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Market Studies Needs Assessment

Final

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To: Parties to R. 13-11-005 and other interested stakeholders

Fr: Cathleen Fogel, Energy Division

Subject: Market Studies Needs Assessment – Energy Division response to recommendations

Energy Division has reviewed and approved the Market Studies Needs Assessment prepared by Opinion Dynamics and has considered its recommendations to Energy Division for short-term market studies priorities (see Table 1 below, and page 21 of the report). In general we concur with these recommendations- with some exceptions-- and are considering them as part of our 2015 EM&V Roadmap Update process. This memo reviews the market studies, or similar studies, that we will initiate using 2013-14 Market Studies funds in the short term and outlines our process to address the additional recommendations going forward.

1. Short Term Market Studies Recommendations

Energy Division generally supports moving forward with the following recommended studies, and is further exploring the timing and leadership for management of these studies in the sector-based EM&V Project Coordinating Groups (PCGs) going forward:

- Commercial Market Refrigeration Market Characterization
- Commercial Plug-in Lighting
- Commercial Boilers Market Characterization
- Residential Hot Water Market Characterization
- Residential Decision Making
- Residential Wants and Needs

We are considering these studies against other priorities for funding in 2015.

We are not considering the following studies at this time:

- Commercial HVAC market characterization

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- MIDI Barriers Assessment and Market Characterization
- LED Quality Market Assessment

Our assessment is that we currently are managing a large number of HVAC studies and do not have the bandwidth to manage an additional study in 2015. We will reconsider this recommended study in 2016. Our assessment is that a Middle Income Direct Install (MIDI) study is not needed at this time, as the Investor Owned Utilities (IOUs) have already accomplished the basic requirements indicated for this program via Commission decision. We are also not considering the LED Quality Market Assessment in 2015 while we launch other priority studies, including the suggested Commercial Plug-in Lighting study. We will reconsider the recommended LED Quality Market Assessment study in 2016.

Table 1. Suggested Short-Term Market Studies

| ID | Study Name | Description | Sector | Study Type |
|----|--|--|------------|--|
| 1 | Commercial Refrigeration Market Characterization | This study would explore, characterize, and assess the market for commercial refrigeration equipment. It would examine the commercial display case and remote refrigeration supply chain to ascertain where an energy efficiency intervention would work best. | Commercial | Market Characterization |
| 2 | Commercial HVAC Market Characterization | This study is a targeted market characterization of the markets for commercial air conditioners, heat pumps, and evaporative coolers. The study would include a characterization of both the primary (retail) and secondary (used equipment) markets for these measures, with particular attention to barriers to adoption for ACs and heat pumps. For evaporative coolers, the study would also include an assessment of market share, characterization of the supply chain, and an assessment of the trade-off between energy and water use. | Commercial | Market Characterization, Market Assessment |
| 3 | Commercial Plug-In Lighting Study | The study would analyze data from the most recent CMST/CSS study to determine the extent of lighting plug-load in commercial buildings. If a substantial contributor to commercial lighting load, this study would examine the market for commercial lighting plug load and opportunities for energy use reduction. | Commercial | Market Assessment |

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| ID | Study Name | Description | Sector | Study Type |
|----|--|---|---------------|--|
| 4 | Commercial Boilers Market Characterization | This study would characterize the market for commercial boilers and opportunities for energy efficiency interventions. | Commercial | Market Characterization |
| 5 | Residential Hot Water Market Characterization | There has been an IOU-specific study with useful information. If the study has not been shared with other IOUs, this study would describe the market for residential hot water energy efficiency measures, and identify opportunities for energy efficiency interventions, including market-based approaches. | Residential | Market Characterization |
| 6 | Residential Decision-Making Study | This study would examine how residential consumers make purchase and energy-use decisions. | Residential | Market Characterization |
| 7 | MIDI Barriers Assessment and Market Characterization | This study arises from D.12-11-015 (ordering paragraph 26), whereby the CPUC indicates a desire for doubling the participation of the Middle Income Direct Install (MIDI) program. This study would determine what barriers exist to increased MIDI participation and the penetration and saturation of energy-efficient products in MIDI homes. | Residential | Market Characterization, Market Baseline |
| 8 | LED Quality Market Assessment | This study is also based on D.12-11-015 (ordering paragraph 30), whereby the CPUC calls for an assessment of LED lamp quality. This study would determine the quality, efficiency, and price point distribution of LED lamps available for purchase in California, and what percent of general service screw-base LED products available for purchase in California meet the CEC quality standards. | Cross-cutting | Market Assessment, Market Baseline |
| 9 | Residential Wants and Needs | This study would be a general population study to determine what services customers want in efficiency programs as well as what benefits (energy and non-energy) they may need before choosing to undertake an energy efficient action. | Residential | Market Characterization |

2. Market Studies Project Coordination Group and Studies going forward

The CPUC established a budget for market studies and a dedicated PCG on market studies in 2012, as part of its 2010-12 EM&V Roadmap. Although a market studies roadmap was prepared and a budget allocated, turnover

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and lack of CPUC staff to lead the market studies PCG delayed its launch until 2014. The primary activities of the Market Studies PCG in 2014 have been to undertake the Market Studies Needs Assessment, to undertake two spillover studies (non-residential and residential), and to consider establishing market actor panels to decrease over contacting-related respondent fatigue amongst key market actors. Consultant advisors to the Market Studies PCG also prepared and published two market transformation white papers, with guidance from CPUC staff.¹

The Market Studies Need Assessment recommended that the CPUC take a structured approach to considering and funding market studies going forward. In developing the report, Opinion Dynamics prepared three sector-based Market Studies Planning tools (see report for description). Opinion Dynamics recommended that the CPUC update these tools regularly, using a centralized process, and that it use them in planning for future market studies.

It recommended the following process (page 15):

1. Update tools (who: Market Studies PCG or sector PCG [yet to be determined by CPUC])
2. Use criteria to prioritize high-level budgets (who: CPUC EM&V management team)
3. Indicate initial high-level budget by sector (who: CPUC EM&V management team)
4. Use tool to prioritize within a sector (who: sector PCG)
5. Complete short budget and summary template for proposed studies, indicating how tool and criteria were applied; include in sector roadmap and submit copy to Market Studies PCG (who: sector PCG)

Going forward, CPUC will respond to these recommendations by:

1. Training sector PCG leads on use of market studies planning tools to determine their usefulness.
2. If deemed useful, we will identify an update process and funding mechanisms in the future.
3. Sector PCGs will identify market studies priorities as part of their sector PCG work, and sector PCG leads (ED or IOU) will manage the selected studies.
4. Budget for market studies will be allocated to sector PCGs as part of the periodic budget cycle updates, working through the Market Studies PCG and/or use of contingency funds only as needed.
5. In 2015, we are allocating Market Studies budget to the retention of specialized markets experts (consultants) to advise the sector PCGs on an as-needed basis.
6. Assigned CPUC staff and consultants will also continue to develop the market actor panel concept and support application of this approach to specific study areas (whole house contractors; finance market

¹ "Building a Policy Framework to Support Energy Efficiency Market Transformation in California," Ralph Prah and Ken Keating, December 2014. "Guidance on Designing and Implementing Energy Efficiency Market Transformation Initiatives," Ken Keating, December 2014.

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actors; HVAC contractors) as needed. At present, the whole house study area is moving first to explore development of a market actor panel approach.

CPUC staff question the wisdom of the continued management of market characterization studies by CPUC rather than IOU staff. IOUs are program administrators who most need to understand the markets their specific programs are attempting to influence. CPUC staffs already have extremely limited bandwidth due to heavy workloads and unlike the IOUs, the CPUC is restricted from freely hiring additional staff due to state budget allocations.

Despite these barriers, CPUC staff and many IOU staff continue to identify a strong need for improved market knowledge to guide energy efficiency and integrated demand management programmatic interventions. Therefore, CPUC staff will discuss the future budget allocation and management structure of EE market studies with the IOUs in our PCG 1 group in the near future. We can also discuss this topic with stakeholders at our Quarterly EM&V Stakeholder meetings, if there is interest.

We recommend reducing Market Studies PCG activities to a minimum in 2015, focusing primarily on four areas:

1. Completion of the non-residential and residential spillover studies
2. Coordination of the provision of specialized market experts to sector PCGs, as requested
3. Coordination of market actor panel approaches as they develop (whole house/finance first)
4. Discussion and coordination on markets policy or larger issues as needed

In this latter category, the Market Studies PCG *may* be the appropriate place to begin coordination on further CPUC-IOU and stakeholder consideration of the market transformation white papers published in 2014. Market transformation is included within Phase III of the energy efficiency proceeding (R. 13-11-005), along with many other topics. As desired by stakeholders and the Administrative Law Judge to R. 13-11-005, the Market Studies PCG could plan and initiate stakeholder workshops or further research to inform this upcoming item.

We will also explore terminating or suspending the Market Studies PCG in 2015 and transitioning some or all of activities 2 – 4 above to the PCG 1 – CPUC and IOU EM&V Managers, as only this group has the authority to make certain coordination decisions about EM&V work. In this case, the current spillover studies would revert to PCG 3 coordination approach (ie, a study-specific PCG).

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1. Introduction

In this report, Opinion Dynamics presents a framework for determining California Public Utilities Commission (CPUC) and investor-owned utility (IOU) energy efficiency market study needs and priorities for the next five-to-10 years. The report describes the process of developing a market studies tool to identify current gaps in market knowledge for high-priority end-uses, and provide a means by which future market needs can be determined. We also put forth a prioritization method for choosing among market studies, and, using the prioritization method, we suggest several short-term studies that the IOUs or the CPUC may want to conduct in the next one-to-three years to address existing research gaps.

1.1 Market Studies within California

For decades, California IOUs, the CPUC, and the California Energy Commission (CEC) have engaged in studies to understand various energy efficiency markets. Fifteen years ago, there was a concerted effort to understand available baseline data and the usefulness of existing data with respect to use within evaluations.² Shortly after that study, the focus of energy efficiency programs moved away from market transformation and toward resource acquisition, with fewer market level studies undertaken. Since then, an understanding of markets has grown in importance, and the energy efficiency programs within California have expanded greatly. Toward that end, the CPUC chose to create a structured framework based on data that helps to focus research needs. We hope that the framework put forward in this report serves as a starting point for others to improve the information gathered herein and tailor the framework to fit the specific needs that will arise over time.

1.2 Study Objectives and Methodology

CPUC Energy Division staff requested the research presented in this report in order to answer the three questions in Table 2.

Table 2. Research Questions and Data Collection Tasks

| | Market Studies Needs Assessment Research Questions | Data Collection Task |
|----|--|---|
| 1. | Within which markets does the CPUC already have good data? | Literature Review Stakeholder Interviews (n=23) ^a |
| 2. | Which market studies are worthwhile for the CPUC to undertake, and what is their relative priority? | Stakeholder Interviews |
| 3. | What is an appropriate framework for conducting market study research, and what are the structural and communication requirements of such a framework? | Stakeholder Interviews Secondary Review |

^a Appendix B provides a description of the 23 stakeholders interviewed.

To answer the research questions, we deployed two main data collection activities (as shown in Table 2), and performed structured qualitative analysis to arrive at findings.

² XENERGY, Inc. and Hagler Bailly. *Compilation and Analysis of Currently Available Baseline Data on California Energy-Efficiency Markets*. 1999. (Funded with California Public Goods Charge Energy Efficiency Funds).

1.2.1 Secondary Review

Opinion Dynamics reviewed several documents to support the analysis and eventual creation of tracking tools (in Excel format). We describe these tools in Section 2.2.2.

Energy Efficiency Potential

Staff at the CPUC are methodically using the research on energy efficiency potential to guide the statewide portfolio of programs. As stated in the executive summary of the latest potential study,³ “The Analysis to Update Energy Efficiency Potential and Goals for 2013 and Beyond” is a statewide assessment of energy efficiency potential, which considers key policy mechanisms that California is employing to drive the energy efficiency market. It serves several important roles in the state regulatory framework:

1. To provide guidance for the utilities’ 2015 energy efficiency portfolios
2. To update the forecast for energy procurement planning
3. To inform strategic contributions to California’s greenhouse gas reduction targets
4. To inform the development of benchmarks for efficiency savings and performance incentives⁴

As with most potential studies, the analysis provides data on technical, economic, and market potential across several sectors, end-uses, and measures. Additionally, the study brought in various risk levels to attempt to handle future unknowns, called low, mid, and high values.

There are multiple permutations possible for data from the 2013 Potential and Goals (P&G) study, and the public can use the data tool available to work through these different permutations.⁵ Opinion Dynamics obtained the Analytica⁶ data tool available from the CPUC website, and maintained all default values present when opening up the tool. For market potential, the P&G study presents three scenarios for market penetration of measures: high, medium, and low. We use the market potential for mid-level values (excluding codes and standards) within our analysis, although future updates to the market studies may choose different parameters within the study as the source of potential. Appendix D shows the default inputs used within our analysis.

Areas of CPUC Policy Guidance

The CPUC has been providing guidance regarding energy efficiency programs for decades. Opinion Dynamics reviewed the most relevant decisions from the past two program cycles to understand where the CPUC provided explicit guidance, and how that guidance may affect market studies. While there are many specifics about exactly what the CPUC eventually orders within these decisions, we pulled out 17 specific ordering

³ Navigant, Heschong Mahone Group, Sound Data Management. *2013 California Energy Efficiency Potential and Goals Study*. February 2013.

⁴ *Ibid.*, page 13.

⁵ <http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Energy+Efficiency+Goals+and+Potential+Studies.htm>.

⁶ The Analytica modeling tool contains the data and performs the calculations used by Navigant to develop the savings forecasts.

paragraphs across the three reviewed decisions that had a high relationship to market studies. Appendix E shows the full list of these ordering paragraphs, along with the market study context.

1.3 Terms and Definitions

Although organizations in California and elsewhere have been researching markets for energy-efficient goods and services since the 1970s, there is no agreement on the definitions of commonly used terms. For clarity, and to provide context for discussing market study needs, we define the types of market studies, articulate reasons for undertaking research, and specify the various levels at which to conduct research.

Market Study Definitions

In order to help the CPUC and IOUs plan for future energy efficiency market studies, we have developed the following classifications to categorize the types of market research and reasons why the CPUC or IOU would be interested in conducting it. Opinion Dynamics, along with Ralph PrahI, presented this classification to the California Market Studies Program Coordination Group⁷ (MS PCG) in a memo on March 7, 2014. Since then, we have received comments from the PCG members, and are working to finalize a study list. The classification below represents the most complete study definitions at this time.

Defining a “Market”

We start with a broad definition of a market:

A market is an economic system where a particular good or service is transacted between entities offering them and those seeking to purchase them. A market consists of customers, manufacturers and other suppliers, channels of distribution, and transactions.

In this context, a “market study” refers to any study focused systematically on understanding an entire market or any part of a market (i.e., the customers, suppliers, channels of distribution, or transactions). A market study can focus on a single “good” or “service” (such as air conditioners or quality installation), or be broad and encompass the goods and services available within a sector.

Types of Market Studies

The CPUC expects that the study definitions provided herein can be included in future studies, and will potentially help the study labels to be more consistent going forward. There is full expectation that some of these labels may change over time as the collective evaluation, measurement, and verification (EM&V) community attempts to use the definitions.

⁷ This group consists of CPUC staff and representative from each of the four investor-owned utilities. The PCG meets monthly, and occasionally other entities participate in the meetings.

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Below we present a set of five main market study definitions and one subset of a definition. The main differentiation point between these five studies is that two of them are descriptive (market characterization and market tracking), while the other three are evaluative. Other than that, the categories are not mutually exclusive, and many studies could fall into multiple categories, depending on the research questions. We hope that these categories will help differentiate studies based on the authors' intended objective(s). The uses and study elements provided below are typical for market studies, and do not indicate the full population of uses and elements within these different studies.

Market Characterization

- **Definition:** A study that describes the market for an energy-efficient good or service, usually with respect to a program intervention.
- **Uses:** To decide whether or how to intervene in the market.
- **Study Elements:** Includes some of the following: geographic territory of market being studied; market size (number of customers and suppliers possible for the good or service); supply-side structure and operation; how/when decisions are made; perceptions of product advantages; and barriers to adoption.

Market Characterization—Customer Market Research (“Wants and Needs”)

We include this subset study of market characterization in response to internal discussion and feedback from the PCG. While this type of research can occur within a market characterization, a study with this name would let potential readers know that it focuses solely on consumers and how they may interact with a program or product.

- **Definition:** A study to describe customer needs and desires for a particular good or service. Examples include how customers are using a product or service, what customers value, and customer attitudes.
- **Uses:** To understand how to design a new program or refine an existing program.
- **Study Elements:** Includes research such as the segmentation of customers in terms of awareness, knowledge, attitudes, usage and/or behavior, with specific recommendations on what interventions may work best within the customer segment.

Market Assessment

- **Definition:** A study that evaluates a market or market attribute against some stated criteria.
- **Uses:** Used to assess the market in terms of its lifecycle, status of customer adoption or utilization, new versus older technology solutions, and remaining market potential.
- **Study Elements:** Examines one or more variables of interest or performance, such as market share (of a given product versus its competition or non-energy-efficient equipment), installation rates, or a technology assessment focused on assessing market conditions.

Market Baseline

- **Definition:** A study that evaluates a market or product attribute at a point in time, for future reference and comparison.

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- **Uses:** Used either before an intervention is initiated, or at some well-defined point considered significant, such as the start of a program cycle. Typically conducted with the intention of later revisiting the market to study change in the market from its baseline condition (i.e., to evaluate the effect of an intervention on the market).
- **Study Elements:** May include an examination of market indicators, such as customer adoption rates, market penetration, and market share. May also include a projection of natural market movement (the counterfactual) for use as a comparison in the future.

Market Effects

- **Definition:** A study that evaluates the effects of a program or intervention on the market over a specified period.
- **Uses:** To understand the effects of a program on a market. Program effects may include (but are not limited to) changes in measure pricing, availability, and/or quality.
- **Study Elements:** Includes identifying and verifying the market effects directly attributable to the activities of a given program or initiative. May include comparison against metrics established/assessed in a baseline study.

Market Tracking

- **Definition:** A study that describes specific information on a selected market indicator or indicators at regular intervals using consistent methods.
- **Uses:** To track market progress and maturation.
- **Study Elements:** Includes market indicators, such as equipment-based information, market share, retail price, shelf space, adoption rates, and saturation. Can also include customer cognitive status, such as awareness or specific attitudinal concepts.

Researchers may use different types of market studies at multiple stages in the development of a program. For example, a market characterization could be useful to help prepare for a program by understanding how or whether to intervene in a market. It could also be performed in order to understand how to expand, refine, or end an existing program. The actual decision of which study type to use to answer the research question at hand will need to be decided by the study designer.

2. Market Study Framework

A framework is both a set of parts fitted together and a skeleton or substructure to support something else. Within this study, we expect a market study framework to support ongoing and thoughtful use of research funding. To begin to put in place a logical and structured framework for future market studies, it is important to consider the parts that must fit together. This includes who is involved (the players), knowledge across multiple markets (including potential, where the CPUC is providing policy guidance, and knowledge gaps), and research maintenance logistics. Additionally, a schematic that explicitly provides market knowledge and policy guidance can be a useful tool for maintaining ongoing use of research funding.

2.1 The Players

The desire for information about the markets for energy-efficient goods and services varies somewhat for the different entities involved. Regulators are very interested in market information for planning and oversight, while implementers need information they can use to improve program delivery. Below we list the primary entities who are consumers of or who interact with market studies.

Table 3. Organizations Interacting with Energy Efficiency Market Studies in California

| Player/Group | Role in Energy Efficiency | Interaction with Market Studies |
|---|--|---|
| California Public Utilities Commission (CPUC) Energy Division | Sets the energy efficiency portfolio savings targets, approves budgets, and identifies new programmatic areas of interest. Oversees impact evaluation of programs and some market studies. | Staff identify the impact evaluation needs, and plan for and conduct the evaluations. This may include market effects studies as well as saturation studies such as CMST and CLASS. |
| Investor-Owned Utilities (IOUs) | Administer and implement the energy efficiency programs. | IOU EM&V, strategic planning staff: perform some market research in support of program planning needs. |
| | | Program staff: conduct a small amount of targeted research with program funds. |
| California Energy Commission (CEC) | Funds early-stage R&D for energy efficiency, sets energy efficiency codes and standards, conducts other statewide energy efficiency research | Use potential study data for forecasting energy needs within California. |
| California Independent Systems Operator (CALISO) | Maintains the energy across the grid. | CALISO and the CPUC are engaging with the CEC to forecast energy and demand. Additionally, these groups are beginning to discuss locational energy needs. Market studies may be a useful input for some of their efforts. |
| Non-IOU Program Implementers | RENS, LGPs, third-parties implement non-IOU core energy efficiency programs. | Not clear if they do market research of their own, but if so it is likely minimal. Implementers appear to rely more on published statewide research on CALMAC. |

As shown in Table 3, there are many “players” involved with market studies. The logistics involved with this framework must account for the various roles and interactions among these groups.

2.2 Market Knowledge

To understand where good information does and does not exist for a particular technology group, Opinion Dynamics conducted a literature review of existing market studies. This included both past studies and those planned within the 2013-2014 cycle. However, identifying the need for and planning of energy efficiency market studies required the compilation of information from a variety of sources beyond past studies. These sources represent the best information available at this time, and are data points that CPUC and IOU staff can update as changes occur moving forward. Table 4 shows that future updates and choices around market studies need to include multiple sources of data.

Table 4. Framework Data Sources

| Framework Data Source | Specifics |
|---|--|
| 2013 Energy Efficiency Potential and Goals Study | Market Potential, Mid-Value IOU savings (excluding Codes & Standards) |
| CPUC guidance on policy, program, and evaluation priorities | D.09-09-047: Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets. D.12-05-015: Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education, and Outreach. D. 12-11-015: Decision Approving 2013-2014 Energy Efficiency Programs and Budgets |
| Composition of the current energy efficiency program portfolio at a specific date | February 2014 Monthly Reports from http://eestats.cpuc.ca.gov/ |
| Knowledge needs of program implementers | Interviews with stakeholders performed by Opinion Dynamics in the first quarter of 2014 (n=23) |
| Past completed market studies | Literature review |
| Market studies currently underway | Public site of evaluation studies within California (http://www.emvpsr.com/Projects/) |

2.2.1 Looking for Market Knowledge Gaps – Inventory of Market Studies

To understand where there are possible knowledge gaps, the collective knowledge residing in the sector-specific Program Coordination Groups (PCGs) is a good start. However, there have been more than 100 market studies completed in the past decade, and researchers plan to complete at least another 30 in the next few years. The number of studies by themselves makes it difficult to keep track of what is known and unknown, especially as new people move into PCGs. Additionally, these past studies have multiple purposes, and what becomes even clearer upon reading the specifics of each study is the lack of a defining paradigm for the purpose of the data. While the past studies may have been well crafted individually, the sheer disparity of data across them made categorization of information type extremely difficult (if not impossible).

To understand where gaps in knowledge are occurring, some sort of categorization must be conducted. Ultimately, we chose to align studies with the group about which the study was collecting data (i.e., consumers, designers, etc.), as well as a broader set of groupings, such as “energy savings.” A single study can cover multiple groups. Table 5 shows the categories from our qualitative analysis, along with the sector where we found studies covering the specific category. We recommend continuing a categorization scheme such as the one shown below to help understand future knowledge needs and to appropriately scope market studies.

Table 5. Categorization of Past Market Studies Data

| Sector | Category ⁸ | Market Information within This Category |
|---|-----------------------|--|
| Residential, Commercial | Savings | Potential savings, sometimes incremental measure cost |
| Residential, Commercial, Industrial, Agricultural | Consumer | Information about the consumer (size, wants, needs, etc.) |
| Residential, Commercial | Retailer | Information about the retailer (size, how they work with consumers, etc.) |
| Residential, Commercial | Sales | Sales information (sometimes by efficiency) |
| Residential, Commercial | Property Managers | Information about the property manager (wants/needs, AKAB, etc.) |
| Residential, Commercial | Contractor | Contractor wants/needs, attitudes, market size, etc. |
| Residential, Commercial | Manufacturer | Manufacturer attitudes, size, etc. |
| Residential, Commercial | Supply Chain | Report includes information about the entire supply chain for product, may have barriers and opportunities |
| Commercial | Designer | Designer wants/needs, attitudes, market size, etc. |
| Commercial | Distributor | Distributor wants/needs, attitudes, market size, etc. |
| Commercial, Residential | Penetration | Number of buildings with at least one instance of a technology (i.e., buildings with at least one CFL) |
| Commercial, Residential | Saturation | Percent of efficient items based on all possible installations of item (i.e., sockets with CFLs) |
| Commercial | Technology | Report discusses information about specific technologies and their application, but no specific consumer information |

As can be seen from some of these broad categories, such as “Consumers,” there can be wide-ranging data gathered across the studies, from how many consumers are within a market, to their specific needs for energy efficiency. To make the best use of this information, Opinion Dynamics created schemata within Excel (described in Section 2.2.3) that shows the number of studies by technology group and market category. Within the Excel files, each of the completed market studies has the categorization by technology as well to quickly find each study. However, once the study is chosen, a researcher must read the study to determine if the specific piece of data they desire is included.

2.2.2 Determining Relative Importance - Savings Potential and Program Focus

To determine areas of importance for future studies, we reviewed market potential for future savings, current program activity, and CPUC guidance.

For savings potential, we pulled data from the Analytica model used to develop savings forecasts in the 2013 Potential and Goals (P&G) study conducted by Navigant. We utilize the categorization of measure groups and

⁸ We developed this list from a review of past studies, based on the type of information provided within the studies. Some of the categories are types of market actors, some structural features of the market, sales indicators, or non-market elements (such as savings). Historically, there is no consistent rubric by which the type of information within studies are categorized. We provide the list of data within studies here, as they were the starting point to help us determine where there may need to be further data gathered through future studies.

end-uses in the P&G study so we can compare program activity and measure-level market knowledge. Therefore, the basis for the approach in the market study tools is the CPUC program types (whole house, codes and standards) and measures groupings (HVAC or lighting). We employed this categorization around measures, program interventions, and end-uses primarily because it allows for the maximum use of the information in the P&G study.⁹

For current program activity, we pulled data from the monthly reports of unverified claimed energy savings available at the CPUC's energy efficiency statistics website: <http://eestats.cpuc.ca.gov/>.

We reviewed past Commission decisions on energy efficiency for guidance on specific measures or program areas of focus. These are contained in Appendix E.

2.2.3 Combining Market Knowledge with Relative Importance – Market-Level Schemata

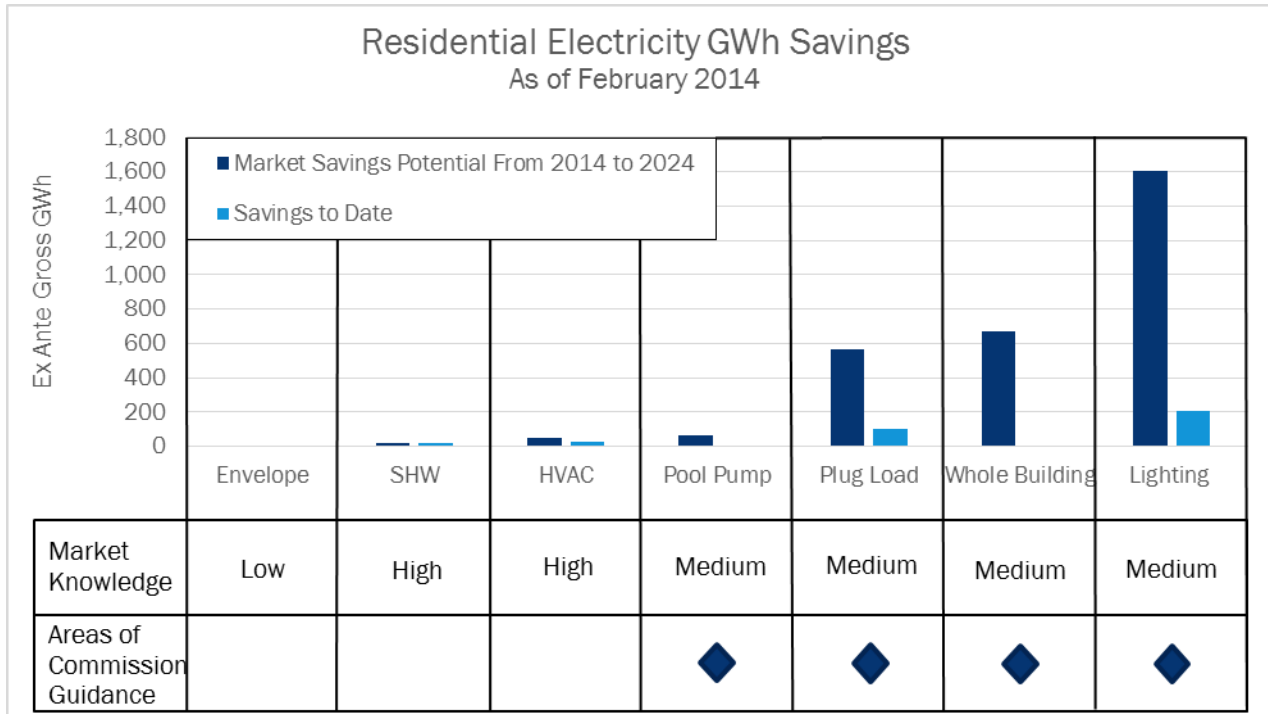
Understanding gaps and trends in information is often best facilitated through visual representation of data. To allow the reader to readily see where future market studies are likely needed, we have developed graphical schemata displaying the information on savings potential, CPUC guidance, current program activity, and existing market knowledge. Within each Excel file, we use the underlying data from the research described in Sections 2.2.1 and 2.2.2 to roll up to a summary of information (Figure 1), as well as a more detailed set of data (Figure 2).

While the schemata draw on the data currently in the Excel-based tool, we have designed the files to be easy to update as new information becomes available. For example, if two years from now, staff wish to understand how much gas savings potential remains for energy-efficient clothes washer measures, the tool can be updated with the IOU program activity (IOU ex-ante gross savings to date) values for the last two years. Compared to the total savings potential for clothes washers over a 10-year period, the user can determine how much potential remains. Additionally, new P&G data can also be updated as they become available to facilitate potential from new and more nuanced data from the P&G study.

To help the user identify specific opportunities by end-use, we have constructed separate files for the Residential, Commercial, and Agricultural/Industrial sectors. The figures below are examples from the Residential sector file.

⁹ We note that the measure-level approach to market potential (used in the P&G study and utilized in our market study tools) is similar to, but not synonymous with, actual markets for energy-efficient goods and services. Instead, a true market-based classification system would likely characterize products by customer need, and would vary by sector (e.g., res indoor lighting, commercial exterior lighting, residential heating, etc.).

Figure 1. Example of Summarized Gap Analysis – Residential



The Gap Analysis Summary in Figure 1 presents a high-level summary of the information contained in the market studies tool for the Residential sector. It shows the GWh electric savings potential and current program activity (the blue bars), market knowledge (high, medium, low), and areas of CPUC decision guidance (indicated by a diamond if technology group is mentioned in a CPUC decision). Market potential is from the P&G study model outputs, and Savings to Date is from current programs from IOU monthly reports of unverified, claimed savings posted to the CPUC’s statistics website, <http://eestats.cpuc.ca.gov/>. Level of market knowledge is a qualitative assessment determined by the number of existing market studies in the inventory described in Section 2.2.1.

We should note that while Figure 1 provides a good high-level summary of the information contained in the sector-specific tool, there are difficulties with this particular graphic. One of the most notable is the lack of IOU savings to date for Whole Buildings.¹⁰ Whole Buildings is an important focus of current programs and a category for which the 2013 P&G study demonstrates high market potential over the next 10 years from residential zero net energy new construction. Unfortunately, the monthly IOU data available on the CPUC’s EE statistics site does not report savings at the Whole Building level. This will likely remain an area of non-comparability until the CPUC changes its reporting template or other research becomes available.

Figure 2 is the most detailed graphic, and combines market potential, CPUC guidance, current cycle program activity, and level of existing market knowledge (based on the inventory of existing market studies). The

¹⁰ The Savings to Date are the ex ante gross impacts provided in the monthly reports by the IOUs.

Market Study Framework

columns in the graphic show end-use by technology group, while the rows display the information for each end-use collected from the data sources reviewed.

In Figure 2, we have shaded each cell to denote relative importance. The intention is to allow the reader to look at the graphic and be able to compare dark and light areas to understand the need for future market studies. Darker cells are those where more information exists, or where there is higher potential savings. Lighter cells are those with low potential, or where there exists little-to-no market information. While we provide the specific values within each cell, they are hidden in the Excel tool for potential and claimed savings, to facilitate looking to the shading for relative meaning compared to the other values in that category. For example, the basis for shading within potential is the percentage of overall savings potential achievable by energy efficiency upgrades for that end-use. For market knowledge, dark cells are those where four or more studies have addressed market potential for that end-use and market knowledge area (e.g., consumers, contractors, manufacturers). We also include the total number of completed market studies for each end-use, and the number of those that are currently underway as part of the evaluation of the 2013-2014 programs.

To use Figure 2 to understand where additional market study is needed most, the user should identify an end-use (such as appliances, LED, insulation, etc.), and compare the shading above and below the dotted red line. Cells above the dotted red line indicate areas of potential or CPUC guidance, whereas cells below the dotted red line indicate current knowledge level. End-uses most likely in need of future study are those that have high relative importance (dark cells above the dotted red line) but low market knowledge (light colored cells below the red line). Market knowledge is qualitatively determined based on the number of studies available for that measure group, as drawn from the market studies inventory.

Figure 2. Example of Detailed Gap Analysis Schema-Residential

| Relative Importance | | Residential Building System | | | | | | | | | | | | | | | | | | | | |
|---|-------------------|-----------------------------|----|--------|---------|----|---------------------|----------|--------------|------------------|----------|---------|----------------------|-----------|------------|----------------|------------|--------------|--------------|----------------|-----------|--|
| | | Envelope | | HVAC | | | | Lighting | | | | | | Plug Load | | | | | | SHW | Other | |
| | | Insulation | AC | Cooler | Furnace | HP | Compact Fluorescent | LED | Halogen Lamp | Occupancy Sensor | Seasonal | Fixture | Consumer Electronics | Computer | Appliances | Clothes Washer | Dishwasher | Refrigerator | Water Heater | Whole Building | Pool Pump | |
| Market Potential (Gross - 2014 to 2016) | Electric (GWh) | | | | | | | | | | | | | | | | | | | | | |
| | Electric (MW) | | | | | | | | | | | | | | | | | | | | | |
| | Gas (MM Therms) | | | | | | | | | | | | | | | | | | | | | |
| D.12-05-015 Policy Guidance - Areas of Focus | | | | | | | ◆ | | | | | ◆ | | | | | | | | ◆ | ◆ | |
| Aggregated End Use Gross Ex Ante Savings (As of 2/2014) | Electric (GWh) | | | | | | | | | | | | | | | | | | | | | |
| | Gas (MM Therms) | | | | | | | | | | | | | | | | | | | | | |
| Knowledge Gaps | Market Knowledge | | | | | | | | | | | | | | | | | | | | | |
| | Completed Studies | 1 | 12 | 2 | 4 | 1 | 15 | 3 | 0 | 0 | 0 | 0 | 8 | 0 | 1 | 4 | 4 | 8 | 4 | 7 | 1 | |
| | Studies in 13-14 | 0 | 3 | | | | 0 | | | | | | 0 | | | | | | 0 | 1 | 1 | |
| | Consumer | 1 | | 1 | 1 | | | 1 | | | | | | | 1 | 1 | 1 | | 3 | 3 | 1 | |
| | Contractors | | 3 | | | | | | | | | | 1 | | | | | 1 | 1 | 2 | | |
| | Distributor | | | | | | 1 | | | | | | | | | | | | | | | |
| | Manufacturer | | | | | | | | | | | | 1 | | | | | | | | | |
| | Penetration | | | | | | | | | | | | | | | | | | | | | |
| | Property Manager | | | | | | | | | | | | | | | | | | | 2 | | |
| | Retailer | | | 1 | | | 3 | 1 | | | | | 2 | | | | | 2 | | | | |
| | Sales | | 3 | | 1 | 1 | | 2 | | | | | | | | 3 | 3 | 3 | | | | |
| | Saturation | | | | | | | | | | | | | | | | | | | | | |
| | Savings | 1 | 3 | 2 | 3 | | 3 | | | | | | 3 | | | 1 | 1 | 1 | | | | |
| Supply Chain | | | | | | 1 | | | | | | 1 | | | | | | | | | | |
| Qualitative Assessment of Market Knowledge | | L | H | L | M | L | H | M | L | L | L | L | H | L | L | M | M | H | M | H | L | |

For example, the end-use “Computer” has high market potential for electricity and gas (shown by the very dark cells at the top of the Computer column), and low market knowledge (shown by the white cells below). However, computers are also Consumer Electronics, which has a high level of market knowledge. The market studies under Consumer Electronics include computers, so this shows that Computer is an area that does not need additional market studies.

The end-use “Insulation” has more complexity. Insulation shows high market potential for gas savings, moderate savings potential for electric MW, and low savings potential for GWh. Looking down the Insulation column at market knowledge, we can see a market study in the inventory that contains information on insulation consumers and savings.¹¹ Because not much is known about insulation contractors, manufacturers, or retailers in California, further study of the market in these areas might allow for the design of a new program or program intervention to capture the high gas savings for this end-use.

For furnaces, there are both high gas savings potential and moderate program activity. The IOUs are making strides in the larger grouping of HVAC therms in terms of claimed savings, as shown by the medium color gray (moderate) for Aggregated Gross Ex Ante Savings. There are four completed market studies in the inventory, with three additional studies planned for the 2013-2014 evaluation cycle. This is reflective of a medium level of market knowledge relative to the other end-uses in the graphic. Because the completed market studies contain information on consumers, sales, and savings, an additional study might focus on contractors, distributors, or retailers, and might enable program administrators to refine their furnace offerings.

While the examples in this section are from the Residential market study tool, we have also created tools and graphics for the Commercial and Industrial/Ag sectors. Each of the three tools contains the same source information, but most of the graphics are sector-specific. Within the tools, we provide additional charts and figures, with iterations for GWh, MW, and therms.

The CPUC and Opinion Dynamics presented the market studies tools¹² to the public for comment during three 90-minute webinars in July and August 2014.

2.3 Logistics to Maintain Ongoing Research

As noted in Table 3, there are many potential interested stakeholders for market studies. Additionally, these studies do not occur in a vacuum, but are part of a much larger set of evaluation studies undertaken by the CPUC and IOUs.¹³ Therefore, the logistics are an important component of helping CPUC and IOU staff determine research priorities. Stakeholders should develop future research priorities based on:

1. **A structured process to determine future market studies**
2. **The current and future market needs**, including:

¹¹ We know that these are both from the same study, because the row showing number of completed studies shows only one in the inventory.

¹² The tracking tools are available to the public and are located here: <http://www.energydataweb.com/cpuc/> (use the search term “market studies”).

¹³ For example, there are currently 116 evaluation studies planned or underway as part of the 2013-2014 program cycle.

- An assessment of current knowledge gaps, updated on a regular basis
- An understanding of changes in policy that may affect future knowledge needs
- A determination of the best study types for filling knowledge gaps
- A prioritization of needed studies

Process for Using and Updating the Market Studies Tools

CPUC staff have not yet finalized the process for updating the market studies tool. Below, we have highlighted areas for updates, and made suggestions for a possible approach to this update process.

Updating the Market Studies Tools

To determine current and future market needs, someone needs to maintain the market study tools to reflect current knowledge about market gaps and study area importance. To facilitate this, the Market Studies PCG could be responsible for coordinating biannual updates to the tools, in collaboration with the sector PCGs and CPUC EM&V staff.

Update Triggers

Key triggers for updating the tools include new values from the P&G study for market potential, new information on planned market studies, new policy guidance, and other findings reflective of market study needs.

Updates to the study inventory could occur as often as every six months to correspond to the updates to the EM&V Roadmaps for inclusion of new studies—released or conceived of in the previous half of the year—and current program activity. Like the EM&V Roadmaps, the market studies inventory list and summary graphics are living documents, and will be most useful if they contain the latest information. Based on the current process, we assume that much of the discussion of studies will occur within the sector-specific PCGs.

Table 6. Frequency of Updates to Market Study Tools

| Item | Timing | Responsible Party and Description |
|---|---|--|
| Update market study inventory | Every 6 months | CPUC-IOUs by way of the Market Studies PCG. This would be incorporated into the roadmap updates and include published studies and new study scopes. |
| Update current portfolio activity | Every 6 months | CPUC-IOUs by way of Market Studies PCG. This would involve inputting the latest values from http://eestats.cpuc.ca.gov/ on IOU claimed program activity within the current program period. |
| Assess policy guidance that may affect future knowledge needs | Every 1 year | CPUC-ED, with help from Market PCG to update tools. |
| Update energy savings values in market studies tools | Every 3 years (or when new P&G study is released) | CPUC-IOUs by way of the Market PCG. Updates to the tools would occur following the release of updated values from a new P&G study. |

Using the Tools to Determine Study Priorities

The following is the process by which a group could utilize the market studies tools to determine energy efficiency market study priorities for the CPUC and the IOUs:

Market Study Framework

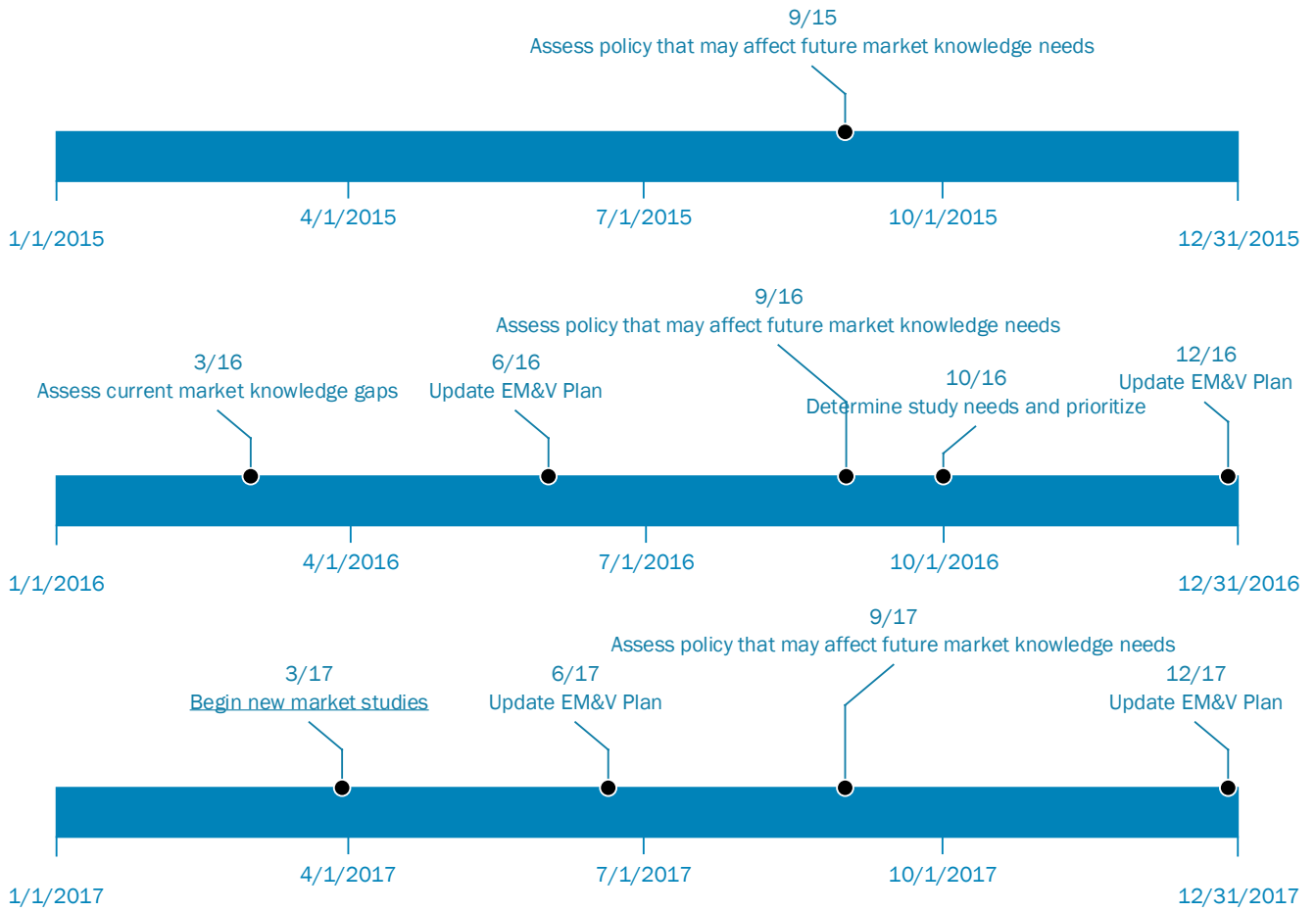
6. Update tools (who: Market Studies PCG or sector PCG [yet to be determined by CPUC])
7. Use criteria to prioritize high-level budgets (who: CPUC EM&V management team)
8. Indicate initial high-level budget by sector (who: CPUC EM&V management team)
9. Use tool to prioritize within a sector (who: sector PCG)
10. Complete short budget and summary template¹⁴ for proposed studies, indicating how tool and criteria were applied; include in sector roadmap and submit copy to Market Studies PCG (who: sector PCG)

As described above, we recommend that updates occur regularly, and precede study-planning efforts where possible. We provide an example of what this might look like under a three-year period in Figure 3. Next year (2015) has little activity due to this current study performing the analysis to determine knowledge needs and future studies.¹⁵ It picks up again in 2016, and has a new suite of market studies beginning in 2017.

¹⁴ In order to review studies in a more unified manner, we believe it would be useful to develop a study summary template. This template would include a study description, budget, market identification, and ability to inform program activities, and would be used by the Market Studies PCG to determine study priorities for the next round of funding.

¹⁵ We expect that a few studies will begin in late 2014 based on this effort.

Figure 3. Draft Timeline of Market Study Research Activities



3. Study Needs and Recommendations

To answer the question of which market studies are worthwhile for the California Public Utilities Commission (CPUC) and investor-owned utilities (IOUs) to undertake, we assessed study needs across all sectors for both the short term and the long term. We defined short-term needs as occurring within the evaluation of the 2013-2014 programs. For long-term needs, we examined potential for energy savings over the next 10 years in comparison to current program activity. We used information from the stakeholder interviews to help set the most appropriate criteria for the study choices.

Utilizing the results of the stakeholder interviews and market studies tools, we are able to identify areas where additional market study would be beneficial. These needs are most apparent in the short term, where program areas are fairly well understood and emerging markets can be identified. In the long term, it becomes harder to predict which markets will need study because markets evolve and change over time. According to the stakeholders interviewed, a useful market study is program-relevant and can inform a current or planned program. Therefore, we present recommendations for studies that the IOUs or the CPUC could conduct to fill areas of market need in the short term, and we suggest utilizing the framework described above as a means to develop needs in the future.

3.1 Priorities for Choosing among Studies

One of the primary research questions posed by CPUC Energy Division was how to prioritize among market study research needs. Through open-ended questions, interviewed stakeholders ranked the top criteria they believed to be most important.¹⁶ The most critical characteristics to consider when choosing which studies to fund were: energy savings potential and ability of the study to inform new or existing programs.

Savings Potential: Respondents felt that potential for future savings **was the most important criterion to use for prioritizing future market research. This included future market potential**, identifying the physical location of the potential, unrealized potential, and focusing on larger energy efficiency opportunities. This was the first choice of one-third of the respondents.

Ability to Inform Programs: This was the second most-mentioned criterion, and was the first choice of one-quarter of respondents. Examples given of ability to inform programs include ability to fill gaps in program offerings, usefulness to program implementers, identifying where programs need to be developed, and increasing targeting of programs.

Conceptually, these two criteria are linked by the need to better understand where savings opportunities occur, and to provide insights to program implementers that will enable them to capture those savings. Table 7 shows respondent priorities.

¹⁶ We provide a detailed description of the interviewed stakeholders in Appendix B.

Table 7. Criteria to Use in Prioritizing Future Market Research

| Criteria in Order of Importance (Ranked Response) | Example Question to Ask When Using This Criterion | Respondents Stating the Criteria (n=23) |
|---|--|---|
| Savings potential | Is the topic of study an area that has significant savings potential, now or in the future? For purposes of this criterion, we have assumed that this is market potential. | 15 |
| Ability to inform programs/usefulness to program administrators | How useful will this study be to program administrators? Will it help inform the programs? | 11 |
| Market information | Will this research provide needed insight into the market for energy-efficient goods or services? | 7 |
| Uncertainty | Is there a lot of uncertainty around the quality of information or the market for the product? | 5 |
| Policy support—strategic planning policy guidance, etc. | Is the topic of study an important policy interest? Will the study inform policy goals or future policy decisions? | 4 |
| Amount of information available | How much do we already know about the topic of study? | 4 |
| Claimed savings | Are there claimable energy savings from the topic of study? | 3 |
| Current IOU program activity amount | How big a portion of the current IOU portfolios is the topic of study? | 2 |
| Cost-effectiveness | What is the cost-effectiveness of the topic of study? | 2 |
| Evaluation considerations | Is the topic of study evaluable? Can this study complement others currently underway? Will it produce actionable results? | 1 |

Table 7 presents 10 different criteria that stakeholders described as important to consider when choosing among potential market studies. To operationalize these criteria and apply to a list of studies, some sort of weighting is useful.

Given stakeholder preferences and the Energy Division’s multiple responsibilities of setting savings goals, providing policy guidance for programs and budgets, and performing regulatory oversight functions, we present the following criteria, scales, and weighting. We include both the “uncertainty” and “market information” areas noted above in the single criterion of “ability to inform programs.”

Opinion Dynamics expects CPUC staff to discuss the prioritization criteria and weighting presented in Table 8. We also expect that there will be further review by the IOUs and other stakeholders. Through this review, we assume that the scales and weighting may change, but we hope that any changes maintain the idea of using scales and weighting. By using a numerical score, multiple people can assign scores and useful discussion can occur regarding the overall priority of a study.

Table 8. Recommended Prioritization Criteria

| # | Criteria | Potential Question | Scale | Score | Weighting |
|-------|--|--|---|-------|-----------|
| 1 | Savings potential | How large a share of future portfolio savings is the topic of the study expected to contribute over the next five years? | 5 = large share 0 = barely any savings | 0-5 | 50% |
| 2 | Ability to inform programs | How useful will this study be to program administrators? Will it help inform the programs with needed insights? | 5 = very useful 0 = not useful | 0-5 | 25% |
| 3 | Current level of knowledge | How much do we already know about the topic of study? | 5 = no knowledge 0 = a lot known | 0-5 | 15% |
| 4 | In support of policy objectives and guidance | Is the topic of study an important policy interest? Will the study inform policy goals or future policy decisions? | 5 = important for policy 0 = not important | 0-5 | 10% |
| Total | | | | 20 | 1.00% |

Beyond the simple numerical values, prioritization can also include a description of the value and worth of the study that contextualizes the numerical values for a study. Through inclusion of this type of description, the CPUC and IOUs can make decisions across several dimensions.

3.2 Short-Term Needs

In this section, we present suggestions for market studies that the IOUs or the CPUC could conduct to fill market knowledge gaps identified in our research. These needs and study suggestions result from the utilization of the market study tools and stakeholder interviews. We encourage reviewers of this report to examine the results of the stakeholder interviews (contained in Appendix C) as well as the market study tools and their inputs, to consider whether these are the correct studies to be undertaking. We present several studies so a discussion may occur following this report to examine needs and priorities by a broader stakeholder group.

The CPUC has allocated 2013-2014 evaluation budget for market studies in this EM&V cycle, but has not yet determined all of the study needs. This report is one of the first tasks under that effort, intended to help the CPUC and the IOUs determine market needs for the future. Therefore, within this EM&V funding cycle, there is some budget available for additional studies. If the CPUC extends the EM&V period through 2015, as is likely to occur, we believe it reasonable for the CPUC to plan to conduct between two and five market studies.

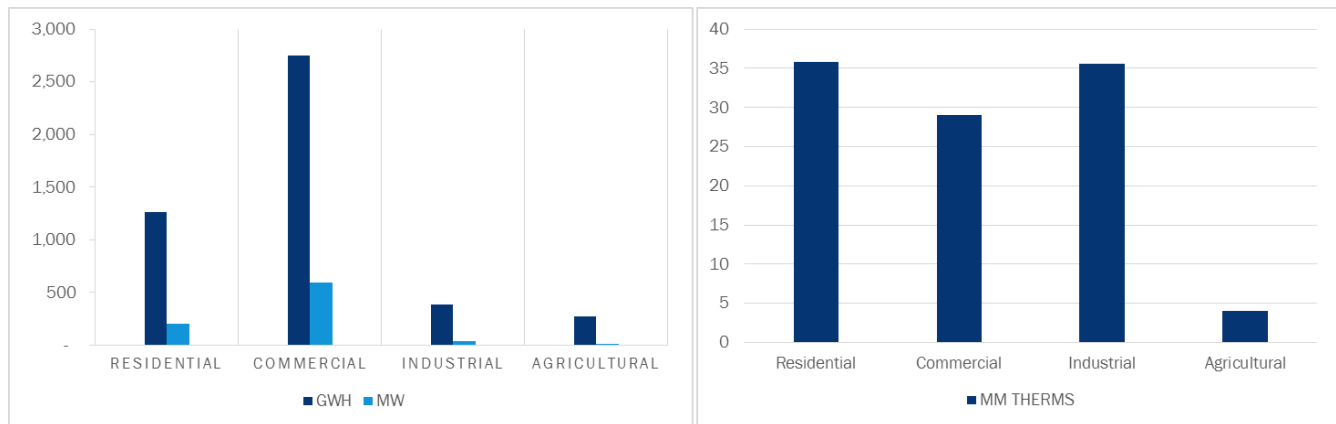
To enable this, we present suggestions for high-priority studies in the short term that would be worthwhile for the CPUC and IOUs to undertake, given the needs identified by the market study tools. We understand that the IOUs have already allocated much of their 2013-2014 EM&V funding, so we believe the CPUC EM&V funds are the most likely source for additional studies in the next one-to-two years. We intend that these study suggestions facilitate discussion and help with the identification and prioritization of study priorities, rather than serve as a final list of study recommendations.

Short-Term Potential

Figure 4 demonstrates that within a three-year market potential period, the Commercial sector has almost twice the electric market potential as the Residential sector, and the Industrial and Agricultural sectors lag considerably. If we look at the electric energy potential, the Commercial sector is a clear winner for a market study, based solely on the market potential. (While stakeholders indicated strong interest in Residential studies in the short term, they also indicated savings potential as the highest priority when choosing a study.)

However, looking at the natural gas market potential shows that the Residential and Industrial sectors have nearly the same level of natural gas savings, and both have more potential than the Commercial sector does. Again, the Agricultural sector lags behind the others. That the Agricultural sector has less market potential is not surprising, as the sector uses about 5% of all electric energy and about 1% of all therms within California.¹⁷

**Figure 4. Short-Term Market Potential for All Utilities (Excluding C&S)
2014-2016**



Thinking about fuel type did not arise as we discussed priorities with stakeholders. Given the relatively low cost for natural gas at this point, high electrical costs within California (compared to other states), and embedded costs for maintenance of transmission and distribution wires, we prioritized electric savings for most of our suggested short-term studies. Table 9 shows the top market potential by technology group and sector for both electric and natural gas.

Table 9. High Market Potential Technology Groups by Sector

| Sector | Technology Group | GWH | MW | MM Therms |
|-------------|-----------------------------|-------|------|-----------|
| Commercial | Plug-In Lighting | 410.5 | 49.3 | -0.9 |
| | Linear Fluorescent Lighting | 355.4 | 79.0 | -3.9 |
| | Plug Load - Refrigeration | 208.2 | 19.8 | |
| | HVAC Heat Pump | 182.7 | 83.0 | n/a |
| | HVAC Boiler | - | - | 13.3 |
| | Service Hot Water | - | - | 5.8 |
| Residential | Computers | 92.8 | 12.6 | 0.6 |
| | Lighting - Fixtures | 27.3 | n/a | n/a |
| | HVAC Furnaces (gas) | 1.1 | 2.1 | 7.4 |

¹⁷ Based on 2012 use data from the California Energy Commission’s California Energy Consumption Database, <http://ecdms.energy.ca.gov/elecbyutil.aspx>. The 2012 use data is the most current available.

Study Needs and Recommendations

| Sector | Technology Group | GWH | MW | MM Therms |
|------------|--|-----|------|-----------|
| | Domestic Hot Water (gas) | 8.0 | 1.6 | 6.0 |
| Industrial | Process Heating Equipment | 6.0 | 0.3 | 7.0 |
| | Process Heating Operations and Maintenance | 1.2 | -0.1 | 6.6 |

Based solely on savings, it is clear that some of the next set of studies should look at the Commercial sector. However, as stated above, interviewed stakeholders indicated a preference for Residential market studies, with no specific “winner” when thinking about which specific technology to include. Ultimately, we recommend eight different studies for possible short-term funding (four Commercial, three Residential, and one study that cuts across sectors), described next.

3.2.1 Short-Term Study Suggestions (2014-2016)

We applied the criteria shown in Table 8, considered studies put forward by stakeholders, and reviewed past decisions to develop the following eight studies. As suggested by the stakeholders, we recommend that the short-term studies focus on data to improve program intervention. As such, we recommend that CPUC staff discuss a specific scope of work with the IOUs within the appropriate Program Coordination Group (PCG) to narrow the specific information desired by program managers, as this type of scoping was outside of this study’s purview. All studies shown in Table 10 are of sufficiently high priority for the CPUC to consider. We discuss the rationale for these studies in more detail following Table 10. The numbers associated with the studies in the table are for ease of reference only, and do not indicate a priority.

Table 10. Suggested Short-Term Market Studies

| ID | Study Name | Description | Sector | Study Type |
|----|--|--|------------|--|
| 1 | Commercial Refrigeration Market Characterization | This study would explore, characterize, and assess the market for commercial refrigeration equipment. It would examine the commercial display case and remote refrigeration supply chain to ascertain where an energy efficiency intervention would work best. | Commercial | Market Characterization |
| 2 | Commercial HVAC Market Characterization | This study is a targeted market characterization of the markets for commercial air conditioners, heat pumps, and evaporative coolers. The study would include a characterization of both the primary (retail) and secondary (used equipment) markets for these measures, with particular attention to barriers to adoption for ACs and heat pumps. For evaporative coolers, the study would also include an assessment of market share, characterization of the supply chain, and an assessment of the trade-off between energy and water use. | Commercial | Market Characterization, Market Assessment |
| 3 | Commercial Plug-In Lighting Study | The study would analyze data from the most recent CMST/CSS study to determine the extent of lighting plug-load in commercial buildings. If a substantial contributor to commercial lighting load, this study would examine the market for commercial lighting plug load and opportunities for energy use reduction. | Commercial | Market Assessment |

Study Needs and Recommendations

| ID | Study Name | Description | Sector | Study Type |
|----|--|---|---------------|--|
| 4 | Commercial Boilers Market Characterization | This study would characterize the market for commercial boilers and opportunities for energy efficiency interventions. | Commercial | Market Characterization |
| 5 | Residential Hot Water Market Characterization | There has been an IOU-specific study with useful information. If the study has not been shared with other IOUs, this study would describe the market for residential hot water energy efficiency measures, and identify opportunities for energy efficiency interventions, including market-based approaches. | Residential | Market Characterization |
| 6 | Residential Decision-Making Study | This study would examine how residential consumers make purchase and energy-use decisions. | Residential | Market Characterization |
| 7 | MIDI Barriers Assessment and Market Characterization | This study arises from D.12-11-015 (ordering paragraph 26), whereby the CPUC indicates a desire for doubling the participation of the Middle Income Direct Install (MIDI) program. This study would determine what barriers exist to increased MIDI participation and the penetration and saturation of energy-efficient products in MIDI homes. | Residential | Market Characterization, Market Baseline |
| 8 | LED Quality Market Assessment | This study is also based on D.12-11-015 (ordering paragraph 30), whereby the CPUC calls for an assessment of LED lamp quality. This study would determine the quality, efficiency, and price point distribution of LED lamps available for purchase in California, and what percent of general service screw-base LED products available for purchase in California meet the CEC quality standards. | Cross-cutting | Market Assessment, Market Baseline |
| 9 | Residential Wants and Needs | This study would be a general population study to determine what services customers want in efficiency programs as well as what benefits (energy and non-energy) they may need before choosing to undertake an energy efficient action. | Residential | Market Characterization |

Below, we present additional information about each of these eight studies, grouping them by studies to inform electric savings, studies to inform gas savings, studies to inform programs based on customer-specific data, and studies based on recent Commission decisions.

Studies to Inform Electric Savings

Commercial Refrigeration Market Characterization

Commercial refrigeration has the fourth-highest market potential within the Potential and Goals (P&G) study, after CFL, fluorescent, and plug-in lighting. The CPUC has provided guidance to pursue plug load energy efficiency within any plug load or appliance incentive. PG&E, at least, provides plug load incentives within their Commercial Calculated Incentives program (PGE21011).

Study Needs and Recommendations

The only market studies about this end-use are the past California End-Use Study¹⁸ and the recent California Saturation Survey (CSS).¹⁹ The CSS has substantial data on what is present within the state, and is a good resource for a market characterization. According to the CSS, three-quarters of display cases are self-contained units (i.e., plug loads) that are found in restaurants and food/liquor establishments.²⁰ These can be hard-to-reach markets, and knowledge of the supply chain for this technology would be useful to determine where intervention may work best to increase energy efficiency. The CSS states that about half of remote refrigeration equipment (i.e., those who use compressors with any refrigeration lines to cool multiple cases) have anti-sweat heater controls (a typical energy efficiency measure), and about one-quarter insulate their refrigeration lines.²¹ Similar to the self-contained units mentioned above, knowledge of who within the market sells and supports this remote refrigeration equipment would be useful for intervention possibilities.

Commercial HVAC: Air Conditioning, Heat Pump, and Evaporative Cooler Market Characterization

These three technologies have the top market potential within HVAC, and taken together are similar in market potential to plug-in lighting.

There have been market studies on this end-use, but may provide somewhat fragmented information. Specifically, studies include the past California End-Use Study and the recent CSS, and one market study on window films that provided HVAC data. There has also been a study of the contractor market within California, but it is focused on the Residential sector. The HVAC Market Effects Study characterized the supply chain, and the HVAC distributor interviews spoke more to the types of distribution channels and key players in California. The current CPUC study (HVAC Compliance and Permitting Market Assessment) is assessing barriers to compliance for change-outs, but this crosses over into how an HVAC system arrives from factory to rooftop as well. The IOUs have a study that is just beginning (PSR 2015) that expects to identify the drivers behind quality installation (QI), quality maintenance (QM), and high-efficiency customer purchase decision-making across various market sectors. Additionally, the study will identify how market actors perceive the benefits of HVAC industry standards based on quality maintenance and installation as well as equipment efficiency, and will provide market intervention strategies for increasing customer understanding of the QM/QI value proposition, to increase their receptiveness to contractor QM/QI offerings and eventually proactively demand QM/QI.

While there does appear to be substantial market knowledge, having a good handle on the market structure would better inform studies that just focus on contractor skills and customer awareness without understanding how the primary market works. There also may be a kind of secondary market that is never looked at by HVAC studies. We recommend a small, more targeted study of this market that aligns with the two points below.

Evaporative cooling has substantial market potential within the P&G study, and according to the CSS, “In dry, arid climates the installation and operating cost of an evaporative cooler can be much lower than a refrigeration air conditioning system by about 80%.”²² However, evaporative cooling has a market presence of

¹⁸ Itron. Prepared for the California Energy Commission. *California Commercial End-Use Survey*. CEC-400-2006-050. 2006.

¹⁹ Itron. Prepared for the California Public Utilities Commission. *California Commercial Saturation Survey*. May 29, 2014.

²⁰ Ibid., Table 8-13, page 8-13.

²¹ Ibid., Table 8-21, page 8-21.

²² Ibid., page 9-12.

Study Needs and Recommendations

less than 5%.²³ Increasing the market share of this technology can reduce energy use, and knowing the supply chain for this technology, its costs, and consumer preferences may help determine a cost-effective and successful intervention. However, these systems also use water. With water becoming a larger issue within California, data on the trade-off between energy and water use would support a choice to either intervene or not with this specific technology.

Direct expansion (DX) air conditioners and heat pumps can be either packaged single zone or split-system single zone systems. The CSS shows that packaged or split-system DX systems make up 66% of HVAC units in California.²⁴ These units have a relatively low efficiency; of the 75% of units where efficiency could be determined, only 5% of units had SEER values above 13.9.²⁵ A market study that highlights barriers to adoption of higher units could help implementers.

Commercial Plug-In Lighting: Market Characterization and Assessment

Plug-in lighting has the second-highest market potential after CFLs.

The on-site audits for the CMST/CSS collected information to separate commercial lighting for plug-in fixtures, but Itron did not separate out the data to show this level of detail. However, it could be a good source of information for a market characterization, and we recommend that the CPUC analyze this data first to enable an appropriately focused market study.

Studies to Inform Gas Savings

Commercial Boilers Market Characterization

Commercial boilers have the highest market potential across all sectors, with close to twice as much potential savings as the next-highest technology of residential furnaces. Outside of the CEUS and CSS studies, there are no known market studies for this technology.

However, this technology requires further discussion before moving forward as a study, because the CSS and the P&G studies have data that appear at odds with each other. It was outside the scope of this study to determine the reasons for these differences, but the P&G study finds more market potential for gas boilers than commercial furnaces (13.1 MM therms versus 0.7 MM therms). The CSS study shows that 3% of natural gas heating systems are boilers and 44% are furnaces. Either the commercial boilers are substantially larger than commercial furnaces and are much less efficient, or the market potential may be over-represented. Before moving forward with this study, we recommend determining the extent of this discrepancy.

Residential Hot Water Market Characterization

Within the Residential sector, domestic hot water has the second-highest market potential, closely following gas furnaces.

²³ Ibid., Table 9-7, page 9-13.

²⁴ Ibid., Table 9-8, page 9-13

²⁵ Ibid., Table 9-11, page 9-18.

Study Needs and Recommendations

There are three studies covering this technology: 1) a 2006-2008 study looking into the feasibility of tankless water heating within the PG&E service territory; 2) a 2006-2008 low-income study showing savings from efficiency technologies; and 3) a 2010-2012 Emerging Technology Program (ETP) study that presented a market-focused program design to accelerate penetration of ENERGY STAR® water heaters.

Because we are making suggestions for statewide market studies and the ETP study is a PG&E-specific study, we recommend that the CPUC take two actions before considering this study. First, the CPUC should review the ETP study to be sure it provides sufficient information. Our review indicates a good study with valuable information. Secondly, the CPUC should check with the other IOUs to see if PG&E has shared the ETP study and if the IOU residential program managers consider it sufficiently relevant for them to use within program design.

Overarching Studies on Customer and Market Interactions

Residential Decision-Making

Stakeholders interviewed indicated that residential behavior and decision-making was a primary area of interest. The P&G study currently does not capture residential behavior well. Nor was the study able to include data driving information around the behavioral aspects of current measures, such as potential from proper training for equipment use and optimization. However, the Residential sector has high gas savings market potential, made up largely by domestic water heating and furnaces. A study on residential decision-making would focus on hot water heaters and gas furnaces, and would examine trigger points, market influence on decisions, understanding of customer motivations and behaviors around purchases, and the difference in appliance purchasing behavior in single-family and multifamily buildings, with the purpose of identifying future intervention opportunities. Additionally, such a study could include both fuel types and include customer's decision making for high-potential electrical measures such as pool pumps, refrigerators/freezers, and (in light of the newly available high efficiency dryers) gas and electric dryers.

Customer Wants and Needs

Another overarching area of stakeholder interest was the wants and needs of customers. The IOUs are currently beginning a suite of studies on commercial customer wants and needs (PSR 2025) that covers small and medium data centers within large office buildings, oil patches, hospital baselines, agricultural energy efficiency, food processing, and irrigation efficiency for small farmers. As such, we do not recommend a commercial customer wants and needs study.

However, we found no studies that have carefully examined and characterized the wants and needs of residential customers. While process evaluations often include assessments of customer satisfaction, the studies rarely address actual wants and needs. We assume that what information does exist is fragmented and spread across multiple studies. We suggest that such a study would answer the following questions: 1) Why do customers participate in efficiency programs? 2) What benefits (energy and non-energy) do they derive from participating?

Studies Suggested by Recent Commission Decisions

Opinion Dynamics reviewed recent CPUC decisions in order to ascertain whether there are unmet market research needs required to satisfy Commission direction. The decision approving the 2013-2014 programs, D.12-11-015, suggests there may be unmet market research needs in two primary areas. The first is a quality assessment of light emitting diode (LED) lamps on sale in California, especially with respect to the California Energy Commission (CEC) quality lamp specification. The second is a market characterization and barriers

assessment for middle-income residential customers targeted for direct install programs, particularly those in multifamily buildings.

LED Quality Market Assessment

In D.12-11-015, the CPUC calls for an assessment of LED lamp quality in ordering paragraphs 30 and 87. Ordering paragraph 30 directs PG&E, SCE, and SDG&E (Joint Utilities) to offer incentives only for “light-emitting diode (LED) bulbs to products that are in the top half of quality on the market and that meet the ENERGY STAR requirements prior to the adoption of a California quality specification for LEDs by the CEC.” After the CEC standard goes into effect,²⁶ the CPUC directs the utilities to offer incentives only for products that meet the CEC quality specification. To know that the incentives are for only the top half in terms of quality, the CPUC needs to understand the quality within the full suite of bulbs available. A market assessment study could answer this question.

Ordering paragraph 87 reiterates that the utilities shall only offer rebates for general service screw-base LED products that are consistent the CEC quality standards. While there are no current studies tracking LED quality, assuring that incentives cover only bulbs meeting the CEC quality specifications is not a market study, but more aligned with an impact or process evaluation. While we mention this here, we do not recommend a specific market study to gather data for ordering paragraph 87.

MIDI Barriers Assessment and Market Characterization

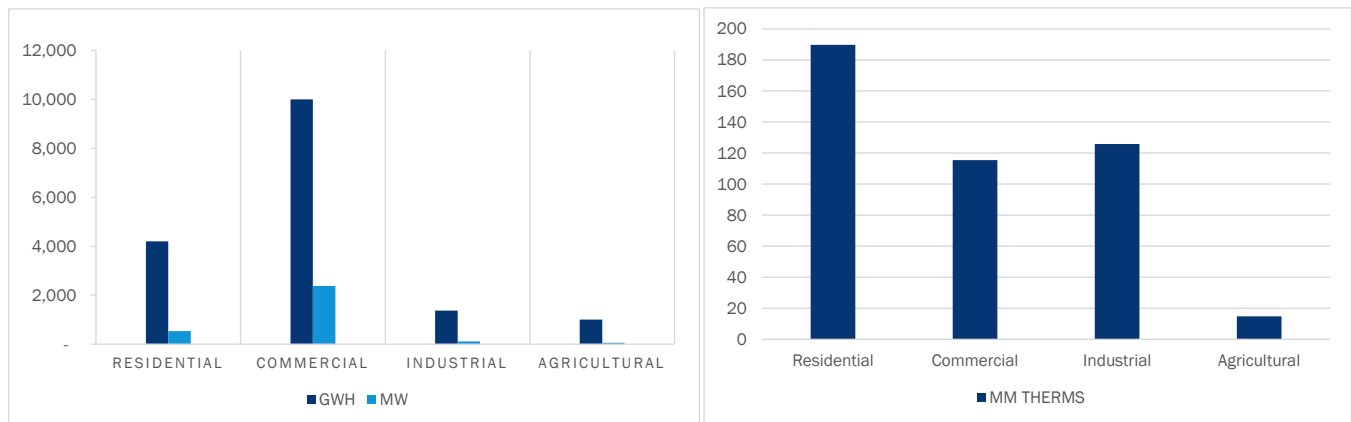
Ordering paragraph 26 of D.12-11-015 calls for the Joint Utilities to double the number of participants in the Middle Income Direct Install (MIDI) program, and to “ensure eligibility for residents of multifamily buildings in the programs.” To do this, the Joint Utilities will need a better understanding of the current barriers to increased participation, as well as saturation and penetration of energy efficiency measures in middle-income homes. The current CLASS study has significant information regarding saturation and penetration of energy efficiency homes, but we present two more potential research areas in Table 10.

3.3 Long-Term Needs

For the longer term, we present relative priority areas with the caveat that the markets for energy goods and services can and will change. By long-term, we refer to market study needs over a 10-year time horizon. This is the length of the rolling portfolio cycle being discussed in the energy efficiency policy proceeding, R.13-11-005, and the limit of the forecasted energy savings potential covered by the 2013 California Energy Efficiency Potential and Goals Study. Figure 5 show the 10-year market potential across the sectors. As was present in the three-year potential, Commercial leads all sectors for energy savings, but Residential and Industrial show higher market potential on the natural gas side.

²⁶ The CEC adopted this voluntary standard in December 2013.

**Figure 5. Long-Term Market Potential for All Utilities (Excluding C&S)
2015-2024**



3.3.1 Long-Term Market Studies

Market studies in future EM&V cycles could provide information on adoption rates of energy-efficient goods and services; rate and direction of market change; persistence of program-related market impacts; and other market information necessary for the development and refinement of utility programs. We expect that areas of high market potential—commercial energy (GWh), commercial demand (MW), and residential gas—will be the priority for future market research, but we recognize that the markets in these sectors may shift over time in unforeseen ways. The only definite characteristic of the future is that it is impossible to predict. The various PCGs (if they continue in their current form) will need to identify future specific studies to support program-planning needs.

The EM&V Plan 2013-2014 Roadmap (V3) outlines several studies that the CPUC expects to occur within the next several years. This is comprised of market transformation indicators (MTIs), CEC-mandated studies, and follow-up market effects studies. Because the CPUC studies are likely to change in response to the rolling portfolio cycles and the new market transformation white papers soon to be released, and because the CEC-mandated studies are outside the scope of the CPUC and the IOUs, we list only the potential market effects studies here.

We point to the market studies framework as the guide for developing long-term recommendations once CPUC staff know more information about conducting evaluation studies in the rolling portfolio cycle, and whether market transformation takes on a new approach within the portfolio. We hope there will be collaboration with the CEC-mandated end-use and saturation studies; however, we note that these have a separate funding source, timing, and focus.

Small-Scale and Recurring Market-Tracking Studies

As the CPUC and IOUs continue to operate in specific markets over time, it may be useful to conduct one or more small-scale studies in order to continue to monitor or track a market progress. The scope of such a study can range from an update to a few parameters of a past study, to an annual study of a few parameters, to a new study of a niche or emerging market. We note that many stakeholders interviewed suggested that short-term, quick turn-around, recurring studies would be extremely useful in program development and targeting of interventions.

4. Next Steps

This report is the beginning of a process. While we have recommended specific studies for the near future, there are several assumptions made, as we chose the studies that could bear consideration by a larger group. While the criteria used for choosing studies came from stakeholders, the choice of weighting for these criteria and the weights applied are our own. In addition, the market studies update process recommended in this report seemed logical and appropriate, but we recognize that the larger community has not fully discussed the process. Lastly, there were areas found during our research that were outside the scope of our specific study, but could be useful areas of future study. Below, we describe these areas for next steps more completely.

4.1 Criteria Weighting

In Table 8, we present recommendations for how to interpret and weight the prioritization criteria when choosing among possible market studies. We include a scale, a score, and possible weighting with numerical values for each criterion, so those making choices can develop a single score for each study.

We acknowledge that using a numeric system can lack the nuance often sought when making choices. The Market Studies Program Coordination Group (PCG) will need to determine how best to use these criteria going forward, specifically in regards to sectors versus specific studies. Stakeholders within this PCG should discuss the chosen criteria, the scales, and the weighting to reach consensus on how or if to use a numeric system.

The California Public Utilities Commission (CPUC) and the investor-owned utilities (IOUs) could also use prioritization criteria to determine budgets for market studies within a funding round. For example, the CPUC and IOUs may use the top criterion, “Savings Potential,” to set high-level budgets for an evaluation period, and the second-most-important criterion, “Ability to Inform Programs,” to determine which studies within that sector are funded. Another approach might be to set a budget for market studies within a cycle, and evaluate a group of study concepts across all sectors using the criteria and an agreed-upon weighting scheme. Because stakeholders must discuss these options before reaching a level of comfort, we do not make a specific recommendation.

4.2 Considerations for Specific Market Studies Process

In Section 2.2 Market Knowledge, we describe the information sources used as inputs in the market study tools. In order to continue to be useful in identifying market study needs, the CPUC and the IOUs should update the tools regularly with current information. We recommend that the next update for the tools occur in early 2016, but stakeholders should discuss the process described herein, and an acceptable process should be put in place by the middle of 2015, to allow completion of the tool update process by early 2016.

The CPUC or the IOUs should develop specific market study concepts by the using the market studies tools and any other relevant information available. Market studies should be coordinated centrally through the Market Studies PCG, and should endeavor to inform the new or existing program activities. Once the planning is complete for the 2013-2014 evaluations, we suggest that the Market Studies PCG direct its attention to assessing future market study needs, using the studies included in this report as a starting point.

Next Steps

We understand that the CPUC is interested in the evaluation approach used by the Northwest Energy Efficiency Alliance (NEEA).²⁷ While we did not review the NEEA process, we know that it embeds evaluation early on and has a long-term approach to following the market through specific studies. We suggest that the Market Studies PCG consider this or a similar approach for implementation within California. As part of this process, a central activity for the Market Studies PCG might be to provide guidance on short-term tracking studies and trend analyses useful to understanding dynamic markets. The specific study needs will likely come from the sector PCGs, with the Market Studies PCG acting in a facilitation and coordination role.

4.3 Possible Future Activities

Outside of the currently recommended studies, there are three areas the CPUC and IOU staff may want to consider in determining usefulness of the efforts.

Large Customer Segmentation

Segmenting market knowledge and needs by customer type is another approach to identifying market study needs. For example, within the Industrial and Agricultural sectors, it would be useful to understand which customer types (likely identified by NAICS code) have high savings potential and low market knowledge. For program implementers, viewing market knowledge gaps in this manner would be more useful than knowing the potential for hot water equipment savings across all industrial customers. Future work might identify customer types with the Industrial, Agricultural, and Large Commercial sectors.

Market Typologies

Possible future activities might focus on developing market typologies to define and bound markets for energy-efficient goods and services. The market definition we have used in this activity is broad, encompassing all aspects of the creation, demand, and delivery. Developing market typologies would allow for the categorization of different types of markets relative to the type of good or service delivered, market actors, channels of distribution, and types of transactions. The identification and application of market types would enable a more refined assessment of specific markets and their needs.

Market-Tracking Studies

Outside of mentioning market-tracking studies under the long-term section, this report makes no mention of specific sectors where there is a need for market-tracking studies. However, tracking the market fits in well with the NEEA approach, and most likely is a set of studies needed by California. Before moving forward with a market-tracking study, the CPUC and the IOUs need to determine the choice of market to track, the detailed information to collect, and the use of study information.

²⁷ NEEA market research and evaluation reports are available at <http://neea.org/resource-center/market-research-and-evaluation-reports>. NEEA conducts research in four categories: Market Research (for programs, to define challenges and develop market data on regional energy consumption); Evaluation (to ensure that program goals are being met); Long-Term Monitoring and Tracking Reports (to measure continued energy savings from previously funded initiatives); and Emerging Technology Reports (to assess and develop market interventions for emerging technologies).

4.4 Appendices

The remaining portion of this document contains the following appendices:

- Appendix A: Application of Criteria by Evaluation Team
- Appendix B: Descriptive Statistics of Studies within Literature Review
- Appendix C: Market Studies Stakeholder Interview Results
- Appendix D: Market Potential Model Inputs
- Appendix E: Summary of Past CPUC Decisions Regarding Market Studies
- Appendix F: List of Expected Market Studies Based on Current CPUC Direction

Appendix A. Application of Criteria by Evaluation Team

The evaluation team applied the criteria described in this document to help prioritize which commercial and residential studies to recommend. One person did this exercise to ensure that application of the criteria could be internally consistent. However, we recommend that future use of this process, if kept, be performed by multiple stakeholders, and that the numeric values be aggregated through averaging total scores.

Table 11. Criteria Application for the Commercial Segment

| Commercial Building System | | | | | | | |
|----------------------------|-----------------------|-------------------|----------------------------|----------------------------|--|-------------|----------|
| | | Weight | 50% | 25% | 15% | 10% | |
| End Use | Measure | Scalar Values | | | | Total Score | Priority |
| | | Savings Potential | Ability to inform programs | Current level of knowledge | In support of policy objectives and guidance | | |
| Envelope | Insulation | 2 | 1 | 5 | 1 | 2.1 | |
| HVAC | Cooler | 5 | 2 | 5 | 4 | 4.2 | 3 |
| | Ventilation | 2 | 1 | 2 | 1 | 1.7 | |
| | Chiller | 3 | 2 | 4 | 3 | 2.9 | |
| | AC | 4 | 3 | 2 | 4 | 3.5 | 9 |
| | HP | 5 | 3 | 5 | 4 | 4.4 | 2 |
| | Boiler | 0 | 0 | 4 | 0 | 0.6 | |
| | Furnace | 0 | 0 | 5 | 0 | 0.8 | |
| | Thermostat | 4 | 2 | 5 | 3 | 3.6 | 7 |
| Lighting | Energy Management | 2 | 2 | 1 | 1 | 1.8 | |
| | CFL | 5 | 1 | 5 | 4 | 3.9 | 4 |
| | LED | 5 | 1 | 4 | 5 | 3.9 | 5 |
| | Halogen Lamps | 2 | 1 | 5 | 1 | 2.1 | |
| | Flourescent | 5 | 1 | 0 | 5 | 3.3 | 10 |
| | Plug in | 5 | 1 | 5 | 4 | 3.9 | 4 |
| Plug Load | Sensors | 4 | 1 | 4 | 3 | 3.2 | |
| | Computer | 3 | 5 | 3 | 5 | 3.7 | 6 |
| | Vending Machine | 2 | 5 | 5 | 5 | 3.5 | 8 |
| Hot Water | Refrigeration | 5 | 5 | 4 | 5 | 4.9 | 1 |
| | Water Heating | 2 | 1 | 4 | 1 | 2.0 | |
| Other | HVAC Fault Detection | 4 | 3 | 5 | 2 | 3.7 | 6 |
| | Foodservice Equipment | 2 | 2 | 4 | 1 | 2.2 | |
| | Retro-commissioning | | | | | 0.0 | |
| | Whole Building | 3 | 3 | 1 | 2 | 2.6 | |

Table 12. Criteria Application for the Residential Segment

| Residential Building System | | | | | | | |
|-----------------------------|----------------------|-------------------|----------------------------|----------------------------|--|-------------|----------|
| Weight | | 50% | 25% | 15% | 10% | | |
| End Use | Measure | Scalar Values | | | | Total Score | Priority |
| | | Savings Potential | Ability to inform programs | Current level of knowledge | In support of policy objectives and guidance | | |
| Envelope | Insulation | 2 | 5 | 4 | 5 | 3.4 | |
| HVAC | AC | 2 | 2 | 3 | 2 | 2.2 | |
| | Cooler | 5 | 2 | 3 | 1 | 3.6 | |
| | Furnace | 2 | 2 | 3 | 1 | 2.1 | |
| | HP | 2 | 2 | 3 | 2 | 2.2 | |
| Lighting | Compact Fluorescent | 5 | 1 | 2 | 5 | 3.6 | |
| | LED | 5 | 1 | 2 | 5 | 3.6 | |
| | Halogen Lamp | 2 | 1 | 5 | 1 | 2.1 | |
| | Occupancy Sensor | 0 | 5 | 5 | 1 | 2.1 | |
| | Seasonal | 3 | 5 | 5 | 1 | 3.6 | |
| | Fixture | 4 | 5 | 5 | 1 | 4.1 | 3 |
| Plug Load | Consumer Electronics | 0 | 2 | 2 | 5 | 1.3 | |
| | Computer | 5 | 5 | 5 | 5 | 5.0 | 1 |
| | Appliances | 0 | 1 | 4 | 2 | 1.1 | |
| | Clothes Washer | 3 | 5 | 5 | 2 | 3.7 | |
| | Dishwasher | 2 | 5 | 5 | 2 | 3.2 | |
| | Refrigerator | 5 | 5 | 2 | 2 | 4.3 | 2 |
| SHW | Water Heater | 3 | 2 | 2 | 1 | 2.4 | |
| Other | Whole Building | 5 | 2 | 1 | 5 | 3.7 | |
| | Pool Pump | 4 | 5 | 1 | 5 | 3.9 | 4 |

Appendix B. Descriptive Statistics of Studies within Literature Review

To inform the literature review, our team reviewed documents from the California Measurement Advisory Council (calmac.org), the repository for completed California studies dating back to 1994, as well as the California Emerging Technologies website of projects (etcc-ca.com). Ultimately, 105 distinct studies prior to 2013-2014 formed the basis of the current level of market knowledge included in the tracking tools. Additionally, within the tracking tool we included the known studies for 2013-2014 to assure knowledge of current studies. Table 13 shows the number of studies within a study cycle included in the first version of the market studies tools (i.e., V1.0).

Table 13. Past California Market Studies by Study Cycle

| Study Cycle Year | Entity Performing the Study | | | | | | | Total |
|--------------------|-----------------------------|-----------|-----------|-----------|-----------|----------|----------|------------|
| | CEC | CPUC | IOU | PG&E | SCE | SDG&E | UC Davis | |
| 2004-2005 | | 1 | | | 6 | 1 | | 8 |
| 2006-2008 | 1 | 10 | | 15 | 15 | | | 41 |
| 2010-2012 | | 14 | | 23 | 21 | 2 | | 60 |
| 2013-2014 | | 11 | 19 | | | | 1 | 31 |
| Grand Total | 1 | 36 | 19 | 38 | 42 | 3 | 1 | 140 |

There is no universally accepted definition of the various market study types, although the Market Studies Program Coordination Group (PCG) is attempting to reach universal definitions. The evaluation team grouped the studies based on the originally noted study, as well as a review of the completed reports.

Table 14 presents the same set of studies, but now broken out by type of study. Note that these studies are self-defined as the specific study type, and do not necessarily align with the current set of definitions the Market Studies PCG discussed.

Table 14. Past California Market Studies by Study Cycle and Type of Study

| Study Type and Year | Entity Performing the Study | | | | | | | | Total |
|--------------------------|-----------------------------|------|----|-----|------|-----|-------|----------|-----------|
| | CEC | CPUC | ED | IOU | PG&E | SCE | SDG&E | UC Davis | |
| Best Practices | | | | 1 | | | | | 1 |
| 2013-2014 | | | | 1 | | | | | 1 |
| Market Assessment | | 7 | 4 | 4 | 1 | 1 | | | 17 |
| 2006-2008 | | 1 | | | | | | | 1 |
| 2010-2012 | | | 4 | | 1 | 1 | | | 6 |
| 2013-2014 | | 6 | | 4 | | | | | 10 |
| Market Baseline | | 1 | 4 | 2 | 6 | 2 | | | 15 |
| 2006-2008 | | | | | 3 | 1 | | | 4 |
| 2010-2012 | | 1 | 4 | | 3 | 1 | | | 9 |

Descriptive Statistics of Studies within Literature Review

| Study Type and Year | Entity Performing the Study | | | | | | | | Total |
|--------------------------------|-----------------------------|------|----|-----|------|-----|-------|----------|-------|
| | CEC | CPUC | ED | IOU | PG&E | SCE | SDG&E | UC Davis | |
| 2013-2014 | | | | 2 | | | | | 2 |
| Market Characterization | | 2 | | 9 | 17 | 9 | | | 37 |
| 2004-2005 | | | | | | 1 | | | 1 |
| 2006-2008 | | | | | 4 | 2 | | | 6 |
| 2010-2012 | | | | | 13 | 6 | | | 19 |
| 2013-2014 | | 2 | | 9 | | | | | 11 |
| Market Effects | | 5 | | | 1 | 5 | | | 11 |
| 2004-2005 | | | | | | 3 | | | 3 |
| 2006-2008 | | 4 | | | 1 | 2 | | | 7 |
| 2013-2014 | | 1 | | | | | | | 1 |
| Market Potential | | | 1 | | 2 | 2 | 1 | | 6 |
| 2006-2008 | | | | | 1 | | | | 1 |
| 2010-2012 | | | 1 | | 1 | 2 | 1 | | 5 |
| Market Study | 1 | 6 | | | 6 | 20 | 1 | | 34 |
| 2004-2005 | | 1 | | | | 2 | 1 | | 4 |
| 2006-2008 | 1 | 1 | | | 3 | 9 | | | 14 |
| 2010-2012 | | 4 | | | 3 | 9 | | | 16 |
| Market Study Needs | | 1 | | | | | | | 1 |
| 2013-2014 | | 1 | | | | | | | 1 |
| Market Tracking | | | | | 1 | 1 | | | 2 |
| 2006-2008 | | | | | 1 | 1 | | | 2 |
| Market Transformation | | | | 1 | | | | | 1 |
| 2013-2014 | | | | 1 | | | | | 1 |
| Other | | | | 2 | | | | | 2 |
| 2013-2014 | | | | 2 | | | | | 2 |
| Potential | | | | | 1 | | | | 1 |
| 2010-2012 | | | | | 1 | | | | 1 |
| Reference | | 4 | | | 3 | 2 | 1 | 1 | 11 |
| 2006-2008 | | 4 | | | 2 | | | | 6 |
| 2010-2012 | | | | | 1 | 2 | 1 | | 4 |
| 2013-2014 | | | | | | | | 1 | 1 |
| Spillover | | 1 | | | | | | | 1 |

Descriptive Statistics of Studies within Literature Review

| Study Type and Year | Entity Performing the Study | | | | | | | | Total |
|---------------------|-----------------------------|-----------|----------|-----------|-----------|-----------|----------|----------|------------|
| | CEC | CPUC | ED | IOU | PG&E | SCE | SDG&E | UC Davis | |
| 2013-2014 | | 1 | | | | | | | 1 |
| Grand Total | 1 | 27 | 9 | 19 | 38 | 42 | 3 | 1 | 140 |

Appendix C. Market Studies Stakeholder Interview Results

Memorandum

To: Cathy Fogel and Carmen Best, Energy Division, California Public Utilities Commission

From: Mary Sutter and Mikhail Haramati, Opinion Dynamics

Date: 5/8/14

Re: Market Studies Stakeholder Interview Results

The Market Study Needs Assessment (MSNA) consists of two main phases, with tasks within each phase. This memo presents the results of one part of Phase 1.

When complete, the MSNA Work Order will answer the following research questions:

| | Market Studies Needs Assessment Research Questions | Task 1 | Task 2 |
|----|---|--------|--------|
| 1. | Within which markets does the CPUC already have good data? | X | X |
| 2. | Which market studies are worthwhile for the CPUC to undertake, and what is their relative priority? | X | X |
| 3. | What is an appropriate framework for conducting market study research and what are the structural and communication requirements of such a framework? | | X |

Specifically, part of Task 1 consists of stakeholder interviews to determine interests in and desire for market studies. Through these interviews, we have identified research gaps that we will use to inform the market studies prioritization tool. We will submit an additional memo following the completion of Task 2 that pulls all of our data together and is ready for sharing with the public to obtain feedback on information found and to add to what we know.

Overview of Stakeholder Interviews

We designed the stakeholder interviews to help inform MSNA Work Order research questions 1 and 2 above. Specifically, the purpose of the structured stakeholder interviews is to better understand current and planned market studies for energy efficiency activities in California, to identify research gaps, and to inform prioritization of possible future research. The results of these interviews will help inform the CPUC's decisions on how to allocate limited market research funds. To this end, this memo summarizes the stakeholder responses regarding the markets that are most important to understand over both the short term and the long term, studies of value, and the criteria for prioritizing research.

Market Studies Stakeholder Interview Results

From February through March of 2014, we conducted 23 in-depth interviews with knowledgeable stakeholders and professionals active in California energy efficiency. This included program implementers, IOU staff, evaluation consultants, CPUC staff, and other interested parties. We created the stakeholder list in conjunction with CPUC staff. The interviews were approximately an hour in length, open-ended, and explored several concepts involved in planning and prioritizing market research. (We provide the interview guide in Attachment 2.) Table 15 presents the respondents across two different groupings: where they sit within a regulatory framework, and their expertise area.

Table 15. Respondent Type by Regulatory Status and Expertise Area

| Organization | Total Respondents (n=23) | Types of Respondent | | | | Respondent Expertise Area ²⁸ | | |
|-------------------------------|--------------------------|---------------------|-------------|------------|------------|---|----------|---------------|
| | | IOU Non-Implementer | Implementer | Regulatory | Intervener | Res | Non-Res | Cross-cutting |
| SCE | 5 | 3 | 2 | 0 | 0 | 3 | 0 | 2 |
| EM&V Consultant | 4 | 0 | 0 | 4 | 0 | 0 | 1 | 3 |
| CPUC | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 3 |
| Intervener (ORA, NRDC, CEEIC) | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 3 |
| PGE | 3 | 1 | 2 | 0 | 0 | 1 | 1 | 1 |
| SCG | 2 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| CEC | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| SDG&E | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Third-Party Implementer | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| Total | 23 | 12 | 6 | 8 | 3 | 5 | 3 | 15 |

In recognizing that respondent interests are likely to be highly influenced by the type of work they do, we made an effort to interview stakeholders with diverse roles and sector expertise. We performed extensive qualitative data analysis of the responses from our 23 respondents to arrive at the conclusions provided below.

Interview Themes

Qualitative data collection, such as our interviews, provides a source of rich information. We expected to have discussions that showed a clear differentiation between “markets” and “market studies,” and to delve more deeply into market studies. However, most respondents did not distinguish between markets for energy-efficient goods and services, and the long- and short-term studies needed to better understand those markets. Instead, respondents talked about the markets, end-uses, program needs, and studies together.

For some programs (like Energy Upgrade CA), respondents talked about the market for these services by using the program name. These results highlight a potential source of difficulty as CPUC staff begin to work across stakeholders to plan future studies. Clarity of purpose and definitions within communications may help bridge the conceptual differences we found among respondents as they consider markets and market studies.

²⁸ We categorized respondent area of expertise based on questions RO1 and RO2 of the interview guide in Attachment C.

Regardless of this conceptual difference, several broad themes emerged. We bin these themes into two larger concepts of “study content” and “how to conduct the study,” as shown below.

Study Content

Market research in support of program design – Many of the implementers mentioned that they would like to see more market research that they could use to improve programs. Usability and actionability of results were of particular interest. The next two points echo this theme, and parse out specific areas that respondents indicated as needed within program design.

Interest in better understanding the efficiency value proposition and customer motivation – Part of supporting program design is knowing what motivates customers, the relationship between building owners and energy use, and where the trigger points are for action. Respondents thought these particular areas are some of the least-understood parts of the energy efficiency value proposition. Similarly, several respondents suggested that a more customer-focused approach to coordinated DSM programs and offerings would be very beneficial.

Savings potential – Respondents expressed a strong desire to have a better understanding of where the energy savings opportunities are. This includes knowing the physical location of the potential, opportunities for savings and market involvement, and a better understanding of the gap between the potential study and real opportunities.

How to Conduct the Studies

Increased Coordination – Many respondents voiced interest in increased coordination in the planning of studies and programs. Several suggested the need for more transparency, and a lack of ownership around progress within a market segment. Several stakeholders suggested that a more expanded PAG/PCG meeting might be a good approach, as well as both a strong facilitator and market sector leads/champions.

Need for Monitoring of Quickly Changing Markets – For rapidly changing markets, frequent, timely information on market share and adoption rates is critical for understanding the extent to which a program intervention can help move the market. A number of respondents raised the need for more timely evaluation results, and a mechanism by which short-term, rapid-turnaround market studies can be undertaken.

Prioritization Criteria

CPUC staff were interested in understanding how other stakeholders would prioritize future market research. To focus responses, we asked the stakeholders to envision a situation in which they had to choose to fund one study over another, and to describe the three most important criteria they would use when making that choice, in order of importance. For each respondent, we assigned their top choice a value of 3, their second choice a value of 2, and their third choice a value of 1, and then summed the values across the multiple criteria we received from the respondents.

As shown in Table 16, the respondents felt that the top two criteria, energy savings potential and usefulness of the study to program administrators, were the most important considerations. Many stakeholders brought up energy savings potential in describing the need to know more about opportunities to operationalize energy savings potential within a particular market or sector. Implementers and non-implementers mentioned being able to use study results to improve the programs equally. Conceptually, these two criteria are linked by the need to better understand where savings opportunities occur, and to provide insights to program implementers that will enable them to capture those savings.

Table 16. Criteria to Use for Prioritizing Future Market Research (Open-Ended)

| Criteria in Order of Importance (Ranked Response) | Example Question to Ask When Using This Criterion | Respondents Stating the Criteria (n=23) | Summed Score |
|--|---|---|--------------|
| Savings potential | Is the topic of study an area that has significant savings potential, now or in the future? | 15 | 36 |
| Ability to inform programs/ usefulness to program administrators | How useful will this study be to program administrators? Will it help inform the programs? | 11 | 26 |
| Uncertainty | Is there a lot of uncertainty around the quality of information or the market for the product? | 5 | 13 |
| Market information | Will this research provide needed insight into the market for energy-efficient goods or services? | 7 | 11 |
| Policy support – strategic planning policy guidance, etc. | Is the topic of study an important policy interest? Will the study inform policy goals or future policy decisions? | 4 | 10 |
| Amount of information available | How much do we already know about the topic of study? | 4 | 7 |
| Claimed savings | Are there claimable energy savings from the topic of study? | 3 | 6 |
| Current IOU program activity amount | How big a portion of the current IOU portfolios is the topic of study? | 2 | 5 |
| Cost-effectiveness | What is the cost-effectiveness of the topic of study? | 2 | 2 |
| Evaluation considerations | Is the topic of study evaluable? Can this study complement others currently underway? Will it produce actionable results? | 1 | 2 |

Besides the criteria above, eight respondents provided us with suggestions we could not neatly categorize into a group. Respondents gave all of these “other” responses secondary or tertiary importance. The other criteria fell into the previously noted large themes of “content” and “how to conduct the study.” These include:

- Criteria Related to Study Content
 - Understanding the benefits a customer is getting from alternative market technologies
 - Understanding how to overcome market hurdles
 - Whether the area being studied is new
 - Next greatest emerging technology product
 - Early market penetration
- Criteria Related to How to Conduct the Study
 - Cost of the study
 - Timeliness of study

Market Studies Stakeholder Interview Results

- Ability to touch all sectors
- Allowing for local government energy efficiency planning

Savings Potential: As stated above, respondents felt that potential for future savings was the most important criterion to use for prioritizing future market research. This included future market potential, identifying the physical location of the potential, unrealized potential, and focusing on larger energy efficiency opportunities. This criterion was the first choice of one-third of the respondents.

Ability to Inform Programs: This was the second-most-mentioned criterion, and was the first choice of one-quarter of respondents. Examples given include ability to fill gaps in program offerings, usefulness to program implementers, identifying where programs need to be developed, and increasing targeting of programs.

Uncertainty: Uncertainty around intervention effectiveness, quality of existing information, large unknowns, and markets likely to be significant source of savings in the future (but where good baseline information does not yet exist) were also listed by stakeholders as being an important prioritization considerations.

Market Information: Respondents felt that market information in various forms is also important. Examples include market trend information, adoption rates, hot products in the market, and understanding the market value and natural occurrence of energy efficiency.

Policy Support: Respondents also mentioned policy support as a key consideration. For example, respondents listed alignment with the CAEESP and policy directives, ability to meet CAEESP goals, and support for future policy decisions.

Most Important Market Studies

Below we present the market sector and research areas in which stakeholders think studies are most needed over the next five-to-10 years. These research priorities reflect the respondents' individual areas of expertise, awareness of existing information, knowledge of trends and potential, and impressions of relative importance. We will include these findings as a piece of information in the market studies planning tool we are building under Task 2 to help the CPUC determine study priorities.

Studies of Interest

We found significant variation within the stated specific study needs. Stakeholders described roughly 120 different study areas or specific studies they would prioritize for future research. (We provide the full list in Attachment 1). Table 17 shows the most commonly mentioned studies, when grouped by sector and research area. The table data show the broad and sometimes overlapping way that stakeholders think about studies.

However, while this ranking helps to show where respondents indicated a need for studies, there is little agreement about specific studies, even within these areas. For example, the 14 respondents who listed residential studies provided us with study needs ranging from “plug loads—past and present” to “obstacles for future savings.”

Table 17. Ranking of Sector/Research Area

| Sector/Research Area | Frequency of Respondents (n=23) | Frequency of Studies (N=124) |
|----------------------|---------------------------------|------------------------------|
| Residential | 14 | 22 |

Market Studies Stakeholder Interview Results

| Sector/Research Area | Frequency of Respondents (n=23) | Frequency of Studies (N=124) |
|--------------------------------|---------------------------------|------------------------------|
| Market research | 8 | 13 |
| Behavior/decisions/motivations | 8 | 12 |
| Codes/adoption/compliance | 9 | 9 |
| Miscellaneous | 8 | 9 |
| HVAC | 7 | 9 |
| Lighting | 4 | 8 |
| Industrial | 5 | 7 |
| Potential | 2 | 7 |
| Other non-residential | 4 | 5 |
| Financing/cost studies | 6 | 4 |
| Water energy nexus | 6 | 4 |
| Commercial | 4 | 3 |
| Agriculture | 3 | 3 |
| WE&T | 3 | 3 |
| Market transformation | 3 | 3 |
| Non-energy benefits (NEBs) | 2 | 2 |

In order to understand whether role (implementer or non-implementer) or type of stakeholder played a part in the choice of study importance, we examined whether the distribution of study area changed depending on these two areas. Ultimately, the small sample size precluded us from seeing any significant differences among any specific stakeholder group, so we do not present data by the different respondent types.

Market Study Process Recommendations

We asked a series of questions about the market studies framework, targeted the non-implementer groups, as we expected them to be involved with determining which studies to perform. Several themes emerged during the analysis:

- Increased collaboration between CPUC and IOUs (and industry where active)
- Integrating process and market, and process and impact studies, to focus more on market progress and value proposition to the customer
- Better tracking of market share and where a product is in the market cycle
- More timely and more regular research

Specific recommendations included the following:

Market Studies Stakeholder Interview Results

- More market share and sales tracking for products besides lighting. Respondents noted that this could be done using a web crawler to track product offerings, with a panel of market actors, a consumer panel, or tracking of an energy-efficient “basket of goods” similar to the CPI.
- Designation of a market steward or champion that holds one person responsible for driving research and keeping up with what is current in the market. Focus on markets rather than programs, as has been done with lighting and HVAC. It would be useful to have a market manager rather than a program manager at the utilities, in order to move to a more comprehensive look at markets.
- Have evaluators help administrators get the market information they need in order to be successful in moving a market.
- Use of a PAG or other type of group to discuss program ideas and provide feedback before the IOUs submit programs in the PIPs for CPUC approval. The LED framework is an example of this approach.
- Focus integration around market indicators and increase clarity regarding whether the purpose of the intervention is market transformation or resource acquisition.
- Use of a matrix approach for integration with study area leads (process, impact, market) and sector leads (residential, commercial, industrial, agriculture, ZNE, NC).

Attachment 1 – Detailed Study Needs

In questions R1, R2, and R3 of the Stakeholder Interview Study Guide, we asked respondents about research gaps and priorities. We list the individual studies for each sector or research area in the table below. Studies within each area tend to vary widely, covering broad research topics such as behavior or market transformation, and specific topics such as “pool pump demand response shut-off potential.”

While many studies could fall under multiple sector or research areas, we have made the choice to list each study in a single category below. “Res HVAC,” for example, could fall under either residential or HVAC, but has been categorized here as HVAC because that is how the CPUC categorizes this type of study for evaluation planning purposes. For other studies, we categorize them based on the area they will inform (e.g., “Res Behavior”). We present this complete list so the CPUC can understand the specific studies that stakeholders believe are most needed in the future.

Table 18. Study Needs by Sector/Research Area

| Sector/Research Area | Individual Studies Stated by Respondents | Total |
|----------------------|--|-----------|
| Residential | | 22 |
| | ARP | |
| | Home automation | |
| | MF | |
| | MF market characterization | |
| | MF res | |
| | New plug load | |
| | Plug load | |
| | Plug load | |
| | Plug load - past and future | |
| | Pool pump DR shutoff potential at peak | |
| | Res emerging technologies | |
| | Res NC | |
| | Res NC | |
| | Res plug load | |
| | Res retrofit obstacles to deeper savings | |
| | Res strategies for intervention | |
| | Residential | |
| | Small appliances | |
| | Water heating | |
| | Whole house | |
| | Whole house and distributed generation interplay | |
| | Whole house cost reduction | |

Market Studies Stakeholder Interview Results

| Sector/Research Area | Individual Studies Stated by Respondents | Total |
|--|---|-----------|
| Market Research | | 13 |
| | Consumption trends | |
| | Contextual info on market studies | |
| | How to optimize achievement of goals | |
| | Market baselines | |
| | Market hurdles and barriers | |
| | Market share | |
| | Market share tracking | |
| | Market share/market tracking | |
| | Opportunities to maximize savings goals | |
| | Plumbing certification baseline | |
| | Replacement rates | |
| | Value proposition of intervention (cost and energy savings) | |
| | ZNE market baseline/natural occurrence | |
| Behavior/Decisions/ Motivations | | 12 |
| | Behavior (baselines) | |
| | Behavior and decision-making | |
| | Building owner and occupant characteristics | |
| | Customer wants and needs | |
| | Decision trigger points | |
| | Large C&I decision-making | |
| | Market influence on decisions | |
| | Relationship between building occupants and owners | |
| | Res behavior | |
| | Res behavioral baselines | |
| | Res retrofit decision-making | |
| | Understanding customer/contractor motivations | |
| Codes/Adoption/ Compliance | | 9 |
| | Building code level of compliance | |
| | Code adoption/compliance | |
| | Codes and standards | |
| | Gap between code compliance and IOU programs | |

Market Studies Stakeholder Interview Results

| Sector/Research Area | Individual Studies Stated by Respondents | Total |
|----------------------|--|----------|
| | Permit baseline | |
| | QiQm res to code | |
| | Res code compliance rates | |
| | To code | |
| | To code market baseline | |
| Miscellaneous | | 9 |
| | Batteries | |
| | Building characteristics | |
| | Characteristics of successful programs | |
| | Gas pool heaters | |
| | IDS | |
| | Macro consumption | |
| | ME&O | |
| | Rate design | |
| | Service-provider business models | |
| HVAC | | 9 |
| | HVAC | |
| | HVAC | |
| | HVAC | |
| | HVAC | |
| | HVAC emerging technologies | |
| | HVAC technician training (res and comm) | |
| | HVAC to code | |
| | QiQm | |
| | Space-conditioning | |
| Lighting | | 8 |
| | LED market | |
| | LED quality | |
| | Lighting | |
| | Lighting | |
| | Lighting technological change | |
| | New lighting technologies (res) | |
| | Office lighting | |

Market Studies Stakeholder Interview Results

| Sector/Research Area | Individual Studies Stated by Respondents | Total |
|-------------------------------|--|----------|
| | Res lighting | |
| Industrial | | 7 |
| | Industrial | |
| | Industrial controls | |
| | Industrial gas usage | |
| | Industrial market characterization | |
| | Industrial market potential | |
| | Industrial operations and maintenance potential | |
| | Oil fields | |
| Potential | | 7 |
| | Commercial building potential | |
| | Disconnect between potential study and opportunities to capture savings | |
| | Education and outreach potential | |
| | Locational potential and related market studies | |
| | Savings potential | |
| | Where market potential is lower than economic/technical potential | |
| | ZNE potential | |
| Other Non-Res | | 6 |
| | Cooking (ET and C&S) | |
| | Custom projects | |
| | Local and state government load | |
| | Non-res maintenance (e.g., steam traps and chiller walls) | |
| | Public buildings | |
| | Retro commissioning | |
| Financing/Cost Studies | | 4 |
| | Cost-effectiveness | |
| | Finance market assessment | |
| | Measure cost study for DEER | |
| | Res and commercial finance | |
| Water Energy Nexus | | 4 |
| | Water energy load and potential (for diesel, gas, and IOU pumping loads) | |
| | Water energy measures | |

Market Studies Stakeholder Interview Results

| Sector/Research Area | Individual Studies Stated by Respondents | Total |
|------------------------------|---|----------|
| | Water energy nexus | |
| | Water energy nexus | |
| Commercial | | 3 |
| | Commercial end-use | |
| | Commercial market characterization | |
| | Commercial potential | |
| Agriculture | | 3 |
| | Ag operations and maintenance potential | |
| | Ag pumps (replacement and testing) | |
| | Ag water pumping | |
| WE&T | | 3 |
| | Baseline for training and training needs (WE&T) | |
| | Plumbing training market characterization | |
| | WE&T (esp. for maintenance and building operations) | |
| Market Transformation | | 3 |
| | Market transformation | |
| | Market transformation | |
| | Market transformation | |
| Non-Energy Benefits | | 2 |
| | NEBs | |
| | NEBs | |

Attachment 2 In-depth interview

Opinion Dynamics sent the following information to each respondent prior to our interview so they would be aware of the questions and context for the interview.

Market Needs Assessment – Stakeholder Interview Guide

Needs Assessment Study Objective

The interviews are part of a Market Needs Assessment Study. The objective of the study (and follow-up implementation activities) is to allow Commission and/or Program Administrator (PA) Staff to collect data on key markets at regular intervals for the long term, identify and field high-priority market research within the 2013-2014 cycle, and track market research across the evaluation portfolio.

The Market Needs Assessment Study seeks to answer the following questions:

- Within which markets does the CPUC or PA's already have information valuable for understanding the progress of the market in which programs are operating?
- Which market studies are worthwhile for the CPUC or PAs to undertake and what is their relative priority? What are the short term priorities (1-2 years) and what are the long term priorities (2-10 years)?
- What is an appropriate framework for identifying, prioritizing, and conducting market study research and what are the structural and communication requirements of such a framework?

Working Definitions

For the purpose of this survey effort, we are defining a market as follows: an economic system bringing together the forces of supply and demand for a particular good or service. A market consists of customers, suppliers, channels of distribution, and transactions.²⁹

We use the term “market study” to refer to *any study focused systematically on understanding an entire market or any part of a market* (i.e., the customers, suppliers, channels of distribution, or transactions). A market study can focus on a single “good” or “service” (such as air conditioners or quality installation) or be broad and encompass the goods and services available within a sector.

Examples of market studies include: market assessment, market baseline, market characterization, market effects research, market share tracking, market saturation, and market transformation.

How the results will be used

Based on the results of stakeholder interviews, Opinion Dynamics will develop and suggest to CPUC staff a prioritization framework within which to conduct future market research. Following these initial one-on-one interviews, the Opinion Dynamics team will hold a series of workshops to obtain stakeholder comment on the prioritization criteria. These will likely be via webinar where will be soliciting comments.

²⁹Partially taken from Barron's Business Guides. Dictionary of Marketing Terms. Third Edition

Sample

We will conduct in-depth interviews with knowledgeable stakeholders and professionals active in California energy efficiency. This includes Commission Staff, IOUs, evaluation consultants, program implementers, and other interested parties at the direction of the CPUC.

Stakeholder Interviews

We thank you for agreeing to participate in our research. The purpose is to better understand current and planned market studies for energy efficiency activities in California, identify research gaps, and to inform prioritization of possible future research. These interviews are exploratory with a few key concepts to be covered. As such, the guide provided herein is broad and open-ended. To enable us to perform our analysis, we plan to tape our interview and have it transcribed. We would like to share specific responses with the CPUC, but we will keep our interview confidential if you request.

Interview Guide

Role and Area of Expertise

R01. Could you describe the role you play at your organization with respect to energy efficiency programs and markets for energy efficient products?

R02. What sector(s) of energy efficiency programs do you interact most with? If so, what are some of the technologies or goods and services that you have worked on?

Existing Market Studies

S1. In looking for past and upcoming market studies within California, we have reviewed the CALMAC.org website, the Emerging Technology Program database, and the current studies within the Commissions public web archive of evaluation studies (www.energydataweb.com/cpuc), and the updated EM&V roadmaps. Are there other areas you suggest we look for studies?

[FOR PROGRAM IMPLEMENTERS ONLY IF NOT COVERED BY CPUC DATA REQUEST]

S2. Where can we find out about possible market studies that occur using program funding (i.e., studies that we as the EM&V side of the work would be unaware)?

Research Gaps

R1. Thinking about the markets you are familiar with for energy efficient technologies or services, what markets do you think are most important to understand over the next 10 years? Do you think there are markets that are poorly understood and where you need to know more? [Probe for possible goods and services within the different sectors: res, comm, indust, ag]

R2. Of those that you just told me about, which markets or aspects of markets should be studied in the next 1-2 years? Are there specific studies that you think are needed to understand these markets over the long term? What about regular market tracking/feedback needs?

R3. What would be the primary purpose (or purposes) and value of these studies to you? [Probe: Do you need to understand the markets better so that energy efficiency or integrated DSM program administrators know where to intervene? Better understand the impacts of energy efficiency or integrated DSM program interventions? Determine baseline assumptions? Better understand how to intervene? Lay the groundwork for understanding market effects? Something else?]

a. What information would be valuable to you from regular market feedback?

b. What information would be valuable from long-term market research?

Desire for Research within Markets

P1. Of the studies you just mentioned for the next 1-2 years, which do you think are the most important and why? Which are the most important long-term research needs and why?

(Potential criteria include: baseline research for program planning, baselines for impact assessments, measure progress towards strategic plan goals, show program market effects, understanding naturally occurring energy efficiency)

Market Studies Stakeholder Interview Results

P2. If you had to choose to fund one study over the other, what are the top three criteria that you would consider when making your choice? (e.g. market share, presence in IOU programs, market growth potential, amount of existing information, etc.)

P3. What do you think should be the primary emphasis of market studies, what outputs from market research provide greatest value to you?- (Probe: to support short term program design needs, long term planning, strategic planning, development and tracking of market indicators, or some other purpose?)

Market Studies Framework [OMIT FOR PROGRAM IMPLEMENTERS]

F1. If the CPUC and IOUs were to focus more on market studies, do you have any ideas on how this work could be structured and conducted (to meet your organization's needs)?

F2. What suggestions do you have about how market studies should be tied together (or not) with respect to the programs, and the impact and process evaluations that occur each year?

F3. How could (or should) market study outputs be integrated within execution of programs and tracking of goals or indicators (e.g. strategic plan goals, market transformation indicators, etc.)?

F4. Are there any important market indicators that are not being tracked across markets, and which we haven't already discussed?

Closing

C1. Are there any important considerations that we didn't talk about today that might affect the market studies needs for the next 1-2 years or over the longer term?

Appendix D. Market Potential Model Inputs

Below is a screen shot of the Potential and Goals Study Model Inputs we used in this study. These inputs formed the basis for the estimates for energy savings potential used in the residential, commercial, and agricultural and industrial sector tools.

The screenshot displays the '2013 California Energy Efficiency Potential & Goals Study' interface. At the top, it features the California Public Utilities Commission logo, the study title, and the NAVIGANT logo. Below the title bar are navigation buttons for 'Run Model', 'Instructions', 'Version 3.0', and 'Model Details'.

The main content area is organized into four primary sections:

- Basic Inputs:** Contains 'Model Settings' (Service Territory: All, Select Building Type: Edit Table, Net or Gross Savings: Gross, Interactive Effects: Yes) and 'Set Study Scenario' (Study Scenario: Mid EE Penetration).
- Advanced Scenario Inputs:** Divided into three sub-sections:
 - Economic Inputs:** Retail Price Forecast (Mid), Building Stock Forecast (Mid), Avoided Costs (Mid), Policy View (Expected).
 - Programmatic Inputs:** TRC Threshold (0.85), ET TRC Threshold (0.50), Incentive Level (50% o...).
 - Financing Inputs:** Financing (No), Loan Interest Rates (Mid), Leverage Ratio (Mid).
- Key Assumptions & Input Data:** Lists inputs like Measure, Measure Classification, Applied Building Stock by Sector, Retail Rates, and Avoided Costs Nominal, each with a 'Result' button and a 'mid' indicator.
- Output:** Lists results such as IOU Annual Savings (excludes C&S), IOU Cumulative Savings (excludes C&S), IOU Annual Savings by End Use, Total Annual Savings (Aggregate), Technical Potential Savings, and Economic Potential Savings, each with a 'Result' or 'Calc' button and a 'mid' indicator.

At the bottom, the interface includes logos for HMG (Heschong Mahone Group) and NAVIGANT.

Appendix E. Summary of Past CPUC Decisions Regarding Market Studies

| Decision | Decision Name | Ordering Paragraph | OP Language | Market Study Needs Assessment Context |
|-----------|---|--------------------|--|--|
| 09-09-047 | Decision Approving 2010-2012 Energy Efficiency Programs and Budgets | 8 | The Commission definition of market transformation is modified to state (changes noted in italics): Market transformation is long-lasting, sustainable changes in the structure or functioning of a market achieved by reducing barriers to the adoption of energy efficiency measures to the point where <i>continuation of the same</i> publicly-funded intervention is no longer appropriate in that specific market. <i>Market transformation includes promoting one set of efficient technologies until they are adopted into codes and standards (or otherwise adopted by the market), while also moving forward to bring the next generation of even more efficient technologies to the market.</i> | This definition seems to mean that the awareness of when adoption into C&S occurs is a useful market indicator of need for program interventions. |
| 09-09-047 | Decision Approving 2010-2012 Energy Efficiency Programs and Budgets | 22 | This is a very long OP that is all about the Lighting Market Transformation programs (LMP). Guidance is provided around the IOU submission, and indicates that LMP plans should be based on market data. | Because the LMT has pilots and requires a list of key lighting technologies, systems, and strategies that required LMP pipeline plans, the full suite of market information about multiple lighting technologies is required to be sure a pilot is needed and designed well. |
| 09-09-047 | Decision Approving 2010-2012 Energy Efficiency Programs and Budgets | 24e | The Strategic Plan interim milestone for residential new construction, adopted in Decision 08-09-040, is clarified so that the milestone is based upon current 2008 Title 24 building code such that the interim milestones for 2011 are 50% of new homes exceed 2008 Title 24 standards by 20%, and 10% of new homes exceed 2008 Title 24 standards by 40%; | Continual tracking of RNC must be based on 2008 standards. Need for market share tracking. |
| 09-09-047 | Decision Approving 2010-2012 Energy Efficiency Programs and Budgets | 25a | Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall ensure that the activities in the Compliance Enhancement sub-program (CEP) only target Federal Standards and pre-existing codes and standards (non-CASE) | Must know which measures have low compliance rates to fulfil this OP |

Summary of Past CPUC Decisions Regarding Market Studies

| Decision | Decision Name | Ordering Paragraph | OP Language | Market Study Needs Assessment Context |
|-----------|--|--------------------|--|---|
| | | | measures) that have low compliance rates in these utilities' service territories | |
| 12-05-015 | Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach | 45 | Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall include in their 2013-2014 Energy Upgrade California proposal strategies to better leverage the program to achieve energy savings from plug loads, appliances, lighting, and/or swimming pools. | Information on plug loads, appliances, lighting, and swimming pools (pool pumps) is needed. |
| 12-05-015 | Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach | 58 | Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall establish Middle Income Direct Install programs in 2013-2014, if they have not yet done so, and shall explore expansion of eligible Middle Income Direct Install measures to improve the program's comprehensiveness. | The measures included in the DI may need saturation information |
| 12-05-015 | Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach | 63 | Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall include in their 2013-2014 applications the criteria they use to determine the best delivery channel for any given plug load or appliance incentive or intervention in their plug load and appliance Program Implementation Plans for the 2013-2014 transition period. | Information on the market sales channels for plug loads is needed. |
| 12-05-015 | Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach | 64 | Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall clearly identify, in their 2013-2014 applications, the selected delivery channels for all measures included in the Home Energy Efficiency Rebate and Business and Consumer Electronics programs, and identify where synergies allow for more coordinated engagement work with retailers and manufacturers across the Home Energy Efficiency Rebate and Business and Consumer Electronics programs. | Need to understand sales channels for measures within the HEER and BCE programs. |

Summary of Past CPUC Decisions Regarding Market Studies

| Decision | Decision Name | Ordering Paragraph | OP Language | Market Study Needs Assessment Context |
|-----------|--|--------------------|---|---|
| 12-05-015 | Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach | 68 | Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall include a reoriented Appliance Recycling Program in their 2013-2014 transition period proposals, and shall take all feasible steps to minimize costs associated with this program while maximizing savings. | The market for appliance recycling needs to be understood to allow for cost optimization. |
| 12-05-015 | Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach | 70 | Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall identify in their 2013-2014 applications (1) market barriers to achieving residential Zero Net Energy homes by 2020, and (2) the mechanisms that their proposed Residential New Construction programs will employ to address any such barriers starting in 2013. | Market barriers must be explicated for ZNE and how to address them within RNC is needed. |
| 12-05-015 | Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach | 81 | In their 2013-2014 applications, Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall propose and budget for upstream rebates in the Primary Lighting sub-program for basic CFLs to capture the remaining market potential of CFLs, less any of the same potential captured through the Energy Saving Assistance program during the same period. | Continued CFL incentives require ongoing information about the market to assure that all remaining potential is obtained. |
| 12-05-015 | Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach | 87 | In their 2013-2014 applications, Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall only propose rebates for general service screw-base Light Emitting Diode (LED) products that are consistent with the quality standards developed by the California Energy Commission. | Understanding of the QA for LEDs is needed to assure that any incented bulbs meet CEC QA standards. |

Summary of Past CPUC Decisions Regarding Market Studies

| Decision | Decision Name | Ordering Paragraph | OP Language | Market Study Needs Assessment Context |
|-----------|--|--------------------|---|---|
| 12-05-015 | Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education and Outreach | 96 | Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company shall leverage findings from existing research, as well as findings from current evaluation and the Commission Potential and Goals (P&G) studies, to obtain robust market potential estimates on targeted technologies and systems. | Market potential across multiple technologies is needed. |
| 12-11-015 | Decision Approving 2013-2014 Energy Efficiency Programs and Budgets | 5 | Pacific Gas and Electric Company, San Diego Gas & Electric Company, Southern California Gas Company, Southern California Edison Company, the San Francisco Bay Area Regional Energy Network, and the Southern California Regional Energy Network shall submit a revised program implementation plan for the Energy Upgrade California (EUC) program to the Commission in a Tier 2 advice letter by no later than April 1, 2013. The advice letter shall propose the geographic areas to be covered by the utilities and the regional energy networks for the EUC program. The re-designed Basic Path alternative must include a requirement for at least three energy-efficiency measures; a tiered incentive structure; and shall support the energy efficiency loading order and appropriate combustion safety testing. | Information about whether a typical home can use at least three EE measures is required. Also, what the barriers are for homeowners to include three measures at a single time. |
| 12-11-015 | Decision Approving 2013-2014 Energy Efficiency Programs and Budgets | 6 | Pacific Gas and Electric Company, San Diego Gas & Electric Company, Southern California Gas Company, and Southern California Edison Company shall propose an upstream incentive program for distributors of residential heating, ventilation, and air conditioning equipment in a Tier 2 advice letter by no later than April 1, 2013. | Knowledge about the distributor interactions are required. A market characterization that includes this would be useful. |
| 12-11-015 | Decision Approving 2013-2014 Energy Efficiency Programs and Budgets | 26 | Pacific Gas and Electric Company, San Diego Gas & Electric Company, Southern California Gas Company, and Southern California Edison Company shall double their target number of participants for their Middle Income Direct Install programs and ensure eligibility for residents of multi-family buildings in the programs. | Penetration and saturation information on the measures included in the MIDI would help make choices in the future for reduction of this program. |

Summary of Past CPUC Decisions Regarding Market Studies

| Decision | Decision Name | Ordering Paragraph | OP Language | Market Study Needs Assessment Context |
|-----------|---|--------------------|--|---|
| 12-11-015 | Decision Approving 2013-2014 Energy Efficiency Programs and Budgets | 30 | Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company shall only offer incentives for light-emitting diode (LED) bulbs to products that are in the top half of quality on the market and that meet the Energy Star requirements prior to the adoption of a California quality specification for LEDs by the California Energy Commission (CEC). Once the CEC quality specification is adopted, the utilities shall design a transition period of less than one year, in consultation with the CEC and Commission staff, after which they shall only offer incentives to LED bulbs that meet the California quality specification. | Understanding of the QA for LEDs is needed to assure that any incented bulbs meet CEC QA standards. |

Appendix F. List of Expected Market Studies Based on Current CPUC Direction

The list of market studies in Table 19 represents the collection of market studies the CPUC and IOUs planned to conduct prior to the Market Studies Needs Assessment.

Table 19. List of Expected Market Studies over the Next 10 Years (2015-2024)

| Proposed Start ³⁰ | Study Name | Description | Sector | Previously Completed |
|------------------------------|--|--|---------------|-----------------------------|
| 2015 | Potential and Goals Study | Study required by PU Code 454.55 to identify all potentially achievable cost-effective electricity efficiency savings and to establish efficiency targets to meet procurement needs with cost-effective energy efficiency. Study supports energy efficiency goals and targets for 2015 and beyond. | Cross-cutting | 2013 (recurs every 4 years) |
| 2016 | MTI Tracking and Development | Tracking of progress toward market transformation indicators (MTIs) and market indicators (MIs) identified in IOU program implementation plans. | Cross-cutting | New |
| 2017 | LED Market Effects | Follow-up to the LED Market Baseline study completed in 2014. This study would assess market effects and change in the retail LED market since 2014. | Cross-cutting | New |
| 2017 | Residential Multi-Family New Construction Market Effects | Follow-up to the Residential New Construction Multi-Family Market Baseline study completed in 2014. This study would assess market effects and change in the market for new multi-family buildings in California since 2014. | Residential | 2014 |
| 2018 | Whole House Market Effects | Follow-up to the Whole House Market Baseline study completed in 2014. This study would assess market effects and change in the market for residential whole building retrofits since 2014. | Residential | New |
| 2018 | HVAC Market Effects | Follow-up to the HVAC Market Baseline study completed in 2014. This study would assess market effects and change in the market for residential and nonresidential HVAC equipment since 2014. | Cross-cutting | New |
| 2018 | Commercial Market Share Tracking Study (CMST)/CSS | Collects data on market share of commercial products in order to describe current baseline purchases of select equipment and saturation of energy efficiency measures in the commercial and general population. | Commercial | 2014 (recurs every 5 years) |

³⁰ Many of these studies will take several years to complete. We list them by their start date and the results will be available from 1-3 years after the study start time, depending on the scope and data collection period.

List of Expected Market Studies Based on Current CPUC Direction

| Proposed Start³⁰ | Study Name | Description | Sector | Previously Completed |
|------------------------------------|---|--|---------------|-----------------------------|
| 2019 | Potential and Goals Study | Study required by PU Code 454.55 to identify all potentially achievable cost-effective electricity efficiency savings and to establish efficiency targets to meet procurement needs with cost-effective energy efficiency. Study supports energy efficiency goals and targets for 2015 and beyond. | Cross-cutting | 2016 (recurs every 4 years) |
| 2023 | Commercial Market Share Tracking Study (CMST)/CSS | Collects data on market share of commercial products in order to describe current baseline purchases of select equipment and saturation of energy efficiency measures in the commercial and general population. | Commercial | 2014 (recurs every 5 years) |

Appendix G. Comments from IOUs on Report and Response to Comments

The joint IOUs submitted written comments to the evaluation team on 11/11/14. These are included in their entirety below along with Opinion Dynamics' response.

| Comment Number | IOU Comment | Opinion Dynamic's Response to Comments |
|----------------|---|--|
| 1 | Page 4, paragraph 1: The text should specify which of the five studies are descriptive and which are evaluative. | Updated text in this paragraph to show which are descriptive and which are evaluative. |
| 2 | Page 8, Table 4: Categorization of Past Market Studies Data, there are two rows for Commercial Sector – Categories Penetration and Saturation. Doesn't RASS/CLASS have penetration and saturation information and therefore the Sector for these rows should be Commercial & Residential. | Updated text in the table to show both residential for penetration and saturation categories |
| 3 | Residential Market Planning Tool: If possible it would be very useful to have information split out by IOU. | Acknowledged, but no change in the document |
| 4 | Figure 2, Page 12: | |
| 4a | - Can you define what the different color coding means? | Acknowledged, but given the other comment below, no change in the document |
| 4b | - This shows an example from the Residential Market Planning Tool, tab 5-Residential. P. 11 states: <i>For example, the end-use "Computer" has high market potential for electricity and gas (shown by the very dark cells at the top of the Computer column), and low market knowledge (shown by the white cells below). However, computers are also Consumer Electronics, which has a high level of market knowledge. The market studies under Consumer Electronics include computers, so this shows that Computer is an area that does not need additional market studies.</i> | Acknowledged, but no change in the document |
| 4c | I wouldn't know this by just looking at Figure 2. If consumer electronics studies included substantial information on computers, I would show this under the computer column for market knowledge. I would do this for each individual plug | Acknowledged, but no change in the document |

Comments from IOUs on Report and Response to Comments

| Comment Number | IOU Comment | Opinion Dynamic's Response to Comments |
|----------------|---|---|
| | load category and note that the broader category of consumer electronics overlaps with these individual categories. | |
| 5 | <p>Table 9, Page 21 and text on following pages: Short term market study suggestions</p> <ul style="list-style-type: none"> - Overarching: During the 2013-2014 roadmap planning, the residential team came up with a study need to measure a few key market indicators. This study outline was developed by Ralph/Ken. Can you tell us if you have reviewed this study need? If this study need is rejected, can you tell us the reasons why? | Acknowledged, but no change in the document |
| 6 | <ul style="list-style-type: none"> - Study 3 - Commercial Plug-In Lighting: Market Characterization and Assessment: This study would be well worth doing. Currently, task lighting is not counted in the wattage/square foot calculation that determines Title 20 triggers. (Specifically, if main lighting can be kept below 0.5 watts/square foot, controls are not required.) Retrofitters are often encouraged to use lots of task lighting to avoid the controls requirement. It makes sense that plug load lighting could easily slip through the cracks as an energy hog. <p>It would be good to clarify if this study would only consist in re-analyzing CLASS data, without any primary data collection. In that case, the study budget should be adjusted accordingly.</p> | Acknowledged, but no change in the document |
| 7 | <ul style="list-style-type: none"> - Study 5 - Residential Hot Water Market Characterization: PG&E may have a hot water heater study initiative for Residential Solution Workbook II project, with 2013-2014 M&E fund. Andy Fessel is the project lead. The scope of this study may not include updated market characterization but development of a planning tool for the program managers. An updated market characterization may be very helpful. At the bottom of p. 24, ODC recommends that the CPUC review of the ETP study | Acknowledged, but no change in the document |

Comments from IOUs on Report and Response to Comments

| Comment Number | IOU Comment | Opinion Dynamic's Response to Comments |
|----------------|---|--|
| | <p>on water heating and to “check with the other IOUs to see if PG&E has shared the ETP study and if the IOU residential program managers consider it sufficiently relevant for them to use within program design.” These two actions are supported by the IOUs.</p> | |
| 8 | <ul style="list-style-type: none"> - Study 7 - MIDI Barriers Assessment and Market Characterization: This MIDI market characterization study is not needed. <p>The MIDI program is a direct install program and its budget may have more to do with portfolio cost effectiveness than customer wants/needs. Please review the recently completed LI customer wants/needs by Evergreen. In this study, it is pointed out that LI single family homes often have a much greater need for EE/IDSM assistance than LI-MF dwellers. The Athens research through the low-income program analysis provides the IOUs with zip-code level analysis of income qualified customers. This information is available for up to 200% FPG, up to 300% FPG or adequate income population. The above Athens research is updated regularly. The most recent update was delivered earlier in 2014.</p> <p>There is also discussion with the ESAP/LI program to treat non-income qualified customers in qualified zip codes with the MIDI program. For example, 50% of apartment renters are income qualified for direct install ESAP/LI measures, given the zip-code qualification. The IOUs may proceed to install MIDI list of measures in the other 50% of apartment units.</p> | <p>Acknowledged, but no change in the document</p> |
| 9 | <p>Study 6 – Residential Decision Making: Can the measure list be expanded to include additional high-potential electrical measures such as pool pumps, refrigerators/freezers, and, (in view of heat pump technology becoming newly available) to gas and electric dryers? This should not be focused on decision making of gas measures only.</p> | <p>Expanded list in document to include both fuels and included the types shown by IOUs in their comments.</p> |
| 10 | <ul style="list-style-type: none"> - Study 8 - LED Quality Market Assessment: On the one hand, the information to be collected in this study may be useful, since lighting quality is | <p>Acknowledged, but no change in the document</p> |


Comments from IOUs on Report and Response to Comments

| Comment Number | IOU Comment | Opinion Dynamic's Response to Comments |
|----------------|---|---|
| | <p>important for consumer acceptance. In addition, the requirement for IOU incentives only to be made available for CEC standard products, means that this would be important market indicator information. It would be very useful to have available histograms on the availability and quality of LED lamps by measure. One the other hand, there are some reservations about this study, because 1) to do a good job it would likely be expensive and 2) there could be a good deal of overlap with the DNV-GL shelf surveys, as well as the webscraping effort in the IOU-led LED Workpaper Update study. If there was a choice between lighting studies, we would recommend the Commercial Plug-in Lighting: Market Characterization and Assessment study.</p> | |
| 11 | Page 25: Customer Wants and Needs. | |
| 11a | <ul style="list-style-type: none"> - This study or study area does not seem to be included in table 9 on p. 21. Can you clarify if this is part of one or several other studies, or if it should be included as a separate effort (study 9). | Added this study as study 9 in Table 9 on page 21 |
| 11b | <ul style="list-style-type: none"> - IOUs Marketing, ET and other Departments do internal studies on this topic. This should be determined before a study on this is warranted. | Acknowledged, but no change in the document |
| 11c | <ul style="list-style-type: none"> - Overall, looking at customer wants and needs can be useful. It would seem that customers' wants and needs may vary tremendously by income, education and other key demographic variables. It is also true that the customers wants/needs may vary by attitudinal customer segmentation schemes. | Acknowledged, but no change in the document |
| 11d | <p>If this work proceeds, it should build upon the residential AKAB whitepaper and the AKAB analysis within the general population survey from 2010-2012 by RIA/ODC. We generally found the generic AKAB work from 2010-2012 to be less useful than program specific AKAB. This speaks to understanding general consumer wants/needs versus understanding how program interventions are having effects on the participants.</p> | Acknowledged, but no change in the document |


Comments from IOUs on Report and Response to Comments

| Comment Number | IOU Comment | Opinion Dynamic's Response to Comments |
|----------------|--|---|
| 11e | Finally, this wants/needs study should separate homeowners versus renters, from both single family home and MF dwellers. | Acknowledged, but no change in the document |
| 11f | I would also argue that participants usually have a good idea of why they participate in efficiency programs and the benefits they received. We could use more information on why consumers NOT participate in these program, other than not being aware of the program. | Acknowledged, but no change in the document |
| 11g | For a general population customer wants/needs assessment, we should not be limited to only EE measures. We need to look at IDSM measures in the home. | Acknowledged, but no change in the document |
| 11h | We could use more information on customer decision from the perspective of price/cost. Today, the consumers have access to several different types of program intervention- (1) information based feedback, (2) single measure based rebate, (3) comprehensive retrofit with bundled measures. If the consumer is income qualified, then there are direct installed measures available to them. | Acknowledged, but no change in the document |
| 12 | Additional short-term studies to consider: Study 9 - EUC-HU Market Characterization and Market Indicator Measurement | Acknowledged, but no change in the document |
| 12a | There is another urgent market characterization needs to support the EUC-HU MT directive. As a part of this effort, the PAs and ED have jointly agreed to explore three target customer segments: (1) home renovation, (2) HVAC replacement, (3) whole house retrofit. The EUC-HU program is generally familiar with the whole house retrofit market and PG&E has completed several studies in this area, however the other two markets are not characterized as a part of home retrofit target market – to persuade the homeowners to install more than otherwise measures. | Acknowledged, but no change in the document |
| 12b | Following this market characterization need, this MT initiative would require market baseline measurement, as well as operationalize and measure/track a list of recommended indicators for this MT initiative. These study efforts needs to be sufficiently rigorous to support MT best practice and best program design guideline from Keating/Prahl and NMR. | Acknowledged, but no change in the document |
| 12c | Please also review the EUC-MT work to date by Navigant. In the Navigant work, they have recommended several market | Acknowledged, but no change in the document |

Comments from IOUs on Report and Response to Comments

| Comment Number | IOU Comment | Opinion Dynamic's Response to Comments |
|----------------|---|---|
| | <p>indicators for ongoing tracking purpose. So this study needs to do the following:</p> <ol style="list-style-type: none"> 1) complete market characterization work 2) analyze the EUC-HU logic model from the Navigant project, 3) operationalize the EUC-HU recommended market indicators, 4) perform baseline measurement and/or counter-factual baseline | |
| 12d | See EUC-MT/Navigant presentation: | Acknowledged, but no change in the document |
| 12e |  <p>EMV Webinar Presentation 2014 09 :</p> | Acknowledged, but no change in the document |
| 13 | Additional short-term studies to consider: Study 10 - Supplemental RASS/CLASS to Add Plug Load for Gas and Electric | Acknowledged, but no change in the document |
| 13a | <p>As indicated in the Residential Solution Workbook, the statewide of California and IOUs have been systematically tracking and monitoring residential customer's appliance saturation for many years through data collection efforts such as RASS/CLASS. In the last 20-30 years, we are seeing an explosion of home electronic equipment and plug load in home. Until recently, the growth of plug load outpaced many traditional major home appliances. Today, an old and outdated set-box could draw electrical load similar to a small refrigerator. We recommend an analysis to look at the coverage from RASS/CLASS as compared to overall gas and electrical plug load needs for home. We need to see if this is a time to expand the coverage for RASS/CLASS so we can plan future data collection efforts.</p> | Acknowledged, but no change in the document |
| 13b | Attached: Residential Solution Workbook - 2014 | Acknowledged, but no change in the document |

Comments from IOUs on Report and Response to Comments

| Comment Number | IOU Comment | Opinion Dynamic's Response to Comments |
|----------------|--|---|
| 13c |  Residential Solutions Workbook I v1.0 6-23- | Acknowledged, but no change in the document |
| 14 | <p>Page 27: Long term markets studies</p> <p>For the residential study, we currently conduct population surveys in the form of RASS/CLASS which are saturation and inventory survey. These studies does not measure or analyze the velocity of appliance turn-over. The RASS/CLASS survey only cover a handful of major appliances. For the most part RASS/CLASS today do not track or monitor plug load appliances outside of major end-use appliances.</p> | Acknowledged, but no change in the document |

Appendix H. Comments from IOUs on Market Studies Planning Tools

The evaluation team received comments regarding the Market Studies Planning tools from Caroline Chen (Caroline is participating in the Market Studies PCG on behalf of SCE, SDG&D, and SoCalGas) as well as PG&E. Below are their comments verbatim so we do not lose any comments. These comments were on the tools, but Opinion Dynamics made no subsequent changes due to budget.

Comments from Caroline Chen on the Residential Market Studies Tool

(Sent by Caroline Chen in email to Mikhail, Mary and Cathy on 10/29/14)

Here are some overarching comments:

- 1) Thank you for providing this global planning tool. It is wonderful to find all the key information at one place without digging through piles of reports.
- 2) For the IOUs to use this workbook as planning documents, it would be helpful to provide the information both at the California and by IOUs level, when possible.
- 3) Increasingly residential housing type (i.e., SF, MF) and income level (i.e., 200% FPG, 300% FPG, all else) of the population are all critical planning dimensions. A global California state view may also be helpful. For that matter, either statewide attitudinal segmentation or segmentation within IOUs could also be helpful. The key is to have all this information in the same place.
- 4) Working document such as this does require regular updates. I would not recommend an update every six-month, that is probably too frequent. I think an annual update would be appropriate to keep the information fresh and relevant for all concerns. In many cases, the source data may not be updated on an annual basis. We should also strive to make this document available to the residential program managers and planners.
- 5) I am thinking about the granularity of IOUs Residential Solution Workbook and this Residential Market Planning Tool. We need to go back to the objective of these tools:
 - a. Residential Solution Workbook is a planning tool for the IOUs program managers.
 - b. Residential Market Study Planning Tool is more of a tool for the California policy makers.Both of these tools are useful and fill planning data needs. Some healthy overlap between these two tools should be considered as desirable.
- 6) However, it is also clear while we have a good command on major end-uses, but we do not have a good handle on plug loads beyond major end-uses. I know NEEA is doing a study to look at the whole house energy usage. I think our current RASS/CLASS coverage for end-usage should be expanded to cover more than just major end-use.
- 7) In the case, where this Residential Market Planning Tool may be making a different recommendation or conclusion than the Residential Solution Workbook, then we need to round up the troops to have a discussion. (see comments below)

Below, please find detailed comments for each tab:

- 1) For the most part, this workbook represent an aggregated statewide view, which is helpful. For IOUs' program and portfolio planning, we are usually looking at the IOUs specific numbers. If these numbers can be presented in both format, then this workbook can be even more useful.
- 2) Tab-2: Useful sector information is also help. This provides context for residential relative to the other sectors. If this information can be available by IOUs, it would be great.
- 3) Tab-3: Summary graphics are really helpful and informative. Can this go to IOUs level?

Comments from IOUs on Market Studies Planning Tools

- 4) Tab-4: I found the presentation of tab-4 to be confusing. I am not sure what you are trying to illustrate with the big circle in the middle. Perhaps, a more direct pie-chart may be easier on the eyes.
- 5) Tab-5: This is an important chart. I found the shades of black/white/grey to be difficult to discern. If there is an area you want to highlight as high potential to address, perhaps we should consider a different color (i.e., green). Also, this chart requires some conversation since the Residential Solution Workbook has dived down to an even more granulate details (i.e., in-home appliances and all plug load). I think we need to have a side-by-side discussion of this chart versus residential workbook to make sure the story is the same.
- 6) Tab-6: I am not sure I understand the intent of this tab??
- 7) Tab-7,8,9 – would be more meaningful if it can be at the IOUs level.
- 8) Tab-10: This is also good information. I am assuming the residential other is “behavior program”. Can you confirm this? This would be better at the IOUs level also.
- 9) Tab-11: good global information.

Comments from IOUs on Market Studies Planning Tools

Pacific Gas and Electric Company
 Comments on the Market Studies Planning Tool
 August 15, 2014

| Subject: | Section/ Page: | Type (Question or comment): | Comment or Question: |
|---------------------------|---------------------------|--|--|
| Planning Tool Sources | General | Question | <p>What efforts will be made to address the error that could result from the use of the Goals and Potentials study as the basis for this tool? Are other possible resources on which to base this tool being explored?</p> <p>Our question stems from a concern that the Goals & Potentials study may not be the strongest foundation available for this tool, especially given the large variability of the reported results in the most recent G&P study. The use of the EE P&G study as the base from which remaining potentials are identified, and research assignments made, is concerning, and it is recommended that other more reliable resources be explored.</p> |
| Planning Tool Integration | General | Question | <p>What process will be put in place to sync up this tool with similar tools that are already developed or under development so that we are not duplicating efforts? For example: the work that ODC has done so far is similar to work that the IOUs already have underway with Research Into Action (RIA) called the Residential Solution Workbook (there are two iterations of this; one is completed, one is underway).</p> <p>There is also a similar effort that was completed for lighting called the Lighting Solutions Workbook. Will this Planning Tool build upon the extensive work currently completed/underway? Or is it meant as a replacement? As it stands now, it seems like the efforts related to residential products and lighting (in all three planning tools) are disconnected from the IOU-led initiatives completed (Lighting Solutions Workbook) or underway (Residential Solutions Workbook). What steps, if any, will be taken to integrate these efforts?</p> |
| Planning Tool Usability | General | Question | <p>What process will be adopted to keep this tool current across all relevant market sectors? Who will keep this up to date? How frequently will it be updated, and what sources will be used for these updates? Will a group or specific point of contact be set up to coordinate these efforts? Will these updates also incorporate all the non-CALMAC studies, such as SCE's program ISP documents and WO033 comments on baselines?</p> |

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