based on measure IDs provided by the IOUs. While considerably better than what faced the 2006–2008 evaluators, the process to identify ETs that were assessed by ETP and transferred into the portfolio remains challenging. This year's evaluation provides three overarching considerations for helping the future process, with details in Section 0:

- Make specific changes in the ETP database to ensure that the IOUs can label clearly and unequivocally the adoption of projects into the EE portfolio
- Agree on how to count adopted projects in the future
- Clarify mapping of measure codes between the ETP database and the EE portfolios

The IOUs and CPUC most likely can easily implement the first and second considerations, but it will take discussion among ETP and CPUC staff to agree on exactly how to implement the changes. The third consideration sounds straightforward, but is not. There are several different IOU teams involved with moving a measure through the individual processes from the ETP and eventually to the EE portfolio.[36]

Regardless of the difficulties within this year's efforts to summarize savings from ETs that were assessed by ET and transferred into the portfolio, including the known gaps and likely incomplete assessment present (see Section 5.2.2), the current suite of 122 measures from ETP projects adopted into the EE portfolio between 2010 and 2014 provides about 2% of the 2013–2014 statewide ex ante claimed electric savings and slightly less therm savings (Table 30). Notably, this reflects incremental savings from measures recently introduced into the portfolio, not a cumulative assessment of ET measures assessed by ETP over time.

Table 30. 2013–2014 Ex Ante Savings from ETs Assessed by ETP and Transferred into EE Portfolio
(ETP projects adopted between 2010 and 2014)

Item	Number of Claims	First-Year Gross MWh Savings	First-Year Gross MW Savings	First-Year Gross MTherms Savings[a]
EE Full Portfolio	2,925,879	5,648,823	907	98,280
EE Portfolio of Programs with ETP Matching Measures	1,418,206	1,985,952	311	10,651
ETP Matching Measures	60,003	94,058	16	1,245
ETP as Percent of Portfolio of Programs with Matching Measures	*4%*	*5%*	*5%*	*12%*
ETP as Percent of Full Portfolio	*2.1%*	*1.7%*	*1.7%*	*1.3%*

[a] Only therm values over zero are included in the sum of savings. Negative therm savings from lighting projects are not included.

Over time, the evaluation team expects the cumulative savings from ETs assessed by ETP and adopted into the EE portfolio to slowly increase as evaluators are able to map more and more measures and the ETP transfers measures to the EE portfolio. This year provides a good snapshot in time, with future assessments adding to the body of knowledge. As the process becomes smoother and the savings have fewer known holes, the evaluation team expects that the IOUs and CPUC may want to carefully consider how to use this data point when assessing the effectiveness of ET adoption in the EE portfolio. Importantly, for measures introduced via

[36] The recent evaluation, "Study of the California Utility Internal Measure Development Process," by Evergreen Economics dated February 25, 2015, provides the processes within each IOU of an ETP project from selection to adoption. It does not cover what occurs once the ETP has made a recommendation for adoption, though, which is essential to understand.

ETP, ETP may not be the sole or even a major cause of its introduction or success in the portfolio, therefore, ETP recommendation for transfer does not imply attribution of energy impacts.

Below we document our conclusions and considerations.

4.3. Conclusions and Considerations

Aggregate analysis involves the analysis of a variety of data collected for all of the projects in each utility's ETP portfolio to provide a statistical overview of the ETP portfolio.[37] We used the aggregate analysis to:

- Verify PIP objectives and PPM, where relevant
- Characterize the ETP portfolio and identify and track movement of measures into the IOU EE portfolio via the ETP database "Status" variable, as well as other variables, in addition to the IOU PPM Reports
- Provide a statistical overview of the ETP portfolio, including technical potential of measures adopted into the EE portfolio

4.3.1. Conclusions

While it is the PPM and PIP objectives set by the CPUC and the IOUs that are the main guides for assessing the program through this aggregate analysis, the PPM do not set specific success criteria or expected accomplishments, but do provide a framework for what the CPUC considers important and tend to focus on measure adoption. The PIP objectives, set by the IOUs, provide a specific number associated with the expected activity in the program cycle. Based on our analysis, we found that the ETP:

- **Consistently overachieved PIP objectives:** The 2013–2014 ETP consistently exceeded PIP objectives. Moreover, the ETP exceeded some objectives by significant amounts. The IOUs achieved all PIP objectives, including conducting technology introduction (161%), assessment (131%), and development activities (158%), as well as transferring measures from the ETP into the EE programs (176%).[38] According to the IOUs, 44 ETP projects[39] were adopted into the IOU EE portfolio representing 175 measures. Notably, our analysis covers activities performed from Q1 2013 through Q3 2014, meaning that results are likely an underestimate of total activities through 2014.
- **Objectives were achieved within allocated budget:** The IOUs met these objectives within the allocated [40]budget, spending 48% of the 2013–2014 budget, with the remainder allocated for ongoing projects.

[37] The aggregate analysis description is based on the California Evaluation Framework for the Emerging Technologies Program.

[38] Note that 44 projects were adopted into the IOU EE portfolio in 2013–2014, with a statewide objective of transferring 25 measures.

[39] The evaluation team excluded 6 SCE projects that were initiated prior to 2010 to ensure equivalency across the IOUs.

[40] The program has up to 6 years following the initiation of the projects to complete the project and spend the allocated budget. For PG&E, project budgets are developed and spent within the program cycle. For SCE, SDG&E and SoCalGas, project budgets are developed and expended by program cycle, (e.g., a 2010-2012 initiated project uses 2010-2012 budget, but can expend budget over the next 6 years).

- **Projects align with the CEESP end-use areas:** Nearly three-quarters (73%) of ETP projects adopted in 2013-2014 are within the specified R&T Framework to support California's Big, Bold Strategies.
- **Technical potential values are too high:** California's energy use by the IOUs in 2013 was approximately 191,000 GWh and approximately 11,000 million therms,[41] while the California Energy Commission forecasts a demand for California (including areas outside of the IOUs) between 60 and 65 GW.[42] The first-year technical potential from the 44 ETP projects included in the analysis is 77,933 GWh (40% of 2013 use), 22 GW (33% of demand), and 415 million therms (4% of therms).
- **Adopted measures in 2013–2014 account for approximately 2% of the IOU Electric EE portfolio and slightly less therm savings.** Notably, this accounts for measures adopted into the EE portfolio in 2013–2014, providing a snapshot of ETP adopted measures at one moment in time. However, our team was unable to map measure IDs to the EE portfolio database in all cases, leading to a likely underestimate of savings in the EE portfolio from ETP measures.
- **Difficult to map achievements within program cycle as well as over time.** The ETP database continues to have limitations in terms of its data quality, as well as the metrics it seeks to track and how they are documented. Further, because projects start and stop at varying times, it is difficult to capture program results both on an annual and cumulative basis.

Overall, ETP program staff achieved all PIP objectives (i.e., total number of projects conducted, projects that align with end-use areas, and number of projects adopted) captured within the aggregate analysis. However, tracking and capturing achievements was limited by existing data tracking (as detailed below).

We provide key considerations below, including: 1) adjusting PPM and PIP objectives, 2) enhancing tracking of ET savings assessed by ETP in EE portfolio, 3) improving metric reporting and database tracking, and 4) determining a temporal approach to metric reporting. These are intended to support implementation of the recommendations provided in Chapter 7.

4.3.2. Considerations for Implementing Recommendations

Adjust PPM and PIP Objectives

The 2013–2014 evaluation effort, as well as the 2010–2012 effort, indicates that the PPM and PIP objectives could be adjusted to better reflect ETP goals and implementation efforts. We document key considerations below:

- **Develop metrics that measure program effectiveness:** Some of the current PPM are misaligned with current program design and do not provide metrics against which to determine if the program is performing as expected or not. Additionally, revised metrics may better support CPUC guidance if they are focused on technology-specific achievements for measure transfer as well as for market transformation. For example, current end-use alignment with CEESP is tracked at a project level, rather than technology level. Due to this, the same technology could be accounted for in multiple projects. To enable the CPUC to be able to determine whether there is a need for further guidance for the program, the evaluation team suggests that the IOUs and CPUC work collaboratively to identify revised metrics. Once established, the IOUs should propose metrics and how they will track them

[41] Source: http://ecdms.energy.ca.gov/elecbyutil.aspx *and* http://ecdms.energy.ca.gov/gasbyutil.aspx.

[42] Source: http://www.energy.ca.gov/2012publications/CEC-200-2012-001/CEC-200-2012-001-CMF-V1.pdf.

moving forward. Metrics and objectives should align with anticipated program outcomes, be measurable, follow CPUC guidance, and support program oversight by the CPUC.

- **Align PIP objective success criteria with past achievements:** The PIP objectives of the number of projects initiated or conducted are too low. The IOUs have consistently performed significantly above the expected numbers of projects in each of the past three cycles. These include number of projects initiated, by sub-program, and end-use area, etc. The IOUs should use these past achievements to create new project initiation values as part of their implementation plans.

- **Consider value and use of technical potential:** The technical potential values are too high. The CPUC and IOUs should collaboratively determine the need for the technical potential of adopted measures. If the CPUC and IOUs agree on the value of this information, then the IOUs must begin to use input values that are more realistic. The evaluation team found this technical potential information useful for a rough ranking of the measures coming from the ETP, but we acknowledge that much of the *market potential* of any measure within the EE portfolio relies on program marketing and consumer demand. This alone may be an insufficient reason for the added effort required by the IOUs to create better technical potential information.

Enhance Tracking of ET Savings Assessed by ETP in EE Portfolio

As part of the effort to track savings from ET measures, we identified process-related challenges. The following considerations support enhancing this process moving forward:

- **Capture specific ETP measure ID in savings database:** The CPUC and IOUs should consider the best approach to flag ETP measures in the EE database to review and capture claims. A few approaches could be considered with varying burden to existing systems and stakeholders. The IOUs should consider developing IDs that are one-to-one matches across ETP measure IDs and EE database IDs. This approach should ensure that any measure could be traced to its associated ETP project, but may be more burdensome to institute across the various stakeholders involved.

- **Consider refining approach to capturing custom projects:** Discuss benefits and costs to enhancing custom measure tracking with stakeholders to enable comprehensively capturing ETP benefits. The inability to identify ETP measures in custom projects likely inaccurately captures ETP contributions to the EE portfolio, and, as such, key stakeholders should consider enhancing how custom projects are defined within the tracking data.

Revise Existing ETP Database

In 2010–2012, the evaluation team found that the ETP database did not contain sufficient information to verify adoption of, and energy savings potentials[43] from, measures moved into the EE portfolio from the ETP. The evaluation team continued to encounter issues when trying to identify adopted projects.

We propose a new approach to ensure that evaluators and IOUs report the same number of adopted projects. Any method needs to be clear and systematic so that the ED can track the projects within the ETP by status and technology. The CPUC and the IOUs should consider the following steps:

- **Revise status variables to enhance tracking:** Currently, the ETP database has eight variables regarding the status of a project. The variable *status* is a categorical value that has six different options. The seven *progress point* variables are dates along a continuum of a project. The status and progress point variables are frequently internally inconsistent (e.g., status says "complete/recommended for transfer," while the progress point indicates project is active). We suggest revising these fields within the ETP database to clarify project status, support CPUC oversight, and enhance tracking.
  - ***Drop Progress Points:*** At one point, there was interest in understanding the length of time it took an ETP project to move through the process. The ED, along with the IOUs, put seven progress point variables in place to help gain this knowledge. After 2 years of working on the quality of the ETP database, we continue to see that the IOUs fill in the progress point variables inconsistently and provide information that does not match the status variable. We suggest that the ETP database drop these seven fields.
  - ***Add Start Date and End Date:*** However, there is a need to know when projects begin and end. To replace the progress points, we suggest adding two date fields—a start date and an end date. Each of these fields needs specific parameters. While the progress points included times before the IOUs funded a project, we believe that the start date be the point when an IOU commits to funding a project. Therefore, an IOU will not need to enter a project into the ETP database until it is funded. We suggest that the end date be when the IOU is no longer funding the project (e.g., the project is finished, stopped or cancelled).
  - ***Keep Status, but change categories:*** The ED and IOUs developed the current status categories, shown below. If the suggestion about the start and end dates is chosen, the categories of conceptual planning and planning should be dropped, as there would be no expectation of a project being added to the database until it was funded and "active." We also suggest dropping the qualifier for a complete project and having a single option of "complete."

Table 31. Current and Proposed ETP Database Status Variable

Current Status Categorical Choices	Suggested New Status Categorical Choices
Conceptual planning	Active
Planning	Stopped
Active	Complete
Complete, recommended for transfer	

[43] According to the PPM, 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.

Current Status Categorical Choices	Suggested New Status Categorical Choices
Complete, not recommended for transfer at this stage	
Stopped	
Adopted	

- ***Add "Recommended for Transfer" variable:*** Rather than have the recommendation for transfer embedded in the status variable, we suggest adding a new variable. The "recommended for transfer" variable would have two possible responses: "yes" or "no." While not specific to this variable, we suggest that IOU staff only fill in technical potential for those projects that they recommend for transfer.

- ***Add "Adopted" variable:*** Similar to the previous variable, we suggest removing adoption from the status variable and adding in a new variable that the IOUs fill in only if the "Recommended for Transfer" variable is "yes." The IOUs would need to follow any project through the adoption process and fill out the "adopted" variable, which would have three responses: "yes," "no," and "under review." Notably, the ETP database would continue to include the "Measure Code" variable to allow for cross-referencing ETP projects to the IOU claimed savings database.

- ***Keep "Reason" variables:*** Three variables provide reasons for cancellation of a project, not recommending the transfer of a project, and not adopting a project. We suggest keeping these useful variables to provide context for decisions made about specific projects.

The evaluation team encountered issues with the data quality of the ETP database (despite some improvements made after PY2010–2012 evaluation recommendations). Similar to the 2010–2012 evaluation, program-tracking data are key inputs for evaluation activities. There were substantial issues with the ETP databases that limited our ability to draw conclusions regarding program activities and the achievement of metrics.

- **Continue to improve data tracking comprehensiveness and quality to support program oversight in addition to future evaluation efforts.** We identified program tracking issues in the ETP database for the on-going 273 projects in our aggregate analysis, that resulted in the following considerations:

  - **Ensure that reporting across IOU and ETP database records is consistent:** The evaluation team identified discrepancies between the number of adopted projects from the IOU Quarterly Dashboard Report (submitted for Q4 2014) and the number in the ETP database. Accounting for projects that may have been adopted in Q4 2014, there were still variations in terms of projects adopted. As such, ETP databases and internal IOU tracking are not always consistent.

  - **Comprehensively update the ETP database**: The database continues to have issues with incomplete or missing information. For example, 30 projects do not have a budget, and 21 projects do not have designated end-use for the project.

  - **Ensure that information across ETP variables is internally consistent**: We found this to be specifically relevant for the projects' "status" variables, as there are three different variables that can provide conflicting status results.

  - **Include EE program information and measure codes for all adopted projects**: Of the projects to be included in the analysis, the database contains 35 projects with a status of "Adopted" or "Completed, Recommended for Transfer." However, many projects have missing data on programs

adopted into or missing measure codes. For example, 4 projects do not have an EE program they were adopted into, and 14 projects are missing a measure code.

- **Perform greater review of inputted information**: The evaluation team performed quality assurance (QA)/quality control (QC) on the ETP databases, and the data received were revised several times before an analysis could be performed. Additionally, the evaluation team performed QA/QC on the data for calculating the technical potential as the data fields were not filled in consistently. As such, the evaluation team worked with the IOUs to change the information so it was consistent before calculating technical savings potential.

Determine Temporal Approach to Metric Reporting

- **Clarify annual and cumulative reporting:** As per the PIP, the IOUs report on all PPM at the end of the program cycle, but the PIP does not provide a description of the time frame for analysis (e.g., all projects ever initiated, those initiated in the funding cycle), except for measure transfer. The PIP states: "Transfers may include measures from assessments initiated or completed in previous ETP cycles as well as those from the current 2013–2014 program cycle."[44] Conversely, all PIP objectives are measured within the funding cycle[45] or do not provide a time frame. The timing of measuring metrics and objectives becomes more important as we move to a rolling program cycle, where time frames for program cycles vary and a calendar year may be the best differentiation point. We suggest systematizing annual and cumulative reporting moving forward and provide a straw man for consideration by the ED and IOUs. The system would have two sets of values each year, an annual reporting set of numbers and a cumulative set of numbers.

  - Annual reporting would include new initiated projects in the year of analysis for all PIP objectives and PPM. For adoption and technical potential metrics, annual reporting would provide the total number of recommended and adopted measures in that year (regardless of initiation date), as well as the annual and lifetime technical potential of these measures.

  - Cumulative reporting would incorporate all projects still receiving funding in the year of analysis to ensure that we align activities to funds (which are allocated annually) to calculate both cumulative and annual results.

The graphic below provides an illustration of the proposed approach.

[44] PG&E 2013–2014 Emerging Technologies PIP. p. 20.

[45] For example, PG&E's objective is to assess 28 EE measures in the 2013–2014 funding cycle.

Figure 5: Proposed Approach to Reporting Annual and Cumulative ETP PPM

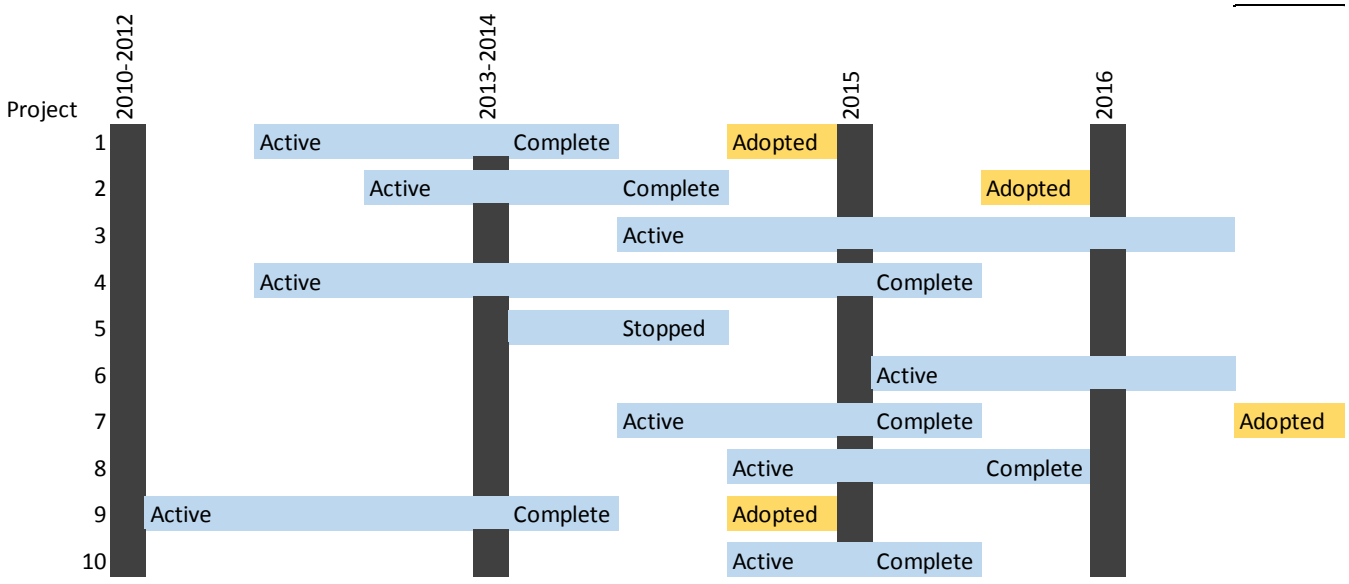


Table 32 shows the counts at the end of each year along with the annual and cumulative metrics. In order to track the total number of projects, the active status values in the annual and cumulative metrics must be the same. The adopted numbers are out of all projects and therefore are below "total."

Table 32. Example of Annual and Cumulative ETP Metric Counts

Status	Annual Metrics			Cumulative Metrics		
	2103–2014	2015	2016	2013–2014	2015	2016
Active	4	5	2	4	5	2
Stopped	0	1	0	0	1	1
Completed	0	3	4	0	3	7
Total	***4***	***9***	***6***	***4***	***9***	***10***
Adopted	***0***	***2***	***1***	***0***	***2***	***3***

The CPUC began systematically tracking ETP projects through the ETP database during the 2010–2012 cycle. We suggest that the metrics use that cycle as the start date moving forward for counts. All projects have up to 6 years for completion, so this choice may miss a few projects that began prior to the 2010–2012 cycle that will be completed in 2015 or 2016, unless there is agreement about which specific projects to include.

5. Assessment of ETP Activities

The four California IOUs have designed ETP to accelerate the use of commercially available but underutilized technologies by "contributing to [their] development, assessment, and introduction…and by facilitating their adoption as measures supporting California's aggressive energy and demand savings goals."[46] Each technology comes with its own set of barriers to adoption, and ETP is equipped with a toolkit of activities known as tactics in order to address various barriers standing in the way of greater adoption in the marketplace.[47] The tactics have different purposes and outcomes, and the ETP staff selects a tactic to meet the needs of the technology. The purpose of this study was to determine the effectiveness of that selection process.

The study attempted to answer the following research questions:

- Is ETP effectively utilizing the available program sub-tactics (Technology Assessments, Scaled Field Placements, etc.) to support the eventual decision for measure transfer or not?
- How does ETP choose and plan specific tactics for a given technology? Does and should the focus of ETP tactics vary by technology?
- Is ETP evaluating the aspects of a technology where their efforts can bring the most value?[48] Are there missed opportunities?
- To what extent do tactics supplement existing industry and market knowledge for particular technologies? Are there redundancies or possible synergies to consider?

To answer these questions, the evaluation team selected a subset of technologies that ETP has worked with since 2010 and, through peer review,[49] assessed whether the tactics performed by ETP staff addressed the barriers identified by peers for those technologies. The evaluation team also summarized information on a number of other emerging technology programs nationwide to provide a sense for how other organizations approached the question of how best to advance emerging technologies.

There are a number of concepts and definitions contained within this chapter, and to facilitate the discussion, these concepts are defined below.

- **Technology:** equipment, practice, or approach used for a particular application or customer segment. The word as used here is more narrowly defined than an end-use such as lighting, and is analogous to a "product category" or a collection of products which are more similar than dissimilar. An example of this would be smart thermostats, which is more specific than HVAC or even temperature controls, but can contain a number of different products that are subject to similar technical and marketplace barriers. Another example is troffer LEDs; these are not the same technology as screw-in LEDs as they are applied to different use cases and customer segments.

[46] 2013-2014 Statewide Emerging Technologies Program Implementation Plan. The PIPs of each of the individual IOU submissions are virtually identical as this is a statewide program.

[47] There are ten tactics available to ETP: lab evaluation, field evaluation, scaled field placement, demonstration showcase, market study, paper study, behavioral study, tool development/enhancement, test standard development, and training program. Short definitions for each tactic are provided in Volume II, Appendix D.

[48] Value is defined as activities/tactics employed that will contribute to the adoption or rejection of a given technology within the IOU EE portfolio.

[49] See Chapter 3 for an explanation of Peer Review from the ETP Protocols.

- **Barrier:** obstacles to adoption for a technology, which could relate either to their inclusion in a program or their broader adoption by society.
- **Technical Barrier**: obstacles that stand in the way of a technology's measureable and replicable performance. These include broad barrier categories of savings uncertainty and technical feasibility.
- **Market Barrier:** obstacles that stand in the way of broader adoption by the marketplace, e.g. customer disinterest or inability of suppliers to deliver a product. These include broad barrier categories of costs, customer-side barriers, and supply-side barriers.
- **Technical Readiness:** technology maturity level with regards to technical feasibility, savings repeatability, and program administrator cost effectiveness.
- **Market Readiness:** market maturity level with regards to supplier availability to provide and maintain as well as consumer awareness, interest, and ability to adopt.
- **Program Readiness:** term used by the California IOUs and some peer programs to refer to a technology's ability to be packaged as a measure in a program This includes mainly technical readiness (e.g., savings reliability) but can also include some aspects of market readiness (e.g., cost effectiveness). This term is not used in this analysis but is included here for clarity.

These terms are reintroduced in the chapter as they come up in organizing the study methods or findings.

5.1. Detailed Methods

There were a number of interim steps before the evaluation team could perform the study tasks. The evaluation team:

- Categorized ETP projects from the ETP database into technology groups, and selected a subset of ten for use in data collection.
- Compiled a list of organizations that perform emerging technology work and chose the ten most similar to ETP to profile and gather peer opinions on technologies.
- Interviewed peer program managers with a two-part goal of gathering information about their organizations and determining how ETP tactics match the peer-indicated key barriers to technologies.
- Conducted short interviews with CA ETP program managers to confirm previous knowledge about the ETP selection process.

More detail on each step follows.

5.1.1. Technology Categorization

ETP initiated 449 projects from January 2010 to June 2014, when the evaluation team received the data set.[50] A small team of engineers sorted through the 449 projects and categorized them. The purpose of the sorting was to organize projects into technologies to facilitate peer program manager interviews. The word "technology," as described above, is more narrowly defined than an end-use such as lighting, and is analogous to a "product category" or a collection of products, which are more similar than dissimilar. An example of this would be smart thermostats, which is more specific than HVAC or even temperature controls, but can contain a number of different products that are subject to similar marketplace barriers. Another example is troffer LEDs; these are not the same technology as screw-in LEDs as they are applied to different use cases and customer segments. The evaluation team chose to focus on the technology level as it is the most natural unit of analysis for facilitating information sharing across jurisdictions and it provides transparency into the ways that ETP projects attempt to address the barriers a technology faces.

Multiple criteria helped determine the list of technologies. Technologies needed to be narrowly focused enough to have a manageable number of projects (5-10) on which to have the peers comment. Technologies also needed to be broadly representative across end uses, as well as have projects spanning the ETP subprograms and the four IOUs. The only technologies excluded outright were those that were not primarily in energy efficiency and were present at only one of the California IOUs. When those criteria were applied, the list came to fewer than twenty technology types. From there, the evaluation team selected, with input from the CPUC and IOUs, the following ten technologies for the interviews:

1. Domestic hot water heat pumps
2. HVAC heat pumps (e.g., ground source, variable capacity…)
3. Plug-loads
4. Smart thermostats
5. Commercial whole-building EMS/continuous commissioning systems
6. Advanced lighting controls for commercial spaces (i.e., multi-sensor control systems)
7. Screw-in LED lamps
8. Troffer LEDs
9. Residential Zero Net Energy retrofit
10. Boiler controls (reset/other load limiting control systems)

As noted in the Methods Chapter (Chapter 3.4), efforts were taken to ensure the technologies selected represent the broader portfolio of projects. First, the tactic distribution is similar. The set of projects used in the analysis contained 67% Technology Assessment projects (consisting of lab evaluations, field evaluations, and scaled field placements), while the overall data set also contains 67% Technology Assessment projects. Therefore, from a tactic perspective, this study's projects are representative of the overall universe of ETP projects. Second, the technologies chosen represent a broad cross-section of end uses indicative of the diversity of technologies that ETP works with. Third, the technologies chosen represent a broad cross section of IOU participation, with at least two and up to four of the IOUs conducting projects for each technology. For these reasons, the results present findings and trends that give a useful perspective on ETP's work. While the

[50] Note that the number of projects differs from the set used in the ETP portfolio summary chapter as the timing of the data sets differs and no projects here were excluded based on timing.

limitations mean that statistically the results here may not be representative of the entire ETP portfolio, they present findings and trends that give a useful perspective on ETP's work.

5.1.2. Peer Program Selection

Listing emerging technology programs similar to ETP from across the United States and Canada served two purposes: first, to locate peers who could speak both to the barriers faced by specific technologies and the role of emerging technology programs in meeting them, and second, to collect information on the operation of other programs. "Emerging technology" can be used in different contexts, but the evaluation team kept the ETP definition of a commercially available but underutilized technology in order to find peer programs most relevant to ETP. As a result, the study excluded pure concept generation Research & Development programs. However, note that many organizations that do traditional R&D are also involved in later-stage market efforts once a technology is commercially available (for example, some national labs and regional organizations have tactics such as scaled field placements and demonstration showcases), and those organizations are therefore included in the study. The overall list included twenty-three programs of varying size and scope, of which the evaluation team chose ten as closest fits to ETP. The ten chosen peer programs are shown in Table 33; the remainder is shown in Volume II, Appendix D.

Table 33. Emerging Technology Peer Programs

Organization	Program(s)	Operates in
Utility or Utility Organization		
Bonneville Power Authority (BPA)	Emerging Energy Efficiency Technology (E3T)	Northwest
Sacramento Utility District (SMUD)	Energy Efficiency R&D	CA
Nicor Gas	Emerging Technology Program	IL
MassSave	Massachusetts Technology Assessment Committee	MA
Statewide		
New York State Energy Research & Development Authority (NYSERDA)	Emerging Technologies and Accelerated Commercialization (ETAC)	NY
Regional Organization		
Northwest Energy Efficiency Alliance (NEEA)	Emerging Technologies (Product Management)	Northwest
Northeast Energy Efficiency Partnership (NEEP)	Market Strategy; EM&V Forum	Northeast
National Organization		
Gas Technology Institute (GTI)	Emerging Technology Program	Nationally
Pacific Northwest National Laboratory (PNNL)	Multiple groups	Nationally
Lawrence Berkeley National Laboratory (LBNL)	Building Technology and Urban Systems	Nationally

The ten programs represent a mix of geographic areas, organization types, budgets, program activity areas, and technology foci as well as how well they matched seven criteria:

1. The organization has designed the program to move energy efficiency technologies to greater adoption through programs (it is a feeder for a resource acquisition program).
2. The program funds tactics that span the three ETP areas (development support, assessment, and introduction support).
3. The program budget is large enough to support multiple projects per year.
4. Program information is publically and readily available.
5. Program contacts are, or can easily be, established.
6. The program targets a range of technologies.
7. The program provides some geographic diversity to the sample.

Once selected, the evaluation team approached each organization's program manager to see if they could take part in the study; all ten agreed to participate.

5.1.3. Interview Approach

The evaluation team's 10 interviews took place via telephone between March 8 and April 9, 2015. Each interview lasted an hour and a half and consisted of three parts.

- **Background on the ETP-like program**: This section gathered information on the peer programs to understand similarities and dissimilarities to ETP as well as interactions between ETP staff and the ETP-like program staff. Questions focused on program objectives, budget, and tactics employed by the programs.

- **ETP:** This section assessed how familiar the peer program manager was with the California ETP and identified existing biases or conflicts such as IOU membership in an organization or ETP staff participating on an advisory committee. Questions also ascertained whether there was any relationship between the interviewee's program and ETP. Prior to the interview, the evaluation team emailed interviewees with a brief background document on ETP, and one of the questions asked whether their perceptions changed after reading it.

- **Technology:** This section solicited, unaided, the interviewee's knowledge on the barriers faced by technologies and, through an aided process, whether the tactics chosen by ETP to meet those barriers were effective. To reduce respondent burden, the evaluation team asked the interviewee to choose up to three technologies out of the list of ten with which they were most familiar. For each technology, the team asked the respondent to identify the barriers facing the technology and the biggest unknowns about how the technology might save energy. Once the interviewee identified the barriers, they were provided with a technology snapshot that displayed the tactics utilized by ETP for that technology as well as a list of the ETP projects with one-line summaries (this information was not provided prior to the interview to limit bias). These snapshots are in Volume II, Appendix E. Respondents were invited to provide their perceptions of the tactics chosen by ETP and whether ETP projects addressed the barriers the peer had previously identified. They also commented on whether there were any gaps or overlaps in the ETP coverage of the technology.

These interviews represented the primary data collection mechanism for the study. Information gleaned from the "Background on the ETP-like program" questions was used to assess trends for the Peer Program Analysis (see Section 5.1.4 below). The barrier identification from the "Technology" section was the key component of the Technology Analysis (see Section 5.1.4 below) which allowed the evaluators to assess whether each ETP project aimed to address the barriers identified for the technology. The peer comments from the "Technology" section are provided in Volume II, Appendix E for completeness, but due to the fact that they are subjective, they are included in the results when they aligned with evidence or when they represented a significant trend.

5.1.4. Analysis

After the interviews were completed, the evaluation team aggregated the results and performed several quantitative and qualitative analyses in two major areas. The first analysis sorted through the information collected on other peer programs to find trends and unique features in how other programs attempt to address the barriers and challenges faced by emerging technologies. The second area focused on the results from the technology portion of the interview, which revealed patterns and/or gaps in how ETP selected tactics for projects.

Peer Program Analysis

Each of the ten peer programs included in the study had a different take on how to accelerate the adoption of emerging technologies. While it is clear there is no one "right way" to run an emerging technology (ET) program, hearing how other organizations address various issues can be informative particularly in areas where many organizations leverage a similar approach. This section includes data from:

- **Collection of program features** – The evaluation team summarized and analyzed organizational practices to identify trends and unique features.
- **Additional feedback provided by respondents** – Though not specifically part of the Task 1 scope, this feedback from peer program managers' experiences with CA ETP is nonetheless useful, as it provides perceptions of ETP from peers familiar with California's program but not intimately involved in it.

The findings on various program features and feedback concern the tactics available to programs (their "toolkits"), their mission, the tactic selection process, any unique features, and notes on California's ETP as a national presence.

Technology Analysis

To provide a quantitative assessment of the outcomes of ETP's tactic selection process, the evaluation team performed a number of analyses on a technology level and then aggregated them. These technology analyses – one for each of the eight technologies[51] the respondents commented on – are provided in Volume II, Appendix E.

- First, for each technology grouping, the evaluation team listed each of the barriers identified by the peer program managers as faced by that technology and their frequency (the number of respondents that listed that specific barrier). These peer-identified barriers were grouped into six categories – savings, technical feasibility, grid effects, customer side, supply side, and cost – and their frequency of appearance recorded. These identified barriers are shown for each technology in Volume II, Appendix E, and Table 40 in the Findings section below shows the barriers aggregated across the eight technologies.
- Next, the evaluation team placed the identified barriers and the ETP projects for the technology into a matrix, and assessed whether each ETP project addressed each barrier directly, indirectly, or not at all. Those projects that, in their project documentation, express an explicit intent to address a barrier are deemed to have directly addressed that barrier (success in addressing the barrier is not required, only intent). Indirectly addressing projects are those projects that do not explicitly address a barrier or seek to address it as a primary goal of the project, but which nonetheless can contribute to the reduction of a barrier through unintended or secondary outcomes of the research. To quantify this difference, projects that directly addressed a given barrier received 1 point while those indirectly addressing a barrier received 0.5 points. These values are arbitrary, but reflect a qualitative belief that there is an observable and significant difference between directly and indirectly addressing a barrier. Table 34 provides an illustrative example of direct and indirect project-barrier matches for a small subset of projects and barriers associated with smart thermostats. The analysis also tallied the number of direct versus indirect matches as another metric of focus. The matrices for each technology are in Volume II, Appendix E.

[51] None of the ten peers chose to speak on the two LED technologies, so they were dropped from the analysis. There are 67 ETP projects across these remaining eight technologies.

Table 34. Examples of Direct and Indirect Project-Barrier Matches for Smart Thermostats

Identified Barriers	Project #1: Scaled field placement to test usability, savings, and functionality in customer homes	Project #2: Lab evaluation to assess performance, communication, and interference issues	Project #3: Lab evaluation resulting in a test protocol used to sift through and qualify new devices for use in incentive programs
Savings Uncertainty	**Direct**: Estimating savings is a primary goal of this project.	**Indirect**: Savings is not a stated goal, but understanding performance in a lab setting can bracket possible savings performance.	**No match:** This project is oriented towards product quality and was not designed to pin down savings estimates.
Market fragmentation[a]	**No match**: The project was not designed to compare a range of products, but rather to test customer response to the category of products.	**No match:** The project only addresses a single product.	**Direct**: The project filters out some of the dozens of products on the market to help customers choose the best ones.
Costs	**No match**: The project does not investigate or ameliorate costs.	**No match**: The project does not investigate or ameliorate costs.	**No match**: The project does not investigate or ameliorate costs.
Internet Is Not Ubiquitous/ Consistent	**Direct**: A scaled installation will identify and run into a range of customer internet issues and can report on them.	**No match:** No customer exposure.	**No match:** No customer exposure.
Product/ Installation Quality	**Indirect**: Issues could be caught while monitoring and feedback could be given to the manufacturer or vendor to improve their operations but it is not the goal of this project.	**Direct**: The project is designed to assess any issues with the unit or its installation, and feedback is given to the manufacturer or vendor.	**Indirect**: By weeding out some of the poor performers, the test protocol will help indirectly with product quality. It does not address installation quality, however.

[a] The barriers listed here are some of the ones identified by the peers. The evaluation team sorted the barriers into categories afterwards, with the following assigned to each of the barriers here: Savings (Savings Uncertainty), Customer-side (Market Fragmentation, Connectivity), Costs (Costs), Supply-Side (Installation Quality), and Technical Feasibility (Product Quality).

- Finally, respondents' comments on the barriers and the ETP projects were included to provide a qualitative record in addition to the quantitative information on the technology. The evaluation team used a "stoplight" system to organize the comments as either positive (green), neutral or a criticism with conditions (yellow), and negative or a direct criticism (red) to assess the general tone of the respondents towards ETP's tactics and the barriers addressed or missed for a given technology. These comments are also available for each technology in Volume II, Appendix E.

Once the barriers, ETP project-barrier mapping exercises, and the respondents' comments had been collected, the evaluation team aggregated these across all technologies to provide a view of where ETP's emphasis lay across the barrier categories and technologies.

5.1.5. Follow-up Interviews with the CA IOUs

Once the analysis was complete, the evaluation team conducted one interview each with the program managers of each of the four California IOUs to confirm knowledge of how the tactic selection process worked. These short (thirty to forty five minute) interviews asked the program managers to explain their process for choosing which tactic to use for a given project, what barriers they identify and attempt to address through

their work, coordination between multiple projects for the same technology, and project-level success criteria. These interview results supplement and clarify information gained from the 2010-2012 evaluation study and the Utility Internal Measure Development Study.[52]

5.2. Detailed Findings

The evaluation team analyzed the data from the interviews with peer program managers in two separate pieces as explained above. The first consisted of mostly qualitative reviews of the ten peer programs for trends in how other programs focused on emerging technologies, found in Section 5.2.1. The second involved quantitative and qualitative assessments of barriers and ETP's tactics on a technology-by-technology basis, which is explored in Section 5.2.2 below. Finally, the evaluation team conducted follow-up interviews with program managers from the four California utilities; these findings are in Section 5.2.3.

5.2.1. Review of Peer Program Features

There are a number of organizations across the United States with similar purposes to ETP in accelerating the adoption of commercially available but underutilized technologies. Ten of the most similar to ETP were included in the scope of this study. As stated earlier in Table 33, these ten are a mix of entities: three utilities, one utility collaborative, one statewide organization, two regional organizations, one national gas R&D organization, and two national labs. Two of the peers pointed out that ETP is essentially a hybrid between an IOU-run program and a regional organization due to its coordination between multiple IOUs and geographic diversity. ETP is also very unique in that it is comprised of four different organizations operating separately with unique processes, motivations, and considerations, though in collaboration with each other. In terms of budget, ETP, with a budget of close to $38 million, has no parallels other than the national labs.

Most of the peer organizations are very familiar with the ETP work – through either research or collaboration – and often use it when researching technologies for inclusion in their programs. Almost all of the organizations mentioned familiarity with the ETCC website and the reports available there, and multiple peers had routinely used their reports when researching work done on emerging technologies. Across the board, there was praise and recognition of the California IOUs as leaders nationally in collaborating on emerging technology products, sharing information, and encouraging other organizations/utilities in building their own programs. Five organizations interact with ETP in some capacity:

- SMUD is a member of ETCC
- BPA is on the advisory board of ETCC and has had the California IOUs participate on its advisory committees
- Three of the four California IOUs participate in GTI's consortium
- Nicor Gas has worked on projects with some of the California IOUs through the GTI consortium
- NEEA has been involved in other regional technology organizations with the California IOUs.

Summaries of each of the ten organizations are in Volume II, Appendix F. The evaluation team summarized and analyzed organizational practices to identify trends and unique features. Each of the ten organizations has a different take on how to advance various emerging energy efficiency technologies, and while it is clear

[52] PY2010-2012 California Statewide Emerging Technologies Program Evaluation, May 2013; Study of the California Utility Internal Measure Development Process, June 2015.

there is no one "right way" to run an ET program, there are both trends and unique features across the organizations that show how they have evolved to meet the challenges presented by the field.

- **Mission and toolkits**: How each program is set up – including their overarching objectives, the tactics at the disposal of the project managers, and the tracked metrics – impacts how the program looks at technologies and the barriers they face, and ultimately decides what the program will do to help advance a technology. Programs ultimately fell into two different camps based on how they emphasized tactics that accelerated the technical readiness and/or market readiness of its technologies, and the programs with tactics beyond lab and field evaluations tended to view market readiness as their mission.

- **Tactic selection processes**: There is a firm trend across the organizations to use technology-level "roadmaps" to guide the projects and tactics. One also builds on the idea of a technology progressing towards greater program and market readiness by setting a sequence of tactics for a selected technology. Additionally, programs may use other guidance and input in choosing the tactics for projects, including external advisory committees or top-down goals for technology types.

- **Integration within the utility**: A few programs have developed unique processes in order to address the challenges of integrating emerging technologies into incentive programs or to greater market acceptance, including bridge incentives and lifecycle product managers.

The following sections explain each of these features in more detail.

Mission and Toolkits

The program's objectives and design affect what tactics it will employ to advance technologies and how. Discussed below are comparisons between the programs in terms of their mission, focus in the technology lifecycle, associated tactics, and the metrics used to track progress.

Mission

Generally speaking, among the peer programs, there are two types of program "mission" that define the end goals of the programs.[53] The first type is feeder for resource acquisition. The term "resource acquisition" is used to refer to the goal of accumulating quantified and tracked energy savings, so an emerging technology program with a goal of filtering technologies into such programs will focus on finding, assessing, and readying the technology for inclusion in a utility incentive program. Generally, the program is most concerned with the technology's "technical readiness," or a technology's maturity with regards to its performance. These programs are concerned first and foremost with verifying the technology's savings potential and repeatability, but also testing its performance, technical feasibility in the service territory, fit with the program's goals, and suitability as a measure.

Programs that provide support for market transformation activities, on the other hand, have a broader focus to increase the market share of the technology in whatever method is most feasible. This focus will include technical readiness, as there is no use promoting a technology that cannot perform, as well as market readiness. Market readiness, or a technology's maturity levels with regards to market factors that ultimately determine the technology's uptake in the general marketplace, includes customer and supplier awareness,

[53] These two types of missions were self-reported by the peer programs. Market transformation programs tended to explicitly use that term to describe themselves, whereas some of the feeder for resource acquisition programs did not use the term but referred to their goal as sorting through and recommending measures for energy efficiency programs.

interest, and ability to adopt the technology. These programs may also list codes and standards as the ultimate goal of their work, and they do view resource acquisition programs as one of the tools, which can be used to advance market transformation

The terms "resource acquisition" and "market transformation" were used in the context of the interviews to define a program's mission, but the outcome of those missions is how the organization emphasizes tactics that target the technology's technical readiness and/or market readiness. Out of the ten peer programs included in this study, four focused on technical readiness only and six had tactics that supported both technical and market readiness (see Table 35 below). Of the technical readiness ET programs, three were utilities and one is a nonprofit that includes a consortium of utilities. The market/technical readiness programs include a utility, a statewide authority, two regional organizations, and two national labs.

Table 35. Emerging Technology Mission by Peer Organization

Organization	Program(s)	Type of Organization
Technical Readiness		
Sacramento Utility District (SMUD)	Energy Efficiency R&D	Utility
Nicor Gas	Emerging Technology Program	Utility
MassSave	Massachusetts Technology Assessment Committee	Utility Collaborative
Gas Technology Institute (GTI)	Emerging Technology Program	National organization
Market Readiness and Technical Readiness		
Bonneville Power Authority (BPA)	Emerging Energy Efficiency Technology (E3T)	Utility
New York State Energy Research & Development Authority (NYSERDA)	Emerging Technologies and Accelerated Commercialization (ETAC)	Statewide organization
Northwest Energy Efficiency Alliance (NEEA)	Emerging Technologies (Product Management)	Regional organization
Northeast Energy Efficiency Partnership (NEEP)	Market Strategy; EM&V Forum	Regional organization
Pacific Northwest National Laboratory (PNNL)	Multiple groups	National lab
Lawrence Berkeley National Laboratory (LBNL)	Building Technology and Urban Systems	National lab

While both types of programs can benefit from similar tactics, the goal often influences where the organization will focus its work and what type of tactics they select.

Lifecycle Focus

Although most peer organizations defined "emerging technology" in an identical way (commercially available but underutilized), they operate in different stages along the technology's development.[54] For the purposes of this study, the evaluation team identified seven phases where an emerging technology program may do work. Note that Research & Development and Codes & Standards – usually considered before and after a technology is "emerging," respectively – are included here in the specific cases where the team involved in emerging technology also participates in these stages.[55]

- **Research and Development**: Though a number of organizations also do traditional R&D work on technology/product development, the team that works on emerging technology may also perform late-stage technology improvements itself. The evaluation team thus means "R&D" to refer to this involvement rather than early-stage development.
- **Development Support**: Programs may provide guidance to manufacturers on key technology parameters, such as developing test standards or tools.
- **Performance Validation**: Once a technology is ready for the market, there is a need to verify the savings potential and other parameters that affect its performance (such as user interface). Programs may do so through lab or field evaluations, simulations, or literature review.
- **Technology Demonstration**: In order to gain greater market share, potential customers must know about the technology and be motivated to use it. In order to provide case studies and education about the technology, programs may run scaled field placements/pilot programs, demonstration showcases, or perform various forms of outreach.
- **Commercialization and Business Planning**: As many businesses discover, there is a large gap between having a great idea and being able to sell it. Programs that are involved in this stage work with businesses in order to develop the business case for the technology and increase the chance of the company's (and therefore the technology's) success. This may also include training for vendors.
- **Program Implementation**: While many utilities and organizations run incentive programs that emerging technologies may become a part of, this stage refers to tactics undertaken by the team involved in the emerging technology program in order to prepare the technology for a transfer to a program portfolio. This may include pilot programs or incentives, or additional consulting to design a program around the technology.
- **Codes and Standards**: Once a technology has achieved a greater hold in the market, many organizations include work on codes and standards down the line in order to lock in savings. These are typically separate teams, but there are places where the emerging technology team may participate in those discussions early on in order to collect data, and may be continually involved throughout the process.

[54] The emerging technology definition used in CPUC decision d.12-05-015 does specify between new advanced and/or unproven technologies vs. emerging and/or under-utilized technologies, whereas some other entities roll these two together in their definition. A technology's maturity level is typically assessed during the selection process as a key factor in deciding what tactics should be used on it.

[55] These seven stages represent the evaluation team's method of categorizing the programs and their activities, which combines the three ETP subprogram areas and several different peer program "technology diffusion curves" into a system that captured each of the tactics employed across the eleven programs.

Each of the programs and the stages in the lifecycle development process they operate in are shown in Table 36 below.

Table 36. Technology Lifecycle Focus of ET Programs

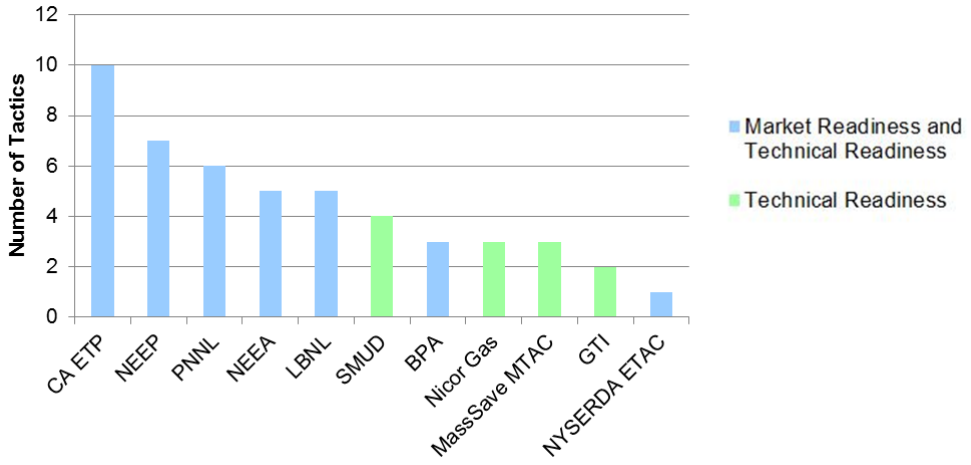
	Research and Development	Development Support	Performance Validation	Technology Demonstration	Commercialization and Business Planning	Program Implementation	Codes & Standards
CA ETP		X	X	X	X		X
Technical Readiness							
SMUD	X		X	X		X	X
Nicor Gas			X				
MassSave MTAC			X				
GTI			X	X		X	
Market Readiness and Technical Readiness							
BPA			X	X	X		
NYSERDA ETAC			X	X			
NEEA		X	X	X	X	X	X
NEEP		X	X	X			
PNNL	X	X	X	X			X
LBNL	X	X	X	X			X
Total (Peers)	**3**	**4**	**10**	**8**	**2**	**3**	**4**

Interestingly, every single program is involved in some form of performance validation and eight of the ten peers do some form of technology demonstration. Other than ETP, only NEEA and BPA perform commercialization and business planning tactics that focus on the supply-side.

Tactics in the Toolkit

The program's goal, whether it be to ready a technology for transfer to a program or to work on any number of barriers to a technology's adoption, influences the design of its toolkit. As shown in Figure 6, market/technical readiness peer programs tend to have more tactics available. This makes sense as the programs that feed measures into resource acquisition programs tend to focus on performance validation and have more targeted tactics, whereas a market/technical readiness ET program may need a wider range of projects to meet some market barriers.

Figure 6. Peer Programs by Tactic Count



However, the number of tactics available is not the only key measure here; the type of tactic is more important to what an organization can accomplish. Field and lab evaluations were by far the activity of choice for emerging technology programs, with nine and seven peer programs utilizing them, respectively, as shown in Table 37. The technical readiness peers tended to focus almost exclusively on these tactics that could be used to validate savings (field and lab evaluations), with some additional tactics based on the organization. Organizations that focused on market readiness in addition to technical readiness tend to have much broader foci, as they do not have the same filter for products to deliver through a custom or deemed program. To them, demonstrating savings is a priority item, but so is researching the market for the technology, getting the technology out into the field, developing tools and standards, training suppliers, and collecting data to use in codes and standards. Therefore, the additional tactics they use may target the barriers that factor into the technology's market readiness, for example customer awareness and preferences through demonstration showcases or behavioral studies. ETP's toolkit also contains these additional tactics typically employed to deal with non-savings barriers; its toolkit is therefore more representative of one of the regional organizations or national labs. Only the national labs have budgets on par with ETP's, but it was also pointed out in a few interviews that ETP is essentially a regional organization in and of itself, given that it is a form of a collaborative across four diverse utilities.

Table 37. Tactics Used by Peer Emerging Technology Programs

	Lab Evaluation	Field Evaluation	Scaled Field Placement	Demonstration Showcase	Market Study	Paper Study	Behavioral Study	Tool Development/ Enhancement	Test Standard Development	Training Program	Pilot Incentives	Informing Policy	Informing Codes & Standards[a]
CA ETP	X	X	X	X	X	X	X	X	X	X			X
Technical Readiness													
SMUD	X	X									X		X
Nicor Gas	X	X								X			
MassSave MTAC	X	X				X							
GTI		X				X							
Market Readiness and Technical Readiness													
BPA	X	X	X										
NYSERDA ETAC		X											
NEEA	X	X			X				X				X
NEEP		X		X	X			X	X			X	
PNNL	X	X		X				X					X
LBNL	X			X				X					X
Total (Peers)	**7**	**9**	**1**	**3**	**2**	**2**	**0**	**3**	**2**	**1**	**1**	**1**	**4**

[a] ETP does also perform some Codes and Standards work, including data gathering. However, this is not considered a formal tactic tracked in the ETP database.

Several peer organizations used tactics that went beyond ETP's scope into helping the technologies transition into the programs through pilot incentives, informing policy discussions, and direct involvement in codes and standards development, but ETP had the largest toolkit by far of any of its peers.

Progress Metrics Used

One key question that all ET programs run into in setting up their programs is how they measure progress towards goals. Programs have developed different ways to assess success as a program. Some of these are quantitative and tracked explicitly; others are qualitative and are more anecdotal. Table 38 lists these metrics below.

Table 38. Primary Success Metrics for Peer Programs

	Number of completed projects/reports	Number of transferred technologies	Other
CA ETP	X	X	Technical potential (in GW and therms)
Technical Readiness			
SMUD	X	X	
Nicor Gas		X	
MassSave MTAC		X	
GTI	X	X	
Market Readiness and Technical Readiness			
BPA			Technology/Measure/Program Readiness Levels (TRL, MRL, PRL)
NYSERDA ETAC	X	X	Direct energy savings, leveraged co-funding, replication of savings
NEEA			Technical & Market Potential (in MW)
NEEP			Number of projects incorporated into TRMs, market strategy recommendations implemented
PNNL			Each group has own metrics
LBNL			Each group has own metrics

Perhaps unsurprisingly, the metrics listed as the primary ways of judging success differ based on the organization's structure and goals. Technical readiness peers tended to focus on their volume – number of completed projects (for example, a technology assessment) or reports – and the fulfillment of their goal, i.e. a technology transfer to an energy efficiency portfolio. Entities with broader market readiness goals might include those two but had a number of additional metrics. These could include other impacts from the projects (increase in the product's readiness for prime time, direct energy savings, and leveraged co-funding, among others) or impacts post-completion of the project (replication of savings, number of projects incorporated into Technical Resource Manuals (TRMs), or number of recommendations from the technology reports implemented).

Two peer organizations in particular had unique quantified metrics that they track at various stages throughout their projects. BPA uses a set of three metrics – technology readiness level, measure readiness level, and program readiness level (or TRL, MRL, and PRL) – that assess how various features of the product would allow for success as a technology (vis-à-vis the market) and as a measure (vis-à-vis the program). TRL is measured on a numerical scale, whereas MRL and PRL are more akin to checklists of key factors. The Readiness Levels (RLs) are included in project selection, alongside an assessment of how much BPA thinks the project can improve the RLs; BPA revisits these levels during/after the projects to see how far the needle has moved.

NEEA assesses technical and market potential for a technology rather than readiness. In its initial fact-finding phase, NEEA estimates the potential for the technologies in megawatts (MW); these potentials allow NEEA to compare the scale of opportunity across potential technologies they may choose to initiate projects with. NEEA revises these MW numbers as it progresses through its tactics, and once the technology reaches the market development stage, NEEA tracks the market's progress towards the MW market target it sets. While ETP also calculates market potential for its technologies, the difference is how those numbers are used for reporting.

NEEA uses the technical potential to compare and prioritize projects as part of their upfront selection process, and there is evidence that some of the California IOUs also use market sizing in their scanning and screening process as well. However, ETP also uses technical potential as a measure of program success and as explained in Chapter 4 this may be a less useful metric in this regard.

Tactic Selection Processes

With hundreds of technologies that could use help, limited budgets, and a toolkit of potential actions to help a technology advance, an emerging technology program needs to choose appropriate projects and tactics for its technologies in order to maximize its value and chance of success. Each peer program has evolved its own mechanisms for collecting enough information to make a good decision as to what tactic to pursue for the technology. Four features are highlighted below.

Use of Technology-Level Roadmaps

Before making a decision on a project tactic, all but two of the peer organizations have a due diligence phase that culminates in a "roadmap"[56] that lays out the technology's path (the two organizations that do not create roadmaps have only one tactic, so their process of designing the project's scope differs somewhat). These roadmaps provide a compelling story for how the program can be of assistance and how the technology will progress beyond the emerging technology program. The roadmaps can include various amounts of information based on the organization, but typically they include the technology's current status, the barriers faced by it, if there is research/work being done by other organizations, the actions the program might take and why, and a vision beyond the program (into a portfolio of programs or the market). Seven of the peer organizations do the roadmap on a technology, rather than project, level – this allows them to coordinate multiple projects that may be done for a technology to ensure the work is systematically addressing barriers without duplication or gaps. Table 39 lists typical components of these roadmaps.

[56] Note that these roadmaps are not the same as Technology Roadmaps used by some California IOUs. The former are for a specific technology group (i.e. advanced lighting controls or hot water heat pumps) and are used to plan specific tactics for the peer emerging technology program to pursue. The latter are utility-wide documents for the utility and are done on a broader end-use level.

Table 39. Peer Program Technology Roadmap Components

Component	Description
State of the technology	Description of the technology, why it presents a good opportunity, its current use, etc. While the level of detail varies by organization, this is contained in all eight roadmaps.
Barriers to adoption	Explicit identification of the main barriers to greater adoption, which includes both technology and market barriers. At least 4 organizations explicitly identify barriers.
Other research	Listing of what research/projects other organizations/utilities have done to address these barriers. This can include identification of potential partnerships. At least 5 organizations identify other research efforts in their due diligence.
Strategies, tactics, and a schedule	Identification of projects and research that the organization can undertake to systematically address the identified barriers. If the organization cannot address some of the barriers, it can point to other efforts that can or make recommendations. For the tactics it can perform, a schedule is provided. Depending on the organization, this can be specific (akin to a scope of work) or bigger-picture. While the level of detail varies by organization, this is contained in seven of the peer roadmaps.
Path forward	Six of the peer roadmaps include a section that looks beyond the organization's tactics to programs, codes and standards, and/or other work
Metrics	At least two organizations, NEEA and BPA, have metrics associated with the roadmaps that allow them to see how the tactics move the technology towards being more market- and program-ready (see Metrics section above)

Four of the peer organizations update these roadmaps at the completion of a project or on an annual or semi-annual basis to assess how the organization's tactics are helping the technology, as well as to stay abreast of the current state of the market for the technology.

Coordination across Multiple Projects

Six of the peer organizations are either large or targeted enough to perform multiple projects on a single technology. The technology roadmap is the primary method of coordinating the efforts to guarantee there is a line of sight to the larger goal of advancing the product or solution. It also ensures that efforts are not duplicative or missing some of the major barriers identified. In addition to the roadmaps, BPA also ensures that projects build off each other by having a pre-determined, specific sequence of three tactics that the technology progresses through in order to ready it for a program or the market. A technology will start with a lab evaluation before moving to a field evaluation and a scaled field placement. If a technology is more developed or has a greater body of research behind it, BPA may omit the first or second step based on its original assessment of the technology's readiness (see TRL/MRL/PRL metrics above).

External Expert Input into the Decision-Making Process

Six of the ten peer organizations have advisory committees that include outside experts to provide input on selecting projects and the activity scope. These include BPA, MassSave's MTAC, NYSERDA's ETAC, GTI, NEEA, and NEEP. These advisory committees usually feature utility representatives from energy efficiency programs (as either member organizations or key stakeholders) and may include other emerging technology programs or collaborators. Outside technical consultants may also be involved. While the main purpose is to provide

expert opinion on the technologies and the potential project to guide it towards what is most useful, it also ensures that there is buy-in from stakeholders and a larger degree of collaboration between entities that are involved.

Bottom-up Approach to Resource Allocation

An organization can choose to allocate its budget to technologies and projects in two ways – it can budget ahead of time, by assigning a certain amount of money to specified technologies, or it can allocate funds to be spent as the program staff learns about the technology and decides to pursue a project. The two national labs use the first method, budgeting explicitly by technology category. For example, they have dedicated a budget and group of people to work specifically on LEDs. Interestingly, they are the only ET organizations interviewed with a financial scale similar to ETP. One peer has a *de facto* technology budget by providing spending targets to team members with end-use-specific responsibilities (i.e. a person responsible for HVAC or lighting), and the remainder all let bottom-up, organic market factors drive their resource allocation. The roadmaps used by most of the organizations fit into these frameworks in different ways. All of the organizations do varying levels of research and due diligence before committing to spending money on an emerging technology. This can be in the form of a fully funded group to study a technology (in the case of the national labs), a focused effort on several technologies (in the case of the regional organizations), or a technology that lands on a staff member's desk (in the case of several others). This information becomes part of the knowledge gathered in the roadmaps, and scopes out the project work. The difference is that the national labs do that on a longer-term strategic level for specific technology groupings, whereas other organizations are sifting through every new technology and are free to pursue any that fits their program's parameters.

Even if there are no explicit divisions in funding, many of the peer organizations try to "balance" qualitatively their portfolios between sectors, end-uses, and other factors. Nicor Gas has three criteria they look at – heating vs. non-heating technologies, to balance seasons; capital vs. non-capital projects, to balance costs; and residential vs. commercial vs. industrial, to balance customer segments – and while they do not assign quotas to one or another category, they try to ensure they are not overemphasizing one side over another.

Integration with Post-ET Programs

Peer programs have developed features that allow them to address one of the largest challenges for emerging technologies: transfer to an energy efficiency portfolio and beyond. While an emerging technology effort may have moved a technology along, many may not be implemented as a measure without an internal champion, and even so may still suffer low uptake.

At least two organizations try to ensure a smooth transition from R&D to ET to programs by assigning a product manager that stays with the technology through the whole cycle. Collaboration with codes & standards teams, even early on, occurs for the ET teams for the two national labs, NEEA, and SMUD in order to start collecting the data to promote eventual codes and standards efforts. Two organizations also mentioned that they are trying to work with utility forecasting teams and create a feedback loop from the EM&V teams to emerging technology programs so that emerging technology programs can tweak technologies already in programs if needed and search for technologies that may fill gaps.

In order to bridge what it calls "the valley of death" between emerging technology and the rest of the portfolio, SMUD offers higher-than-normal initial incentives for the technology, called emerging technology incentives. These are not subject to the same cost-effectiveness requirements as other measures, and aim to increase interest in the technology immediately. After a period, SMUD reduces these incentives to a level in accordance with the rest of the portfolio and the cost-effectiveness requirements.

Summary

Peer organizations have developed their own takes on how best to advance emerging technologies across the various stages of their development and to deal with the challenges they face. Each has developed its own motivations and end goal – which typically determine whether it attempts to accelerate a technology's technical readiness only or both its technical and market readiness– and a toolkit of tactics and metrics in order to reach them. There are many commonalities: performance validation through efforts such as field and lab evaluations are present at almost all of the organizations, as are roadmaps that chart a way forward for a technology and create a strategic vision to adhere to. Other components are unique, for example, BPA's sequence of tactics and SMUD's emerging technology incentives. Despite the diverse backgrounds of the organizations, most were very familiar with ETP and were peers in the sense that they were often collaborators with and consumers of ETP's efforts.

5.2.2. Examination of Tactics

As explained in Section 5.2.1 above, findings here are derived from information about the tactics chosen and the scope of work for each project in the eight technology groups to ascertain patterns in how ETP's projects address barriers. During the interviews, the respondents identified 58 discrete barriers, or obstacles to a technology's adoption by the market, across the eight technologies.[57] Many of these appeared across multiple technologies, though several barriers were very specific to the application. The evaluation team grouped the barriers into six major categories that appear throughout the analysis. Table 40 provides a summary below.

[57] The identified barriers are listed by technology in Volume II, Appendix E.

Table 40. Emerging Technology Barriers Stated by Peers, by Categories

Category	Unique Barriers [a]	Frequency of Responses	Percent (Based on Frequency)	Description
Savings	16	30	33%	The ability to count on a certain savings potential is imperative for transition into programs, but there are multiple factors that can diminish the reliability of savings. Barriers include: ● Persistence concerns ● Savings variability based on applications ● Customer behavior impacts ● Product claims based on black box savings approaches ● Other technology-specific factors (interactive effects, performance under certain circumstances, translating information into savings)
Customer-side	15	24	26%	For the technology to ultimately be successful, customers must be motivated to seek out, purchase, and use it. Barriers include: ● Disinterest/distrust in new technologies ● Lack of knowledge of benefits ● Consumer education on how to operate it effectively ● Lack of corporate policies in place ● Efficiency not valued in the value of a home or building
Costs	10	16	17%	Advanced technologies often have higher costs than conventional equipment. Barriers include: ● First costs ● Cost-effectiveness - whether savings justify the costs ● Lack of economics of scale ● Ongoing costs (e.g., of software)
Supply-side	10	13	14%	Similar to customer-side, suppliers must be motivated to understand, stock, and correctly install the technology. Existing business models may also hinder the uptake of new concepts. Barriers include: ● Disinterest in new technologies ● Installation quality/understanding of how to correctly install it ● Misaligned business models
Technical feasibility	4	5	5%	In order for a technology to save energy, it must work correctly on its own and with the equipment it is used alongside. Barriers include: ● Compatibility with legacy equipment ● Proprietary communication platforms ● Product quality concerns
Grid effects[b]	3	4	4%	Heat pump technologies have an additional barrier that stems from fuel switching. Swapping an oil or gas furnace/boiler for an electric heat pump adds load to the grid; in places where electric resistance heat is used, switching to a more efficient heat pump removes DR capacity.
Total	**58**	**92**		**N/A**

[a] There are two counts listed for barriers: number and frequency. Number represented the total number of unique barriers identified, while frequency takes into the account that multiple respondents may recognize the same barrier. Because individuals can reasonably disagree about a given barrier, the frequency metric is the more appropriate measure, as it gives a "confidence" weighting to the true prevalence of a barrier; the rest of the analysis uses frequency whenever referring to the barriers.

[b] Grid effects could be considered as a subset of technical feasibility, but the evaluation team felt the two categories are different enough in their needs and approach to warrant inclusion separately. Technical feasibility is concerned with the operation of the unit and grid effects with the effects of large-scale deployment on the overall electric grid.

The evaluation team used the barriers identified for each technology to assess how ETP's projects seek out and meet the major challenges facing emerging technologies by matching each project to the expert-identified barriers it addressed. There were four key findings from this analysis regarding how ETP attempts to address these barriers:

1. Uncertainty on energy savings represented the largest single barrier and the barrier most addressed by ETP projects. However, it was not the only major barrier and sometimes not the primary one. ETP projects did address market barriers, but the greater emphasis was with savings uncertainty and technical feasibility (both technical readiness barriers).
2. The types of barriers identified differed across technologies, and there were technologies that ETP tended to address more comprehensively than others.
3. A little under half of the comments peers made on ETP's tactics were identifying gaps in the portfolio of projects for technologies. Though many gaps were technology-specific, two respondents explicitly commented that the ETP tactics appeared to be uncoordinated and lacking a strategic plan to move the technology forward.
4. The barriers facing ZNE in a residential retrofit application differ markedly from other technologies and solutions; the peers that commented on this technology noted that ETP missed what they believed were the largest barriers.

The following sections discuss each of these findings in more detail.

Project Emphasis on Savings

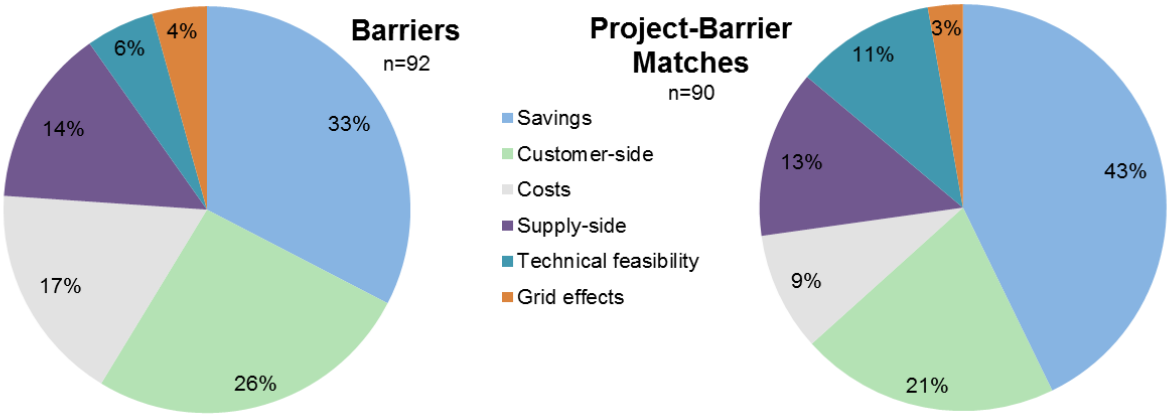
Savings uncertainty – the core technical readiness barrier, alongside technical feasibility – represented the barrier most identified by peers, most addressed by ETP projects, and most directly addressed. However, market readiness barriers (including costs, customer-side, and supply-side barriers) represent a large portion of the overall responses and a smaller subset of ETP projects.

The figures below show the results of the analyses described in Section 5.1.4., noted on the left side of Figure 7, is a count of the barriers to technology adoption identified by the peers in the interviews, sorted by category, and shown in Table 40 on the previous page.[58] Project-Barrier Matches, on the right side of Figure 7, show the number of times an ETP project addressed one of the barriers sorted by barrier category, with direct matches counting as 1 and indirect matches counting as 0.5 to the total count.[59] Savings represented 33% of all identified barriers and was the largest single category. It was also the category most addressed by the ETP projects, with a larger percentage (43%) of all matches responding to savings. However, customer-side, costs, and supply-side barriers (collectively referred to as market barriers) ultimately made up a larger portion of barriers, with a combined 57% of peer-identified barriers and only 43% of ETP project-barrier matches.

[58] We have chosen to display the "Frequency of Response" value in the graphic as opposed to the count of "Unique Barriers". With the Frequency of Response value, when the same barrier is mentioned by two different peers it is counted twice. The more frequently a barrier is mentioned, the more likely it is to be real and important. As such, we view that value as a more meaningful number than the Unique Barrier counts. That said, the distributions of the two different values are not significantly different.

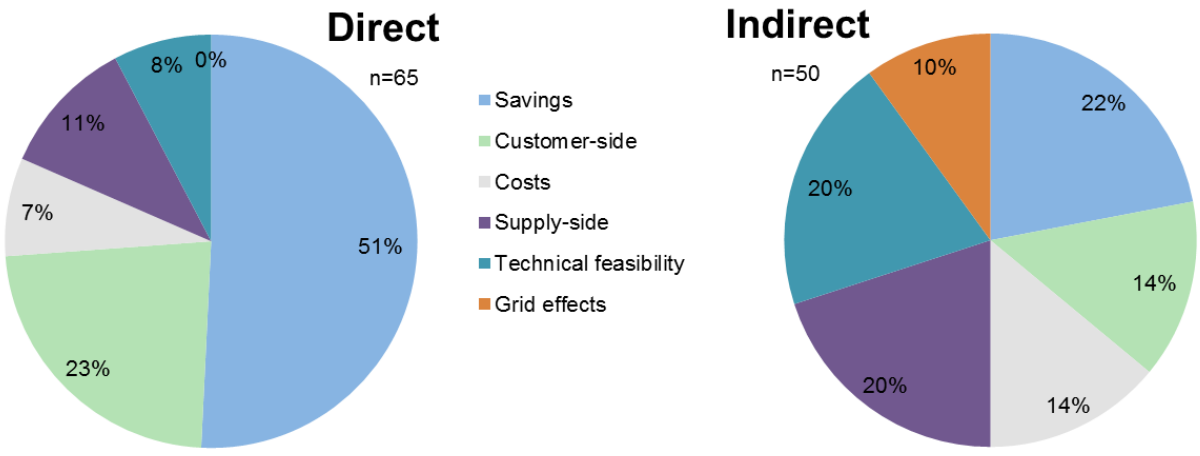
[59] Note that direct matches were assigned a "match score" of 1 and indirect 0.5. This point score is arbitrary but reflects the fact that there is a large difference between a project that explicitly aims at addressing a barrier and one that gains information on a barrier as a byproduct.

Figure 7: Percent of Identified Barriers and Project-Barrier Matches by Category



Another measure of emphasis is comparing the breakdown of projects that directly or indirectly address barriers. A direct match means that the project included actions explicitly designed to meet that barrier (see Section 5.1.4 for a more detailed explanation and examples of direct/indirect matches). Therefore, a barrier with a greater proportion of direct matches indicates that there were more projects intending to address that barrier, whereas a barrier with a greater proportion of indirect matches indicates that information gathered about the barrier was mostly a byproduct of projects targeting other barriers. This is a way of assessing focus insofar as it shows which barriers projects are designed to address. Figure 8 shows that 51% of direct project-barrier matches focused on savings. Customer-side barriers represented the next-largest category of direct matches.

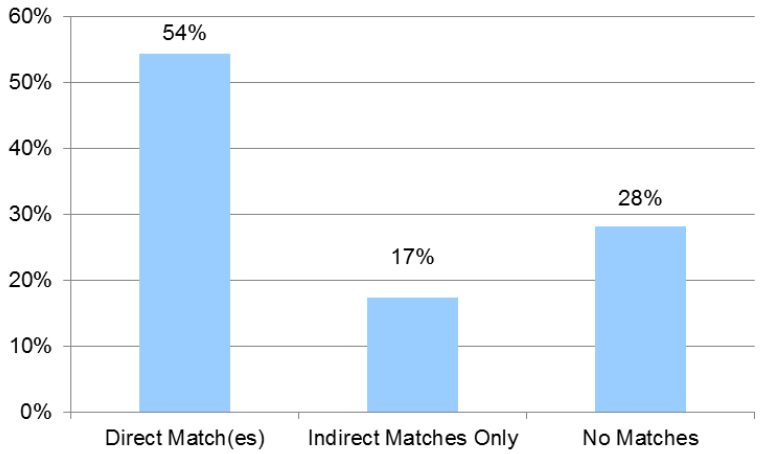
Figure 8. Direct vs. Indirect Matches by Barrier Category



One final perspective on the data looks at these numbers in reverse: instead of asking how many barriers were hit, we ask how many barriers were missed. Based on the results of the project-barrier matching exercise,

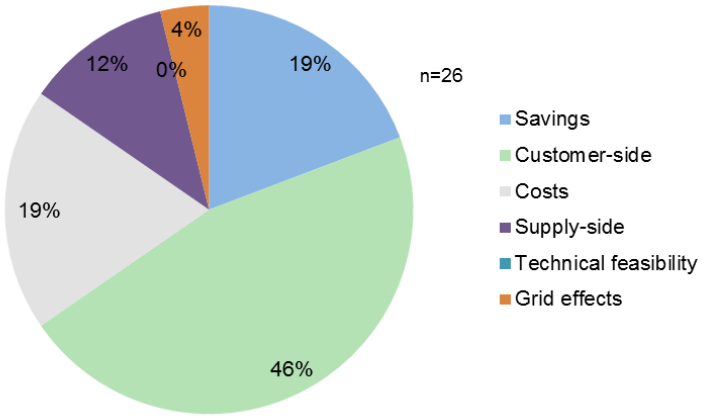
barriers were sorted into the following categories: those with at least one direct match, those with only indirect matches, or those with no matches. Figure 9 summarizes those results.

Figure 9. Breakdown of Barrier Hits and Misses



We are unable to say whether hitting 54% of the barriers directly is appropriate for an ETP program; in baseball getting on base that frequently would be record-breaking, but in basketball shooting free throws at this clip is abysmal. However, by looking at the distribution of misses we can see, again, where emphasis is being placed and not. Figure 10 shows the distribution of barrier misses (barriers with no project matches) by barrier category. Market readiness barriers make up 77% of the barriers, which received no attention at all for these technologies, with customer-side barriers being the most missed.

Figure 10. Barrier Misses by Barrier Category



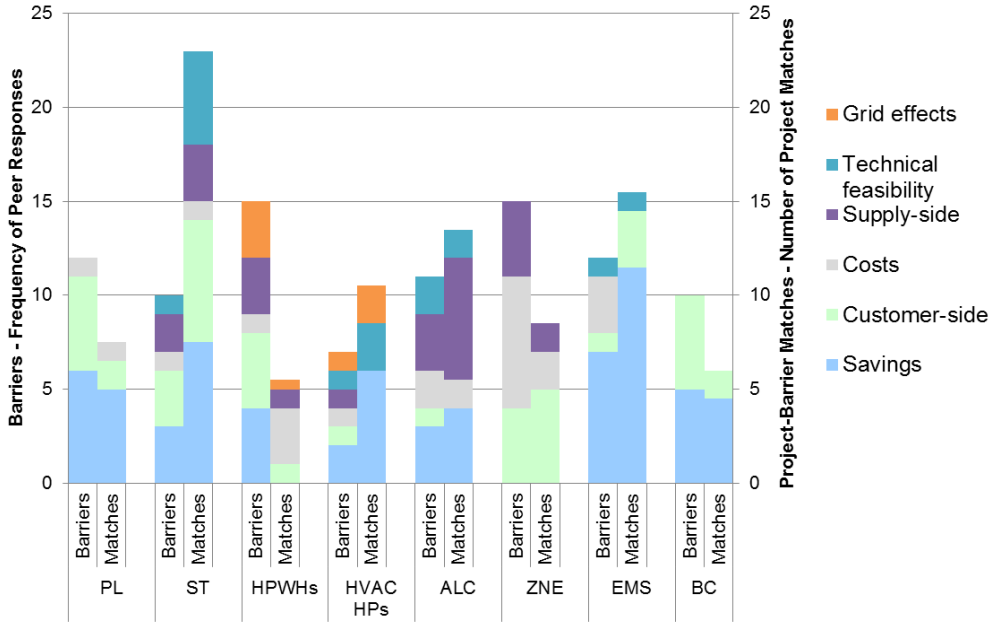
Across the board, these results indicate that ETP's focus is on technical readiness barriers and in particular savings barriers – unsurprising, given the prevalence of performance validation tactics among projects. An analysis of all ETP projects from 2010 through June 2014 showed that 67% of all projects were lab evaluations, field evaluations, or scaled field placements, projects which are commonly used to target savings and technical feasibility barriers. That number rises to 72% when the scope of projects is narrowed to 2013 onward.

ETP also targets market barriers, but they are typically less emphasized than savings barriers. Note again that the evaluation team cannot assess how much attention is appropriate for each barrier vis-à-vis number of projects, nor can this assessment give an absolute number of how many barriers ETP projects had addressed, but it provides insight into where ETP places emphasis in selecting its tactics to address barriers.

Differences across Technologies

ETP deals with a wide range of technologies, and as the applications and market needs for each are varied, ETP's tactics should differ by technology. For each of the eight technologies, Figure 11 shows the frequency of barriers identified alongside the technology's project-barrier matches, broken up by the six barrier categories.[60] For each technology, the bar on the left shows the number of times a barrier was identified by a peer, with the bar on the right showing the number of project matches for a barrier.

Figure 11. Identified Barriers and Project-Barrier Matches by Technology*



*PL = Plug-Loads; ST = Smart Thermostats; HPWHs = Heat Pump Water Heaters; HVAC HPs = HVAC Heat Pumps; ALC = Advanced Lighting Controls; ZNE = Residential ZNE Retrofits; EMS = Commercial Energy Management Systems; BC = Boiler Controls.

ETP's projects were more effective at hitting what the peers identified as barriers for some technologies than for others based on the number of project barrier matches. Smart thermostats had the most project-barrier matches by far, followed by commercial EMS and advanced lighting controls. Heat pump water heaters and boiler controls had the fewest matches. The number of projects conducted explains much of this variation; ETP had ten projects for smart thermostats and advanced lighting controls, whereas it only did four projects for heat pump water heaters and three for boiler controls.[61] As each project should be able to address one or more barriers, more projects should lead to more matches from barriers addressed and should be able to

[60] Volume II, Appendix E contains the identified barriers and project-barrier matches for each technology.

[61] The evaluation team targeted technologies with 5-10 projects to ensure a decent sample size; as additional research was done, some projects were dropped from the data set due to their cancellation or as more information about the project revealed it did not fit within the technology grouping.

address a greater range of barriers. ETP's ten projects for advanced lighting controls also spanned eight tactics, which indicates there are a number of different barriers at play that the projects may target. The fact that the project portfolios differ across the technologies indicate that ETP is reacting to the particularities of the technology and market context.

As discussed above, the emphasis on savings is evident across the board. On a percentage basis, savings represents a greater proportion of the project-barrier matches than it does barriers for all but two technologies. In the case of heat pump water heaters, this lack of savings matches is most likely because the peers identified "advanced" savings concepts – such as interactive effects – as the main savings concerns, which were not addressed in the ETP projects. Savings uncertainty was not identified as a barrier for residential ZNE retrofits, so there are no associated matches (this is discussed further below). Note also that there was at least one identified customer-side barrier for each of the eight technologies.

Zero Net Energy Residential Retrofits

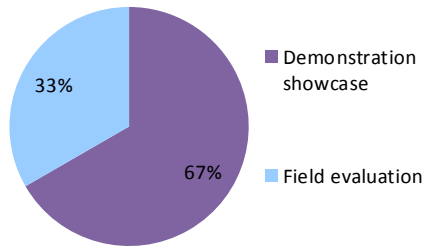
Zero Net Energy buildings are a strategic initiative to which the State of California has committed itself as part of the CEESP. Several peer program managers commented during the interviews that various technologies (i.e. heat pumps) were good to support for their role in reaching California's ZNE goals in homes and businesses. For the residential ZNE retrofit category itself, both the barriers and ETP tactics were very different from any other technology group; however, the ETP tactics chosen did not map well to the barriers identified by the peers.

For barriers, residential ZNE retrofit was unique as none of the peers identified savings or technical feasibility as barriers – they most frequently identified market readiness barriers such as costs as the key roadblocks, followed by customer-side and supply-side barriers (see Figure 11 above). However, ETP's projects tended to focus on providing case studies of ZNE applications and the savings, as shown by the snapshot of ETP projects in Figure 12 below (this snapshot, along with the snapshots for the other seven technologies, can be found in Volume II, Appendix E).

Figure 12. Snapshot of ETP Projects on Residential ZNE Retrofits

RESIDENTIAL ZERO NET ENERGY RETROFIT Number of Projects: **6**

Tactics	
Demonstration showcase	4
Field evaluation	2



Projects:

Demonstration showcase

- Retrofit several homes to reach ZNE - include a simulation, installation, measurement, recalibration of simulation models, and evaluation of progress towards ZNE after one year.
- Demonstrate Near Zero Energy home in retrofit application
- Identify lessons learned while retrofitting homes to ZNE in a report
- Demonstrate opportunities in building performance and energy use from a combined package of efficiency, smart appliances, and on-site renewable energy with the objective to achieve ZNE at a San Bernardino residence.

Field evaluation

- (2 projects) Two-phase project to develop and test ZNEH retrofit strategies at a single-family home and a student coop residence at UC Davis.

Furthermore, all four respondents who spoke about residential ZNE retrofits noted that the ETP tactics missed what they felt were the major barriers. While the demonstration projects directly address customer interest in ZNE (one of the customer-side barriers identified), one of the respondents commented that there were other

market readiness issues receiving less attention. All four respondents listed cost as the key barrier to greater adoption, and it was not clear that any project addressed costs. The respondents were less impressed here than for other technologies – it was the only technology where there were no positive comments, and out of the seven comments made, four were negative.

While one of the limitations of this assessment is that it does not give credit for the barriers that ETP assessed that were not covered by one of the respondents, the four that commented on residential ZNE retrofits were explicit that the technologies and their ability to save energy were not in question.

Coordination across Projects

Although ETP's portfolio of projects appears to respond to technology specific barriers, peers pointed out many gaps in ETP's coverage and questioned how connected the projects were.[62] Overall, they felt that ETP may not be systematically addressing barriers. Note that these are the subjective views of the peers, but there was enough repetition to warrant inclusion. During the interviews, the peer program managers were shown a snapshot of ETP's portfolio of projects in the technology group (these snapshots are available in Volume II, Appendix E). Just under half of the 54 comments (44%) made by respondents on the technologies were on two main areas:

- Identifying tactics, technology-subtypes, or sectors that were missing (i.e. understanding customer behavior, missing small business components) or
- Noting that an ETP activity was not as practical in addressing a key barrier as another could have been.

Two respondents went a step further to connect those gaps with a lack of strategic planning on a technology level. They commented explicitly that while there were a number of great projects included in the technology portfolio, they appeared to be uncoordinated and lacking a larger vision to advance the technology. Rather than designing a way for a technology to progress through a set of tactics and systematically addressing a suite of barriers through multiple projects, they represent a "scattershot" of tactics. Evidence of this is the frequent appearance of "one-off" projects targeting a narrow technology context, the lack of clear relationships among projects within a technology, and the lack of explicitly sequenced projects. A counter example that was observed as positive was a four-phase set of projects that advanced smart thermostats from the lab to a scaled field placement and beyond.

This may be a symptom of ETP actually comprising four separate entities each with its own projects, but it does raise a question of whether the current approach leads to the most effective allocation of ETP resources or presents opportunities for gaps in coverage.

Summary

The interview process and analysis revealed interesting information about what other emerging technology peers perceived to be major barriers facing several technologies and where ETP has placed the most emphasis in its efforts. Savings-related barriers are the largest single barrier and the category that ETP has most focused on – savings barriers account for the largest proportion of matches, the most direct matches, and the largest proportion of matches in most of the individual technologies covered. Given its large toolkit, ETP also puts some effort on the market-related barriers of costs, customer-side barriers, and supply-side barriers. However, market barriers combined are more prevalent than savings/technical readiness barriers. ETP's tactics do differ by technology, suggesting there is no one-size-fits-all view; however, the respondents noted a number of gaps

[62] Peer comments for each technology are contained in Volume II, Appendix E.

and suggested that ETP does not necessarily have a strategic vision for each technology that ties the projects together. In some cases, notably with residential ZNE retrofits, respondents felt that the ETP tactics focused too much on savings and did not acknowledge or address some of the major market barriers to adoption.

5.2.3. ETP Tactic Selection Process

The evaluation team used short interviews with the ETP program managers alongside other evaluation studies (e.g., the UIMD study) to supplement and clarify the team's understanding of the tactic selection process after completing the analysis portion. Note that since there was limited data collection done on ETP's processes as part of this study, the following findings do not represent a comprehensive view of ETP's methods and there are further opportunities for research. All findings also come from self-reported information from the IOUs as opposed to an independent review. More detailed accounts of each IOU's scanning/screening tools can be found in the Utility Internal Measure Development study and the 2010-2012 evaluation study.

Assessing Initial Needs

Once ETP identifies a technology as a potential fit for a project, there is a decision made about what format the project or projects should take, which is the crux of the tactic selection process. All four IOUs indicated that the main determination of what tactic they will perform for a technology is technology maturity and the robustness of savings data. Questions the ETP Program Managers told the evaluators that they ask themselves are: how much data exists? How vetted/valid is the data available? What data is needed to get this into program? For example, a brand new technology with little data will start with a lab evaluation. An incremental change to a technology, or one for which there is already independent data (especially through a National Lab), will go to a field evaluation. Generally, the utilities reserve scaled field placements for technologies that have already gone through a field evaluation and where more data is needed for a work paper [63], and where budgets can handle the additional expense. None of the program managers mentioned the non-performance validation tactics in this initial assessment of maturity. The general theme is that these initial assessments are geared towards technical readiness. This corresponds with the technical readiness mission and performance validation lifecycle focus described in Section 5.2.1.

SCE alone out of the four noted that there are other potential outcomes of this conversation for a first-pass technology – the technology may already have more than enough data and fits directly into a custom program, for example. If there is data and the results indicate it could be a successful technology, they may move into a launch scenario with IOU-led production support, though this is not common.

SCE is also the only IOU that mentioned explicitly identifying barriers for the technologies it is assessing as part of its selection process in order to determine appropriate tactics. PG&E will informally identify barriers, as well as collect information on barriers and other market information it learns as it is performing a project. This information may also be collected in the final reports for each project rather than in the scorecard – the evaluation team reviewed 20 performance validation project reports from the 2013-2014 cycle to see how market barriers were captured in reporting and found that market barriers, or project findings related to market barriers, were sometimes included. The level of detail varied widely across reports, and even within the documents for the same IOU the reporting was not consistent. Some reports included explicit lists of market barriers, some referenced results from surveys (and may have attached the survey responses as an appendix),

[63] Work papers are the technical reference document that the utilities must submit for review to the CPUC in order to get a measure approved. It must contain sufficient documentation of the methods and assumptions necessary to calculate savings for a given measure.

some included discussions of challenges encountered/overcome during the project, some included all of these elements, and many included none. There was no clear pattern.

The conversation on tactic selection is different for an underutilized measure – that is, a measure returned to ETP because it has not been getting much traction in the programs. Three of the four said that this is usually when they look at targeting market barriers and market readiness. These can include marketing strategies or market data, turning the measure into a deemed measure if it had been custom, training vendors and contractors, or other projects. However, the evaluation team did not directly observe this activity and thus cannot verify how often it is taking place. This does raise a question as to whether waiting for the measure to become underutilized – reactively rather than proactively identifying market barriers – is the best place to be assessing market readiness factors. One respondent in the UIMD study who was downstream of PG&E's ETP program and therefore on the receiving end of the technologies explicitly stated that "there needs to be a little more focus on market barriers or other conditions that could limit customer or market acceptance rather than just the detailed energy savings."[64] The Commission has also ordered that "[the] IOUs should also utilize enhanced market behavioral research to address customer and end-users acceptance and adoption of new technologies, in particular for technologies that are being considered for transfer into the energy efficiency portfolio."[65]

Planning Tools

Each of the four IOUs use their own set of scanning and screening tools to collect enough information to make the decision on pursuing a technology. Across the board they include a scoring mechanism used to assist in prioritizing various criteria. (Note that the 2010-2012 evaluation analyzed these tools and scorecards and contain more information as to their contents and the criteria, though they have evolved since then). In addition to providing a decision making record, the documents act, in some cases, as a receptacle for gathered information. SCE uses a single document, called a scorecard, that follows the technology through the various gates of its measure development process, beginning with a one-page business case that migrates into a multi-tab spreadsheet after the technology becomes a project. This spreadsheet includes TRC calculations, market potential information, funding sources, a description of the state of the technology, and written recommendations for the projects undertaken for the technology. PG&E does use its scorecard to collect information, but unlike SCE's, it is not organized at the technology level, but rather at the project level; put another way, a new document is generated for each project. SCG and SDG&E use their documents only as mechanisms to score the technology, as opposed to a host for institutional knowledge. While the scanning and screening documents used by each IOU correspond roughly to the technology "roadmaps" used by seven of the peer organizations, there are substantial differences. For example, with the exception of SCE, all the IOUs use their documents on the project, rather than technology level. None of the four re-score the technologies after they complete projects, but SCE does add information to its scorecard as it moves through projects.

The IOUs have another set of planning documents (also referred to as roadmaps) that function on a higher level to direct and prioritize the entire measure development process at the IOUs. These documents are organized at the end-use (i.e. HVAC, lighting) level to show where in development various technologies are and when hand-offs from ETP to the latter stages of measure development, or full program launch, are likely to occur. These roadmaps, which differ in detail and content by IOU, may include a list of ETP projects by technology (including the name and project number). However, beyond the projects that are in process, the

[64] Draft Study of the California Utility Internal Measure Development Process, June 2015, pg. 25

[65] R.09-11-014 pp. 265

roadmaps do not contain more information on ETP. Some market barrier information may be captured here as well; however, it is typically at the end-use rather than technology level.

Coordinating Multiple Projects

Internal Coordination

All four IOUs at one point or another have done multiple projects for a single technology to gather additional data. The decision to do an additional project is made based either on an obvious upfront need for two types of tactics or, more commonly, on the results of the first project, creating a sequence of projects. The most common of these are two-phase lab and field evaluations, or a field evaluation with a subsequent scaled field placement. SCE mentioned a second project might be used to collect market data as well. Across the board, the sequence of projects is not preordained but is developed in reaction to whatever data arrives first. This phased approach seems very similar to the one employed by BPA.

The documentation for the secondary projects varies across the utilities. PG&E mentioned that they might have multiple projects as line items on the original scorecard, or multiple scorecards for a technology in sequence or sometimes in parallel. SCE revises their original scorecard to include findings and recommendations for its projects. SCG mentioned that if they need a second project, they do it; SDG&E is similar in that they typically do not capture information on the follow-up projects on the scoring document. This is a departure from peer program planning documents, which generally include information on multiple projects that can be or have been completed. The end-use-level technology roadmaps may also be updated to reflect multiple projects and the timing associated with each, but do not typically include information about tactics or findings.

External Coordination

Each of the IOUs may be interested in doing projects for the same technology, which creates a need for coordination across them to ensure there is no duplication. The Emerging Technologies Coordinating Council (ETCC) monthly meetings are generally helpful for some level of logistics coordination, and the program managers noted there is a fair amount of informal communication via phone and email on potential projects. Vendors who submit technologies typically submit them to multiple utilities, in which case they must decide which utility wants to do a project if at all, or if they should perform it jointly. There are a number of examples of the IOUs coordinating on a project to do a subset of sites in each territory, and there are also times where one utility will allow another to take a first pass based on the strategic priorities (and budgets) of each.

5.3. Conclusions and Recommendations

The above findings span an investigation of peer programs' approaches to emerging technologies, a quantitative analysis of ETP's approach to a subset of projects, and a review of ETP's self-reported tactic selection process. Across those categories of research, two themes present themselves for the key conclusions and considerations that result from this effort:

- Mission and Focus: this theme encompasses the strategic objectives of the program, to which the day-to-day activities, available tactics, and planning approaches should align.
- Tactic Planning: this theme addresses the tactical approach taken by the programs on a day-to-day basis, which drive their project generation and tactic selection processes.

Below these themes are addressed in recommendations. Even when the results of research demand reporting structures that differ from the originally posed questions, it is good practice to answer those questions directly as best as possible. The following bullets address each objective:

- Is ETP effectively utilizing the available program sub-tactics (Technology Assessments, Scaled Field Placements, etc.) to support the eventual decision for measure transfer or not?
  - **ETP effectively uses program tactics to support the decision for measure transfer** in so much as that decision is defined in a way that is limited to the concept of "technical readiness." That is, ETP does an effective job at identifying technology and savings maturity and deploys appropriate tactics within that context. Whether measure transfer and subsequent program design around the measure should hinge primarily on technical readiness or should instead also emphasize market readiness is a separate question and one that deserves further examination. This concept is reviewed in much greater detail in the following subsection, labeled "Section 5.3.2"
- How does ETP choose and plan specific tactics for a given technology? Does and should the focus of ETP tactics vary by technology?
  - **ETP tactics appropriately vary by technology.** The preceding section on the California Tactic Selection Process outlines the evaluation team's understanding of the process by which ETP chooses and plans specific tactics for a given technology. In summary, it entails internal and external, primary and secondary research into technology and savings maturity, which then places a technology in a lab evaluation, field evaluation, or scaled field placement. In more limited circumstances, another type of tactic might be called for in reaction to a specific context. It is clear from reviewing the process and its empirical results that ETP tactics employed should and do vary by technology.
- Is ETP evaluating the aspects of a technology where their efforts can bring the most value? Are there missed opportunities?
  - **ETP brings value when evaluating technical readiness aspects of a technology, but may be missing market readiness aspects**. Similar to the first question above, if the question is limited to the context of technical readiness, then the answer is yes. However, the research is suggesting that there may be missed opportunities in the area of market readiness. Whether or not an emphasis on technical readiness offers the most valuable use of ETP funds is a question worthy of further examination and is discussed in greater detail in the following subsection, labeled "Mission and Focus."
- To what extent do tactics supplement existing industry and market knowledge for particular technologies? Are there redundancies or possible synergies to consider?
  - **ETP recognized as a key contributor to ET knowledge nationwide.** California ETP is generally recognized by its peers as a nationwide leader in most emerging technology research. While the ETP tactic selection process involves a review of existing resources, the program often finds itself breaking new ground. In so much as ETP is relied upon as a resource for others, the program gets very high marks from its peers as a collaborator and sharer of information.

5.3.1. Mission and Focus

A program's approach, tactics, and outcomes are framed by its mission and focus. Broadly speaking, the investigation of peer programs' approaches to emerging technologies revealed a divergence between those

who pursue only technical readiness for the technologies they seek to accelerate and those who go beyond technical readiness to also pursue market readiness.

A range of documents formally define ETP's goals and focus.[66] ETP's formal goals and focus aside, it is clear from both the quantitative analysis of ETP's project selection as well as a review of ETP's tactic selection process that ETP's emphasis is on technical readiness. A review of ETP's tactic selection process shows that for the technology sample in this study, technology maturity and the robustness of existing savings data are the primary criteria by which the IOUs select tactics. From 2010 through June 2014, the time segment used for this study, 67% of all projects were lab evaluations, field evaluations, and scaled field placements, which are typically used by ETP to validate or accelerate technical readiness.[67] Technology feasibility and savings uncertainty represent 39% of the barriers identified by peer program managers for the selection of technologies analyzed, but represented 54% of the project-barrier matches and 59% of *direct* project-barrier matches. Furthermore, 77% of those barriers that were neither directly nor indirectly targeted by any ETP projects were market readiness barriers. These numbers suggest an emphasis on technical readiness over market readiness within the project sample. ETP's process is geared towards accelerating technical readiness, and project distribution reflects that process.

With these findings in mind, the question then becomes whether this focus on technical readiness is appropriate for ETP or if more attention should be paid to market readiness. It is true that ETP is not – and should not be – the entity within each respective IOU that is solely responsible for pursuing market readiness. ETP managers have noted that other entities within the IOUs can and often do pursue market readiness for certain technologies. However, there is evidence that suggests ETP can and should do more to support market readiness for the technologies on which they engage. First, more than one ETP Program Manager noted that ETP often engages in projects that support market readiness *only after* a measure which ETP recommended for transfer is observed to be underutilized in the program to which it was ultimately transferred; that is, ETP accelerates a technology's technical readiness, the technology moves to the program, it fails in the market even with subsidy, and *then* ETP seeks to overcome market barriers as part of a second pass (this is discussed in Section 5.2.3). This suggests that in those cases market readiness deserves greater attention in the initial phase. Second, one PG&E energy efficiency program manager suggested, as a response in the UIMD report, that "there needs to be a little more focus on market barriers or other conditions that could limit customer or market acceptance rather than just the detailed energy savings."[68] Finally, the same UIMD report, which looks beyond ETP at the broader ecosystem of IOU program entities, makes almost no mention of market barriers or any of ETP's non-Technology Assessment related tactics at all (the only mention being the PG&E quote above). This significant omission suggests that other IOU entities are not systematically addressing market barriers, as ETP program managers believe they should be.

Reasonable questions can be raised regarding the relative costs and benefits of pursuing market readiness – whether by investigating market barriers or attempting to overcome them directly – and it is also reasonable to suggest that ETP should not be responsible for overcoming all market barriers. It appears, though, that market readiness does not get significant attention from the measure development process in general and ETP can play a role in pursuing market readiness, whether through investigating market barriers or in

[66] See Chapter 2 for a summary of relevant ETP guidance documents.

[67] The proportion of Technology Assessment projects (lab evaluations, field evaluations, and scaled field placements) grew from the 2010-2012 to the 2013-2014 cycles – 64% of the projects conducted in 2010-2012 were TA projects, compared to 72% of 13-14 projects.

[68] Study of the California Utility Internal Measure Development Process, June 2015, pg. 25

attempting to overcome them directly. Further research is required to determine the optimal relative levels of effort that ETP should expend accelerating market readiness.

Recommendation

The evaluation team recommends that ETP increase the attention paid to market barriers during the tactic selection process, as part of technical readiness projects, and through projects which investigate or address these barriers directly. As one of the IOU entities with primary responsibility for scouting and assessing new technologies, ETP is well placed to identify market barriers, investigate market barriers, address some market barriers, and share information on market barriers with their downstream partners within the IOUs who will address market barriers that ETP does not. ETP already takes some actions to understand market barriers, but those practices are not consistent across the IOUs and are not applied systematically. The evaluation team believes that expanding these practices in a consistent and systematic way represents a "no-regrets" option with minimal effort that can increase confidence that ETP – and the other entities within each IOU – are maximally addressing market readiness within the existing framework. The practices suggested for expansion and systematic implementation include:

- **Explicitly identify technical *and* market barriers as part of the tactic selection process and articulate them in planning documentation.** The analysis of project-barrier matches and a review of ETP's tactic selection process both suggest that ETP is responsive to information gathered during the activity selection process. The evaluation team believes that by systematically gathering information geared towards market readiness at that phase, the ETP staff will be well positioned to respond to that information in a cost efficient and effective manner or will be able to share that information with other entities within the IOUs. The evaluators recommend articulating both technical and market barriers at the project or technology (not end-use) level in planning documentation such as the scanning and screening tools or the IOU technology roadmaps. The level of detail need not be excessive; in many cases, a single sentence or phrase can sufficiently describe the barrier.

- **Purposefully use performance validation projects to gather information on market barriers and include that information in all project reports.** It is known that performance validation projects – including lab evaluations, field evaluations, and scaled field evaluations – sometimes organically reveal information that can accelerate market readiness. Program reporting sometimes captures that information. The evaluation team believes there are opportunities to extract more information in this regard. As a tangible and specific instance of this consideration, field evaluations and scaled field placements regularly put ETP staff in contact with customers and suppliers and sometimes their opinions on the technology are gathered and reported; ETP should take advantage of that captive audience by systematically having participants fill out surveys on their motivations regarding deployment, knowledge of the technology, experience with it, ability to deploy it, etc. This is one specific and obvious example of the opportunity that technical readiness projects provide for addressing market barriers. ETP should explicitly articulate opportunities like that in their planning documentation, rather than only reacting when market barrier information presents itself. Furthermore, *every* performance validation project report should include a section for information gathered on market barriers.[69] This section

[69] The evaluation team reviewed 20 performance validation project reports from the 2013-2014 cycle to see how market barriers were captured in reporting. Most reports included no or insufficient detail on market barrier elements, but there were some strong examples, which could be emulated. There were differing levels of detail across the four IOUs, and even within the documents for the same IOU the reporting was not consistent. Some reports included explicit lists of market barriers, some referenced results from surveys (and may have attached the survey responses as an appendix), some included discussions of challenges encountered/overcome during the project, some included all of these elements, and many included none. There was no clear pattern.

might include findings from surveys, comments of customers and vendors, challenges faced while deploying the technology, lessons learned, etc. If no information presents itself, the section can say so, but simply having the section will encourage ETP staff to gather this information and report it when it is reasonable to do so. Given that ETP's projects may be one of the few chances the IOU measure development teams have to try a technology out with customers before a measure moves into a pilot or full program deployment phase, if ETP does not identify those obstacles to adoption and pass the information on, those barriers may go unnoticed until they start to affect the measure's success. Overall, this effort towards exposing market barriers will ensure that they are flagged earlier, which will help in the program design process and will help avoid measures that struggle to gain traction once they reach the resource acquisition programs. Ultimately, this should lead to accelerated adoption of measures.

The evaluation team also proposes further study on the relative costs and benefits of projects that are oriented to market readiness. What are the practical limitations for tackling market barriers? What are the best practices for reducing market barriers through past ETP projects? How do the costs of pursuing market readiness compare to the costs of pursuing program readiness? What are the costs of *inaction* on market barriers, of waiting until a measure is considered underutilized in a program to target those barriers? Answering these questions for ETP as a whole will help provide greater context to the value of pursuing market readiness as a mission and focus for ETP and will allow the IOUs and CPUC to better understand the optimal allocation of resources.

5.3.2. Tactic Planning

Tactic planning refers to the deliberate resource coordination process that defines projects and their tactics for a specific technology. The investigation of peer programs revealed a broadly shared preference for "technology roadmaps" when doing tactic planning. These roadmaps differ from the technology roadmaps that the IOUs use to guide utility-wide DSM efforts; those are used as a tool to broadly organize the utilities' activities, whereas the peer program roadmaps coordinate activities within the entities' emerging technologies groups. Key common features of these peer technology roadmaps include:

- Specific to the emerging technology group
- Organized at the technology or product category level (broader than product, narrower than end use)
- State of technology and current research (both in and outside the jurisdiction)
- List of program *and* market barriers to adoption
- Projects the organization can/should participate in
- Back-of-envelope market sizing to gauge opportunity size
- Path beyond ET program
- Informed via research and expert committee (ETP, implementation team, and outsiders)
- Revisited and updated to track progress over time and across projects

ETP utilizes tactic planning documents that are similar in nature and include some of the above features. Across the IOUs these documents have different names, and there is significant variation in how they are used,

but all include some of the above features to one degree or another. At the same time, all are missing some of the above features to one degree or another.

Broadly speaking, the project-barrier matching data shows that current tactic planning processes lead to projects that are generally responsive to the specific barriers faced by a given technology; the evaluation team regards this as a significant positive indicator for the tactic planning process. However, tactic planning is not perfect as evidenced by the shortcomings observed in Sections 5.2.2 and 5.2.3.

The evaluation team attributes shortcomings to three key aspects of tactic planning: 1) the planning is generally done at the project level, not the technology level, which limits strategic planning across projects; 2) planning is IOU-by-IOU with coordination occurring only secondarily when interests overlap; and 3) the emphasis on technical readiness noted above.

Recommendation

The evaluation team recommends that the IOUs pilot a new tactic planning approach (e.g., "strategic technology plan") with the following features:

- Technology-level barrier identification – barrier identification should occur at the technology level (e.g., smart thermostats) to ensure that selected projects are able to address the full range of barriers.
- Statewide coordination – all 4 IOUs should participate in the methodical determination of barriers and collaborate to address all barriers which can be addressed feasibly and cost effectively. Each IOU should participate in the barrier identification process, but each will retain full control over the use of its own funds when it comes to actual project execution.[70]
- A plan to address market and technical barriers comprehensively – for each barrier identified above, ETP should assign an ETP project (or projects) which either investigates or addresses the barrier *or* identify an entity within the IOUs that is better positioned to address the barrier (e.g., Workforce Education and Training) and provide reasonable efforts to support that entity in gathering data on and/or addressing that barrier. This aspect of the pilot could provide context and data for the further research proposed in the above section on the costs, benefits, and best practices associated with addressing market versus technical barriers.

The IOUs and the CPUC should work together to define goals and success criteria for the pilot.

[70] MassSave's MTAC group is a model for this. The committee, which performs scanning/screening and background research activities on new technologies, is made up of staff from the eight MassSave utility members. The MTAC group does not have a budget; participant efforts in scanning/screening and background research are essentially an in-kind service provided by the member utilities. Once a technology has been deemed a good fit for utility programs, the members coordinate on pilot projects or performance validation in their respective territories or go their own direction with the measure. Generally, they take turns on projects where there is mutual benefit, stepping up and owning those projects which are of special interest to them.

6. Effectiveness of ETP Dissemination Efforts via ETCC Website Subscribers

For this objective, the evaluation team assessed the effectiveness of ETP external[71] dissemination activities specific to the ETCC website mailing list. The ETCC website (http://www.etcc-ca.com) is the primary channel for external ETP information dissemination.[72] According to the PIP, the ETCC website should provide "an overview of the ET program, a database of ETP project reports and fact sheets, information on upcoming meetings, and information on hosting an emerging technology project or proposing a measure for consideration."[73] This effort focuses on individuals on the ETCC mailing list and asks about ETP external dissemination efforts that they may have been exposed to.

6.1. Detailed Methods

This section documents our survey effort, beginning with a description of our survey methodology, sample frame, and response rates.

We conducted an Internet survey with the ETCC mailing list (which includes subscribers and interested parties from a list purchased by the ETCC, whom we collectively refer to as "subscribers").[74] As of June 2014, the ETCC website manager maintained a mailing list of 2,201 contacts. We conducted a census of all contacts on the mailing list that we identified as non-members of the ETCC.[75]

The ETCC website has maintained a list of subscribers since the site launched. On January 8, 2014, the ETCC began collecting additional information about these individuals, including company type, how they learned about the ETCC, sector of interest, and technology of interest. Therefore, different kinds of information are available about these people, depending on when they were added to the ETCC mailing list; we have detailed information for 79 of the individuals in our sample.

We removed duplicates and known program members from the list of 2,201 contacts we were given, yielding 2,103 valid contacts with email addresses (Table 41).

[71] The 2010-2012 ETP evaluation addressed the effectiveness of internal dissemination activities (i.e., information provided to IOU EE program staff).

[72] Other external dissemination efforts suggested in the PIP include: debrief assessment partners on findings through a meeting, memo, or podcast; execute public relations efforts, such as development and dissemination of press releases and articles for trade publications; present findings at industry and community meetings/conferences, with a focus on promoting IDSM efforts; submit articles to industry publications; provide technical information to and support information dissemination by the energy centers operated by each IOU; meet with market actors, including technology owners, manufacturers, allies, channel partners, trade association members, utilities, investors, and technology developers; and use the biannual ET Summit Conference as a forum to communicate assessment results.

[73] Output for Action Strategy 2.2.3: PG&E 2013–2014 Energy Efficiency Portfolio Program Implementation Plan Statewide Program Emerging Technologies PGE2106, April 23, 2013, p. 21.

[74] The sample provided by ETCC included both ETCC subscribers and a purchased list of interested parties. We were unable to identify which respondents were subscribers and which were found on the purchased list.

[75] ETCC affiliates include staff at the IOU, CPUC, or evaluation contractors who work directly for the ETP (i.e., ETP program managers, the CPUC project manager, and third-party ETP evaluation contractors).

Table 41. ETCC Sample Data Cleaning Steps

Data Cleaning Steps	Contacts	%
Initial Count of Contacts	2,201	100%
Known program members (i.e., CPUC, IOU, or contractors)	20	1%
Duplicate contacts	78	4%
Total Contacts	**2,103**	**96%**

We sent emails inviting all 2,103 contacts in the sample frame to take the online survey, and followed up with two reminder emails. The survey was fielded from November 12, 2014 through January 2, 2015. The average time to complete the Internet survey was 28 minutes.

The survey response rate is the number of completed surveys divided by the total number of potentially eligible respondents in the population. We calculated the response rate using standards and formulas set forth by the American Association for Public Opinion Research (AAPOR using Response Rate 1 [RR1]).[76] The survey response rate was 6.57%. The formulas used to calculate RR1 are presented below. The letters used in the formulas are defined in the survey disposition tables that follow.

$$RR1 = I \div (I + R)$$

Table 42. ETCC Survey Dispositions

Disposition	Number
Completed Interviews (I)	113
Eligible Non-Interviews (R)	1,608
Refusals	*0*
Mid-Interview Terminate	*0*
No Response	*1,608*
Not Eligible (e)	382
Bounce Backs	*356*
Known Ineligibles (replied with reason)	*11*
Known Ineligibles (screened out)	*15*
Total Participants in Sample	2,103

6.2. Detailed Findings

The evaluation team fielded the survey to better understand the effectiveness of ETCC ETP dissemination efforts. We document our findings below by research area: Reach and Purpose, Awareness of Dissemination Activities, Engagement, and Reported Actions Taken.

[76] We felt that RR1 was the most appropriate because we fielded the survey to known eligible customers. Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys, AAPOR, 2011.

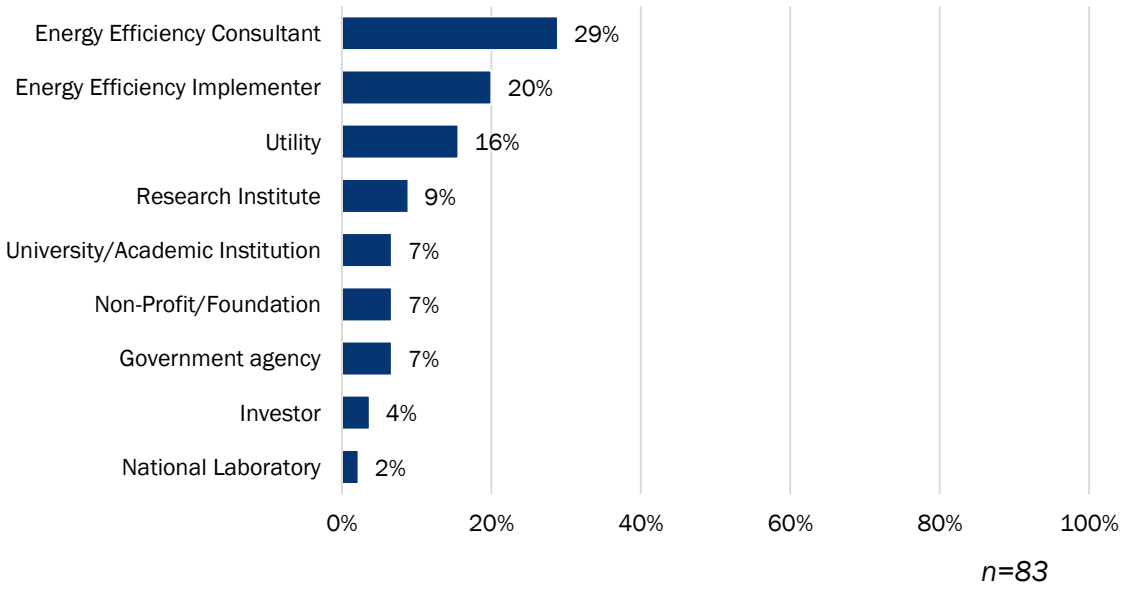
6.2.1. Reach and Purpose

To understand target audience reach and purpose, we needed to know how many people subscribed, what types of organizations they worked for, where they were based geographically, and why they subscribed to the ETCC website.

The ETCC staff provided a list of 2,103 individuals from their mailing list either who subscribe to the website or whose contact information was purchased by the ETCC in order to disseminate information to them. Of the 113 survey respondents, 73% recalled subscribing to the ETCC. In addition to removing from the sample frame people affiliated with the IOUs, CPUC, or evaluation contractors, we incorporated a question in the survey to ensure that we characterized respondents by the organization they were affiliated with. The vast majority (83%) of respondents did not work for any organizations affiliated with the ETCC.[77]

The figure below shows that almost half of the survey respondents who were not ETCC members (or staff of affiliated organizations) worked for a utility, EE consultancy, or EE implementer—organizations likely to benefit from receiving ETP information disseminated by the ETCC.[78,79]

Figure 13. ETCC Survey Respondent Company Category (Multiple Response), n=83



Note: The evaluation team added this question while the survey was in field. As a result, the number of respondents is fewer than the total number of respondents to the entire survey.

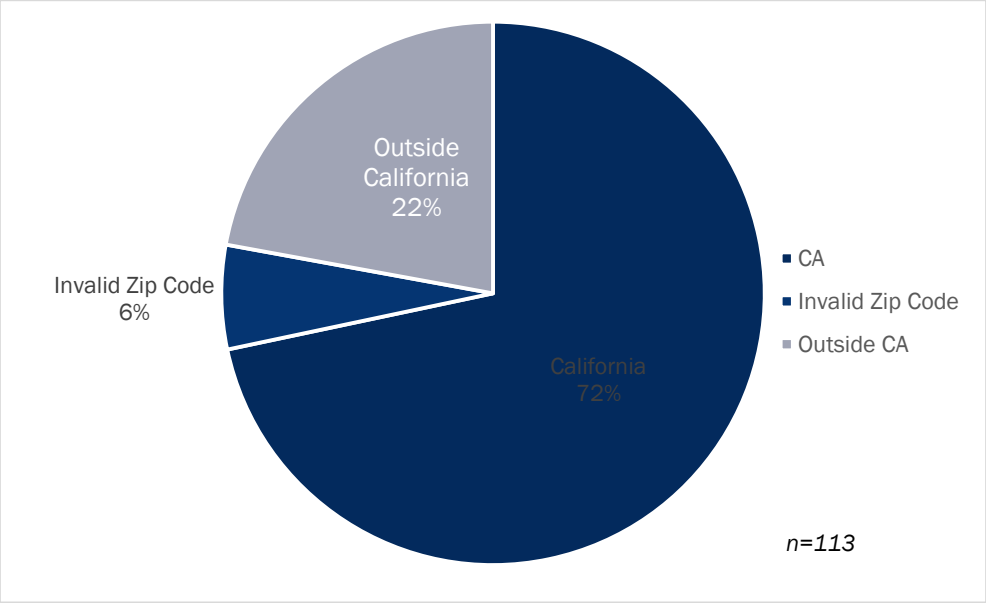
[77] Member respondents were as follows: 14% affiliated with CEC, SMUD, LADWP, PG&E, SCE, SDG&E, or SCG; 2% reflected evaluation contractors for members; and 1% of respondents were from the CPUC.

[78] We incorporated this question midway through the survey fielding process, resulting in a lower total number of respondents (83 out of 113).

[79] We do not include organizational background for the sample frame as there were a limited number (n=79) with these data.

The ETCC dissemination efforts target largely organizations and individuals in California. Zip code data collected through the survey instrument showed that 72% of respondents live in California and 22% reside elsewhere (Figure 14).

Figure 14. ETCC Survey Respondents' Location, n=113



Respondent interest in the ETCC aligns with content disseminated through the ETCC website. To better understand the respondents, we collected information regarding several key respondent characteristics: interest areas, reasons for subscribing, and level of interest in energy efficiency. Respondents volunteered a broad spectrum of interests in the ETCC (shown in Table 43). Survey responses to an open-ended question about where respondents are particularly interested in incorporating technologies showed not only third-party/utility programs (21%), but also the market (19%), while leveraging the ETCC for access to investment in new technologies garnered the fewest responses (4%).

Table 43. ETCC Survey Respondents Professional or Personal Interest in the ETCC, Unaided (Multiple Response), n=113

Interest Categories (n=113)	Percent of Respondents
Incorporate technologies into third-party/utility programs	21%
Incorporate technologies into market	19%
Relevant information for work	18%
Understand future products/technologies market opportunity	18%
Understand where industry is headed	15%
Access investment for new technologies	4%
Other	1%
Don't know	1%
Refused	4%

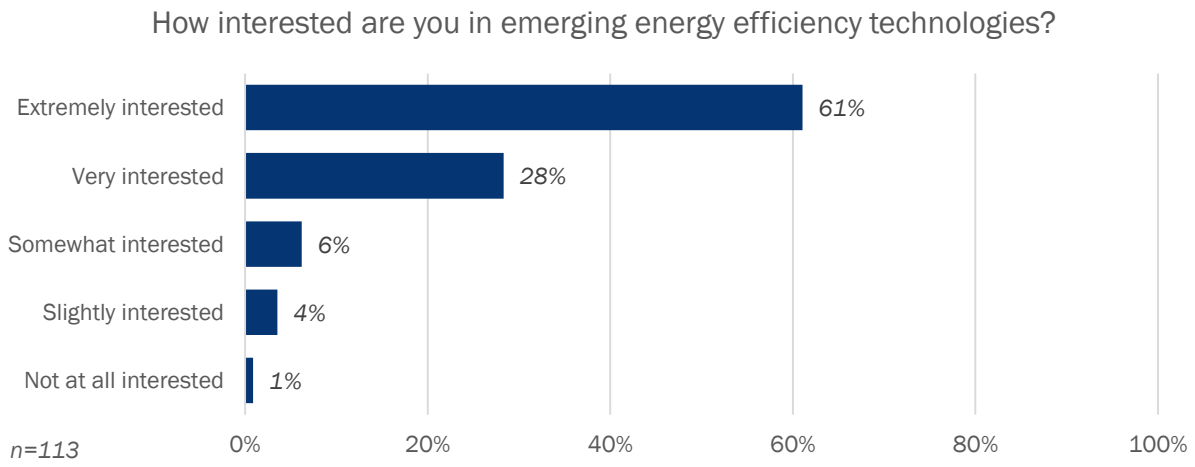
Respondents report that they went to the website to find general information about emerging energy-efficient technologies, as well as to learn about the California ETP. This finding also highlights the fact that the website is attracting visitors who are interested in emerging technologies.

Table 44. ETCC Survey Respondents Reasons for ETCC Subscription, Aided (Multiple Response), n=113

Reasons (n=113)	Percent of Respondents
Get general information about emerging EE technologies, systems, or practices	78%
Get information about the ETP	69%
Get information about a specific technology	60%
Get information about the ETCC Open Forum	58%
Get information on an upcoming event	58%
Submit and receive feedback on emerging EE technologies, systems, or practices	49%
Get information about the ETCC Quarterly Meeting	41%
Get information about TRIO events	41%
I do not recall	9%

The vast majority of respondents (89%) are extremely or very interested in emerging EE technologies.

Figure 15. ETCC Survey Respondent Interest in Emerging EE Technologies, n=113



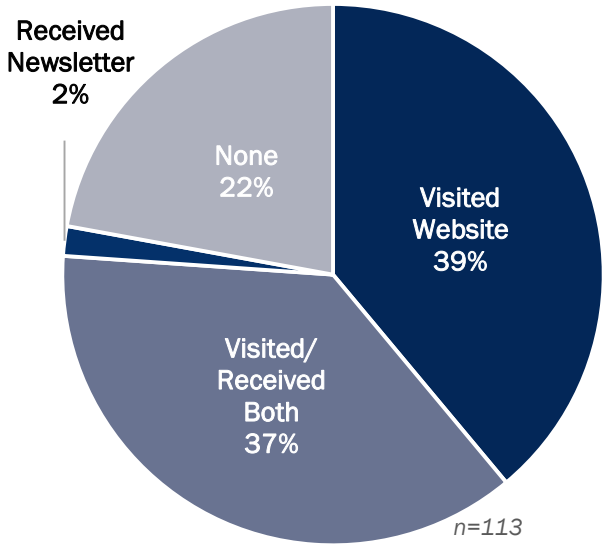
6.2.2. Awareness of Dissemination Activities

Awareness of ETCC dissemination activities is a key metric for success for the ETCC. Therefore, we assessed visits to the ETCC website since January 2013[80] (as well as engagement with other ETCC dissemination activities like the Insight Newsletter). We also assessed the extent to which respondents were aware of ETP activities, events, and reports.

[80] Note, respondents may have subscribed to the website prior to January 2013 and therefore been eligible for our survey, but had not visited the website since January 2013.

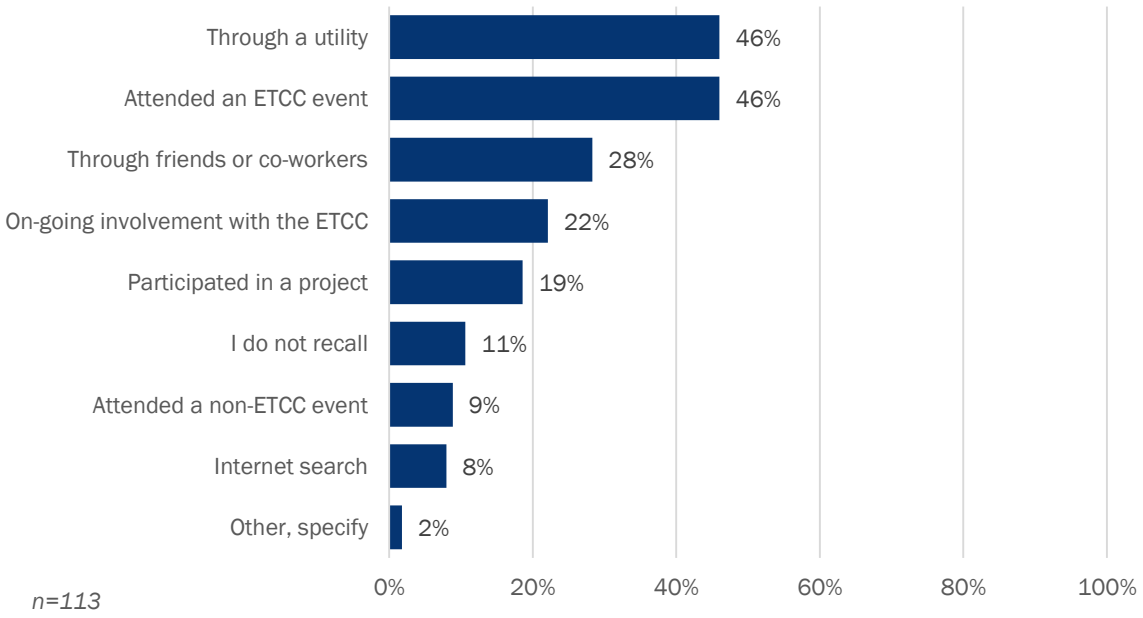
The majority of respondents were monitoring ETCC dissemination efforts. Since January 2013, 76% of respondents visited the ETCC website. Most respondents report that they visited the ETCC website only (39%), read the ETCC Insight Newsletter only (2%), or both (37%).

Figure 16. ETCC Survey Respondent ETCC Website and ETCC Insight Newsletter Exposure since January 2013, n=113



Most respondents had learned about the ETCC through a utility or an ETCC event, which suggests cross-marketing may occur between utility efforts (like Energy Centers) and the ETCC. For example, a little over one-third of respondents (34%) encountered ETCC information through a different dissemination mechanism (the Energy Centers) (see Figure 17 below). This aligns with the PIP, and indicates that the ETCC is not the only external dissemination channel available for ETP to share information.

Figure 17. Channel through Which ETCC Survey Respondents Said That Learned about the ETCC (Multiple Response), n=113

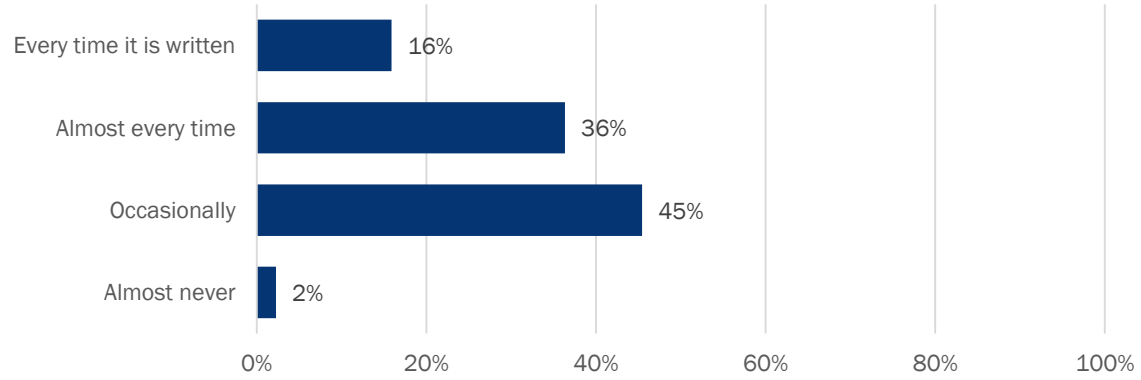


6.2.3. Engagement

Another key metric for dissemination success is engagement with the ETCC content and website. We assessed not only whether respondents engaged with ETP information (such as ETP reports and events), but also the ease of finding information and the relevancy and value of the information.

Respondents reported engaging with the ETCC and found that the ETCC website/newsletter was an effective communications tool. However, respondents who used the ETCC dissemination information used it with only moderate frequency. About 52% of respondents who read the newsletter since January 2013 will read it almost every time or every time that they receive an issue, while 45% read it only occasionally.

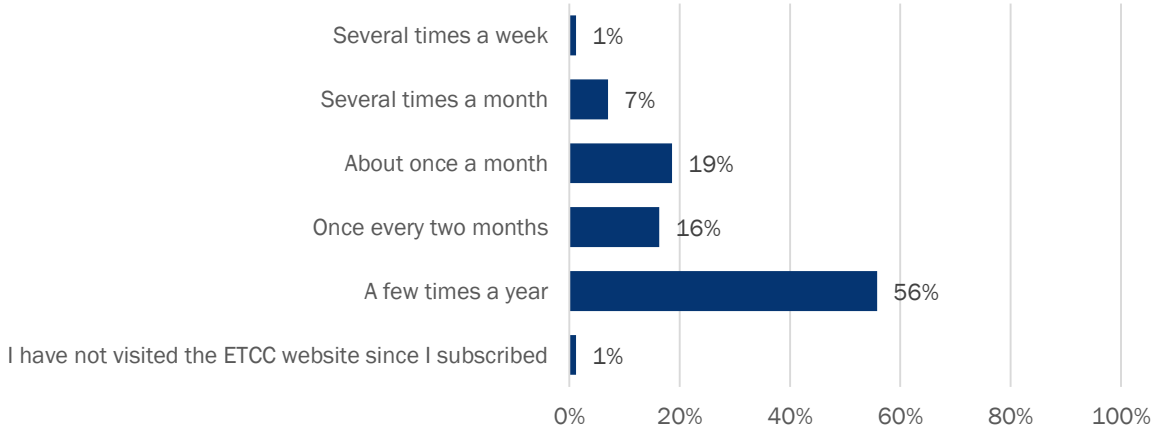
Figure 18. Frequency That ETCC Survey Respondents Read the ETCC Newsletter, n=44



Results do not total due to rounding.

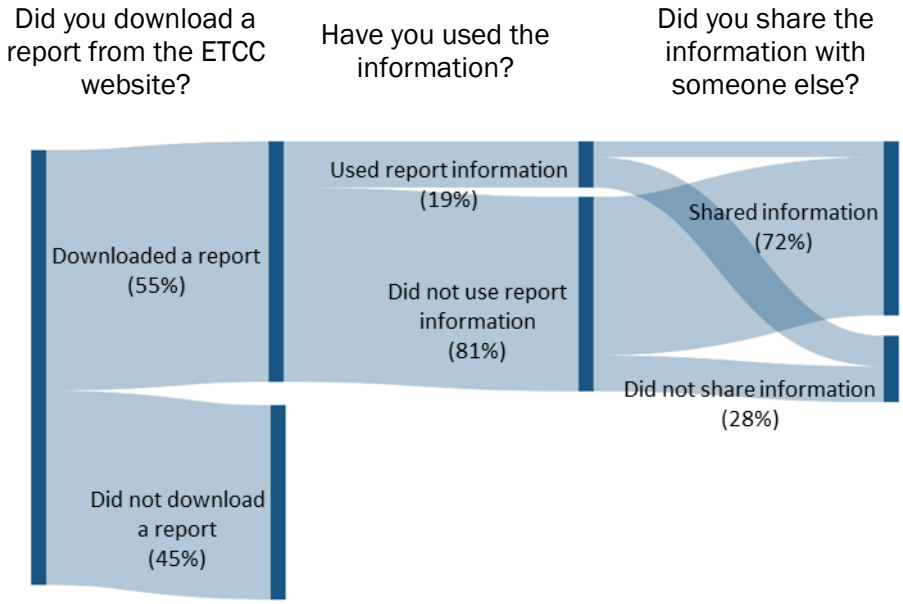
Of the respondents who visited the website since January 2013, about 27% check the website at least once a month and 56% typically visit only a few times a year. These results indicate that newsletters may be a good vehicle to present key information or prompt readers to visit the ETCC website, as website visits occur less frequently than reading the Insight newsletter.

Figure 19. Frequency of ETCC Survey Respondent Visits to the ETCC Website, n=86



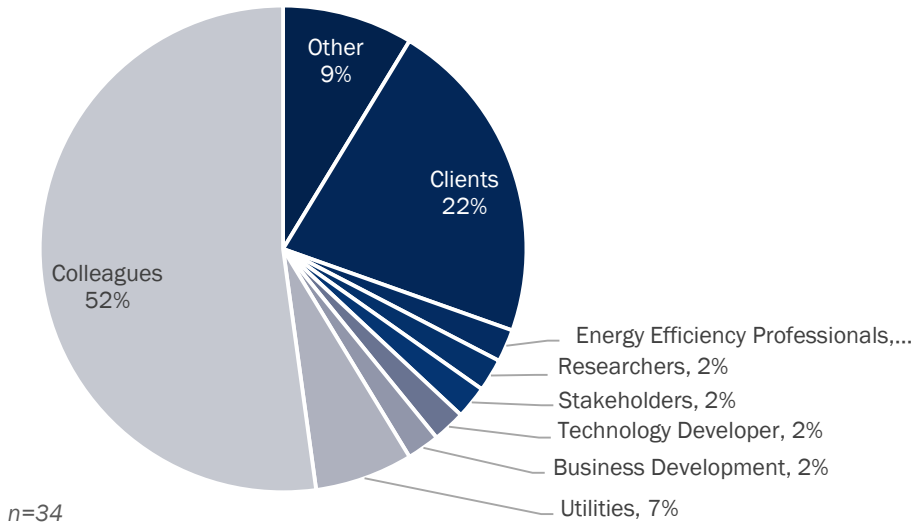
More than half of the respondents who visited the website (55%) downloaded reports; however, the majority of these downloads were not necessarily used by the person or respondent who obtained the information (only 19% of respondents who downloaded a report used the report information). Of the respondents who downloaded a report, 72% shared the information with others. This suggests that the ETCC information extends broadly beyond the people who are on the mailing list, but may not be specifically relevant to the website visitors. Figure 20 illustrates subscriber engagement with the website and information dissemination.

Figure 20. ETCC Survey Respondent Information Downloads and Use, n=86



Respondents typically shared the information that they found on the ETCC website with their colleagues (52%), followed by clients (22%).

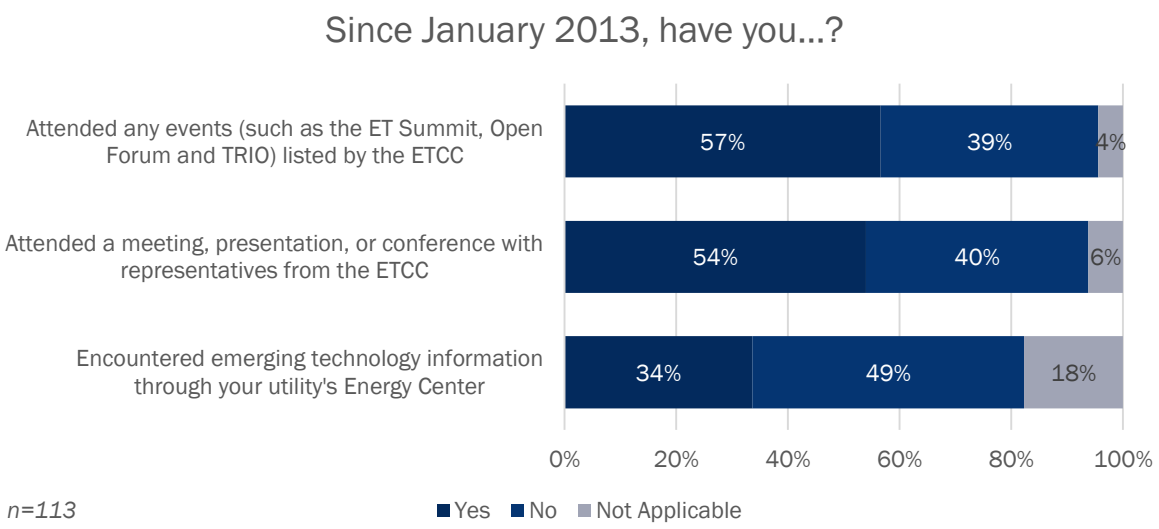
Figure 21. ETCC Survey Respondents Shared ETCC Website Reports, n=34



Respondents also indicated that they attended a variety of ETCC-hosted events or functions or ETP-funded activities, indicating that survey respondents were interested in, and potentially derive value from, ETCC events. Many respondents attended events listed by the ETCC (57%) and functions with an ETCC

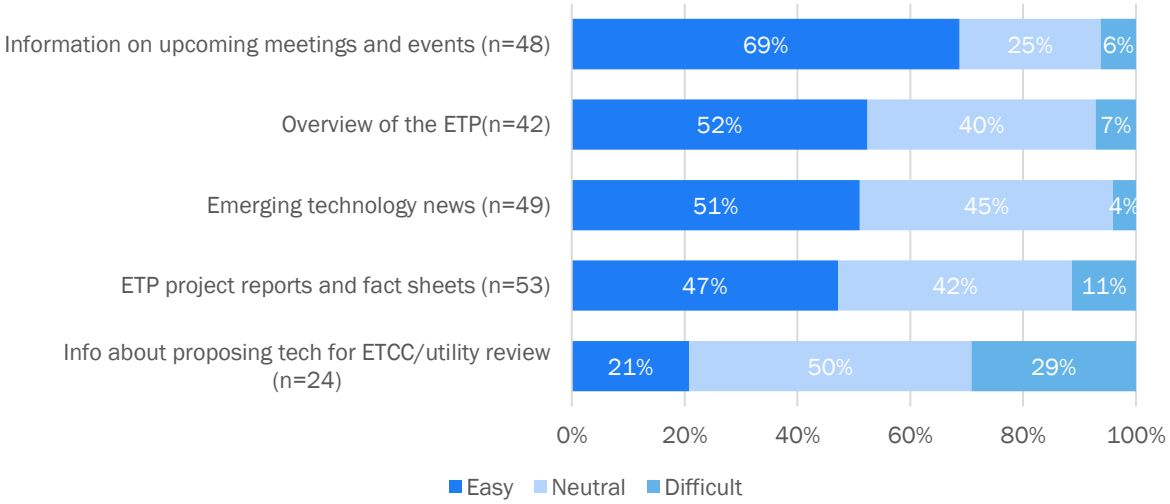
representative (54%). Some respondents encountered emerging technology information through the utility's Energy Center (34%).

Figure 22. ETCC Survey Respondents Attending or Encountering ETCC Information, n=113



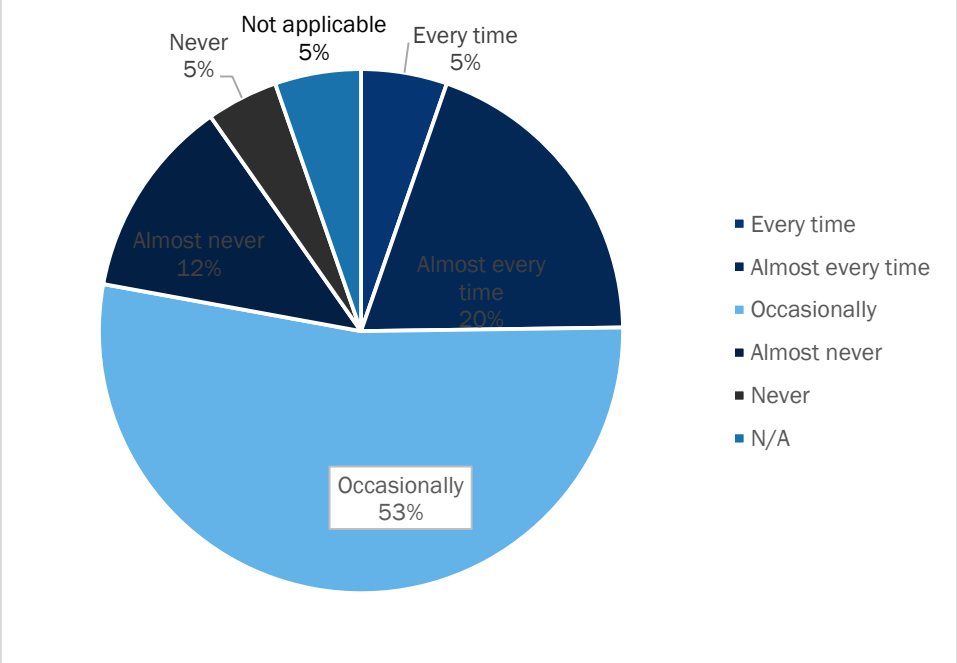
We found variation in terms of whether or not respondents easily found information on the ETCC website. Respondents reported that information regarding upcoming meetings and events was the easiest to find (69%), followed by an overview of the ETP (52%). However, respondents had greater difficulty finding ETP project reports and fact sheets (47%) and information about proposing technology for ETCC/utility review (21%) (Figure 23). Notably, results presented below reflect valid responses (i.e., excludes respondents who indicated that the question was not applicable). Information about proposing a technology was not applicable to 73% of respondents who visited the website.

Figure 23. ETCC Survey Respondents Ease of Finding ETCC Information



Approximately half (53%) of the respondents indicated that they learned new information occasionally when receiving information from the ETCC. One-quarter (25%) of respondents suggested that they learned new information every time or almost every time that they received information from the ETCC. We also assessed whether the frequency of visits to the website increased the frequency of learning new information through the ETCC. We found that respondents who visited the website a few times a year or about once a month tended to indicate that they learned new information occasionally.

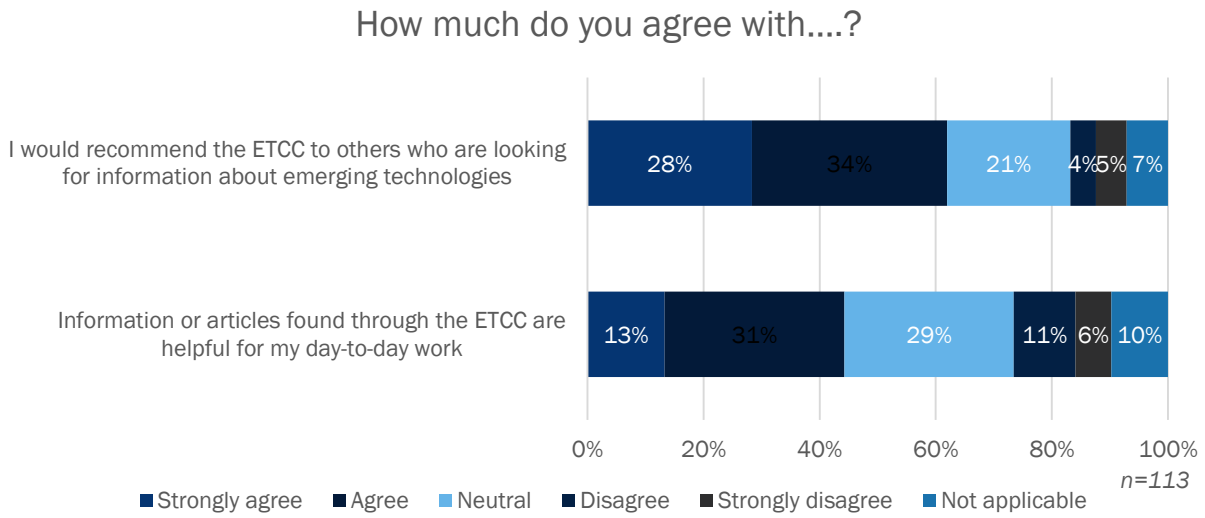
Figure 24. ETCC Survey Respondent Frequency of Learning New Information through the ETCC, n=113



Nearly two-thirds (62%) of all respondents agreed or strongly agreed that they would recommend the ETCC as a source of information on emerging technologies. In fact, many respondents who downloaded a report from the ETCC forwarded the information to others (typically a colleague or client) (Figure 20, Figure 21).

Slightly less than half (44%) agreed or strongly agreed that they found information that was useful to their day-to-day work. Approximately half of the respondents who disagreed that the information was helpful for their day-to-day work were energy efficiency professionals. Notably, those respondents who had downloaded a report were statistically significantly more likely to strongly agree or agree that the information was useful for their day-to-day work.

Figure 25. ETCC Survey Respondents Quality of ETCC Information, n=113



Respondents suggested ETCC improvements in the following areas.

Table 45. ETCC Survey Respondent Comments regarding Improving the ETCC, n=113

Row Labels	Count	Percentage
Nothing	59	52%
Improve content	11	10%
Don't know/not applicable/refused	9	8%
It's hard to find/access reports	7	6%
Didn't know/look at newsletter	7	6%
Submission requirements/response	5	4%
Improve layout	3	3%
Improve outreach	3	3%
Other[a]	9	8%
Grand Total	**113**	**100%**

[a] Other includes the ETCC being "too narrow" by just promoting EE, the ETCC could improve research quality, or improving content and layout.

The following text boxes provide verbatim responses that reflect these recommended improvements for ETCC content and navigability. Respondents suggested making improvements regarding site content.

"Be good to have a handy list of current utility ET studies on the ETCC website…"

"Clearer information about the utilities' technology priorities and full range of programs for supporting emerging technologies"

"...have [a] section dedicated to the...work required to change from old technology to new technology"

"More case studies and customer testimonials..."

"...describe if [technologies] were deployed and offer feedback and lessons learned"

Respondents also suggested making improvements regarding site navigability.

"[search engine optimization] and improved navigation to be able to search/find [reports] more easily"

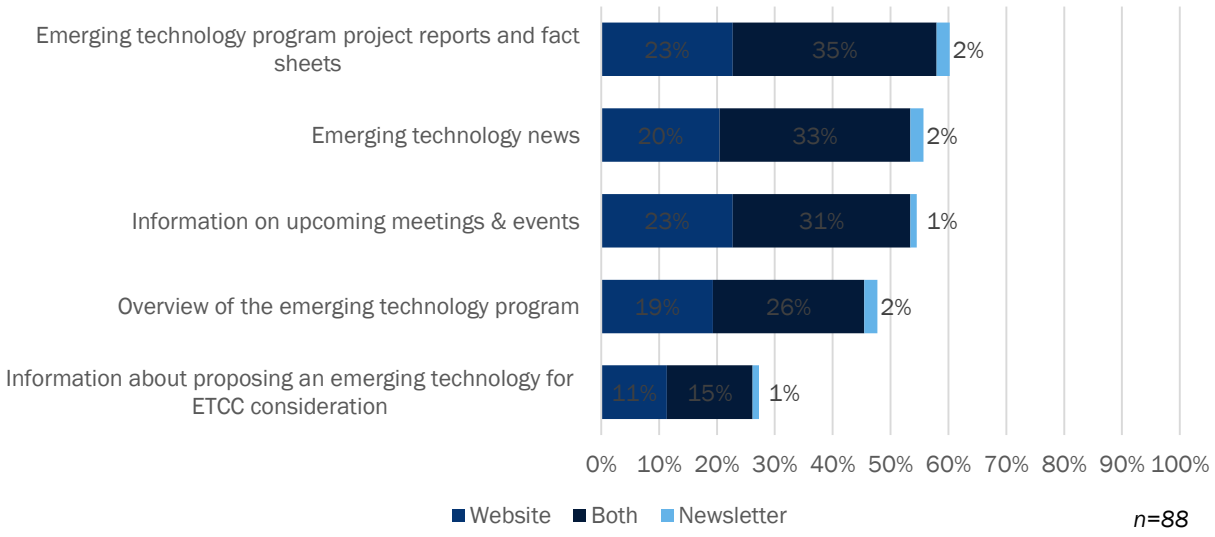
"Sort [reports] by categories...that way you may discover new reports in a category you were interested in"

"Frequent stress testing...most recently the website PDF links to technology reports weren't working on the Chrome web browser"

"Easier access to reports and...links to more current and relevant advanced technology web sites"

Respondents reported engaging with the majority of the topic areas covered by the ETCC. In particular, of the 88 respondents who visited the ETCC website and/or read the newsletter in 2013, over two-thirds said that they read the ETP project reports and fact sheets, and the emerging technology news, respectively.

Figure 26. ETCC Survey Respondents Information Read through the ETCC (Website or Newsletter) (Multiple Response), n=88



6.2.4. Actions Taken

To understand ETCC dissemination effectiveness, we captured information on any actions taken by respondents regarding ETP, the ETCC, or emerging technologies, as well as any changes in knowledge associated with engaging with ETCC information. A little over half (56%) of respondents indicated that their experience with the ETCC increased their level of knowledge related to emerging technologies. These results suggest that the ETCC dissemination efforts are effective in increasing respondent knowledge.

Figure 27. ETCC Survey Respondent Self-Reported Knowledge Impacts, n=113

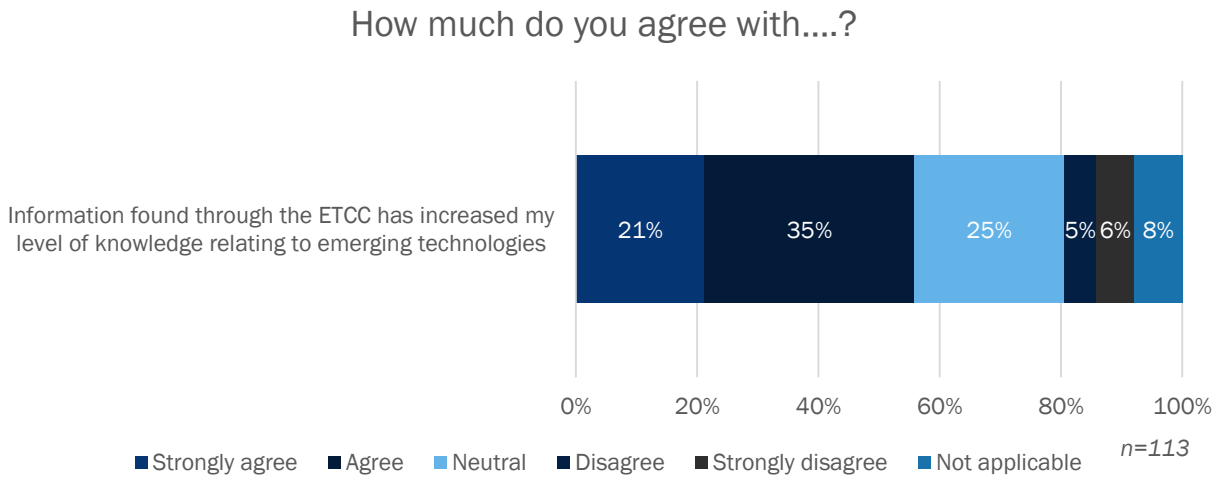
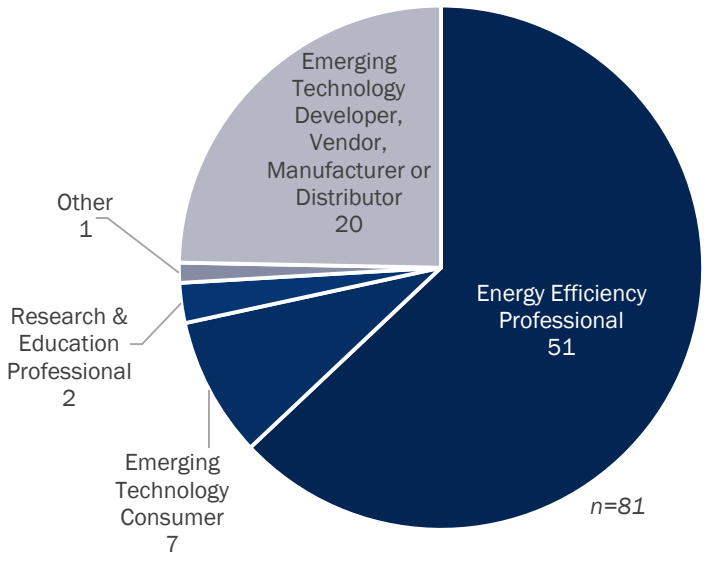


Figure 28 illustrates the professional occupations of the respondents who indicated that their experience had increased their level of knowledge related to emerging technologies (respondents selected "agree" or "strongly agree").

Figure 28. ETCC Survey Respondent Increased Knowledge of Emerging Technologies from ETCC Information, n=81

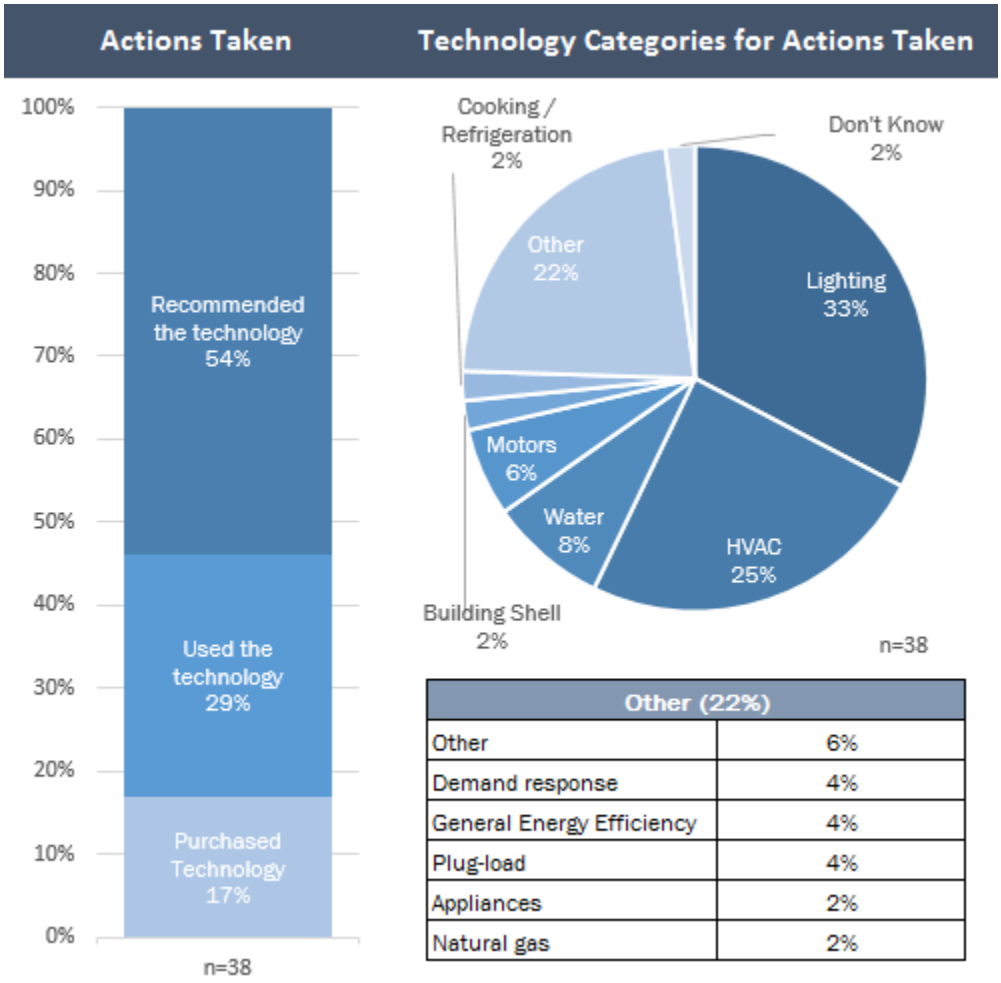


Further, over half of all respondents (54%) indicated that they sent information from the ETCC to friends and colleagues, while nearly two-thirds (61%) of respondents look to the ETCC when searching about emerging energy-efficient technologies (see Figure 28 above).

According to our survey, about one-third of respondents (38 of 113) took action related to the technologies featured by the ETCC. To ensure that we accurately captured potential actions taken, we narrowed responses to those where actions were applicable to their professions or professional interests.[81] Of these 38 respondents, 54% have recommended the technology, 29% have used the technology, and 17% have purchased the technology (Figure 29). The majority of these technologies are lighting and HVAC related (35% and 25%, respectively). Figure 29 provides a summary of the various actions taken.

[81] Our survey included a "not applicable" selection option to ensure that respondents reported actions that were feasible for them to take.

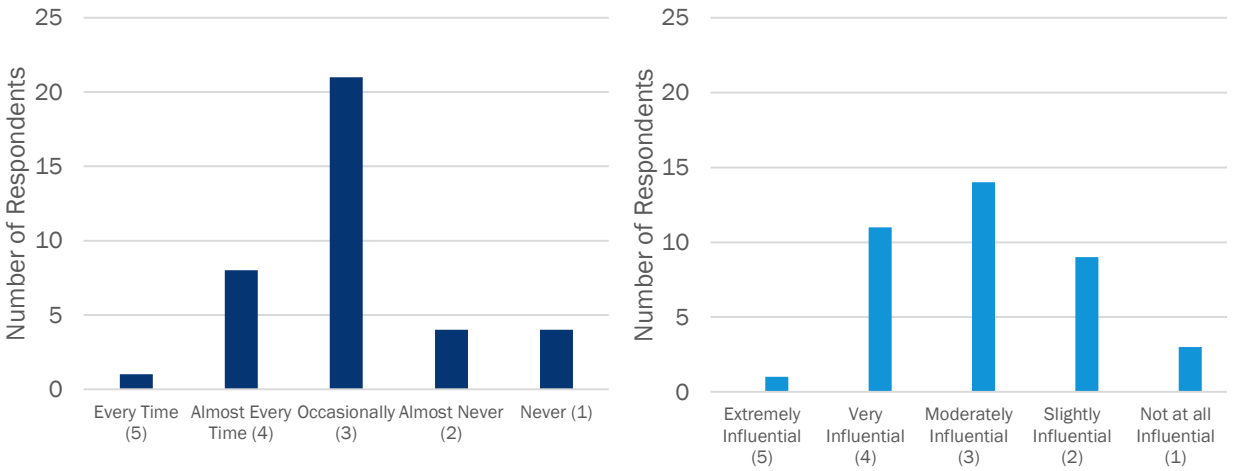
Figure 29. ETCC Survey Respondent Reported Actions Taken, n=38



Other (22%)	
Other	6%
Demand response	4%
General Energy Efficiency	4%
Plug-load	4%
Appliances	2%
Natural gas	2%

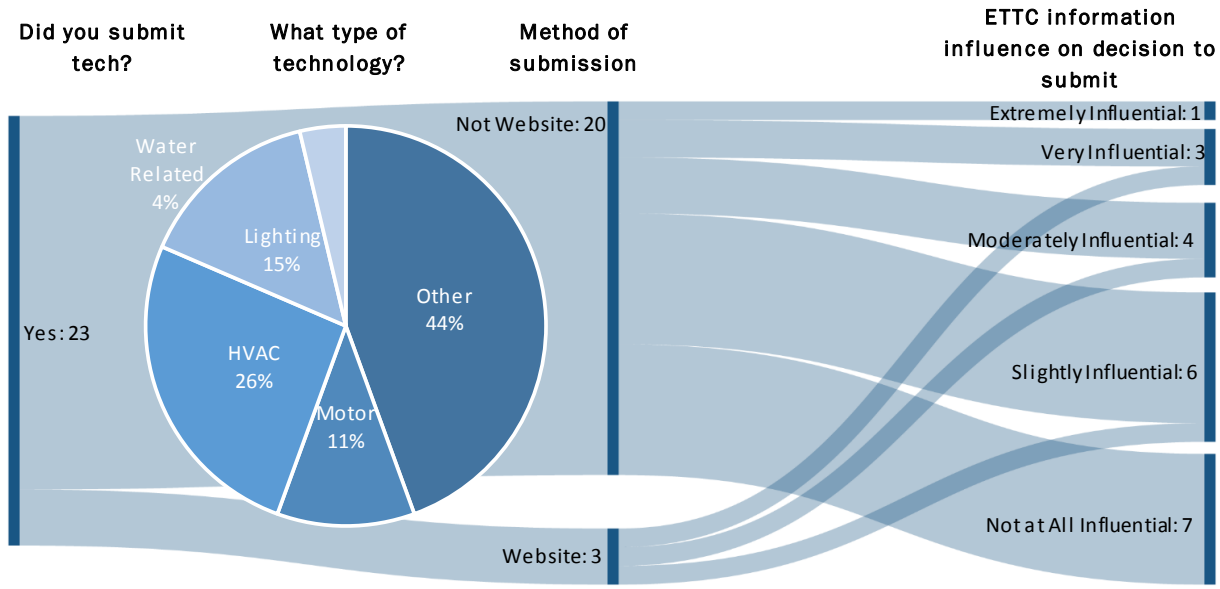
Most (55%) of the respondents who indicated that they had taken some kind of action reported that they only occasionally use information from the ETCC to inform their decision to act. One-third of respondents, however, reported that ETCC information was extremely or very influential in their decision to take action. The figure below provides more detail on frequency and influence in respondent decisions to take action.

Figure 30. ETCC Survey Respondent Frequency of Using ETCC Information to Take Actions and Influence of the ETCC on Actions Taken, n=38



About a quarter (28%) of all respondents for whom submitting a technology was applicable to their profession submitted a technology for review by ETCC members. The two largest categories of technology are HVAC (26%) and lighting (15%). According to respondents, most submissions were not made through the website, but rather through other avenues. However, 70% of these respondents indicated that ETCC information was influential to some extent.

Figure 31. ETCC Survey Respondent ETP Technology Submissions, n=23



Respondents that described ETCC information as being moderately, very, or extremely influential cited its accurate, helpful, and unbiased nature:

"There are few reliable sources of information on emerging efficient technologies. ETCC has high standards and I trust it."

"ETCC represents one of the key sources of objective data on new technologies in terms of their effectiveness and savings…ETCC provides me with unbiased reporting."

"The information and research is well documented, professionally developed and independent."

"I was on the fence in my purchasing [decision] but after review of information on technology [I] felt comfortable moving forward with [the] investment."

Respondents who noted that ETCC information was not influential say it was because the ETCC information was limited, was not timely, was one of many sources used, or did not cover all the technologies needed. ETCC engagement results are consistent with findings from the PY2010–2012 evaluation, which found that EE program managers who received information from ETP staff found that the information could have been more timely. For example, respondents to the EE program manager survey indicated that they had received a report after a decision had been made to adopt or reject the technology into the portfolio (8 of 19 reports).[82]

6.3. Conclusions and Considerations

Below we document conclusions and considerations.

6.3.1. Conclusions

The ETCC dissemination efforts reach the intended audience, encourage engagement with ETP information, and promote emerging technology actions. As such, the ETCC dissemination activities appear to be a useful tool for a group of targeted individuals. However, the content and navigability of the ETCC website could be improved, particularly as it relates to submitting a technology on the site, and it would also be useful to identify opportunities to increase website engagement. Notably, this survey effort provides findings for a targeted population that receives ETP information via the ETCC. Given the target audience for this population, we are unable to benchmark results against other website offerings.

- **Survey respondents represent audiences who are likely to benefit from ETCC dissemination activities.** Nearly three-quarters of respondents are California-based energy efficiency professionals interested in emerging technologies and the ETP (drawn from energy efficiency consulting and implementation, utilities, and research institutes). Respondent interest in the ETCC aligns with the content disseminated through the ETCC website, indicating that the ETCC is disseminating information relevant to supporting emerging EE technologies. Notably, approximately three-quarters of respondents who download reports from the ETCC website tend to share information with others. This suggests that the ETCC dissemination efforts have a broader reach beyond those who are on the ETCC mailing list.

- **Respondents tend to be aware of ETCC dissemination activities.** Three-quarters of respondents visited the website after January 2013, over half attended events listed by the ETCC, and over half attended a function with an ETCC representative. Most respondents had learned about the ETCC through a utility or an ETCC event, suggesting cross-marketing occurs between utility efforts (like Energy Centers) and

[82] PY2010–2012 California Statewide Emerging Technologies Program Phase II Program Effects Report: Volume I.

the ETCC. This indicates, and aligns with the PIP, that the ETCC is not the only external dissemination channel available for ETP to share information.

- **Respondents tend to engage with the ETCC moderately.** Another key metric for dissemination success is engagement with the ETCC content and website. Therefore, we assessed not only whether respondents engaged with ETP information (such as ETP reports and events), but also the ease of finding information and the relevancy and value of information. Of those respondents who visit the ETCC website, the frequency of use is moderate (for example, over half of respondents visit the ETCC website a few times a year); 56% of respondents typically visit only a few times a year. Overall, we found that respondents had varying ease of finding information on the ETCC website, depending on the type of information they were searching for. For example, respondents reported that information regarding upcoming meetings and events was the easiest to find (69%) and that information about proposing technology for ETCC/utility review was the most difficult (21%). For the ETCC to be a useful tool, people should want to engage and continue to engage with the ETCC dissemination information. Our results indicate that half of respondents (53%) learn something new "occasionally."

- **Slightly less than one-third of respondents indicated that they took action after receiving information from the ETCC.** Those various actions included recommending, using, and purchasing the technology, where applicable for their profession. Of those respondents, 55% occasionally use information from the ETCC to inform their decision to take actions, while 24% use this information every time or almost every time and 21% never or almost never use the information. Most respondents found that the information was either very influential (29%) or moderately influential (37%) in their decision to take action. Even if people did not take action specific to an emerging technology, over half of all respondents report increased knowledge of emerging technologies. Less than one-fifth of respondents submitted a technology for review and, of those, 13% submitted the technology through the ETCC website.

6.3.2. Considerations for Implementing Recommendations

Below we provide some considerations for the ETCC dissemination activities to promote continuous engagement with ETP activities. These are intended to support implementation of the recommendations provided in Chapter7.

- **Improve website navigability.** Respondents suggested making improvements in site navigability, particularly allowing users to find/search for reports and to sort reports by categories. More specifically, respondents suggested making it easier of finding the technology proposal link on the website. Although this feature is not relevant for most users on the ETCC mailing list, a small subset of respondents reported difficulty finding information on the ETCC website regarding proposing a technology for ETCC/utility review. We know from other research efforts that there are market actors who are looking for opportunities to engage with ETP, so making it easy to submit or propose a technology could be beneficial.

- **Develop strategies for increasing the frequency of website visits by refreshing information and improving content and website navigability.** Respondents suggested that the ETCC could improve information on utility technology priorities, case studies and testimonials, and links to more current or relevant technology websites.

7. Study Conclusions & Recommendations

A review of ETP program implementation plans and regulatory guidance indicates that the ETP should serve two important functions by supporting both the technical and market readiness of technologies. The philosophies documented within the PIP present both views regarding ETP's role to support 'technical readiness' through feeding the energy efficiency portfolio, or 'market readiness' through supporting market demand, such as supplier or customer interest. For example, the Technology Introduction Support sub-program seeks to support market readiness via technology introduction and whole-building deep energy reduction solutions to "seed" market demand among targeted end-users. Alternatively, the Technology Assessments sub-program supports technical readiness by establishing replicable savings estimates and validating technical feasibility. Below we provide conclusions based on the three research objectives for this study.

7.1. Conclusions

Summary of ETP Portfolio

In the 2013-2014 program cycle the ETP worked on 273 projects, while initiating 164 projects, across a variety of end-uses as well as across program readiness and market readiness activities. The aggregate analysis[83] describes the sufficiency and orientation of these projects undertaken by the IOUs. Additionally, the descriptive statistics derived from the ETP data analysis determines if the IOUs have met their PIP objectives, and provides insight into the overarching program and policy objectives (i.e., the Program Performance Metrics [PPM]).[84]

- **The ETP met program objectives.** The IOUs met their 2013–2014 objectives within the allocated budget, spending 48% of the 2013–2014 budget, with the remainder allocated for ongoing projects.[85] Additionally, over the past three cycles, the IOUs have consistently overachieved their ETP PIP objectives (achieved 141% of overall projects initiated, and 176% of measures transferred in PY2013–2014)[86]), but no effort has been made to align objectives with prior achievements. As such, the PIP objectives are not effectively specified as IOU efforts have consistently exceeded objectives over time.

- **The ETP activities align with CEESP end-uses.** Per its mission, the ETP is transferring measures to the EE portfolio, and focusing on specified end uses within the CEESP. The 2013-2014 adopted projects align with CEESP specified end-uses; 86% of the adopted projects are within the specified R&T Framework to support California's Big Bold Strategies and about two-thirds (73%) of projects align with PPM specified end-uses (advanced HVAC technologies, high-efficiency plug loads and appliances, and advanced lighting technologies).

[83] As defined in the Protocols, the aggregate analysis provides a statistical overview of the of the ETP portfolio using the ETP program databases.

[84] See Volume II, B for the 2013–2014 ETP PPM and PIPs.

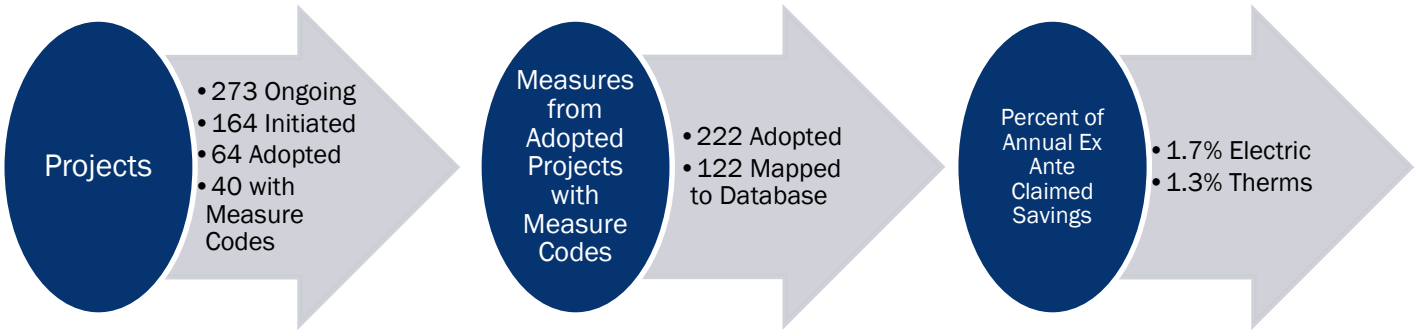
[85] The program has up to 6 years following project initiation to spend the allocated budget. For PG&E, project budgets are developed and spent within the program cycle. SCE, SDG&E and SoCalGas develop project budgets with funds from a program cycle, but the expenditures can occur beyond the program cycle (e.g., a 2010-2012 initiated project uses 2010-2012 funds, but can expend this budget over the next 6 years).

[86] The IOUs achieved all PIP objectives outlined in the PIP, including conducting technology introduction (161%), assessment (131%) and development activities (158%), as well as transferring measures from ETP into the EE programs (176%).

- **Current data tracking systems, and poor data quality, hampers ability to quantify savings from Emerging Technologies assessed through ETP in EE portfolio.** Although there are no specified success criteria for the PPM, poor data tracking hampers the ability of the evaluation team to ascertain the value of transferred measures (e.g., moving measures into EE portfolio programs). For example, issues with measure tracking from the ETP database to the IOU EE savings database likely reflect an incomplete assessment of Emerging Technology savings in the EE portfolio.

- **Despite limited data, ETP is making contributions to the EE portfolio.** Figure 4 provides savings for ET assessed through ETP in 2013–2014 that were adopted into the EE portfolio between 2010-2014. Regardless of the difficulties within this year's efforts to summarize these savings, including the known gaps and likely incomplete assessment (see Section 5.2.2), the current suite of 122 mapped measures from ETP projects adopted into the EE portfolio from 2010–2014 provides about 2% of the 2013–2014 Statewide ex ante claimed electric savings and slightly less therm savings. Notably, this represents projects adopted into the portfolio between 2010-2014, reflecting a snapshot in time, rather than a cumulative assessment, of ET savings in the EE portfolio. Importantly, ETP is one element that may contribute to a measures' success within the ET portfolio, this assessment attempts to show that the program is adding value, but is not solely responsible for how this value is harnessed within the EE portfolio. As such, this assessment does not speak to any causal relationship between ETP and EE portfolio savings.

Figure 32: Adoption Metrics for 2013–2014 ET assessed by ETP in the EE Portfolio



Assessment of ETP Activities

The peer review evaluation activity assessed how the IOUs are targeting their activities (i.e., what tactics the IOUs select) as they review technologies.[87] This review garnered key insights regarding the type of tactics ETP uses to support their mission and goals, as well as opportunities for program enhancement.

[87] "Technology" refers to an equipment, practice, or approach used for a particular application and customer segment. The word as used here is more narrowly defined than an end-use such as lighting, and is analogous to a "product category" or a collection of products which are more similar than dissimilar. An example of this would be smart thermostats, which is more specific than HVAC or even temperature controls, but can contain a number of different

- **The ETP focuses on technical readiness.** ETP effectively uses program tactics to support the decision for measure transfer in so much as that decision is defined in a way that is limited to the concept of technical readiness and mostly excludes market readiness. The quantitative analysis of ETP's project selection and a review of ETP's methods show that ETP's emphasis is on technology and savings maturity, with savings and technical barriers receiving a disproportionate share of ETP's attention. A review of ETP's methods shows that technology maturity and the robustness of existing savings data are the primary criteria by which the IOUs select tactics. From 2010 through June 2014, the time segment used for this study, 67% of all projects were lab evaluations, field evaluations, and scaled field placements, which are typically used by ETP to validate or accelerate technical readiness. ETP is surely not the only entity within the IOUs that can or should address market readiness, and reasonable questions can be raised about how best to allocate resources across different IOU entities to address market barriers. That said, there is evidence – the fact that some recommended measures return to ETP after they are not readily embraced in the marketplace, and the total exclusion of market readiness concepts from the UIMD report that looked at the entirety of the IOU measure development process – that ETP can do *more* than it does to address market barriers and that it is well positioned to do so.

- **The ETP has a broad array of tactics compared to peers.** The evaluation team conducted ten interviews with peer programs, selected based on seven criteria (including whether the peer focuses on program readiness, funds tactics across the three ETP sub-program areas, budget size, publically available information, geographic diversity, etc.).[88] The ten peer programs either focus on technical readiness alone or go beyond technical readiness to include market readiness as well. The number and types of tactics used by other ET-like programs throughout the nation vary. Those programs that focus on only technical readiness tend to use fewer tactics, and those tactics tend to fall in the Technology Assessment category. Those programs that go beyond technical readiness to include market readiness employ a larger and more diverse set of tactics. Compared to other ET-like programs, the ETP has the most tactics available to deploy and the greatest number of non-TA tactics. Notably, ETP also has a much larger operating budget than the other ET-like programs reviewed with the exception of the national labs. Interestingly, we found little correlation between budget and number of available tactics.

- **The ETP tactics differ by technology.** ETP's tactics do differ by technology, suggesting there is no one-size-fits-all view. The evaluation team asked peers to identify barriers faced by a given technology and calculated their frequency, then matched the identified barriers to existing ETP projects by technology to assess whether each ETP project addressed each barrier directly, indirectly or not at all. Finally, our team leveraged peer comments on the barriers to provide a qualitative record in addition to quantitative information on the technology. Those findings showed that as barriers varied, so too did tactic choices; the ETP practice is reactive to barriers.

- **California ETP is generally recognized by its peers as a nationwide leader in most emerging technology research.** While the ETP tactic selection process involves a review of existing resources, the program often finds itself breaking new ground. In so much as ETP is relied upon as a resource for others, the program gets very high marks from its peers as a collaborator and sharer of information.

- **The ETP could benefit from greater strategic focus when choosing tactics.** Although ETP is seen as a leader on many emerging technologies, the evidence indicates that ETP may suffer from a lack of

products that are subject to similar marketplace barriers. The evaluation team chose to focus on the technology level as it is the most natural unit of analysis for facilitating information sharing across jurisdictions and it provides transparency into the ways that ETP projects attempt to address the barriers a technology faces.

[88] For an overview and criteria used for selecting ET-like programs, see Chapter 5.

strategic focus when choosing projects to address barriers. Evidence of this is the frequent appearance of "one-off" projects targeting a narrow technology context, the lack of clear relationships among projects within a technology, and the lack of explicitly sequenced projects. A counter example of this criticism is a four-phase set of projects used for smart thermostats that could serve as a model for a more strategic approach going forward. This may be a symptom of ETP actually comprising four separate entities, but it does raise a question of whether the current approach leads to the most effective allocation of ETP resources.

Assessment of ETCC Dissemination Efforts

Providing information on emerging technologies to an audience broader than the IOUs may change how others consider a technology. The evaluation team assessed the effectiveness of ETP external[89] dissemination activities specific to the ETCC[90] website, which is a primary channel for external ETP information dissemination. The ETCC website (http://www.etcc-ca.com) is the primary channel for external dissemination efforts. [91]

- **The ETCC dissemination is useful for respondents, with opportunities for improvement.** Survey results indicate that the ETCC dissemination efforts reached the intended audience, encouraged engagement with ETP information, and promoted emerging technology actions. We found moderate use of the website (56% visit the ETCC website a few times a year, 53% occasionally learn something new), but found that respondents took a variety of actions after receiving information from the ETCC, including recommending, using and purchasing a technology. Overall, respondents found the dissemination efforts to be useful, with minor opportunities to improve website content and navigability.

7.2. Recommendations

Absent sufficient activities, ETP cannot adequately support the EE portfolio. If ETP is performing activities that do not align with Commission guidance, then they may be spending ratepayer funds in areas that may not support the long-term goals of the State as highlighted in AB32. Overall, we found that the ETP is supporting CEESP and resource acquisition objectives. Our analysis found that 85% of ongoing projects met CEESP end-use areas, while contributing a little under 2% of annual ex ante claimed savings. However, tactic selection does not appear to be strategically deployed, despite the myriad tactics available to ETP staff. Finally, ETP maintains a useful website for dissemination, consistent with PIP objectives to disseminate ETP related information with external stakeholders.

Of equal importance is the ability of the Commission to guide the program towards achieving policy objectives. Our evaluation effort indicates that the current PPM are insufficient for the CPUC Energy Division to assess

[89] The 2010-12 ETP evaluation addressed the effectiveness of internal dissemination activities, (i.e., information provided to IOU EE program staff).

[90] Note that members of the ETCC include the IOUs, CPUC, CEC, Sacramento Municipal Utility District (SMUD), and the Los Angeles Department of Water and Power (LADWP).

[91] Other external dissemination efforts suggested in the PIP include: debrief assessment partners on findings through a meeting, memo, or podcast; execute public relations efforts, such as development and dissemination of press releases and articles for trade publications; present findings at industry and community meetings/conferences, with a focus on promoting IDSM efforts; submit articles to industry publications; provide technical information to, and support information dissemination by the energy centers operated by each IOU; meet with market actors, including technology owners, manufacturers, allies, channel partners, trade association members, utilities, investors, and technology developers; and use the bi-annual ET Summit Conference as a forum to communicate assessment results.

achievement of policy objectives, as well as progress towards achieving these objectives. Further, given ETP's focus on tech readiness activities (as well as achievement of objectives), additional effort is needed to align objectives and metrics with ETP's market readiness objectives (alignment with regulatory and legislative documents). For example, R.09-11-014 underscores the need to "[prioritize] different combination and distribution of technologies suitable for California's market sectors and end-use applications while considering the technologies' **market and technical potential**." ETP currently has a suite of tactics in support of both technical readiness and market readiness, but the current data tracking and metrics do not enable comprehensive assessment of long-term policy achievements.

Below we provide our integrated recommendations derived from the targeted effectiveness evaluation. We provide specific recommendations for implementation drawn from considerations offered within Chapters 4, 5 and 6.

Recommendation #1: Adjust PPM and PIP Objectives to measure program effectiveness

Some of the current PPM are misaligned with current program design do not provide metrics against which to determine if the program is performing as expected or not. For example, the IOUs and CPUC should consider removing project technical potential as a PPM and focusing on claimed savings achievements due to measure transfer into the IOU EE portfolio. Additionally, revised metrics may better support CPUC guidance if they are focused on technology-specific achievements for measure transfer as well as for market readiness. For example, current end-use alignment with CEESP is tracked at a project level, rather than technology level. Due to this, the same technology could be accounted for in multiple projects.

Additionally, PIP objectives are substantially overachieved year over year. For example, ETP has consistently overachieved objectives since 2010-2012. These include number of projects initiated, by sub-program, and end-use area, etc.

Revising metrics to align objectives with past achievements and incorporate more useful assessments of achievement will support program assessment. We suggest that the IOUs and CPUC work collaboratively to:

- Agree on objectives of the program and how to document and track outcomes,
- Shift objectives and metrics to reflect technology, rather than project, activities,
- Identify and implement adjustments to track achievements.

Once established, we recommend that the IOUs propose metrics and how they will track them moving forward. Metrics and objectives should align with anticipated program outcomes, be measurable, follow CPUC guidance, and support program oversight by the CPUC. Literature review[92] and ET-like program metrics can provide additional support for developing relevant metrics.

Recommendation #2: Improve tracking of three program parameters of interest– project status, project adoption, and measure transfer

The ETP data tracking and reporting quality continues to limit the CPUC's ability to provide oversight on ETP activities, or evaluation of program effectiveness. In support of improving tracking, we recommend four efforts to support program oversight:

[92] Example site for developing metrics: http://www.orau.gov/pbm/documents/overview/uc.html

- Improve ETP data tracking and reporting quality for status variables
- Clarify time frames for adoption to enable annual and cumulative tracking of adoption to EE portfolio
- Assure measure codes are in place within the ETP database and accurately match measure codes in the savings database
- Investigate the benefits of capture information of custom projects needed to support claimed savings assessments.

Chapter 4 provides detailed considerations for implementing these recommendations.

Recommendation #3: Launch a moderate-length pilot initiative (perhaps 2 years) within ETP to create and execute a statewide "strategic technology plan"

Consistent with regulatory guidance,[93] ETP could benefit from shifting from a project-level to technology-level focus, increasing statewide coordination on a technology by technology basis, and increasing the use of tactics that investigate and address market readiness. However, this approach first needs to be tested out to be sure it is a workable solution for California.

We recommend that the pilot should be performed for a technology of sufficient interest to warrant multiple projects, which will allow for full implementation of this type of approach – perhaps a technology whose projects would cover 5% of the overall ETP budget for two years. As part of this effort, we recommend that:

- The IOUs work with the CPUC to define and set annual goals for outcomes of the pilot
- For a specific technology, we recommend:
  - Methodically determining all barriers for that one technology by explicitly identifying technical and market barriers as part of a coordinated tactic selection process
  - Collaborating across the four IOUs to address barriers that can be cost-effectively and feasibly addressed
  - Collectively identifying appropriate technical- and market-readiness projects and distributing them to one or more IOUs for execution, as interest, budget, climate, and other IOU-specific characteristics allow. Additionally, for those barriers that ETP is unable to address, identifying other entities within the IOUs that are better positioned to address them.

Recommendation #4: Increase attention paid to market barriers.

ETP's current approach emphasizes projects that target barriers to technical readiness (e.g., reducing savings uncertainty). IOU decision makers inside and outside of ETP will be more likely and better able to address market readiness if an effort is made to gather more information on market barriers. As an entity that scouts and assesses new technologies, ETP is well placed to identify market barriers, investigate them, address some,

[93] The regulatory guidance is interpreted from R.09-11-014, which presents challenges from the PY2010-2012 program cycle, is that 'the current program design is that there is no clear mapping of program activities (as reflected in the PIP) to target specific markets and end-uses particularly to achieve the Zero Net Energy goals of the Strategic Plan. In other words, program budgets and activities are allocated by program elements and do not necessarily link pre-defined sets of technology development milestones to advance the Strategic Plan." pp. 260.

and share information on them within the IOUs so that other entities can address them. ETP already takes some actions to understand market barriers, but those practices are not consistent across the IOUs and are not applied systematically. The evaluation team believes that expanding these practices in a consistent and systematic way represents a "no-regrets" option that can increase confidence that ETP – and the other entities within each IOU – are optimally addressing market readiness within the existing framework. The practices recommended for expansion and systematic implementation include:

- Explicitly identify technical *and* market barriers as part of the tactic selection process and articulate them in planning documentation (e.g., scanning and screening tools). As appropriate, ETP can respond to market barriers by investigating them further or referring them to other entities within the IOUs.
- Survey market participants (i.e., customers and suppliers) during field evaluations and scaled field placements, on their interest in, experience with, and ability to deploy the technology being studied, when reasonable.
- For all performance validation projects (lab evaluations, field evaluations, and scaled field placements), explicitly articulate opportunities (such as surveys) for gathering information on market barriers in the planning documentation and include a section on market barriers in all performance validation project reports to encourage the gathering and reporting of that information.

Recommendation #5: Make improvements to ETCC website navigability and content to support ETP dissemination efforts.

The PIP objectives cite the importance of external dissemination to increase market knowledge of products. However, the ETCC website, despite being useful for respondents, could improve some aspects related to content and navigability. The following considerations support implementation of this recommendation:

- Enhancing website navigability, particularly by improving users ability to find/search for reports and to sort reports by categories as well as make it easier to find the technology proposal submission link.
- Improving website content specifically related to IOU technology priorities, case studies and testimonials, as well as offer links to more current or relevant technology websites.

This concludes our targeted effectiveness study of the PY2013-2014 California Emerging Technologies Program. Volume II of the report includes the following appendices:

- Appendix A: Data Collection Instruments
- Appendix B: PPM and PIP Objectives
- Appendix C: Detailed Aggregate Analysis Information
- Appendix D: ETP Tactic Definitions
- Appendix E: Technology Analyses
- Appendix F: Peer Program Descriptions
- Appendix G: Emerging Technology Programs Considered
- Appendix H: ETP Projects Used for Analysis

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