2013-2016
Energy Division & Program Administrator
Energy Efficiency
Evaluation, Measurement and Verification Plan
Version 6

California Public Utilities Commission, Energy Division

San Francisco, California

January 14, 2016

Table of Contents

1. Overview of Plan Development and Budget Summary 1
1.1. Introduction 1
1.2. EM&V Goals, Directives, and Planning Principles 2
2. Sector and Program Area Long Term Research Roadmaps 14
2.1. Residential 14
2.2. Commercial (Small/Medium Buildings, Prescriptive Measures) 61
2.3. Industrial /Agriculture/Large Commercial, Non-residential New Construction 82
2.4. Heating, Ventilation, Air Conditioning (HVAC) 111
2.5. Local Government Partnerships 138
2.6. Regional Energy Networks and Community Choice Aggregators 165
2.7. Lighting 178
2.8. Integrated Demand-Side Management 201
2.9. Codes and Standards 216
2.10. Zero Net Energy/New Construction 231
2.11. Emerging Technologies Program 243
2.12. Finance 252
2.13. Marketing, Education and Outreach 274
2.14. Workforce Education and Training 290
3. Study Type Long Term Research Roadmaps 301
3.1. Impact Analysis 301
3.2. Market Studies 303
4. Policy Planning Long Term Research Roadmaps 312
4.1. Goals and Potential Analysis 312
4.2. Policy Studies 315
4.3. Strategic Plan Updates and Support 318
4.4. Ex Ante Review and Database for Energy Efficiency Resources (DEER) 327
5. Processes and Procedures Supporting the Evaluation 333
5.1. Management of Energy Division EM&V Effort 333
5.2. Stakeholder Participation 343
5.3. Contracting – by Energy Division & IOUs 347
5.4. Energy Division - IOU Collaboration 351
Appendix A. Summary of EM&V Studies 359
Appendix B. Guidelines for CPUC-ED and California IOU EM&V Reports 360

1. Overview of Plan Development and Budget Summary

1.1. Introduction

This evaluation measurement and verification (EM&V) plan for the Investor Owned Utilities' (IOUs) energy efficiency programs expands on Energy Division's past energy efficiency evaluation work both in its objectives and its administration. The most recent addition to this plan is funding authorized in D.14-10-046 to continue evaluation activities and D.15-10-028 established a rolling portfolio regulatory model for approving programs and continuing to conduct evaluation. This plan continues to implement the five core evaluation and research objectives set forth in September 2009 in D.09-09-047 and re-affirmed in D.12-11-015:

- Savings Measurement and Verification
- Program Evaluation
- Market Assessment
- Policy and planning support
- Financial and Management audit

This scope of the EM&V plan supports oversight of the program administrators portfolio of energy efficiency programs. The energy efficiency portfolio is guided by the California Energy Efficiency Strategic Plan, and continues to emphasize market transformation and comprehensive approaches to energy savings. Evaluation of these objectives helps the California Public Utilities Commission build a growing body of research and knowledge to support future program innovations and the work of other state agencies, including the California Energy Commission and the California Air Resources Board, while supporting the Energy Division's critical oversight role of the IOU ratepayer funded energy efficiency programs.

The core content of this Evaluation, Measurement & Verification Plan was developed and is maintained through a dis-aggregated approach that focused on research needs grouped at the sector level. Energy Division and program administrator evaluation staff collaborated at the sector level, via Project Coordination Groups, to assess status and outputs from current research to inform incremental evaluation needs for the next needed evaluation. The sectors and Program Coordination Groups align with the sector and program areas in the program administrator portfolios and the California Strategic Plan. We believe that developing the needs at the sector level makes it easier to identify existing knowledge gaps and ultimately makes the research more useful and accessible for strategic planning and program implementation improvements. The sector level coordination groups encourage the ongoing participation of stakeholders and implementers in the EM&V process in reviewing plans and results.

In order to meet the CPUC's EM&V objectives, this plan, as reflected in the proposed sector or topic area research 'roadmaps' and overarching budget allocations:

- Balances the first three (impact, market, process) research objectives for each specific sector;
- Provides for a market studies, including addressing spillover and sector specific research to inform market transformation progress;
- Provides sufficient resources for continued in-depth research on the impacts of energy efficiency measures, programs, and portfolios;

- Enables portfolio-level analysis of costs and impacts, with the goal of assessing portfolio cost effectiveness and improving savings estimates in the future;
- Provides the necessary resources for Energy Division's oversight, reporting, savings potential and goals development, and strategic planning responsibilities related to energy efficiency EM&V.

This master evaluation joint plan outlines the allocation of project funds to discrete activities that address Program Administrator and Energy Division information needs across over several sectors of intervention. The majority of the studies will be overseen and prioritized within the given sector Project Coordination Group, and will often address multiple needs in the same study; the sector level evaluation plans will be updated as this process continues to keep stakeholders informed of such evolutions in the master plan. Several sector-level plans address information needs across programs to maximize process and impact evaluations of the same programs or participants. In this way, the evaluation is more efficient, and eliminates duplication, overlap, and unnecessary disruption of program participants. Likewise, coordination across study types, impact and market studies in particular, will ensure consistency in methods and coordination of activities to improve efficiency and relevance of the results.

This EM&V Plan includes documentation of the planning process; descriptions of all EM&V activity areas, enumeration of all proposed EM&V studies, and an EM&V budget. By design, this plan is not a fixed document. Budget allocations and study descriptions will shift as the plan is executed and in response to observation of actual program activity, as well as evolving program and regulatory needs. The plan is a starting point and will be refreshed every six months to reflect changes in budgets or proposed studies. Program Administrator and Commission staff will scope each of the EM&V studies more fully in the initial research planning stage of implementation.

1.2. EM&V Goals, Directives, and Planning Principles

This section summarizes the goals and regulatory requirements for EM&V, as well as guidance and direction used to develop the sector-level research plans.

1.2.1. Goals and Regulatory Directives

The EM&V plan builds off the research and findings from past evaluations. The core objectives of EM&V were set out in Decision (D.)09-09-047. These objectives were slightly modified in D.10-10-033, D. 10-04-092, and in R.09-11-014 and were recognized in D.12-11-015 to continue through 2015 activities per D 14-10-046. The Efficiency Savings and Performance Incentive (ESPI) mechanism was adopted by the Commission in D.12-12-032 in 2012 for the program administrators. In addition to that decision, D.15-10-028 changes the structure and budget cycles of energy efficiency programs and evaluation by moving to "Rolling Portfolios" starting in 2016. The five EM&V research objectives for the portfolios continue as below:

1. **Savings Measurement and Verification** – Measurement and verification of savings resulting from energy efficiency measures, programs, and portfolios serve the fundamental purpose of developing estimates of reliable load impacts delivered through ratepayer-funded efficiency efforts. Measurement and verification work should reflect a reasonable balance of accuracy and precision, cost, and certainty, and be designed for incorporation in procurement planning activities.
2. **Program Evaluation** – Evaluation of program-specific qualitative and quantitative measures, such as the program performance metrics and process evaluations, serves a key role in providing feedback for the purposes of improving performance and supporting forward-looking corrections to utility programs and portfolios. In order to maximize return on ratepayer dollars, program evaluations

must be completed on a timeline which informs mid-course corrections and/or program planning for the following cycle.

3. **Market Assessment** – In a constantly evolving environment, market assessments are an essential EM&V product needed to set the baseline for strategic design and improvement of programs and portfolios, identify and track appropriate metrics of market change, and measure progress toward achieving the goals of the California Long-Term Energy Efficiency Strategic Plan.
4. **Policy and Planning Support** - Consistent with prior program cycles, it is essential to reserve funding to support overarching studies and advisory roles which support Commission policy goals. Over the last program cycle this has been inclusive of potential and goals studies, maintenance of the Database for Energy Efficiency Resources, and other means which support the Commission's oversight role, but do not fall under the core EM&V categories described above.
5. **Financial and Management Audit** – Supporting the Commission's oversight function of ensuring the efficient and effective expenditures of ratepayer funds within the IOUs' energy efficiency portfolios is another objective of EM&V activities. Rigorous financial and management audits overseen by Commission staff will be critical in ensuring that the IOUs' general and administrative costs and other program expenditures are prudent and reasonable.

1.2.2. Planning and Organizing Principles

The EM&V planning exercise covers the five research objectives by combining them into three core activity areas: Program Portfolio and Market Analysis; Regulatory Planning and Policy Development; and Managing EM&V Compliance and Reporting.

Program Portfolio and Market Analysis covers the majority of the research portfolio. This area includes the detailed research plans for impact, process and market studies for each sector or program area. It also includes the coordinating functions and overarching studies for specific study type (i.e. market and impact studies). Long term research roadmaps for each of these segments will guide the work going forward. In developing the EM&V Plan for this activity area, Energy Division and utility staff focused on the following approach:

- Identify incremental research needs based on past studies;
- Address a mix of needs across various study types (impact, process, market);
- Prioritize within limited budgets and Commission directed distribution of funds by agency;
- Consider external stakeholder study needs;
- Centralized planning and coordination for core functions (i.e. data) or research types (i.e. market studies).

Regulatory Planning and Policy Development includes the activities funded through EM&V that support ex ante value development and review, the potential analysis and goals development, support for the California Energy Efficiency Strategic Plan, and ad hoc policy research or improvements to evaluation methods. In developing and maintaining the EM&V Plan for this activity area, Energy Division focused on the following approach:

- Identify incremental research needs based on past studies and remaining funds;
- Focus on Commission directives for oversight, research; and
- Meet the needs for future planning and preparation for the next cycle.

Managing EM&V Compliance and Reporting covers the critical support activities of data management and reporting and the financial audits. These activities ensure compliance with Commission guidance on

reporting energy savings and costs, and provides for a financial audit of the expenditures. These activities also ensure that evaluation findings and aggregate summaries of progress towards savings goals, cost effectiveness targets, and program performance are shared with policy makers, the public and other stakeholders. Developing user friendly systems for accessing data and information (at appropriate levels of aggregation and in compliance with security provisions) is also a core function covered in this area of activity including:

- Identify incremental activities based on infrastructure already developed and remaining funds
- Focus on Commission directives for oversight, accessibility and transparency

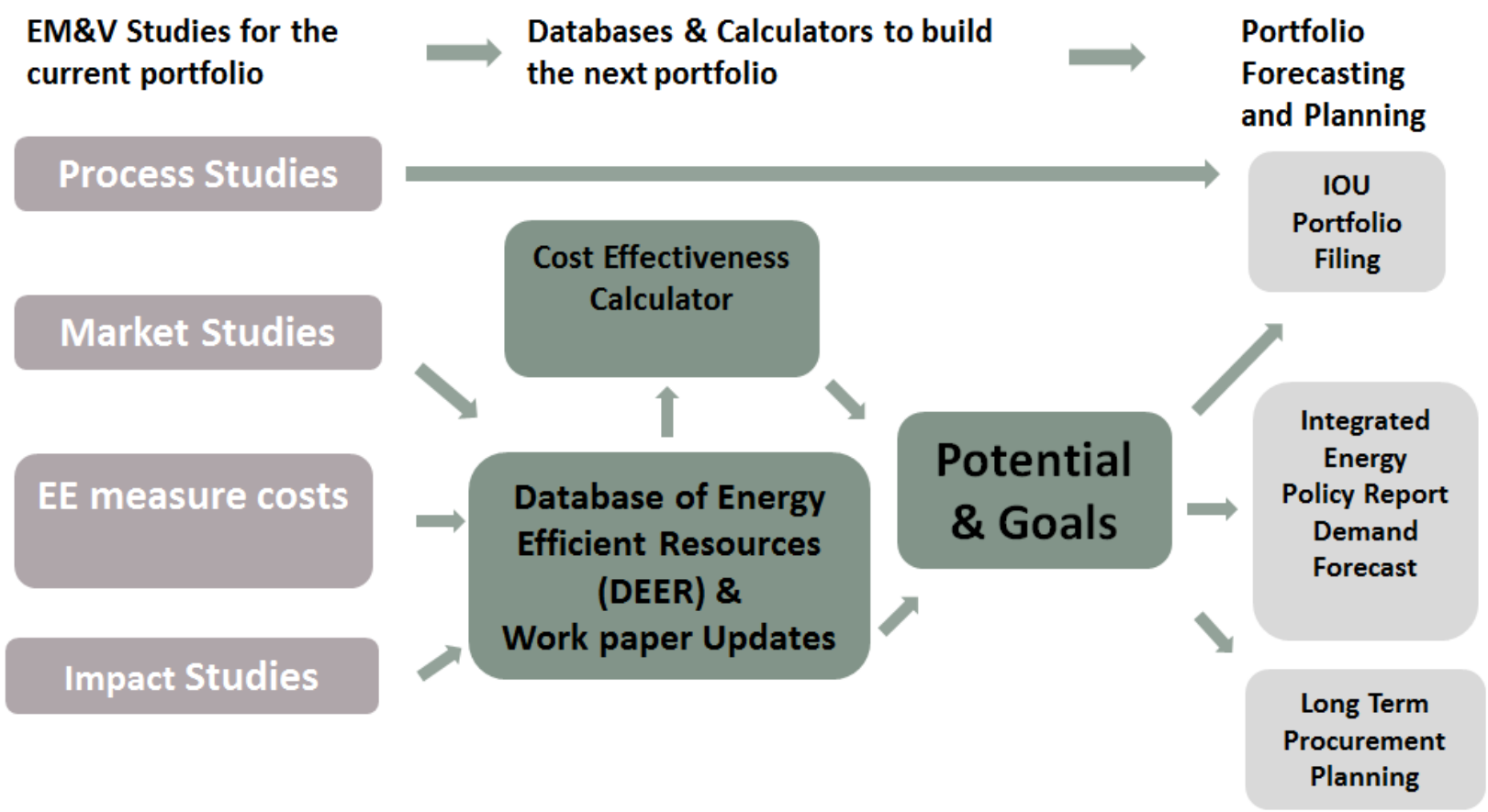
1.2.3. Timing and Feedback Loops

The timeliness and relevance of the research proposed in this portfolio is dependent on its availability to inform changes in measure savings estimates, program design, or policy directives. These activities operate in the context of both a regulatory proceeding and are interdependent with other analytical activities within Energy Division.

The Commission has adopted the 2013-2015 (and many will be implemented as is in 2016) programmatic activities on which this evaluation plan is currently designed. Program planning for the next energy efficiency cycle is intended to be on-going and the proposed changes to the portfolio would be developed, reviewed and adopted by the Commission in future years. The Energy Savings Performance Incentive (ESPI) mechanism is one of the key drivers for the timing of studies in this plan. The schedule for those activities is included in D.13-09-023; and was updated in D.15-10-028.

The goals and potential models, energy savings estimates (ex ante DEER and work papers), program design and policy adjustments are also drivers for timing of studies included in this plan. The flow of information is illustrated in Figure 1. Research roadmaps and individual studies will also have detailed timelines that consider this and future program cycle planning horizons to ensure timeliness and relevance of the planned research.

Figure 1. Feedback Loop for Evaluation Measurement and Verification



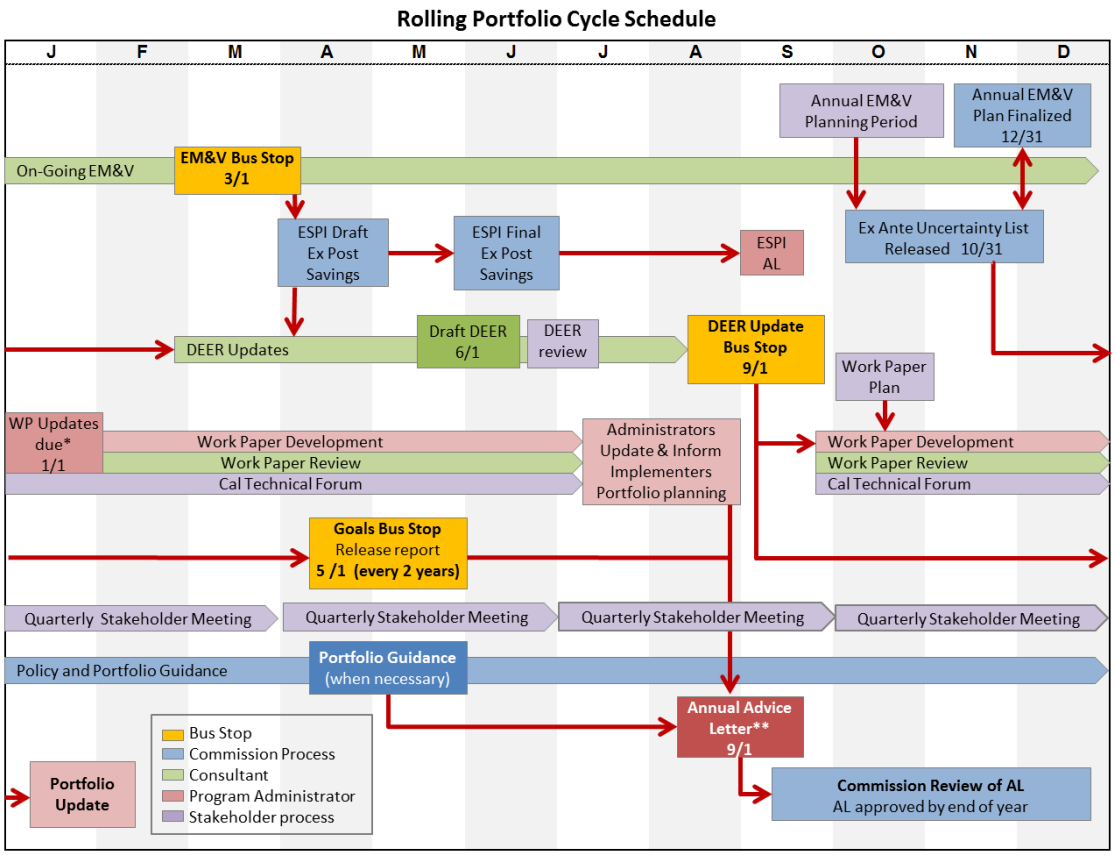
As noted in Figure 1, the information from impact evaluation is expected to provide feedback for updates to savings parameters but realistically the time to get the utility tracking data, field an evaluation and do meaningful analysis necessitates a year (or more) delay. Energy Division is continuing to try to close this gap, but there are some limitations beyond our control. The Energy Savings Performance Incentive is a key driver in schedules for prioritizing and delivering impact studies for uncertain measures as noted earlier.

Process evaluations feed directly back to program performance and design changes, and can typically be completed within the program cycle time frame to provide actionable feedback for program implementers. These findings can also have implications for policy decisions regarding which programs are most successful.

Market studies have the dual purpose of feedback into baselines for savings estimates, and program design in understanding where opportunities lie in the market based on current trends. These studies typically have a long time horizon and hence are most helpful when their long term timelines can coincide with opportunities for new policy direction.

In D.15-10-028, the rolling portfolio cycle also acknowledged the need for predictable feedback and timing of deliverables. In that decision the following annual flow of work was adopted.

Figure 2. Rolling Portfolio Cycle Schedule

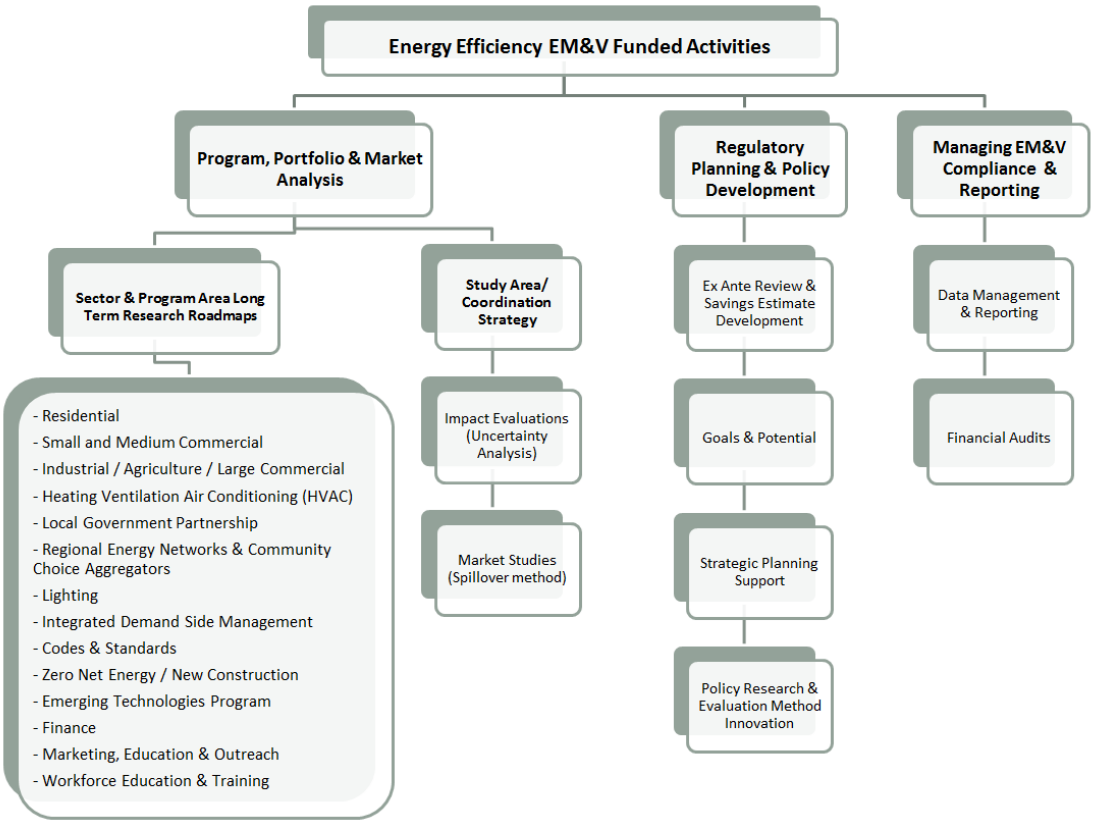


*Work papers for existing measures that are impacted by DEER updates shall be submitted by 1/1, to provide sufficient time for review
**In years that business plan is filed, advice letter filing should be filed concurrently for budget review. Portfolio guidance and business plans are not defined by a set schedule

Studies and work plans contained in this master evaluation plan will be developed in accordance with the expected timing of deliverables. It is important to note, not all deliverables will be available every year. One of the key assets of the rolling portfolio cycle is an opportunity to prioritize and focus evaluation work on short and long term needs to inform the policy process and program improvement.

This evaluation plan is organized around three major categories, Program, Portfolio & Market Analysis; Regulatory Planning and Policy Development; and Managing EM&V Compliance and Reporting. These areas of evaluation activity are described in further detail in the following sections of the plan.

Figure 3. Organization of the Joint Evaluation Measurement and Verification Plan



Program Portfolio and Market Analysis

Sector and Program Area Research Roadmap Development

This planning effort was a collaborative process between CPUC Energy Division (ED), California IOUs and CPUC advisory consultants. Multiple Project Coordination Groups have been formed and continue to be formed to address the program activity areas in the energy efficiency portfolios and the California Energy Efficiency Strategic Plan. Each of these teams followed a similar process to develop their long term research roadmap plan, as described below.

1. Assess which studies have been recently completed and/or in-progress and prior program cycles to develop study and information gaps. This assessment included considerations for types of studies, and scope and depth of those studies.
2. Avoid duplication and strive to leverage resources to address prioritized information gaps and study needs by:
   a. Considering the status of past studies that are still underway but not yet completed
   b. Identifying areas of significant program changes
   c. Identify research areas that are under-developed
   d. Identify the high priority program team information needs and consider public stakeholder information needs (via public webinars)
   e. Investigate areas of potential overlap and duplication with research proposed in other coordination groups
3. Set priorities for 2013-2014 study agenda given limited budget and resources by:
   a. Conducting multiple rounds of prioritization of project content as well as budget re-sizing by the Project Coordination Groups (PGCs).
   b. Consolidating, adding, and deleting projects as a result of key stakeholder review and comments received by the PCG

The current Long Term Research Roadmaps contained in this version of the joint evaluation plan are a result of the above collaborative process. The plans are living documents that evolve as funds are available and as priorities and needs are considered.

Study Type Research Roadmap Development

Two study type research roadmaps are included in this EM&V plan. The purpose of these plans is to identify how Energy Division and the IOUs will track, coordinate and prioritize research activities across sector research but for a specific study type. These roadmaps serve a coordinating and strategies function, but also identify some specific research needs. The Market Studies research roadmap is focused on the coordination of market studies across the program administrators and Energy Division and the need for standing research activities to address long term tracking of market progress. Each roadmap is provided in this research plan. Commission staff will update the roadmaps throughout the evaluation cycle.

Regulatory Planning and Policy Development

Goals and Potential, Ex Ante (DEER), Strategic Plan Roadmap Development

Energy Division took sole responsibility for reviewing and preparing this segment of EM&V funded activities. Energy Division staff reviewed existing plans and remaining funding for research and have summarized the next steps to take in research or analysis in the upcoming years. These research roadmaps, specifying the research activity, are provided in the following section of this plan. The line item for Ad Hoc Policy Research and Evaluation Methods has not yet been scoped and is provided in this plan as a place holder to address up and coming evaluation or policy research needs.

Managing EM&V, Compliance, and Reporting

Data Management and Reporting

Energy Division took sole responsibility for preparing this segment of EM&V funded activities. The Data Management and Reporting section is based on past activity and future needs, similar to the research roadmaps. The summary of the background, future activities and proposed budget are provided in the second chapter of this evaluation plan.

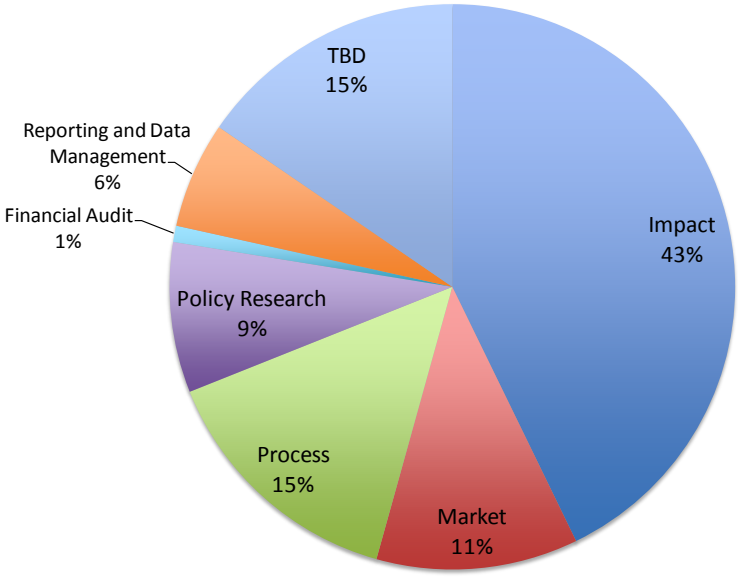
1.2.4. 2013-2015 EM&V Plan Budget Summary

In this section we present summaries of the current EM&V budgets by activity area and project. Table 1 includes the budget by the EM&V activity categories which are introduced in Section 3 of this plan. The list of active projects, budgets and status projects can be tracked on the Project Status Reporting web page: [http://www.emvpsr.com/Projects/] along with studies currently being completed. program cycle. The funds that were authorized for 2016 are included as draft distributions to various sector-level roadmaps, but have not yet been distributed to specific studies.

The EM&V projects are explained in more detail in the sector level research roadmaps in the following sections. In summary the distribution of funding across the general research objectives are illustrated in the following figures. These are dependent on the classification of each study, which is cited for each project in the project status reporting tool.

A contingency budget has also been set aside to deal with unexpected research needs. It frequently is used to leverage planned field work expansion to cover currently unknown needs.

Figure 4 Distribution of 2013-2016 EM&V Funds



The funding approved in 2016 for EM&V for Energy Division has only been allocated by research roadmap area (not the categories shown in the pie chart and are hence shown as “TBD”).

Table 1. EM&V Plan Sector Budgets[1]

		Study Type				
Sector	Study Manager	Impact	Market	Process	Total 2013-2015	Incremental 2016
Residential	***Total***	**$3,787,282**	**$495,000**	**$1,997,000**	**$6,279,282**	**$3,834,162**
	ED	$3,787,282	$405,000		$4,192,282	$2,934,162
	IOU		$90,000	$1,997,000	$2,087,000	$900,000
Small & Medium Commercial	***Total***	**$6,470,000**		**$1,660,000**	**$8,130,000**	**$1,726,664**
	ED	$6,470,000		$1,660,000	$8,130,000	$1,676,664
	IOU					$50,000
Industrial and Agriculture, and Large Commercial	***Total***	**$7,915,000**	**$1,989,200**	**$250,000**	**$9,454,200**	**$4,282,077**
	ED	$7,915,000			$8,015,000	$3,982,077
	IOU		$1,989,200	$250,000	$1,439,200	$300,000
Integrated Demand Side Management (IDSM)	***Total***	**$100,000**	**$663,000**	**$600,000**	**$1,363,000**	**$838,332**
	ED		$583,000	$500,000	$1,083,000	$838,332
	IOU	$100,000	$80,000	$100,000	$280,000	$0
Workforce Education and Training (WE&T)	***Total***	**$391,222**	**$550,000**	**$337,008**	**$1,278,230**	**$204,792**
	ED	$391,222	$550,000		$941,222	$104,792
	IOU			$337,008	$337,008	$100,000
Marketing, Education & Outreach (ME&O) (D. 13-12-038)	***Total***	***$825,000***		***$1,049,000***	***$1,874,000***	**$880,711**
	ED	$825,000		$1,049,000	$1,874,000	$880,711
Emerging Technologies	**Total**		**$90,000**	**$1,262,222**	**$1,352,222**	**$104,792**
	ED			$782,222	$782,222	$104,792

[1] Source: "2013-2015 EMV Plan Study Inventory_v2.xls";

		Study Type				
	IOU		$90,000	$480,000	$570,000	$0
Local Government Partnership	***Total***	**$430,000**		**$1,510,000**	**$1,940,000**	**$1,133,332**
	ED	$430,000		$500,000	$930,000	$838,332
	IOU			$1,010,000	$1,010,000	$295,000
Lighting	***Total***	**$3,340,000**	**$1,400,000**	**$1,514,906**	**$6,254,906**	**$3,174,579**
	ED	$3,340,000	$1,400,000		$4,740,000	$2,724,579
	IOU			$1,514,906	$1,514,906	$450,000
Finance	***Total***	**$3,228,054**		**$2,722,751**	**$5,950,805**	**$419,166**
	ED	$3,228,054		$100,000	$3,328,054	$419,166
	IOU			$2,622,751	$2,622,751	$0
Codes & Standards	***Total***	**$6,175,497**	**$95,000**	**$215,000**	**$6,485,497**	**$1,317,915**
	ED	$5,455,497		$120,000	$5,575,497	$1,047,915
	IOU	$720,000	$95,000	$95,000	$910,000	$270,000
Zero Net Energy / New Construction	***Total***	**$235,974**	**$932,116**	**$581,250**	**$1,749,340**	**$808,749**
	ED		$586,832		$586,832	$628,749
	IOU	$235,974	$345,284	$581,250	$1,162,508	$180,000
Heating, Ventilation, and Air-Conditioning (HVAC)	***Total***	**$6,790,497**	**$2,310,000**	**$325,000**	**$9,425,497**	**$2,824,996**
	ED	$6,515,497	$1,775,000		$8,290,497	$2,514,996
	IOU	$275,000	$535,000	$325,000	$1,135,000	$310,000
Regional Energy Networks/Community Choice Aggregators	***Total***					**$1,231,120**
	ED	$590,000		$645,000	$1,235,000	$838,332
	REN/CCA					$392,788
				Grand Totals	**$62,846,979**	**$22,781,387** (of which $880,711 for ME&O)

Table 2. Overall Budgets – Study Type Coordination Strategy and Regulatory Planning & Policy Development

		Study Type (Impact, Process, Market)				
Study Type / Coordination Strategy	**Study Manager**	**Impact**	**Market**	**Process**	**Total 2013-15**	**Incremental 2016**
Study Type Coordination						
Impact Analysis	ED				(funded via impact studies)	(funded via impact studies
Market Studies	ED		$3,769,260		$3,769,260	$104,792
Regulatory Planning and Policy Development						
DEER / Ex Ante Review	ED	$7,100,000			$7,100,000	$0
Policy Research/ Evaluation Methods	ED				$2,059,242	$500,000
Potential Goals and Targets	ED				$3,946,680	$2,000,000
Strategic Plan	ED				$600,000	$500,000
Managing EM&V, Compliance, and Reporting						
Data Management and Reporting	ED				$4,085,000	$2,095,830
Financial Audit	ED				$500,000	$540,592
Report/Comments/Invoice tools	ED				$84,000	$84,000
Server Space	ED					$74,000
					$18,197,502	**$5,899,214**

Table 3. Overall Budgets – Other Costs

Other Costs	Study Manager	Total Budget 2013-15	Incremental Budget for 2016
Utility EM&V Fixed Costs	IOU	$15,850,000	$5,300,000
Fixed Costs (EM&V Staff)	ED	$3,000,000	$1,000,000
Technical Advisors	ED	$2,480,000	$400,000
Evaluation Administration	ED	$6,164,866	$1,676,664
Contingency		**$3,169,799**	**$1,372,008**
	ED	$858,299	$169,844
	IOU	$2,331,500	$1,202,164
Total Budgets across all Research and Management 2013-2016		**$90,785,900**	**$38,429,273**
	ED	$74,309,400	$28,679,321
	IOU	$16,476,500	$9,749,952

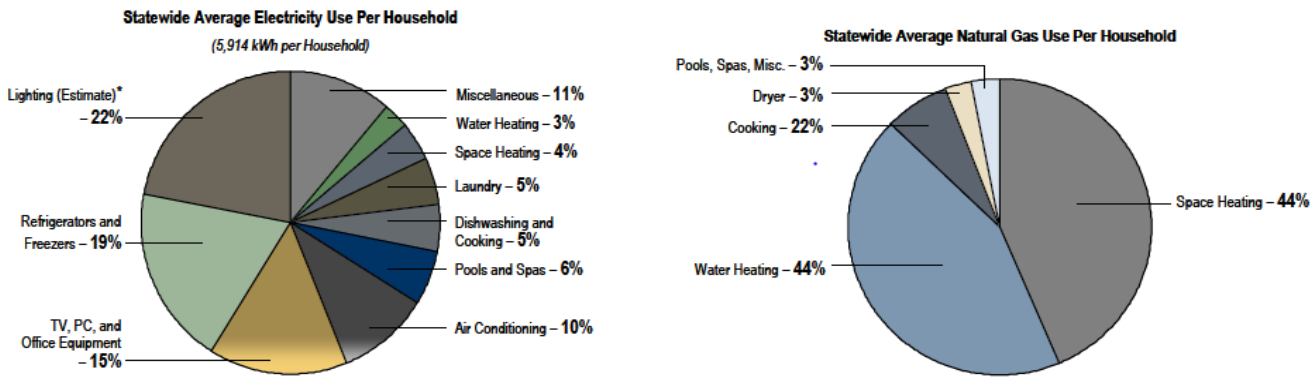
The budgets provided here are summarized in greater detail (by evaluation project) in the project status reporting tool. The detailed descriptions of the activities are found in the sector or study type roadmaps or chapter that describes the support activity.

2. Sector and Program Area Long Term Research Roadmaps

2.1. Residential

As indicated in the California Energy Efficiency Strategy Plan, in 2008, energy demand for California's 12.6 million households represent 32% of total state electricity consumption and 36% of its total natural gas consumption. Approximately one-third of all households reside in multi-family structures and the other two-thirds of households live in single family homes. The concentration of renters as compared to homeowners is about 42% and 58%, respectively. Below is a profile of the electricity and nature gas usage profile from the California Energy Efficiency Strategy Plan (January 2011 update).

Figure 5. Profile of Electricity and Nature Gas Usage



The California Energy Efficiency Strategy Plan establishes the following goals:

1. New construction will reach "zero net energy" (ZNE) performance (including clean, onsite distributed generation) for all new single and multi-family homes by 2020.
2. Home buyers, owners and renovators will implement a whole house approach to energy consumption that will guide their purchase and use of existing and new homes, home equipment, household appliances, and lighting and plug load amenities.
3. Plug loads will be managed by developing consumer electronics and appliances that use less energy and provide tools to enable customers to understand and manage their energy demand.
4. The residential lighting industry will undergo substantial transformation through the deployment of high-efficiency and high-performance lighting technologies, supported by the state and national codes.

These goals above are designed into the IOUs portfolio of residential programs for the 2013-2014 transition period.

Residential Portfolio of Programs for 2013-2014

For the 2013-2014 Program Cycle, the residential portfolio of programs has been substantially reorganized into the following structure:

1. Whole Home Programs – a market transformation program
    a. Whole House - Energy Upgrade California (EUC) – Basic/Advanced/Flex Path
    b. Multifamily - Energy Upgrade California (EUC)

   c. Moderate Income Direct Install (MIDI) (SCE-Only)
2. Multifamily Programs
   a. Multifamily Energy Efficiency Rebate Program (MFEER)
   b. Comprehensive Manufactured Homes (CMHP, 3P program, SCE Only)
   c. Direct Install for Manufactured and Mobile Homes Program (DIMMHP, 3P program, PG&E Only)
3. Home Energy Advisor Program
   a. Home Energy Advisor Survey (HEA) & Universal Audit Tool (UAT)
   b. Comparative Energy Usage Report
   c. Home Buyer Guide (aka On-line Buyer Guide)
4. Plug Load & Appliance Program (PLA) – a market transformation program
   a. Home Energy Efficiency Rebate Program (HEER/downstream & midstream),
   b. Appliance Recycling Program (ARP/downstream)
5. Residential New Construction Program- a market transformation program
6. Residential HVAC Program – a market transformation program
7. Residential Third Party Program

Table 4. 2013-2014 Residential Portfolio Savings and Budget Summary

IOU	Program Name	Budget	kWh Savings	% of Residential Budget	% of Residential kWh
Statewide	Energy Advisor	$30,366,771	222,489,015	9%	39%
Statewide	Res HVAC	$30,308,036	9,400,205	9%	2%
Statewide	MFEER	$16,860,983	61,792,921	5%	11%
Statewide	Res New Construction	$34,578,307	6,354,191	11%	1%
Statewide	Plug Load & Appliances	$103,735,173	229,428,671	32%	40%
Statewide	EUC – WH	$79,532,810	25,177,380	24%	4%
Statewide	Res Third Party	$32,961,639	16,030429	10%	3%
	Total Statewide	**$328,343,718**	**570,672,812**		
	% of Statewide Portfolio			17%	15%

For the purpose of this long-term residential research roadmap, we will set aside the Residential HVAC and Residential Third Party Programs. Evaluation of HVAC and Third Party activities will be managed by the other PCGs. This residential long term study roadmap is organized into two parts:

- Part-1: Residential Retrofit Programs and Study Area
- Part-2: Residential New Construction Program and Study Area

2.1.1. Background – Part-1: Residential Retrofit Programs & Study Area

Sector or Program Area Description

The 2013-2014 Statewide Residential Program Portfolio is 17% of the total IOUs' statewide EE program portfolio budget. It is the second largest program budget in aggregate next to the statewide Commercial Program Portfolio. Within the Residential Program Portfolio, each IOU has opted to implement different program strategies to meet their energy savings goals.

Each IOU is asked to provide a broad scope and array of programs to serve a multitude of customer wants and needs, including lower income homeowners (i.e., those not meeting the low-income qualification requirements). In addition, several residential retrofit programs are identified as market transformation programs (i.e., Energy Upgrade California and Plug Load and Appliance Programs).

These programs are generally designed to target two distinct groups of customer segments:

1. Homeowners & renters,
2. Apartment owners/managers.

The residential portfolio of programs is also designed to serve the needs of small business entities that behave like homeowners and/or renters in terms of their purchase behavior and/or energy usage profile.

The program theories are often expressed to overcome the following market barriers commonly faced across the residential energy efficiency sector:

- Lack of energy efficiency information available to and understood by consumers and contractors;
- Lack of awareness of specific measures, programs and/or practices available for consumers and contractors;
- Availability of energy efficiency products for retailers and contractors;
- Split incentive challenges in motivation for property owners versus renters;
- Lack of funds or financing options;
- Lack of quantity and quality of skilled contractors and installation workforce.

For these programs to be successful it is important for all the participating and non-participating market actors to be aware and knowledgeable about the specific program - thus motivating the desired purchase decisions and best quality installation efforts.

Programs included in the Research Scope

As indicated above, the residential program portfolio has changed substantially for 2013-2014. Several programs have been consolidated into this sector to simplify program design and administration and to allow for synergy savings and cost effectiveness.

1. Whole Home Programs – a market transformation program
2. Multifamily Programs
3. Home Energy Advisor Program
4. Plug Load & Appliance Program (PLA) – a market transformation program

Table 5. 2013-2014 Residential Retrofit Programs Savings and Budget Summary (Without HVAC, New Construction & Res. Third Party Programs)

2013-2014 Program Years	kW	kWh	Therms	Budget	kW%	kWh%	Therms	Budget%
SCE								
Energy Advisor Program	5,730	12,667,350		$10,061,000	15%	7%	0%	14%
Plug Load and Appliances Program	19,574	98,197,140		$34,463,000	50%	57%	0%	47%
Multi-family Energy Efficiency Rebate Program	9,622	56,050,448		$8,487,000	24%	32%	0%	12%
Energy Upgrade California - Whole Home Upgrade Program	4,532	6,461,750		$19,786,000	11%	4%	0%	27%
SCE Total	**39,458**	**173,376,688**		**$72,797,000**	**100%**	**100%**	**0%**	**100%**
% of Statewide Program Total	45%	32%	0%	32%				
PG&E								
Energy Advisor Program		209,821,666	6,832,780	$17,641,102	0%	67%	64%	18%
Plug Load and Appliances Program	14,771	88,962,058	1,659,601	$39,947,273	42%	28%	16%	42%
Multi-family Energy Efficiency Rebate Program	588	279,897	451,067	$2,059,866	2%	0%	4%	2%

2013-2014 Program Years	kW	kWh	Therms	Budget	kW%	kWh%	Therms	Budget%
Energy Upgrade California - Whole Home Upgrade Program	20,227	16,207,443	1,661,972	$36,202,940	57%	5%	16%	38%
PG&E Total	**35,586**	**315,271,064**	**10,605,420**	**$95,851,181**	**100%**	**100%**	**100%**	**100%**
% of Statewide Program	40%	59%	64%	42%				
SDG&E								
Energy Advisor Program	0	0	0	$820,112	0%	0%	0%	3%
Plug Load and Appliances Program	5,428	30,344,439	204,171	$12,673,003	66%	79%	21%	42%
Multi-family Energy Efficiency Rebate Program	747	5,450,983	204,634	$3,902,566	9%	14%	21%	13%
Energy Upgrade California - Whole Home Upgrade Program	2,007	2,508,188	573,873	$12,847,890	25%	7%	58%	42%
SDG&E Total	**8,182**	**38,303,610**	**982,678**	**$30,243,571**	**100%**	**100%**	**100%**	**100%**
% of Statewide Program Total	9%	7%	6%	13%				
SCG								
Energy	0	0	0	$1,710,997	0%	0%	0%	5%

2013-2014 Program Years	kW	kWh	Therms	Budget	kW%	kWh%	Therms	Budget%
Advisor Program								
Plug Load and Appliances Program	5,025	11,925,034	3,245,009	$17,131,897	100%	100%	64%	54%
Multi-family Energy Efficiency Rebate Program	7	11,593	1,157,850	$2,411,550	0%	0%	23%	8%
Energy Upgrade California - Whole Home Upgrade Program	0	0	684,288	$10,696,979	0%	0%	13%	33%
SCG Total	**5,032**	**11,936,627**	**5,087,147**	**$31,951,423**	**100%**	**100%**	**100%**	**100%**
% of Statewide Program Total	6%	2%	31%	14%				
Statewide Total	**88,258**	**538,887,989**	**16,675,245**	**$230,843,175**				
% of Statewide Program Total	100%	100%	100%	100%				

These residential programs serve residential single family and multi-family customers energy efficiency purchase needs, comprehensive retrofit needs, and behavior/information needs.

Uncertainties and Challenges to Successful Implementation

The residential retrofit programs face the following uncertainties:

In 2013-2014, two of the residential sub-programs are identified as "market transformation programs": Plug Load and Appliance and Whole House programs. To support this directive, the preliminary process for managing market transformation has been identified in the program implementation plan. Furthermore, Decision 12-05-015 has identified the need to engage an additional market transformation consultant to help direction for this process for the various stakeholders.

Below is a list of uncertainties facing the residential program (i.e., retrofit only):

1. Support for progress tracking and planning efforts for residential retrofits markets and deep energy reduction strategic planning goals,
2. Determine the effectiveness of new program designs and accuracy of associated energy impacts (i.e., EUC Whole House and EUC-MF/MIDI, Comparative Energy Usage, Online Audit Tools, etc.),
3. Support efforts to update work-papers to ensure accuracy of energy savings claims,
4. Collect data to support innovation activities,
5. Support required for WE&T residential contractor data and sector strategy needs (i.e., EUC Whole House and MF)
6. Uncertainty about double-counting deductions from behavior program savings

Much like the lighting studies, a wide range of residential studies are typically authorized by both ED and IOUs to cover Low-income/ESAP, Demand Reduction, Marketing Education and Outreach programs. A critical synthesis may be required to summarize key data such as customer awareness and attitudes across these study areas.

The residential retrofit study roadmap is designed to address these uncertainties and data needs to support program designers, policy makers, key stakeholders and other entities.

Ex Ante Coordination

Ex ante processes (including DEER updates, Uncertain Measures List updates, work papers review, and custom projects review) incorporate data and results from the latest EM&V studies. The ex ante values that are relevant to this sector are highlighted in this section, they may also be included in other relevant chapters.

Summary of DEER 2016 Updates:

- Clothes washers updated to reflect new rating systems
- Appliance (refrigerators and freezers) updated to reflect that a large fraction of the program collected units had little or no market value and thus have no gross savings. The result of this revision was a reduction in gross savings, but an increase in NTG compared to previous DEER versions.

Summary of 2015 Uncertain Measure Updates:

To assess what measures to move off and/or add onto the Uncertain Measures List requires looking ahead to IOU portfolios and analysis of ex ante and ex post teams. The current 2015 Uncertain Measures List (http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M076/K775/76775903.PDF, Attachment 3) contains the following items for this sector and shall be prioritized in the evaluation studies.

The 2015 Uncertain Measure list for residential measures other than lighting remain unchanged.

Table 6. 2015 Uncertain Measures

Measure Description	Comments on Need	PGE	SCE	SDGE	SCG
Home Energy Reports (Residential Energy Advisor Program)	Behavioral program requires ex post evaluation of all claims.	X	X	X	
Energy Upgrade California	Change in program design and	X	X	X	

Measure Description	Comments on Need	PGE	SCE	SDGE	SCG
	maturing program offering makes assumption uncertain; normal replacements versus early retirement assumptions are uncertain.				
Home Energy Surveys (mail and phone)	Changing survey and audit methods and target population makes use of previous result inappropriate.		X		
Variable speed pool pump	Rapid reduction in equipment pricing and improved efficiency makes gross and net savings uncertain.			X	
Water savings kits/items (shower and faucet)	Energy impacts of this measure not subject to previous evaluation and assumption are uncertain; uncertain install rate and level of free riders.			X	X

Ex ante staff leads and ex post staff leads will coordinate processes, studies, and timelines to better align the flow of information between ex ante and ex post projects. Ex post evaluation studies provide data and results for ex ante updates. Planning for ex ante updates in the future will also require evaluation planning and input. Evaluation studies will need to budget time and schedule to provide input into ex-ante processes, such as DEER and the uncertain measure list. Currently, ex ante funding is budgeted under the overall ex ante contract. More information about the budget is provided in the Ex Ante Review section of this document.

Next planned DEER Update

The DEER team is currently in the planning stages for 2017 updates. The scope of these updates is still under development

Program Administrators' Planned Work paper Submissions

Program Administrators submit planned work papers for the upcoming portfolio cycle to Commission staff. These work papers often use DEER data and/or methodology to add technologies that are not in DEER to the energy efficiency portfolio.

Table 7. Planned Work paper Submissions

Program Administrator	Sector	Tech Type	Measure/Value/ Parameter	Reason for the Update/New Work paper
PG&E	RES	Appliances and Plug	Energy Star Clothes	New data

Program Administrator	Sector	Tech Type	Measure/Value/ Parameter	Reason for the Update/New Work paper
		Loads	Dryers	
PG&E	RES	Appliances and Plug Loads	Energy Star Clothes Washers	New data
PG&E	RES	Appliances and Plug Loads	Retail Plug Load	New data
PG&E	COMM	Food Service	Deck Ovens	New data
PG&E	COMM	HVAC	High Performance Evaporatively Pre-Cooled Condenser	New data
PG&E	COMM	HVAC	Indirect Evaporative Dedicated Outdoor Air System (DOAS)	New data
PG&E	AG	Irrigation	Vertical Hollow and Solid Shaft Pump Motors	New data
PG&E	COMM	Refrigeration	Ultra-Low Temperature Freezer	New data
PG&E	COMM	Service and Domestic Hot Water	High Efficiency DHW Boiler (>75 mBTU/h)	New data
PG&E	COMM	HVAC	Economizer Control Commercial	New data
PG&E	COMM	HVAC	Condenser Coil Cleaning Commercial	New data
PG&E	COMM	HVAC	Unoccupied Supply Fan Control Commercial	New data
PG&E	COMM	HVAC	Evaporator Coil Cleaning Commercial	New data
PG&E	COMM	HVAC	Refrigerant Charge Commercial	New data
PG&E	COMM	HVAC	PTAC/PTHP Controller	DEER Updates
PG&E	COMM	HVAC	Economizer Repair	DEER Updates
PG&E	COMM	HVAC	Economizer Control	DEER Updates
PG&E	COMM	HVAC	Condenser Coil Cleaning	DEER Updates
PG&E	COMM	HVAC	Unoccupied Supply Fan Control	DEER Updates
PG&E	COMM	HVAC	Evaporator Coil Cleaning	DEER Updates
PG&E	COMM	HVAC	Refrigerant Charge	DEER Updates
PG&E	COMM	Refrigeration	Vending Machine	DEER Updates

Program Administrator	Sector	Tech Type	Measure/Value/ Parameter	Reason for the Update/New Work paper
			Controller – Uncooled	
PG&E	COMM	Lighting	4 Watt Int Screw-in CFL	DEER Updates
PG&E	RES	Appliances and Plug Loads	Home Energy Upgrade Program	DEER Updates
PG&E	RES	Appliances and Plug Loads	Unit 1 Refrigerator Recycling	DEER Updates
PG&E	RES	Appliances and Plug Loads	CLOTHES WASHER WATER AGENCIES MEF >= 2.4 WF <= 4.0	DEER Updates
SDG&E	RES	Appliances and Plug Loads	Pool Response – This is an IDSM project for pool pumps using a low cost controller. If effective - could be a residential rebate.	Deer Updates
SCG	RES	Appliances and Plug Loads	Showerhead/Faucet Aerator	New Data and Title 24 requirements
SCG	RES	Appliances and Plug Loads	Boiler Reset Control	New Data from ET Field Trials
SCG	RES	Appliances and Plug Loads	Boiler on-demand pump	New Data from ET Field Trials
SCG	RES	Appliances and Plug Loads	residential tub spout & showerhead	New Measure
SCE	RES	Appliances and Plug Loads	Clothes Dryer	WP already drafted by PG&E. SCE deciding whether to adopt.
SCE	RES	Appliances and Plug Loads	Variable speed drive on pool motors	Proceeding through SCE's intake process.

2.1.2. 2013-2014 EM&V Studies

Key Research Questions to Be Addressed in 2013-2014 EM&V

In this section, we describe the planned 2013-14 studies for this roadmap as well as studies authorized elsewhere. Below, please find a list of the residential research studies that addressed specific residential retrofit information needs. In addition to this list of studies, the following residential studies were completed for 2015 in the Low-Income/ESAP proceedings:

- ESA Program Impact Evaluation Study
- LI Multi-family Segmentation Study, ECD
- ESA Program Energy Education Study

- Low Income Needs Assessment

These studies above are funded by a different CPUC proceeding and will be managed by the Low-Income ESAP study team. As indicated earlier, the need for critical synthesis of all residential information will be increasingly critical so a consistent set of overarching findings and recommendations will be possible.

Table 8. 2013-2014 Residential Retrofit Programs EM&V Research Questions Summary

Study Name	Research Questions [2013-2014]
Impact	
(Residential-1B) SDG&E Home Energy Center Trial & Impact Evaluation	Study canceled due to cancellation of program.
(Residential-3A) Impact Evaluation of Comparative Energy Usage Report Programs (i.e., OPOWER implementation)	What is the energy savings when comparing treatment versus control groups? Is the program experimental design by the IOUs acceptable? What are the peak demand savings? How is program targeting affecting the energy savings? What is the realization rate between the impact evaluation and the IOUs energy savings claims?
(Residential-6B) MF-EUC/MIDI & MFEER Focused Impact Evaluation Study Target: Property owners/managers	Are the IOUs and RENs collecting and documenting sufficient data to assess program impacts for the EUC-MF programs? Are the EnergyPro modeled savings estimates reasonable? (EUC-MF) Are the engineering estimates for the ESPI hot water saving measures reasonable? What should the baseline be for the EUC-MF and MFEER programs? Are the measures being replaced prior to the end of their useful life (early replacement), or replaced upon burnout (or failure)? What is the level of free-ridership for EUC-MF and MFEER measures?
(Residential-8B) Focused Impact Evaluation for SF-WH Home Upgrade Basic/Flex Program Target: Homeowners	This study should build-upon results from the process evaluation study (i.e., Residential-8A) Are the IOUs and RENs collecting and documenting sufficient data to assess program impacts for the EUC-SF programs? How can data from 2010-2012 EUC-SF studies be combined with 8A and 8B and what advanced analytics can be used to inform the program? What is the uncertainty around “billing analysis” estimates, what are the savings drivers for Basic/Flex, and can the uncertainty be reduced? What are the energy savings realization rates (kW, kWh, Therms) before attribution? (i.e. adjusted gross savings) What number of full retrofit jobs commenced as “Fast Track – Emergency Replacements” for essential HVAC or other energy equipment?

Study Name	Research Questions [2013-2014]
	Are there other market dynamics that we should account for in this impact evaluation? Include survey questions on financing, spillover and "take back" How can the program process be improved to improve energy savings outcome?
(Residential 16 A) 2013-2014 Residential VSD Pool Pumps Update for ESPI (SDG&E only)	Are the parameters used to calculate program impacts from work papers to program tracking database consistent for 2013 estimates? Has the decrease cost differential between standard 2-speed pumps versus variable speed pumps is now around $200 versus $1200-$1600 back in 2011, moved the baseline? What are the operating parameters (i.e., run time, hours of operation) and average unit size/load that impact gross savings? Has the market changed and what is the potential impact on realization rates, net kWh, kW and therm savings?
Process	
(Residential-1A) SCE and PG&E Pilots/Trial Studies	What is the program theory for this intervention? Why should we implement this program? What is the counterfactual for this program theory? (i.e., what would have happened without this program intervention?) What is the market baseline condition? What is the free-ridership? What is the energy savings? Is the planned energy savings realized in the pilots/trials? Should this intervention be adopted into the core program?
(Residential-3B) SCE UAT Work-paper Update (Project not funded in 2013-2014)	Since SCE has transitioned from Home Energy Efficiency Survey to Home Energy Advisor on-line audit tool, using an ongoing engagement design, has the energy savings claims in the work-paper on file changed? Has the energy savings increased or declined for on-line, mail-in, in-home and phone deliveries? Has this new UAT tool changed customer "behavior"? If yes, how?
(Residential-4) Residential Solution Workbook The goal is to develop an at-a-glance planning document for the residential sector to look at end-use specific and misc. plug load appliances and other home enveloped related measures. This study should leverage data available from prior CLASS/RASS and	This is a similar initiative to the Lighting Solution Workbook. What are the key planning metrics for end-use specific and misc. plug load products and measures? What data is available from prior research studies? (i.e., RASS/CLASS and other tracking and characterization studies) How can the data be displayed so at-a-glance planning and prioritization could be possible?

Study Name	Research Questions [2013-2014]
other general population studies.	
(Residential-5) Market Characterization & Data Collection for Work-paper Update	What market data is needed to update existing work-papers to ensure their relevance? Has the customer usage profile changed? Has the baseline efficiency level of the appliance changed? Has the market dynamics changed thus affecting the level of free-riders?
(Residential-6A) MF-EUC/MIDI Pilots & MFEER Program Change Process Evaluation	What is the program design change? Has this change altered the program theory? Is the program evaluable? Are the program data tracking system sufficient to support both process and impact evaluation? Can these key program processes improve program outputs and outcomes, including energy savings (kW/kWh & Therm)? Is the program's interaction with REN and other entities productive? The result of this study should be the input to Residential-6B study.
(Residential-8A) Focused Process Evaluations for SF WH Home Upgrade Program Change	What is the program design change? Has this change altered the program theory? Is the program evaluable? Are the program data tracking system sufficient to support both process and impact evaluation? Can these key program processes improve program outputs and outcomes, including energy savings (kW/kWh & Therm)? Is the program's interaction with REN and other entities productive? What are the implications for program design and implementation as a result of Title-20 and Title-24 update in 2014? The result of this study should be the input to Residential-8B study. REN's impact evaluation studies are accounted for separately.
Market	
(Residential-2A & -2B) Overarching Residential Study—(2A) Behavior, (2B) Market Transformation Indicators	Behavior: Describe smart meter business case decisions and relevant conservation and DR cost and benefits assumptions anticipated from behavior strategies Describe IOU progress to date implementing Smart Meter behavior strategies (per above decisions) Characterize current residential EE and DR behavior program market; number and type of vendors and services provided, key trends Categorize EE/DR behavior pilots within a behavior program framework. Apply this to IOU/EE programs Summarize savings results from pilots that could be useful to

Study Name	Research Questions [2013-2014]
	project potential energy savings from behavior change in CA Summarize any lessons learned from behavior potential studies in other states or alternate behavior potential estimation models for CA Market Transformation Indicators: This study is on hold as ED further develops white paper on MTIs.

A Summary of 2013-2014 EM&V Studies, Budgets, and Timing

Table 9. 2013-2014 Residential Retrofit Programs Budgets and Timing

2013-2014 Study Area/Title	Study Manager (ED/IOU)	2013-2014 Budget	Status	Completion Date
Impact				
(Residential-1B) SDG&E Home Energy Center Trial and Impact Evaluation	ED	$0	Canceled	Canceled
(Residential-3A) Impact Evaluation of Comparative Energy Usage Report Programs	ED	$584,342	2013 Complete; 2014 Underway	Q4 2015
(Residential-6B) Focused Impact Evaluation of MF-EUC/MIDI & MFEER	ED	$200,000	Underway	Q1 2016
(Residential-8B) Focus Impact Evaluation of WH/EUC Program	ED	$300,000	Underway	Q4 2015
(Residential – 16A) 2013-2014 Residential VSD Pool Pumps Update for ESPI (SDG&E only)	ED	$160,000	Underway	Q1 2016
Process				
(Residential-1A) SCE Set-top Box Trial SCE/SoCalGas EUC-MF Pilot Program Evaluation PG&E RPP Trial	IOUs SCE SCE/SoCalGas PG&E	$80,000 $100,000 (funded by ETP)		Project in progress, ECD: March 2015 ECD: 2015 Tracked by ETP.
(Residential-3B) SCE UAT Work-paper Update (Not funded)	SCE	$0		2014

2013-2014 Study Area/Title	Study Manager (ED/IOU)	2013-2014 Budget	Status	Completion Date
(Residential-4) Residential Solution Workbook Project, Part-I Market View & Part-II Measure View	IOUs	$200,000		Part-I Market View, Completed July 2014 Part-II Measure View, ECD: Q2/2015
(Residential-5) Market Characterization & Data Collection for Work-paper Update SCE CMHP HVAC QM Analysis SW MF Pool Pump Study SW PLA Work paper Characterization Study	IOUs	$32,000 $150,000 $150,000		Final Draft, not yet posted, 2/2015 ECD: July 2015 ECD: Q2/2015
(Residential-6A) Focused MF-EUC/MIDI & MFEER Program Change Process Evaluation (Phase-I ONLY) Please refer to Residential-14 for Phase-II	IOUs	$250,000		2016
(Residential-8A) Focus Process Evaluation for WH/EUC Program Changes	IOUs	$250,000		2016
(Residential-15) SCG & Municipality Joint Offerings: Lessons Learned & Opportunity Study	IOUs, SoCalGas	$50,000		2016
Market				
(Residential 2A & 2B) Behavior Programs Characterization Study	ED	$230,000	Complete	Q3 2015
Total		**$2,836,342**		**$825,000**

2.1.3. 2013-2014 Study Descriptions

Below, please find a brief description for each proposed residential retrofit studies.

Study Title: (Residential-1A) SCE & PG&E Pilots/Trials	**Budget**: $300,000

Study Title: (Residential-1A) SCE & PG&E Pilots/Trials	**Budget**: $300,000
Expected Completion Date: 2014	**Study Manager:** IOUs
Description: Selected PLA trials/pilots to test product/measures, delivery mechanism, customer acceptance & energy savings estimates	
Objective: To support program innovation activities and data collection efforts to quantity benefits	
Key Research Questions: • What is the program theory for this intervention? Why should we implement this program? • What is the counterfactual for this program theory? (i.e., what would have happened without this program intervention?) • What is the market baseline condition? • What is the free-ridership? • What is the energy savings? Is the planned energy savings realized in the pilots/trials? • Should this intervention be adopted into the core PLA program? Note: 1. SCE is working on two projects: a. SCE Set-top Box Trial ($80,000), b. SCE/SCG EUC-MF Pilot Process Evaluation ($75,000/SCE and $25,000/SCG). 2. PG&E is working on one project: a. PG&E EUC-MF Pilot Process Evaluation ($100,000)	
Potential EM&V Methods: See next section for detailed project description	

Study Title: (Residential-1B) SDG&E Home Energy Center Trial & Impact Evaluation	Study canceled due to program cancellation. Budget reassigned to SF-EUC, MF-EUC/MFEER and HERs impact evaluations
Canceled	**Study Manager:** ED
Description: SDG&E Home Energy Center Trial Study and energy savings analysis	
Objective: To support program innovation activities and data collection efforts to quantity benefits	
Potential EM&V Methods: NA	

Study Title: (Residential-2A & 2B) Behavior Programs Characterization	**Budget:** $230,000
Expected Completion Date: 2014	**Study Manager:** ED
Description: A study to develop a framework for estimating behavior potential. ,	
Objective: Identify sources for assumptions to populate potential models for energy savings using behavior change strategies.	
Key Research Questions: Behavior:	

Study Title: (Residential-2A & 2B) Behavior Programs Characterization	**Budget:** $230,000
• Describe smart meter business case decisions and relevant conservation and DR cost and benefits assumptions anticipated from behavior strategies • Describe IOU progress to date implementing Smart Meter behavior strategies (per above decisions) • Characterize current residential EE and DR behavior program market; number and type of vendors and services provided, key trends • Categorize EE/DR behavior pilots within a behavior program framework. Apply this to IOU/EE programs • Summarize savings results from pilots that could be useful to project potential energy savings from behavior change in CA • Summarize any lessons learned from behavior potential studies in other states or alternate behavior potential estimation models for CA	
Potential EM&V Methods: See next section for detailed project description	
Potential Ex Ante Uses:	

Study Title: (Residential-3A) Impact Evaluation of Home Energy Report Initiatives	**Budget:** $584,342
Expected Completion Date: 2014 and 2015	**Study Manager:** ED
Description: Conduct impact evaluation of the Opower comparative energy usage program implemented by the IOUs for program years 2013 and 2014 (PG&E and SCE only. Conduct impact evaluation of SDG&E's Opower expansion starting Q4 2014 through 2015 and impact evaluation on SDG&E's Manage Save Act (MAS) starting Q4 2014 through 2015. SCE's Home Energy Efficiency Surveys (HEES) Enhancement behavior modification programs. Also conduct impact evaluation of Marin Clean Energy's comparative feedback program implemented in Q4 2013 through 2014.	
Objective: (1) verify IOUs energy claims and other study considerations	
Key Research Questions: • What is the energy savings when comparing treatment versus control groups? Is the program experimental design by the IOUs acceptable? • What are the peak demand impacts? • How is program targeting affecting the energy savings? • What is the realization rate between the impact evaluation and the IOUs energy savings claims? • What can we say about persistence of these energy savings claims? • In the case for HEES, how has the added information influence customer behavior versus customers only receiving the HER? • In the case for MAS, are customers responding to the multiple marketing channels of mail, email, web, to take up IDSM actions generating savings comparable or better than the HERs only?	
Potential EM&V Methods: See next section for detailed project description	
Potential Ex Ante Uses:	

Study Title: (Residential-3B) SCE UAT Work-paper Update	**Budget:** $0 (Project not funded)
Expected Completion Date: 2014	**Study Manager:** SCE

Study Title: (Residential-3B) SCE UAT Work-paper Update	**Budget:** $0 (Project not funded)
Description: Update SCE's HEES work-paper, since the program is in transition to the new Home Energy Advisor Tool (aka UAT) using an ongoing engagement model for on-line delivery	
Objective: (1) update work-paper to improve the accuracy of energy savings reporting	
Key Research Questions: • Since SCE has transitioned from Home Energy Efficiency Survey to Home Energy Advisor on-line audit tool, using an ongoing engagement design, has the energy savings claims in the work-paper on file changed? • Has the energy savings increased or declined for on-line, mail-in, in-home and phone deliveries? • Has this new UAT tool changed customer "behavior"? If yes, how?	
Potential EM&V Methods: See next section for detailed project description	

Study Title: (Residential-4) Residential Solution Workbook Project, Part-I and Part-II	**Budget:** $200,000
Expected Completion Date: 2013	**Study Manager:** IOUs
Description: This project is inspired by the Lighting Solution Workbook. The Residential Solution Workbook has two parts: Part-1: Market View ($100,000) and Part-II Measure View ($100,000). For Part-I Market View, this project will develop an at-a-glance planning document to capture key market metrics for end-use specific and misc. plug load products/measures (i.e., saturation, sales volume, efficiency level, etc.). For Part-II, the Measure View project will take a deeper diver to investigate six different measures: (1) clothes dryers, (2) pool pumps, (3) advanced power strips, (4) space heaters, (5) audio/video devices, and (6) computing devices. For these six devices a dash board to highlight key device/measure parameters will be developed. Note: SCE and PG&E have engaged RIA to develop both Part-I and Part-II of this project.	
Objective: to improve statewide residential planning and prioritization efforts	

Key Research Questions:
This is a similar initiative to the Lighting Solution Workbook.
• Part-I: Market View
  ○ What are the key planning metrics for end-use specific and misc. plug load products and measures?
  ○ What data is available from prior research studies? (i.e., RASS/CLASS and other tracking and characterization studies)
  ○ How can the data be displayed so at-a-glance planning and prioritization could be possible?
• Part-II: Measure View
  ○ For six high priority devices/measures, can a dash-board to track key device/measure parameters such as saturation and etc. be developed?
  ▪ Clothes dryers,
  ▪ Pool pumps,
  ▪ Advanced power strips,
  ▪ Space heaters (gas and electric),	

Study Title: (Residential-4) Residential Solution Workbook Project, Part-I and Part-II	**Budget:** $200,000
▪ Audio/video (including speakers, audio systems, docking stations, blue-ray/DVD players, game consoles), o Computing (including desktops/laptops modems, routers, printers, servers and multi-function devices).	
Potential EM&V Methods: See next section for detailed project description. This project will utilize existing and available study results. For part-II, the project may contact selected manufacturers to fill data gaps.	

Study Title: (Residential-5) Market Characterization & Data Collection for Work-paper Update	**Budget:** $365,000
Expected Completion Date: 2014	**Study Manager:** IOUs
Description: Develop updated market characterization and usage profile information to update existing work-papers	
Objective: to improve the accuracy and relevance of residential measures and energy savings claims	
Key Research Questions: • What market data is needed to update existing work-papers to ensure their relevance? • Has the customer usage profile changed? • Has the baseline efficiency level of the appliance changed? • Has the market dynamics changed - thus affecting the level of free-riders? Note: This project has the following statewide sub-projects: 1. (SCE lead, $32,000) CMHP HVAC-QM data analysis by ASW Engineering, project transferred to HVAC PCG. 2. (SCE lead, $150,000) MF pool pump study, this project will go through a RFP process for consultant selection by Q1/2014. 3. (PG&E lead, $150,000) Work paper Update for High Priority Measures and Most Efficient Update by RIA. a. This project will focus on the following measures: (1) clothes washers, (2) water heaters, (3) refrigerators for SF/MF for mid/up-stream rebate considerations), (4) microwave and stove-top/oven (SF/MF), (5) dishwashers (with IOUs defined specification), (6) advanced (Smart) power strips.	
Potential EM&V Methods: See next section for detailed project description	

Study Title: (Residential-6A) Focused Process Evaluation to investigate MF-EUC/MIDI and MFEER Program Changes	**Budget:** $250,000
Expected Completion Date: 2014	**Study Manager:** IOUs
Description: Conduct a process evaluation to look at the effectiveness of new program design and implementation as well as new interaction with REN entities	
Objective: to improve program design, implementation and marketing activities/outputs and	

Study Title: (Residential-6A) Focused Process Evaluation to investigate MF-EUC/MIDI and MFEER Program Changes	**Budget:** $250,000
outcomes	
Key Research Questions: (target: property owners/managers) • What is the program design change? • Has this change altered the program theory? • Is the program evaluable? Are the program data tracking system sufficient to support both process and impact evaluation? • Can these key program processes improve program outputs and outcomes, including energy savings (kW/kWh & Therm)? • Is the program's interaction with new REN partners productive? The results of this study should be the input to Residential-6B study. Please refer to Residential Pilots/Trials Study (Residential-1A). PG&E and SCE/SCG EUC-MF Pilot Process Evaluations are discussed in that study effort.	
Potential EM&V Methods: See next section for detailed project description	

Study Title: (Residential-6B) Focused Impact Evaluation to investigate MF-EUC/MIDI and MFEER Program Changes	**Budget:** $200,000
Expected Completion Date: 2015	**Study Manager:** ED
Description: Calculate savings for high uncertainty measures (water saving devices) identified for the Energy Savings Performance Incentive mechanism (ESPI) delivered through the MFEER program; assess appropriate measure baselines (early replacement vs. replace on burnout); evaluate program free ridership	
Objective: to improve program design, implementation and marketing activities/outputs and outcomes	
Key Research Questions: (target: property owners/managers) Calculate energy savings from ESPI measures; multi-family water savers, specifically for MFEER program. Additionally, • Are the IOUs and RENs collecting and documenting sufficient data to assess program impacts for the EUC-MF programs? • Are the EnergyPro modeled savings estimates reasonable? (EUC-MF) • Are the estimates for the ESPI water saving kits measures reasonable? • What should the baseline be for the EUC-MF and MFEER programs? Are the measures being replaced prior to the end of their useful life (early replacement), or replaced upon burnout (or failure)? • What is the level of free-ridership for EUC-MF and MFEER measures?	
Potential EM&V Methods: See next section for detailed project description	
Potential Ex Ante Uses:	

Study Title: (Residential-16A) 2013-2014 Residential VSD Pool Pumps Update for ESPI (SDG&E only)	**Budget:** $160,000
Expected Completion Date: Q4 2015	**Study Manager:** CPUC, ED
Description: Field study with surveys for SDG&E's variable speed drive pool pump rebate program to provide updates to support the Efficiency Savings Performance Incentives process.	
Objective: To determine parameter inputs in order to validate gross and net savings inputs.	
Key Research Questions: • Are the parameters used to calculate program impacts from work papers to program tracking database consistent for 2013 estimates? • Has the decrease cost differential between standard 2-speed pumps versus variable speed pumps is now around $200 versus $1200-$1600 back in 2011, moved the baseline? • What are the operating parameters (i.e., run time, hours of operation) and average unit size/load that impact gross savings? • Has the market changed and what is the potential impact on realization rates, net kWh, kW and therm savings?	

Potential EM&V Methods:
• Surveys via phone to:
  o Verify that the pool pump was installed.
  o Determine awareness of program
  o Determine what/who influenced decision to purchase VSD pump.
  o Determine likelihood of installing the pump without the program.
• Interview pool contractors to determine installation of VSD pool pumps versus 2 speed since 20ll
• Site-visits to homes with pools to:
  o Verify installation and install meters and collect nameplate data
  o Gather information on hours of operation
• Review Work paper methodology and assumptions, modify as necessary to calculate gross savings.
• Net savings will include realization rates and adjustment for free riders.
 	
Other Considerations:	

Study Title: (Residential-8A) Focused Process Evaluation to investigate WH/EUC Program Changes	**Budget:** $250,000
Expected Completion Date: 2014	**Study Manager:** IOUs
Description: Conduct a process evaluation to look at the effectiveness of new program design and implementation as well as new interaction with REN entities	
Objective: to improve program design, implementation and marketing activities/outputs and outcomes	
Key Research Questions: (target: homeowners) • What is the program design change? • Has this change altered the program theory? • Is the program evaluable? Are the program data tracking system sufficient to support both	

Study Title: (Residential-8A) Focused Process Evaluation to investigate WH/EUC Program Changes	**Budget:** $250,000
process and impact evaluation? • Can these key program processes improve program outputs and outcomes, including energy savings (kW/kWh & Therm)? • Is the "Fast Track" process for HVAC emergency replacement well designed in the perspective of contractors, and customers? • Is the program's interaction with the REN entities productive? The result of this study should be the input to Residential-8B study.	
Potential EM&V Methods: See next section for detailed project description	

Study Title: (Residential-8B) Focused Impact Evaluation to investigate EUC-SF Basic/Flex or Home Upgrade Program Changes	**Budget:** $300,000
Expected Completion Date: 2015-16	**Study Manager:** ED
Description: Conduct an impact evaluation to verify program energy savings claims from EUC-SF	
Objective: to improve program design, implementation and marketing activities/outputs and outcomes	
Key Research Questions: (target: Homeowners) This study should build-upon results from the process evaluation study (i.e., Residential-8A) • Can the program energy savings be verified? • What are the energy savings realization rates (adjusted gross) in terms of kW, kWh, Therms? • What is the uncertainty around "billing analysis" estimates, what are the savings drivers, and can this uncertainty be reduced? • Are there other market dynamics that we should account for in this impact evaluation? • How can data from 2010-2012 EUC-SF studies be combined with 8A and 8B and what advanced analytics can be used to inform the program? • How can the program process be improved to improve energy savings outcome?	
Potential EM&V Methods: See next section for detailed project description	

2015 Program Uncertainties

Per Decision 12-11-015 directed the IOUs to hire a market transformation consultant to guide the EUC-HU market transformation process. As a result of this initiative with the Navigant Consulting team, the statewide EUC-HU program will be making significant process improvements to establish core and regional services as well as standardizing services for participating contractors. Much of these program process changes will be design and implemented in 2015 and beyond.

It is expected that EUC-MF participation and number of completed projects will have increased in 2015. This, along with improved data collection per recommendations from the 2014 evaluation, should facilitate a more thorough evaluation of the EUC-MF program.

In 2015, we are also expecting the ESAP/LI proceeding to be finalized. In this latest ESAP/LI preceding, there is increasing linkage between the Multi-family Energy Efficiency Rebate Program (MFEER) and Moderate Income Direct Installed Program (MIDI), especially through the proposed single-point of contact engagement strategy.

2.1.4. 2015 EM&V Studies

2015 Background

Table 10. 2015 Residential Portfolio Savings and Budget Summary (Without HVAC, New Construction & Res. Third Party Programs)

IOU	Program Name	Budget	kWh Savings	% of Residential Budget	% of Residential kWh
Statewide	Energy Advisor Program	$18,668,949	95,083,815	13%	38%
Statewide	Plug Load and Appliances Program	$44,151,750	105,535,542	30%	42%
Statewide	Multi-family Energy Efficiency Rebate Program	$16,452,872	34,423,267	11%	14%
Statewide	EUC - Home Upgrade Program	$38,644,594	9,385,363	26%	4%
Statewide	Res-NC Program	$13,900,931	2,450,728	9%	1%
Statewide	Res-HVAC Program	$17,050,771	3,054,045	11%	1%
Statewide	**Total Residential Portfolio**	**$148,869,867**	**249,932,760**	**100%**	**100%**

Table 11. 2015 Residential Retrofit Programs Savings and Budget Summary (Without HVAC, New Construction & Res. Third Party Programs)

2015 Program Year	kW	kWh	Therms	Budget	kW%	kWh%	Therms	Budget%
SCE								
Energy Advisor Program	2,428	5,083,803	0	$4,090,800	13%	6%	0	10%
Plug Load and Appliances Program	10,693	45,052,109	0	$13,955,244	57%	53%	0	34%
Multi-family Energy Efficiency Rebate Program	3,192	30,982,642	0	$11,100,651	17%	37%	0	27%
Energy Upgrade California -	2,544	3,694,178	0	$11,995,785	13%	4%	0	29%

2015 Program Year	kW	kWh	Therms	Budget	kW%	kWh%	Therms	Budget%
Whole Home Upgrade Program								
SCE Total	**18,857**	**84,812,732**	**0**	**$41,142,480**	**100%**	**100%**	**0**	**100%**
% of Statewide Program Total	42%	34%	0	35%				
PG&E								
Energy Advisor Program	7,804	90,000,012	3,210,800	$13,531,293	42%	71%	80%	28%
Plug Load and Appliances Program	8,129	32,476,767	222,735	$18,990,738	44%	26%	6%	39%
Multi-family Energy Efficiency Rebate Program	94	981,794	90,715	$1,839,507	1%	1%	2%	4%
Energy Upgrade California - Whole Home Upgrade Program	2,523	3,159,402	492,482	$13,998,809	14%	2%	12%	29%
PG&E Total	**18,550**	**126,617,975**	**4,016,732**	**$48,360,347**	**100%**	**100%**	**100%**	**100%**
% of Statewide Program	41%	52%	61%	41%				
SDG&E								
Energy Advisor Program	0	0	0	$470,967	0	0	0	4%
Plug Load and Appliances Program	4,150	23,860,686	369,033	$4,725,614	73%	82%	70%	35%
Multi-family Energy Efficiency Rebate Program	187	2,456,343	33,502	$2,183,742	3%	9%	6%	17%
Energy Upgrade	1,362	2,531,783	125,323	$5,882,655	24%	9%	24%	44%

2015 Program Year	kW	kWh	Therms	Budget	kW%	kWh%	Therms	Budget%
California - Whole Home Upgrade Program								
SDG&E Total	**5,699**	**28,848,812**	**527,858**	**$13,199,978**	**100%**	**100%**	**100%**	**100%**
% of Statewide Program Total	12%	12%	8%	11%				
SCG								
Energy Advisor Program	0	0	0	$575,889	0	0	0	4%
Plug Load and Appliances Program	2,087	4,145,980	1,433,909	$6,480,154	100%	99.9%	70%	43%
Multi-family Energy Efficiency Rebate Program	1	2,488	481,771	$1,328,972	0	0	24%	9%
Energy Upgrade California - Whole Home Upgrade Program	0	0	119,623	$6,767,345	0	0.1%	6%	44%
SCG Total	**2087**	**4,148,468**	**2,035,303**	**$15,152,360**	**100%**	**100%**	**100%**	**100%**
% of Statewide Program Total	5%	2%	31%	13%				
Statewide Total	**45,193**	**244,427,987**	**6,579,893**	**$117,855,165**				
% of Statewide Program Total	100%	100%	100%	100%				

A Summary of 2015 EM&V Studies, Budgets, and Timing

Table 12. 2015 IOU EM&V Studies, Budgets, and Timing

2015 Study Area/Title	Study Manager (ED/IOU)	2015 Budget	Completion Date
Process			
(Residential-9)	IOUs, SDG&E	$70,000	2015

2015 Study Area/Title	Study Manager (ED/IOU)	2015 Budget	Completion Date
Residential Portfolio Evaluation Whitepaper			
(Residential-10) 2015 Parameter Research to Support Home Energy Reports Program, Early M&V Research to Support Online Audits Program	IOUs, PG&E	$195,000	2015
(Residential-12) 2015 EUC-HU Process Evaluation Phase-2	IOUs, PG&E	150,000	2016
(Residential-13) Cold Water Default Clothes Washer Rapid Feedback Process Evaluation	IOUs, SoCalGas	$70,000	2016
(Residential-14) 2015 Statewide Multifamily Program Process Evaluation Phase-II	IOUs, SCE	$250,000	2016
Market			
(Residential-11A) Market Characterization of Online Peer-to-Peer Market for Used Refrigerators & Freezers	IOUs, PG&E	$45,000	2015
(Residential-11B) Market Characterization of Used Refrigerator Sales: Retail & Auction Houses	IOUs, PG&E	$45,000	2015
Total		**$825,000**	

2.1.5. 2015 IOU Study Descriptions

Below, please find a brief description for each proposed residential retrofit studies.

Study Title: (Residential-9) 2015 Residential Portfolio Evaluation Whitepaper	**Budget:** $70,000
Expected Completion Date: 9/30/2015	**Study Manager:** IOUs, SDG&E
Description: The goal of this whitepaper project is to explore a methodology for developing a "savings impact load shape" for the entire EE and IDSM residential portfolio.	
Objective: Develop a more accurate, less expensive, timely savings impact results from the residential sector programs.	
Key Research Questions: (1) Is there a way to utilize "Smart Meters" to determine a net aggregate residential impact load shape? (2) Can it be accomplished in a more expedient, accurate, cost-effective manner? (3) Can the number of residential programs be significantly reduced? (4) Is there a cut-off point (consumption? X times poverty level) where this methodology doesn't make sense?	
Potential EM&V Methods: • Use Behavior Program's ex-post billing/AMI analysis as the foundation to target market customers	

Study Title: (Residential-9) 2015 Residential Portfolio Evaluation Whitepaper	**Budget:** $70,000

in the residential portfolio,

- Include a Randomize Control Trial (RCT) design using treatment and control groups for comparison. It may be difficult to set aside control group & then not directly offer this group services.
- Utilize vendor end use algorithms to target experimental customers with appropriate messaging (ARP, HVAC, lighting, refrigerator, etc.). The net effects of the measures and behavioral changes will be included in the overall portfolio billing analysis.

- The goal is to yield net savings out of this analysis by discerning the difference between treatment versus control groups. With smart meters, this can be done hourly so get accurate delta load shape for electric, monthly savings for gas.

There are several advantages to this method: (1) Result = NET savings, at residential portfolio level, (2) it can eliminate the need for exact measure counts & savings parameters for both base case and high efficient cases; (3) it can eliminate NTG evaluation and endless debates. This approach is faster and inexpensive relative to the current methods. (4) It can eliminate need for multiple "program designs" and administrative requirements (or at least fewer of them), (5) If not implemented as evaluation methodology, at least this method can provide value to calibrate total net residential savings, (6) it can generate a reliable delta load shape for resource planning

There are disadvantages to this approach: (1) Program intervention attribution is at a residential portfolio level. This study approach will not provide guidance on where to best allocate budgets or sub-program cost effectiveness, (2) There will be a loss of direct EUL and IMC for TRC calculation (some weighted averages may be needed).

Other Considerations:

We don't have all the answers for this approach, but would like to use this whitepaper to explore options to see if this can work. For example: (1) What are the appropriate metrics to collect? (2) How do we get a "true" control group? (3) Does program influence on the control group needed to be counted? (4) What about the treatment of DR savings?

Study Title: (Residential-10) 2015 Parameter Research to Support Home Energy Reports Program, Early M&V Research to Support Online Audits Program	**Budget:** $195,000
Expected Completion Date: 6/30/2015	**Study Manager:** IOUs, PG&E

Description:

Behavior-based programs have become a central element of the IOU's residential energy efficiency portfolios. Removing incremental savings already counted in the Upstream Lighting Program is a central concern for the Home Energy Report Programs. In 2012, PG&E conducted a home inventory study to assess the extent to which program participants installed more light bulbs than the control group. There is a need to update a portion of this study to estimate the proportion of efficient lamps sold at retail in the state of California.

Residential online audit programs are an increasingly important part of the IOU's residential energy efficiency portfolios. In mid-2014 DNV GL published a white paper, funded by the CPUC entitled *Evaluation of Opt-In Behavior Programs* that recommends certain methodologies for estimating the

Study Title: (Residential-10) 2015 Parameter Research to Support Home Energy Reports Program, Early M&V Research to Support Online Audits Program	**Budget:** $195,000
savings resulting from these types of opt-in program designs, namely variance-in-adoption (VIA) model method and matched comparison group, depending on the specific characteristics of the programs. There is a need to the IOUs to employ these advocated methodologies to derive savings estimates for residential online audit programs.	
Objective: The primary objectives of the residential behavioral programs research is to provide improved parameter estimates for Home Energy Reports attribution analyses and to conduct early M&V for residential online audit programs.	
Key Research Questions: • Do behavior program participant households install ULP participant light bulbs at the same levels as control households? • How do the savings estimates resulting from VIA and matched comparison group methodologies compare to those resulting from the more traditional regression based analyses?	
EM&V Methods: Triangulation approach of multiple sources of primary and secondary data for estimating total California lamp sales. Estimated cost: $65,000. Early M&V of residential online audit program. Estimated cost: $130,000	

Study Title: (Residential-11A) Market Characterization of Online Peer-to-Peer Market for Used Refrigerators & Freezers	**Budget:** $45,000.
Expected Completion Date: 7/1/15	**Study Manager:** IOUs, PG&E
Description: Response to Recommendation in "Appliance Recycling Program Impact Evaluation" Report Work Order 35, October 24, 2014: 6.2.5. The magnitude of the peer-to-peer market channel dwarfs other market forces in the second-hand market. Unfortunately this market segment is very difficult to study, and traditionally research into the second-hand market focuses on the retail channel, which can be more easily located. The original research plan for this evaluation did not include a peer-to-peer component, however as the magnitude of the sector became apparent, attempts were made to include and explore it. Analysis funds were not sufficient to fully study the data collected, and additional data could be easily gathered using the methodology develop in the course of this evaluation.	
Objective: The objective of this study is to: 1.) define the size of market of used refrigerators and freezers that transfer ownership via the major online sales systems. 2.) Assess the nature of these online marketplace systems to determine what opportunities might exist for intervention or participation in these marketplaces by IOUs incentive programs. 3.) Define what those online peer-to-peer intervention programs would be like – what they would have to offer – how they would have to be structured – what challenges would they encounter and how could those barriers be overcome? 4.) Issue recommendations for next steps in terms of how might such new intervention programs be implemented, what would be the next steps?	

Study Title: (Residential-11A) Market Characterization of Online Peer-to-Peer Market for Used Refrigerators & Freezers	**Budget:** $45,000.
Key Research Questions: (list not exhaustive) • What is the number of used refrigerators that are sold by on-line exchanges each year within the IOU territories? What is the size of used refrigerators/freezers overall and by channel? • What percentage of the total sales of used refrigerators does this represent? • How many Online Peer-to-Peer market offering are there? • How do they rank and compare to one another in terms of estimated sales and unit transfers achieved per year? • What is the geographic focus of these online peer-to-peer services located across the IOU territories in California? • Where does the growth of online peer-to-peer sales/transfers of used refrigerators and freezers come from – in terms of what the prior channel was for these transfers? • What is the source of the used refrigerators that the online peer-to-peer sells and transfers?	
Potential EM&V Methods: Secondary research, interviews and survey (i.e., market actors, market participants/purchasers), survey	

Study Title: (Residential-11B) Market Characterization of Used Refrigerator Sales: Retail & Auction Houses	**Budget:** $45,000.
Expected Completion Date: 7/1/15	**Study Manager:** IOUs, PG&E
Description: Response to Recommendation in "Appliance Recycling Program Impact Evaluation" Report Work Order 35, October 24, 2014: 6.2.4. Role of Auction Houses in the Secondary Market: Study the role of auction houses and liquidators more closely and determine whether there is an opportunity for the program to plan a role in removing these units from resale on the retail market. This evaluation found that nearly 40% of the units sold back onto the grid passed through auction houses. By targeting this market actor, groups of units could be efficiently removed from the grid.	
Objective: Confirm the magnitude of the "Auction House & Liquidator" sector in the sales of used refrigerators. In defining this sector, the Impact Study brought a new major market actor to the attention of the IOU program managers. This market characterization effort will create an overview of Auction Houses & Liquidators as a channel for the sale of used refrigerators and present information of statistics, trends and insights. The objective of this study is to provide the data and perspectives necessary to enable the program managers to assess if any intervention with this market actor would be viable as an additional program design.	
Key Research Questions: (list not exhaustive) • What is the number of used refrigerators that are sold by Auction Houses and Liquidators each year within the IOU territories? • What percentage of the total sales of used refrigerators does this represent and sales trend? • How many Auction Houses are there? How many Liquidators are there? • Where are these Auction Houses and Liquidators located across the IOU territories in California? • What is the source of the used refrigerators that the Auction Houses and Liquidators sell? Who do they buy them from? Do they get any of them for free? • What percentage of these used refrigerators actually diverted from programs whose intent was to	

Study Title: (Residential-11B) Market Characterization of Used Refrigerator Sales: Retail & Auction Houses	**Budget:** $45,000.
recycle these appliances, and remove them from functioning as energy usage on the grid? • Who are the customers of the Auction Houses and Liquidators, who actually purchase these used appliances? • Where would these customers purchase the refrigerators they need to acquire, if they were not available for purchase from the Auction Houses and Liquidators? • What is the range in prices paid by the Auction Houses and Liquidators when they acquire these used units? What is the range in prices paid for these units? • Are they only bought in bulk? • Can the research consultant discern any opportunities for the IOUs to enter into an intervention in these business models? If yes, what is the program theory and logic model?	
Potential EM&V Methods: Secondary research, interviews and survey (i.e., market actors, participants/purchasers)	

Study Title: (Residential-12) 2015 EUC-HU Process Evaluation Phase-2	**Budget:** $150,000.
Expected Completion Date: 7/1/16	**Study Manager:** IOUs, PG&E
Description: Second Phase of Process Evaluation of EUC Home Upgrade – which will continue and expand upon work done in the First Phase which will be in-the-field from February thru April of 2015. This Second Phase EUC HU evaluation effort will offer a revisit of the key components of the process evaluation as completed in the first part of 2015, as necessary. This Phase 2 effort will also explore other new important components of the program design, program execution and also explore new potential program components for future program development and expansion.	
Objective: Continue to explore the following-- • Process Mapping • Participant Trend Analysis • Marketing Effectiveness • QI/QM best practices • Developmental Evaluation • Expanded Usability Testing • Additional Incentives	
Key Research Questions: Study will define all key aspects of the EUC HU program effort. Questions will be defined via which of the above study components will be selected by the IOUs for implementation.	
Potential EM&V Methods: • Interviews with key market actors • Survey interviews with key program partners – local governments, regulatory staff, contractors who service the home retrofit and renovation marketplace. • Survey interviews with participants of the program. • Survey interviews with interested program participants, who have not yet completed the work. • Survey interviews with non-participants of the program, who completed the same type of work on their homes, but not thru the program. • Focus groups with all of the above target audiences and customers.	

Study Title: (Residential-12) 2015 EUC-HU Process Evaluation Phase-2	**Budget:** $150,000.
• Literature review that defines and evaluates how other entities outside of the California State IOUs complete their home upgrade programs.	

Study Title: (Residential-13) Cold Water Default Clothes Washer Rapid Feedback Process Evaluation	**Budget:** $70,000
Expected Completion Date: Q2 2016	**Study Manager:** IOUs, SoCalGas
Description: SoCal Gas (SCG) is launching a new measure in the PLA program in April 2015, in which rebates will be provided to customers who purchase a cold water default clothes washer. The EM&V team can conduct a rapid feedback analysis in parallel with program implementation to provide program feedback. This information is used to fine-tune and streamline program design. Although this is a SCG pilot initially, this rapid feedback information will benefit all IOUs offering gas services.	
Objective: Provide rapid feedback to program implementers with specific focus on improving the critical early stages of deployment, program recruitment and delivery.	
Key Research Questions: • Are there any pilot implementation and program design concerns? • Is the pilot program theory and logic acceptable to the participants and non-participants? Is this intervention effective? • How does the launch of the new measure compare with current industry best practices? • Is the rebate offered appropriate to achieve the program's goal? • Are the customers satisfied with the product? • What are the recommendations and corrective action, before scaling this pilot statewide?	
Potential EM&V Methods: Interviews, surveys, data collection and analysis. Potential problems that may occur with this study are: • There may be a very small customer sample size to survey. The results of this rapid feedback may be more qualitative than quantitative. • We may need feedback from customers who did not buy the product but were considering it. To gain this feedback it would take more time and funding to locate these customers.	

Study Title: (Residential-14) 2015 Statewide Multifamily Program Process Evaluation Phase-II	**Budget:** $250,000 (phase-I is funding from 2013-2014, $250,000)
Expected Completion Date: 2016	**Study Manager:** IOUs, SCE
Description: This study will investigate the strategic program concerns and characterize the market for the 2014-2015 portfolio of statewide multifamily programs in order to guide program design for 2016 and beyond. Programs covered include EUC-MF, MFEER, MIDI. This is an approved scope of work from 2013-2014, but under-funded. The agreement is to seek phase-II funding of $250,000 in 2015 to support a total project budget of $500,000.	
Objective:	

Study Title: (Residential-14) 2015 Statewide Multifamily Program Process Evaluation Phase-II	**Budget:** $250,000 (phase-I is funding from 2013-2014, $250,000)
The goal of this study is to assess the MF Program design and implementation strategies and characterize the diverse multi-family market segment. Objectives include: assess the single point of contact approach, evaluate marketing and outreach methods, determine the role of property rating and recognition schemes, examine potential multi-family market segmentation schemes, and scope additional issues identified in the approved statement of work.	
Key Research Questions: Phase-II • Prioritize measures appropriate for early replacement in MF sector by major segments. • Review Title 20/24 implementation requirements and identify implications. • Map contractor qualifications and property owners/managers' wants/needs by property and tenant segments. • What is the role and effectiveness of the Energy Star Portfolio Manager? What is the best way to enroll properties? • Potential Addition: Scope out study requirements for (1) laundry room leasing operations, (2) fuel switching concerns, (3) MF BOC training. Once scoping work is done, these may become study requirements for 2016.	
Potential EM&V Methods: • Multi-family program review (inside and outside of California) and literature review, • Contractor phone surveys and in-depth interviews, • Property owner/manager phone survey, • Focus groups with property owners and managers, • Conjoint analysis and engineering analyses, • GIS analysis.	

Study Title: (Residential-15) SCG & Municipality Joint Offerings: Lessons Learned & Opportunity Study	**Budget:** $50,000 (Initially funded by SoCalGas Only, outside of the 2015 SW M&E allocation)
Expected Completion Date: Q2 2016	**Study Manager:** SoCal Gas
Description: SoCal Gas's territory overlaps with many municipal electric providers and there are advantages in offering joint gas, electric and water efficiency programs to customers. SoCal Gas would like to create a comprehensive list of municipal energy efficiency programs to gain an understanding of the various program offerings and attributes. This information will be the first step in providing insight on the various types of programs that exist, what programs are most successful and how can SoCal Gas work effectively with these municipalities. SoCalGas welcomes the other IOUs to participate in this study.	
Objective: Provide a source document with electric, gas and water program summaries for municipalities that provide electric service and overlap SoCal Gas territory	
Key Research Questions: • Identify key stakeholder contacts at muni/water partner candidates. • What gas, electric and/or water energy efficiency programs (as well as low-income) do municipalities that overlap SoCal Gas's territory offer?	

Study Title: (Residential-15) SCG & Municipality Joint Offerings: Lessons Learned & Opportunity Study	**Budget:** $50,000 (Initially funded by SoCalGas Only, outside of the 2015 SW M&E allocation)
• What is the status/length of the municipality program (i.e. pilot, limited, etc.)? • Who pays for the costs for these programs? • What is the incentive structure for the programs (i.e. incentive amount, services, caps, etc.)? • What is the process for marketing and implementing these programs? • What is the participation rate in these programs? • Gauge the Municipalities' interest for joint-program partnership with SoCalGas (SCG being a third-party implementer) where we can share energy savings on the same measure (e.g. attic insulation (for heating and cooling)). • Establish approximate budgets for potential muni/water partners • Create loading order for potential partners (largest to smallest budget) • Establish which existing SoCalGas programs that are most desirable to potential partners (i.e. ESAP, Foodservice, etc.)	
Potential EM&V Methods: Literature review and municipality program manager interviews.	

2.1.6. 2016 EM&V Proposed Studies

A Summary of 2016 EM&V Studies, Budgets, and Timing

Proposed 2016 Energy Division Budget: $2,934,162

The Residential research area will continue to cover the areas of deemed savings and other approaches for promoting high efficiency appliances as well as whole house and multifamily and behavioral interventions. The completion of current studies may reveal some new areas of interest. Evaluation adaptations emerging from the implementation of AB802 related to baseline changes and meter-based program designs may also need to be addressed in this evaluation plan for the future. Regardless, the impact and uncertain parameter updates are required. Specific studies, budgets and timing will be presented in the update to the EM&V plan in 2016.

Proposed 2016 Program Administrator Budget: $ 900,000

IOU-led activities with 2016 funds are described in the following tables. They

Table 13. 2016 IOU EM&V Studies, Budgets, and Timing

2016 Study Area/Title	Study Manager (ED/IOU)	2016 Budget	Completion Date
Process			
Retail Product Portfolio (RPP) MT Evaluation and Market Characterization (Phase I)	IOUs, PG&E	200,000	2016
Home Energy Report Study Fund for Ongoing Interval Data Research Support	IOUs	200,000	2016
Home Energy Advisor Work-paper Update & Process Evaluation Study	IOUs, SCE	175,000	2017

2016 Study Area/Title	Study Manager (ED/IOU)	2016 Budget	Completion Date
Step Up – Power Down (PG&E only)	PG&E	125,000	2016
Market Assessment			
Market Assessment of boilers for M-F and commercial	IOUs, SCG	200,000	2016
Total		**900,000**	

2.1.7. 2016 IOU Study Descriptions

Study Title: Retail Products Platform (RPP) Market Transformation (MT) Evaluation and Market Characterization	**Budget:** $200,000
Expected Completion Date: December, 2016	**Study Manager:** IOU
Description: Piloted to address the problem of growth in residential electric consumption resulting from miscellaneous plug load plug load growth, Pacific Gas and Electric Company (PG&E) is conducting a phase two pilot of a retailer-focused (midstream) program design called the Retail Products Platform (RPP). The RPP Pilot uses a mid-stream design to influence retailers to demand, stock, and sell more energy efficient models of home appliances and consumer electronics in targeted product categories. Retailers are paid per-unit incentives for every program-qualified model that they sell during the program period. The RPP program uses a market transformation (MT) approach to bring about long-term, sustainable changes to the structure or functioning of a market to reduce barriers to the adoption of energy efficient measures.	
Objective: The purpose of this first of a two-phase study is to conduct the tasks related to the process evaluation section, and portions of the savings claim portion, of the evaluation plan entitled *Pacific Gas & Electric Company 2015 Retail Plug-Load Portfolio Program* that is available on the public documents area of the CPUC website (energydataweb.com) under the search term RPP.	
Key Research Questions: Are retailers executing the marketing plans required as a condition of participation in RPP? What are the product-specific market barriers to the adoption of energy efficient measures? Can the rebates paid to retailers be verified to be linked to the sale of qualified models? Is there a detectable change in the key metrics associated with program success (e.g., program-qualified share)?	

Study Title: Home Energy Report (HER) Study Fund for Ongoing Interval Data Research Support	**Budget:** $200,000
Expected Completion Date: December, 2016	**Study Manager:** IOU
Description: Home Energy Reports (HER) represents a key portion of the savings of the statewide residential portfolio. Randomized control trials (RCTs) form the basis of the HER experiments being run by all of the IOUs, but in themselves do not distinguish the portion of savings that may have been claimed by the Upstream Lighting Program.	

Study Title: Home Energy Report (HER) Study Fund for Ongoing Interval Data Research Support	**Budget:** $200,000
Objective: This study would identify the time-of-day, and time-of-year, when the savings observed in HER experiments occurs. It will also provide the opportunity to how the impact of HERs continues after cessation of report delivery (persistence).	
Key Research Questions: How does savings by time-of-day and time-of-year change in households receiving the reports over a number of years? Do savings increase during times-of-day and times-of-year that are associated with increased lighting use? To what extent to energy savings persist in households that had received the reports for some time, after they stop receiving the reports? To what extent do savings observed within specific households endure after a particular customer moves away from the residence?	

Study Title: Home Energy Advisor Work-paper Update & Process Evaluation Study	**Budget:** $175,000
Expected Completion Date: September 2017	**Study Manager:** SCE
Description: Residential home energy advisor programs are an increasingly important part of the IOU's residential energy efficiency portfolios. In mid-2014 DNV GL published a white paper, funded by the CPUC entitled *Evaluation of Opt-In Behavior Programs* that recommends certain methodologies for estimating the savings resulting from these types of opt-in program designs, namely variance-in-adoption (VIA) model method and matched comparison group, depending on the specific characteristics of the programs. There is a need to the IOUs to employ these advocated methodologies to derive savings estimates for residential online audit programs. In addition, changes in implementation of these online tools make a process evaluation necessary to understand how well the programs is achieving its goals of engaging customers and relaying actionable information about energy efficiency and conservation opportunities.	
Objective: The primary objective of the study is to conduct early EM&V for work paper updates and conduct a process evaluation of the HEA program.	
Key Research Questions: What is the functionality of the energy analysis offered by the HEA tools? How are customers using the HEA tool? What could be done to enhance customer's usage of the HEA tool? What data do the tools need to collect to enable evaluability? What are appropriate metrics and values for WP updates?	

Study Title: Step Up Power Down – Commercial (PG&E Only)	**Budget:** $125,000
Expected Completion Date: December 31, 2017	**Study Manager:** IOU
Description: Step Up Power Down – Commercial (SUPD-C) is a marketing campaign being conducted in partnership with the city governments of San Francisco and San Jose. SUPD-C is an 18-month, high intensity marketing and customer engagement campaign to promote PG&E's energy efficiency portfolio and employs strategies focused on new ways to engage people to change behaviors that affect and reduce energy use. PG&E launched this city-based energy savings challenge for large and small-and medium businesses (SMB) PG&E customers.	
Objective: This study would undertake of methodologies to estimate savings resulting from this initiative. Those methodologies include: • Quasi-experimental approaches as recommended by exploratory research undertaken by E2E of the Haas School of Business at the University of California – Berkeley. • Reviewing and augmenting the calibrated simulation models being developed by PG&E's SUPD-C implementation contractor CLEAResult (targeting the largest 20 participating buildings (IPMVP Option D). • Reviewing and augmenting pre/post whole building energy use comparisons also tasked to CLEAResult (IPMVP Option C).	
Key Research Questions: To what extent did SUPD-C achieve its objective of increasing adoption of PG&E's energy efficient measures within the targeted cities? To what extent did SUPD-C result in behavior change related to how people use energy?	

Study Title: MF Residential Boiler Market Characterization	**Budget:** $200,000
Expected Completion Date: December 31, 2016	**Study Manager:** IOU
Description: For the 2016 EM&V research in the residential market, SoCalGas is proposing a statewide market assessment for boilers (water) for the residential MF market. This study is on the list of the ED's Short Term Market Studies Recommendation in the Market Studies Needs Assessment Report by ODC (see below). .	
Objective: This study would characterize the market for boilers and opportunities for energy efficiency intervention The study will collect current market data to run a cross tab on the 1) building/housing type, and 2) existing equipment condition (age, size, efficiency), and 3) energy usage. This information will help leverage the result from the To-Code study on boilers so that the IOUs can strategically develop both deemed and calculated programs for boilers. The study will also collect additional information to refute or agree with anecdotal information about owners/managers' decision process to repair (short-term or indefinitely) or to replace with to-code or above code boilers.	
Key Research Questions:	

Study Title: MF Residential Boiler Market Characterization	**Budget:** $200,000
What is the market potential for boilers? What is the size of the indefinitely repair market? What are the barriers to replace existing boilers with high efficient models (local air quality restriction, production/service continuity, financing, capital, owner vs manager decision?	

2.1.8. 2015 Energy Division EM&V Studies

Table 14. 2015 Energy Division EM&V Studies, Budgets, and Timing

2015 Study Title	Study Manager	Work Order	Proposed Budget[2]	Completion Date
Home Energy Reports PG&E SCE SDG&E Marin Clean Energy	ED	ED_D_Res_3.1 ED_D_Res_3.2 ED_D_Res_3.3 ED_D_Res_3.4	$345,000 IOUs $75,000 MCE	Q4 2016
EUC – MF/MFEER (includes water savers/kits for ESPI)	ED	ED_D_Res_4	$200,000	Q4 2016
SF – Home Upgrade IOUs RENs	ED	ED_D_Res_5	$350,000 IOUs $200,000 RENs	Q3 2017
SW SF Water Saver Kits	ED	ED_D_Res_6	$120,000	Q4 2016
MF Electric Space and Water Heat Technology Economic Assessment	ED	ED_D_Res_7	$40,000	Q4 2015
Appliance Recycling	ED	ED_D_Res_8	$200,000	Q3 2016
Online Audit Tools SCE Evaluability Assessment	ED	ED_D_Res_9	$45,000	Q2 2016
SW Impact Evaluation			$250,000	Q2 2017
Tech Support: 2016 Pilots SCE East West Pilot	ED	ED_D_Res_10	$20,000	Q4 2017
SCE MF 10-10-10 Pilot			$40,000	
SCG CWDCW Pilot			$20,000	
SW Res Plug Load Pilot			$40,000	
Bill Payment Program (Auto-Pay) Study	ED	ED_D_Res_11	$75,000	Q1 2016

[2] All budgets are subject to change pending additional review of program scope and thorough review of evaluation requirements.

2015 Study Title	Study Manager	Work Order	Proposed Budget[2]	Completion Date
SCE Home Energy Audits (HEA) Impact Evaluation	ED	ED_D_Res_12	$135,000	Q2 2017
HER Upstream Adjustment Study	ED	ED_D_Res_13	$350,000	Q3 2016
Other Uncertainty Assessments as Needed	ED		$112,940	
Total Budgeted			$2,542,940	

2.1.9. Energy Division 2015 Study Descriptions

Below, please find a brief description for each proposed 2015 residential retrofit studies.

Study Title: (Residential-3A) Impact Evaluation of Home Energy Report Initiatives	**Budget:** $420,000 ($345,000 for IOUs; $75,000 for MCE)
Expected Completion Date: Q4 2016	**Study Manager:** ED
Description: Conduct impact evaluation of the comparative energy usage programs implemented by the IOUs (PG&E, SCE and SDG&E) and Marin Clean Energy for program year 2015. Also conduct impact evaluations of customer engagement and behavior pilot programs such as; SDG&E's Manage Save Act (MAS) and SCE's Home Energy Efficiency Surveys (HEES) Enhancement behavior modification programs.	
Objective: (1) verify IOUs energy claims and other study considerations	
Key Research Questions: • What is the energy savings when comparing treatment versus control groups? Is the program experimental design by the IOUs acceptable? • What are the peak demand impacts? • How is program targeting affecting the energy savings? • What is the realization rate between the impact evaluation and the IOUs energy savings claims? • Do energy savings persist after suspending the treatment effect? If so, how much for how long? • In the case for HEES, how has the added information influence customer behavior resulting in more energy savings versus customers only receiving the HER? • In the case for MAS, are customers who receive multiple marketing channels of mail, email, web, to take up IDSM actions; saving more than customers receiving the more tradition feedback reports?	
Potential EM&V Methods: Will conducting verifications of methods used, dataset construction and potentially replicating results of early EM&V studies led by the IOUs. This may include using billing analysis of pre and post consumption for treatment and control groups and applying difference-of-difference calculations and fixed-effects regression modeling as used in previous evaluations.	

Study Title: (Residential-6B) MF-EUC Focused Impact Evaluation	**Budget:** $200,000
Expected Completion Date: Q4 2016	**Study Manager:** ED
Description: During the 2013-2014 evaluation cycle, the evaluation team could evaluate only one IOU	

Study Title: (Residential-6B) MF-EUC Focused Impact Evaluation	**Budget:** $200,000
EUC-MF program due to limited participation and data deficiencies. Because all the IOUs are expected to complete MF-EUC pilot projects and claim savings in 2015, the 2015 evaluation would conduct an impact evaluation to assess program energy savings claims for all IOUs. This evaluation would focus on (1) prevalence of early replacement and replace on burnout measures, (2) free-ridership estimates, and (3) accuracy of EnergyPro model simulations. The team would build upon free ridership and early replacement methods established during the 2013-2014 study, and also conduct calibrated simulation modeling using DOE-2 based software to compare against EnergyPro results (if data allows). If possible, the team would also assess the EnergyPro Lite software as an alternative modeling option for program implementers.	
Objective: to improve program design, implementation and marketing activities/outputs and outcome	
Key Research Questions: (target: property owners/managers) • What are the realized energy savings from the 2015 EUC-MF completed projects? • Are the EnergyPro modeled savings estimates reasonable? • What should the baseline be for the EUC-MF programs? Are the measures being replaced prior to the end of their useful life (early replacement), or replaced upon burnout (or failure)? • What is the level of free-ridership for EUC-MF measures?	
Potential EM&V Methods: • Perform interviews with participant primary decision makers (property owners and/or managers) to assess early replacement and free-ridership of program installed measures. • Conduct simulation modeling (DOE2 software, or similar) to assess savings and compare to EnergyPro savings estimates. • Attempt consumption (billing) analysis for EUC-MF projects to compare to EnergyPro Savings estimates.	

Study Title: (Residential-8B) 2015 Residential Whole House Upgrade Impact Evaluation	**Budget**: $550,000 ($350k for IOU, $200k for REN)
Expected Completion Date: Q3 2017	**Study Manager:** CPUC, ED
Description: This is an impact evaluation for the IOU single family whole house upgrade program (Energy Upgrade California). The evaluation includes all IOU and REN upgrade projects for both upgrade packages.	
Objective: To determine savings (net and gross) from the Energy Upgrade whole house program. In addition, understand or confirm participant decision making process and factors of influence.	
Key Research Questions: • What are gross and net kWh, kW and therm savings? • Does the newer simulation software bring ex-ante estimates closer to actual consumptions levels? • To what degree do appliances/plug loads influence savings relative to shell and HVAC measures and what are the interactive affects? • Can AMI data reduce the uncertainty around peak demand impacts created by the multiple simulation software options available in 2015?	
Potential EM&V Methods: • Billing analysis will be the foundation to develop gross savings estimates. ○ Use a statistical approach with a comparison group where the comparison group is made up of	

Study Title: (Residential-8B) 2015 Residential Whole House Upgrade Impact Evaluation	**Budget**: $550,000 ($350k for IOU, $200k for REN)

EUC program future participants.
• Include on-site survey/verification to better understand shell, plug-loads and behavior changes. Example topics include,
  o Dwelling vintage and pre-retrofit condition of home and appliances
  o Hours of operation and equipment control practices (i.e. thermostat settings).
• Survey participants via phone to understand decision making process and factors to,
  o Conduct the upgrade
  o Select a package.
• Create a master database of simulation model data. If more than one model is used, this database must be designed to incorporate multiple data structures.
• Net savings will include realization rates and adjustment for free riders.
• Project costs (for use in cost-effectiveness) can be collected from tracking data and verified through surveys or on-site verification.
Other Considerations:
This evaluation will use simulation model data provided by contractors as the ex-ante savings for the advanced package projects. For IOU basic and REN projects, IOU tracking data will be the ex-ante savings. Simulation models will be calibrated based on on-site verifications.
If there are multiple file formats from several simulation models, the task/budget for data collection may have to be expanded to include a complete database development subtask.	

To date AMI data has been used only for exploratory research and is limited to electricity impacts. This evaluation may use monthly billing data instead of AMI data to satisfy data requirements.	

Study Title: (Residential-16) 2015 Residential SF Water Savers Parameter Update for ESPI (SDG&E and SCG only)	**Budget**: $120,000
Expected Completion Date: 04/30/2016	**Study Manager:** CPUC, ED
Description: This is an ex post update to impact parameters for the water saver, specifically low-flow showerheads and faucet aerators; distributed free via a request for a water saver kit to SDG&E and SCG's websites.	
Objective: To determine the installation rate and level of free riders of participants who received for water savers during the 2013-15 program year savings.	
Key Research Questions: (1) What is the installation rate of water savers? (2) Does the program influence the decision to install low-flow showerheads and faucet aerators? (3) What are adjustments for the install rate and free riders and update to gross and net therm savings?	

Potential EM&V Methods:
• Survey participants via phone to:
  o Identify if there are other water saving devices in the home.
  o How did they first learn about the water saver kits from SDG&E and SCG?
  o Verify that the water saver (low-flow showerhead and/or faucet aerator) was installed and when it was installed. If not installed, determine why not and when they plan to install.	

Study Title: (Residential-16) 2015 Residential SF Water Savers Parameter Update for ESPI (SDG&E and SCG only)	**Budget**: $120,000
○ Determine if the either device was a replacement or a new installation. If replacement, determine reason for replacement. If new, determine why this selection. ○ Determine likelihood of installing the either device without the program. • Review Work paper methodology and assumptions; recommend modifications as necessary to calculate gross savings. • Recommend adjustments for realization rates and free riders to calculate net savings. **Other Considerations:**	
The water saver kits are available for free to whoever completes the application.	

Study Title: (Residential-17) Economic assessment of heat pump space and water heating technologies for multifamily units	**Budget**: $40,000
Expected Completion Date: Q4 2015	**Study Manager:** CPUC, ED
Description: Economic assessment of heat pump installations for multifamily space heating/cooling and water heating in place of high efficient natural gas space and water heating	
Objective: To determine the total cost of ownership of heat pump systems and competing technologies for multifamily building owners and occupants.	
Key Research Questions: (1) What is the total cost upfront cost of retrofit for heat pumps and competing alternatives? (2) What is the total cost of ownership for heat pumps and competing technologies? (3) Are there any barriers (technical or regulatory) to installing heat pumps in multifamily dwellings?	
Study Descriptions: Heat pumps are gaining popularity for both space heating and cooling and water heating due to their high efficiency, flexibility, and easy installation. However, unlike incumbent technologies, the overall efficiency of heat pumps is highly dependent on ambient conditions. This study aims to establish the costs and benefits of heat pump installation and ownership relative to existing conditions and alternative fuels and technologies. DNV GL will consider a number of factors that can have an impact on the overall cost of ownership including climate, utility rates, feasibility of installation, and building type and characteristics. DNV GL will • Identify any technical or regulatory barriers to installation in multifamily units • Determine total cost of retrofit for heat pumps and competing technologies • Model total costs of system ownership for both heat pumps and competing technologies under multiple conditions Should our findings indicate that heat pumps are a viable retrofit technology for multifamily building owners and occupants, we will provide information for developing standard practice installation guide outlining building, climate, and rate structure characteristics that are favorable for cost-effective heat pump installations.	

Study Title: (Residential-18) 2013-2015 Appliance Recycling Impact Evaluation and Market Study	**Budget:** $200,000.
Expected Completion Date: 9/30/2016	**Study Manager:** CPUC

Description: Update the 2013-2015 savings estimates using the current program tracking data. Conduct an analysis to update the contributions to peak kW savings from appliance recycling. Assess trends in refrigerator age to determine whether units being recycled are newer than in prior program cycles.

Objective:

The objective of this study is to: 1.) revise the UES estimates for appliance recycling by applying the savings estimation model developed for the 2010-2012 evaluation to 2013-15 program tracking data (Note that this will not update the methods used to determine NTG and final program savings, simply the gross UEC input to the NTG model). 2.) Develop a model to estimate peak kW savings from metered data collected in 2010-2012 program evaluation, applying the model to 2013-15 units. 3.) Assess trends in refrigerator age in residential homes, and the ages of recycled units, to see if the installed and recycled stock is getting younger over time.

Key Research Questions: (list not exhaustive)

- What is the energy savings from the 2013-15 program cycle?
- The previous evaluation estimated kW impacts by using the old DEER factors for kW. Analyze the metering data to determine what contributions to peak kW can be avoided through recycling old refrigerators and freezers.
- Is the average age of units being recycled changing over time? Are younger units being recycled?
- What is the average age of primary and secondary units in California residential homes? Has this average age as reported in prior CLASS studies changed over time?
- Does the age of recycled units vary by IOU?
- Does the age of recycled units vary by income group or other demographic?
- If the average age of recycled units is newer, has the program design reflected the change in the market?

Potential EM&V Methods:

- Estimate kWh savings by applying 2010-2012 model to 2013-15 program tracking data
- Analyze metering data to determine contributions to peak kW, apply to program tracking data.
- Analyze program tracking data and unit characteristics from prior evaluation cycles (as available), compare to current program tracking data.
- Compare average age of refrigerators in residential homes from last two CLASS studies
- Depending on budget collect new primary data about refrigerator age through non-participant surveys.
- Analyze shipment trends of appliances to estimate an age profile for the residential market in California
- Review secondary literature on refrigerator age in California

Study Title: (Residential-19A -B) 2015 Online Tool Impact Evaluation	**Budget:** $335,000 ($45k for evaluability, $250k for impact)
Expected Completion Date: Q3 2016 Evaluability Assessment Q2 2017 Impact	**Study Manager:** CPUC, ED
Description: This is an impact evaluation for the IOU Online Tool programs for SDG&E and PG&E and an evaluability assessment of the SCE Online Tool program.	
Objective: To determine savings (net and gross) from the Online Tools program. In addition, understand or confirm that the SCE program can be evaluated.	
Key Research Questions: What are the gross and net kWh, kW and therm savings associated with the Tool use? Do the Online Tools increase participation in other IOU rebate or upstream programs? Do the On-line tools sustain on-line interaction over time? Do the On-line tools capture data that support impact evaluation? And, do those data provide qualitative evidence supporting impact results? What is best methodological approach for estimating savings?	
Potential EM&V Methods: • We will follow the recommendations of the Opt-in Whitepaper, using a combination of VIA and matched comparison group approaches to estimate savings. • Joint savings methodology from HER program evaluations will be applied to assess other program uplift. • On-line tool data will be summarized to assess ongoing participant activity and trends. • Data related to savings actions captured by the On-line tool will be summarized and a basic engineering estimate of savings constructed <u>Other Considerations:</u> Under a true RCT, the savings estimates would be net savings. Under the quasi-experimental design, concerns regarding self-selection and the potential of selection bias in the estimated results make the results not necessarily net. This is an unresolvable issue for these kinds of programs. We will attempt to assess the potential range of bias as part of the analysis.	
AMI data may be able to improve the quality of this evaluation.	

Study Title: (Residential-20C-D) ED Technical Support: 2016 Program Pilots: SCE Behavior Pilots: SCE East-West Bank, Multi-family 10-10-10; SCG Cold Water Default Clothes Washers; SW Residential Plug Load Pilot Impact Evaluations Oversight	**Budget:** $120,000

Study Title: (Residential-20C-D) ED Technical Support: 2016 Program Pilots: SCE Behavior Pilots: SCE East-West Bank, Multi-family 10-10-10; SCG Cold Water Default Clothes Washers; SW Residential Plug Load Pilot Impact Evaluations Oversight	**Budget:** $120,000
Expected Completion Date: Q4 2017	**Study Manager:** CPUC, ED
Description: Provide technical support to ED regarding evaluation approach for residential program pilots using RCT experimental designs for behavior program pilots and market transformation strategies.	
Objective: To determine that IOU-led RCT experimental designs and results derived by the IOU's independent impact evaluators meet Commission and industry technical requirements for evaluating RCT programs. Also provide technical review of program pilot evaluation plans/scopes of work.	
Key Research Questions: • Does the proposed experimental design meet CPUC requirements per Decision 10-040-29 for Behavior Programs? • Do the proposed randomized sampling allocations meet RCT standards? • Does the proposed evaluation approach meet known industry standards for evaluating behavior programs (i.e., SeeAction, Uniform Methods Protocols)? • Were there any errors in allocating sample, constructing datasets, running analysis for diff-of-diff, modeling, etc.? • Are the estimates produced reasonable given the RCT approach? • Does the proposed evaluation plans and approach meet Best Practices for assessing market effects? Are the propose market transformation indicators appropriate? Are proposed data collection metrics adequate?	
Potential EM&V Methods: • Participate in discussions, review pilot designs, sampling strategy, review randomized allocation code and output, etc. to ensure experimental design meets technical standards • Review reports, analysis datasets, and code to assess validity of findings. • Review evaluation approach for assessing market effects; review/assess adequacy of market effects indicators; program data tracking and metrics; review sample designs, survey instruments, etc. Other Considerations:	
The RPP pilot is still waiting for final approval of Advice Letter which may push back program implementation.	

Study Title: (Residential-21) Bill Auto-pay Billing Analysis Study	**Budget**: $75,000.
Expected Completion Date: 3/31/2016	**Study Manager**: CPUC

Study Title: (Residential-21) Bill Auto-pay Billing Analysis Study	**Budget**: $75,000.
Description: Conduct billing analysis to assess whether customers who participant in IOU auto-pay payment programs change their energy consumption habits. Recent research by Duke University reveals that residential customers enrolled in utility automatic billing payment (ABP or "auto-pay") use 4-6% more energy than their peers, controlling for other factors. Low income customers enrolled in auto-pay may use even more than a control group cohort.	
Objective: This study will look at residential customer usage trends across all payment methods to determine if California IOU residential customers on auto-pay also use more energy than other customers using different payment methods. Currently, twenty percent or more of IOU residential customers are enrolled in auto-pay; a similar portion of customers visit certain IOU payment websites to manually transfer payments each month. It is useful to know the segmentation characteristics and usage habits of auto-pay customers, as they may present targeted opportunities for the IOU Energy Advisor program teams as they work to drive customer engagement and reduce customer energy usage.	
Key Research Questions: (list not exhaustive) • What is the pre and post energy consumption trends of customers who use auto-pay? • How does it compare to customers who do not use such payment methods? • What are the demographic characteristics for customers who choose the various bill-pay options? Can the IOUs use these characteristics for targeting education/marketing purposes?	
Potential EM&V Methods: • Billing analysis • Summarize and possibility predictive modeling using IOU embedded geo-demographic codes	

Study Title: (Residential-3C) 2015 SCE Home Energy Advisor Surveys (mail and phone audits) Impact Evaluation	**Budget:** $135,000
Expected Completion Date: 11/30/2016	**Study Manager:** CPUC, ED
Description: This is an ex post evaluation of SCE's 2015 HEES audits or surveys program.	
Objective: To determine the net and gross impacts attributable to the HEES program. Also assess program influence in the uptake of other rebated/upstream measures.	
Key Research Questions: • What are the gross and net kWh, kW and therm savings associated with the program? • What actions are customers taking (i.e., measures, practices, etc.) due to participation in the audit? • Would customers have taken these actions without the program? • Did the HEES audits increase awareness of other rebate programs	

Study Title: (Residential-3C) 2015 SCE Home Energy Advisor Surveys (mail and phone audits) Impact Evaluation	**Budget:** $135,000

- Does the HEES increase participation in other IOU rebate or upstream programs?

Potential EM&V Methods:

- Establish a comparison group using either the propensity matching or minimum distance (in consumption) etc. or some other method for matching using quasi-experimental design
- Conduct billing analysis
- Conduct surveys to assess actions taken (to support billing analysis and inform attribution analysis)
- Use Joint savings methodology from HER program evaluations to assess other program uplift.

Other Considerations:

Under the quasi-experimental design, concerns regarding self-selection and the potential of selection bias in the estimated results make the results not necessarily net. This is an unresolvable issue for these kinds of programs. We will attempt to assess the potential range of bias as part of the analysis.

AMI data may be able to improve the quality of this evaluation.

Study Title: (Residential-3D) Home Energy Report Upstream Joint Savings Assessment	**Budget**: $350,000
Expected Completion Date: Q3 2016	**Study Manager**: ED

Description: Conduct survey(s) to assess appropriate upstream lighting (CFLs and LEDs) uptake influence by HER recipients as compared to the control group. This study will allow for properly assessing savings induce by the program that are currently credited to the upstream lighting program. With the appropriate adjustment factors, we can then remove the joint savings from the IOU's HERs and MCE's HURs program in order to eliminate double counting. We will also look for opportunity to expand the scope of the data collection to inform the program administrators on what actions the treatment groups are taking to reduce consumption and also assess the effectiveness of the messaging that includes recommendations.

Objective: (1) determine the adjustment factors needed to remove double counting of savings from upstream lighting measures for each IOU (2) attempt to identify other actions report recipients are taking in response to HERs and HURs messaging.

Key Research Questions:

- Does the HER treatment group purchase upstream lighting measures (CFLs; LEDs) at a higher rate than the control group? If so, what is the fraction of upstream lighting savings that are attributable to the HER program that must be removed from the rebate program?
- What is the proper adoption framework for assessing the savings for upstream measures purchased by the treatment group? Is the adoption curve S-shaped, indicating adoptions are occurring later after receiving reports then decline overtime; or are measures purchased earlier after receiving the reports with more behavior actions following measures?

Study Title: (Residential-3D) Home Energy Report Upstream Joint Savings Assessment	**Budget**: $350,000
• Does the HER treatment group take up more EE behaviors leading to energy savings than the control group? Can we identify the behaviors? How long do they persist?	
Potential EM&V Methods: • Customer surveys (data collection method tbd; depending on shared budgets) • In-depth interviews with program staff; • Possibly focus groups with treatment group • Calculate fraction of savings per measure, per IOU allocation of	

Other Important Considerations

The residential study team is currently coordinating study activities with the following teams:

- EE Lighting study team,
- EE HVAC study team,
- EE WE&T study team,
- IDSM study team,
- And other important study and program areas such as Marketing Education and Outreach (MEO), Financing, and Low-income/ESAP programs.

These coordination activities are helpful to streamline study content to avoid duplication. However, these coordination activities are not meaningful substitutes for an overarching critical synthesis of research findings and recommendations.

2.2. Commercial (Small/Medium Buildings, Prescriptive Measures)

2.2.1. Background

The Commercial Roadmap is focused on five general program types:

- Core Deemed
- Core Direct Install
- Third Party
- Energy Advisor (audits, benchmarking, continuous energy improvement, etc.)
- State and Institutional Partnerships

The tables below presents all programs that correspond to these program types, along with the total 2013-14 ex ante kW, MWh and therm savings.

Table 15. Commercial Roadmap Savings by Program – PG&E

PA	ProgramID	ProgramName	kW	MWh	Therms
PGE	PGE210111	LODGINGSAVERS	5,551	19,024	89
PGE	PGE210112	SCHOOL ENERGY EFFICIENCY	641	7,328	319
PGE	PGE210113	ENERGY FITNESS PROGRAM	2,000	10,223	0
PGE	PGE210114	ENERGY SAVERS	745	4,147	0
PGE	PGE210115	RIGHTLIGHTS	2,339	16,797	0
PGE	PGE210116	SMALL BUSINESS COMMERCIAL COMPREHENSIVE	323	2,703	0
PGE	PGE210117	ENERGY-EFFICIENT PARKING GARAGE	65	617	0
PGE	PGE210118	FURNITURE STORE ENERGY EFFICIENCY	2,359	11,521	0
PGE	PGE210119	LED ACCELERATOR	2,534	11,716	0
PGE	PGE21012	COMMERCIAL DEEMED INCENTIVES	12,484	72,731	4,165
PGE	PGE210122	CASINO GREEN	690	6,980	0
PGE	PGE210123	HEALTHCARE ENERGY EFFICIENCY PROGRAM	169	1,914	262
PGE	PGE210126	K-12 PRIVATE SCHOOLS AND COLLEGES AUDIT RETRO	349	3,778	0
PGE	PGE210128	ENOVITY SMART	54	1,214	79
PGE	PGE210133	STAPLES LOW PRESSURE IRRIGATION DI	3,768	5,966	0
PGE	PGE21014	COMMERCIAL ENERGY ADVISOR	12,969	21,866	3,204
PGE	PGE21017	BOILER ENERGY EFFICIENCY PROGRAM	43	164	1,431
PGE	PGE21018	ENERGYSMART GROCER	4,685	40,595	199
PGE	PGE21022	INDUSTRIAL DEEMED INCENTIVES	1,306	6,166	253
PGE	PGE21024	INDUSTRIAL ENERGY ADVISOR	964	1,622	235
PGE	PGE21027	HEAVY INDUSTRY ENERGY EFFICIENCY PROGRAM	5,170	40,755	2,422
PGE	PGE210310	DAIRY INDUSTRY RESOURCE ADVANTAGE PGM	987	5,240	0
PGE	PGE21032	AGRICULTURAL DEEMED INCENTIVES	24,513	39,908	615
PGE	PGE21034	AGRICULTURAL ENERGY ADVISOR	3,892	26,352	218
PGE	PGE21035	DAIRY ENERGY EFFICIENCY PROGRAM	57	1,378	0
PGE	PGE21036	INDUSTRIAL REFRIGERATION PERFORMANCE PLUS	1,036	9,377	4
PGE	PGE21037	LIGHT EXCHANGE PROGRAM	0	408	0
PGE	PGE21038	WINE INDUSTRY EFFICIENCY SOLUTIONS	1,091	6,256	283
PGE	PGE21039	COMPREHENSIVE FOOD PROCESS AUDIT & RESOURCE EFFICIENCY PGM	937	6,338	3,127
PGE	PGE21042	LIGHTING INNOVATION	4,125	19,955	0
PGE	PGE2110011	CALIFORNIA COMMUNITY COLLEGES	1,574	10,477	862
PGE	PGE2110012	UNIVERSITY OF CALIFORNIA/CALIFORNIA STATE UNIVERSITY	5,153	27,217	1,737
PGE	PGE2110013	STATE OF CALIFORNIA	774	3,560	53
PGE	PGE2110014	DEPARTMENT OF CORRECTIONS AND REHABILITATION	2,577	9,139	382

Table 16. Commercial Roadmap Savings by Program – SCE, SCG and SDG&E

PA	ProgramID	ProgramName	kW	MWh	Therms
SCE	SCE-13-L-003B	CALIFORNIA DEPT. OF CORRECTIONS AND REHABILITATION EE PARTNERSHIP	181	2,965	1
SCE	SCE-13-L-003F	STATE OF CALIFORNIA ENERGY EFFICIENCY PARTNERSHIP	800	2,755	6
SCE	SCE-13-L-003G	UC/CSU ENERGY EFFICIENCY PARTNERSHIP	2,468	20,579	70
SCE	SCE-13-SW-002C	COMMERCIAL DEEMED INCENTIVES PROGRAM	22,501	129,462	0
SCE	SCE-13-SW-002D	COMMERCIAL DIRECT INSTALL PROGRAM	30,871	128,450	0
SCE	SCE-13-SW-003C	INDUSTRIAL DEEMED ENERGY EFFICIENCY PROGRAM	2,638	8,851	0
SCE	SCE-13-SW-004C	AGRICULTURE DEEMED ENERGY EFFICIENCY PROGRAM	355	1,311	0
SCE	SCE-13-SW-005B	LIGHTING INNOVATION PROGRAM	2,896	12,879	0
SCE	SCE-13-TP-003	HEALTHCARE EE PROGRAM	1,495	12,650	0
SCE	SCE-13-TP-004	DATA CENTER ENERGY EFFICIENCY	665	7,862	0
SCE	SCE-13-TP-005	LODGING EE PROGRAM	1,937	15,206	0
SCE	SCE-13-TP-006	FOOD & KINDRED PRODUCTS	3,621	33,801	0
SCE	SCE-13-TP-007	PRIMARY AND FABRICATED METALS	2,046	15,945	0
SCE	SCE-13-TP-008	NONMETALLIC MINERALS AND PRODUCTS	4,662	33,833	0
SCE	SCE-13-TP-009	COMPREHENSIVE CHEMICAL PRODUCTS	3,168	24,549	0
SCE	SCE-13-TP-012	REFINERY ENERGY EFFICIENCY PROGRAM	990	10,944	0
SCE	SCE-13-TP-013	COOL SCHOOLS	589	2,191	0
SCE	SCE-13-TP-014	COMMERCIAL UTILITY BUILDING EFFICIENCY	2,203	11,644	0
SCE	SCE-13-TP-017	ENERGY EFFICIENCY FOR ENTERTAINMENT CENTERS	375	545	55
SCE	SCE-13-TP-018	SCHOOL ENERGY EFFICIENCY PROGRAM	3,176	16,962	0
SCE	SCE-13-TP-020	IDEEA365 PROGRAM	0	359	0
SCG	SCG3711	SW-COM-DEEMED INCENTIVES	1	16	3,160
SCG	SCG3716	SW-IND-DEEMED INCENTIVES	0	-5	1,399
SCG	SCG3720	SW-AG-DEEMED INCENTIVES	0	133	425
SCG	SCG3757	3P-SMALL INDUSTRIAL FACILITY UPGRADES	0	0	574
SCG	SCG3758	3P-PREPS	0	0	297
SCG	SCG3766	3P-SAVEGAS	0	0	19
SCG	SCG3793	3P-IDEEA365-INSTANT REBATES! POINT-OF-SALE FOODSERVICE REBATE PROGRAM	0	0	111
SDGE	SDGE3223	SW-COM-DEEMED INCENTIVES-COMMERCIAL REBATES	9,251	60,203	504
SDGE	SDGE3226	SW-COM DIRECT INSTALL	9,486	36,377	0
SDGE	SDGE3233	SW-IND-DEEMED INCENTIVES	352	1,619	5
SDGE	SDGE3239	SW-AG-DEEMED INCENTIVES	63	350	175

In 2004-2005, the CPUC approved the funding of local government and institutional partnerships across the four investor-owned utilities (PG&E, SCE, SCG and SDG&E). Prior to this, the IOUs had engaged in a few government partnerships individualized to meet the needs and interests of each jurisdiction.

Institutional Partnerships (IPs) are designed to create dynamic and symbiotic working relationships between Investor-Owned Utilities (IOU), state or local governments and agencies or educational institutions. The objective is to reduce energy usage through facility and equipment improvements, share best practices, and provide education and training to key personnel.

The Institutional Partnership Roadmap is focused on the process evaluations of the four statewide partnerships:

- California Community Colleges (CCC)
- University of California/California State University (UC/CSU)
- State of California Partnership
- California Dept. of Corrections and Rehabilitation (CDCR)

The impact evaluations of the Institutional Partnership programs were recently added to the oversight of the Commercial Roadmap. For program years 2013-15 there are no impact or process evaluations

that are specifically targeted to these groups of programs, however, these programs will be included in the sample frame for some of the impact evaluations discussed below (specifically the studies being conducted to meet the needs of the Efficiency Savings and Performance Incentive (ESPI) decision[3]).

In 2010-2012, ED and the four IOUs collaborated on the process evaluation of the Institutional Partnerships (Navigant, 2013[4]). No process evaluations were planned for 2013-2015, due in part to the fact that these are legacy programs whose processes are relatively well-understood by the IOU IP program managers.

Similarly, although the evaluation of local government partnership, REN and CCA programs will be covered by the LGP and REN/CCA roadmaps, the ESPI impact evaluations conducted under this roadmap will also cover some component of these programs.

Furthermore, although there are separate roadmaps and PCGs for custom projects and for lighting, this roadmap will include impact evaluations for all nonresidential downstream lighting measures, both deemed and custom. Therefore, the impact evaluations conducted under this roadmap will also cover some component of the Core Custom and Lighting programs. However, all non-lighting custom measures, nonresidential new construction measures and agricultural audit measures will be covered by the Industrial, Agricultural and Large Commercial (IACL) roadmap.

Finally, the evaluation of upstream HVAC rebates and HVAC Quality Maintenance (QM) HVAC Quality Installation (QI) will be covered by the HVAC roadmap. Therefore, evaluations performed under the HVAC roadmap will be conducted on the programs listed in the table above.

There are a number of primary evaluation needs that the studies in this roadmap are attempting to address which are:

1. Estimating ex post net and gross lifecycle savings values for all custom lighting measures and certain nonresidential downstream deemed measures with high uncertainty to meet the requirements of the Efficiency Savings and Performance Incentive (ESPI) decision[5]. The following studies address these needs:
    a. 2013-14 Nonresidential Downstream Deemed ESPI Impact Evaluation
    b. 2013-14 Nonresidential Downstream Custom Lighting ESPI Impact Evaluation
    c. 2015 Nonresidential Downstream Deemed ESPI Impact Evaluation
    d. 2015 Nonresidential Downstream Custom Lighting ESPI Impact Evaluation
2. Develop a better understanding of how the Direct Install, Third Party and Deemed programs operate, the value that these programs provide, what level of savings each of these programs have delivered, and how effective these programs have been in terms of cost effectiveness and depth of retrofit. The following study addresses these needs:

[3] D.13.09.023, Decision Adopting Efficiency Savings and Performance Incentive Mechanism.

[4] Available at http://www.energydataweb.com/cpucFiles/pdaDocs/908/Statewide_Institutional_IOU_Energy_Efficiency_Partnership_Assessment%20Final%20Draft.pdf

[5] D.13.09.023, Decision Adopting Efficiency Savings and Performance Incentive Mechanism.

a. 2013-14 Impact Evaluation of Deemed, Direct Installation and Third Party Programs
b. 2015 Impact Evaluation of Deemed, Direct Installation and Third Party Programs
c. 2013-14 Direct Install Process Evaluation
d. 2015 Direct Install Process Evaluation
e. 2013-14 Third Party (3P) Programs Value and Effectiveness Study
f. Comprehensiveness Analysis Study

Ex Ante Coordination

Ex ante processes (including DEER updates, Uncertain Measures List updates, work papers review, and custom projects review) incorporate data and results from the latest EM&V studies. The ex ante values that are relevant to this sector are highlighted in this section, they may also be included in other relevant chapters.

Summary of DEER 2016 Updates:

- Nearly all values for interior lighting hours of use (HOU) and coincident demand factor (CDF) were updated using the same analysis approach followed for the 2015 uncertain measure update for CFLs up to 30 watts and T5 replacing metal halide fixtures. **NOTE:** Screw-in CFLs greater than 30 watts were kept for the 2015 uncertain measure list and should still be a focus of upcoming evaluation work even with the recent DEER updates.
- An additional use subcategory for high-bay installations was added to DEER with different HOU and CDF values compared to CFL and conventional LF measures. **NOTE:** Recent IOU research on LED technologies indicates that the standard practice for high-bay applications likely includes some portion of T5 linear fluorescent.
- Lighting measure definitions were updated to include measures originating in PA work papers submitted in 2013 and 2014 and eventually approved through the work paper review, disposition and approval process.
- Several NTG values were updated including:
  - Lighting NTG values were further delineated by technology type and delivery type
  - Agricultural water conserving sprinkler technologies
  - Non-HVAC pipe insulation
  - Custom new construction programs
- Necessitated by the update to lighting HOU, EULs were updated to ensure that no technology exceeded the DEER maximum life in years for any DEER building type

Summary of 2015 Uncertain Measure Updates:

Updates to the 2014 uncertain measure list removed the following measures:

- Screw-in CFLs up to 30 watts: After a review of the available EM&V findings and data, the EAR team proposed to update nonresidential values for interior HOU and CDF.
- T5 linear fluorescent replacing metal halide: After review of the available EM&V findings and data, the EAR team proposed to develop nonresidential values for interior HOU, interior CDF and NTG.

D.15-10-028 directed an effective date for these updates of January 1, 2016, creating ambiguity as to what savings values shall be used for the 2015 program year. Put another way: For 2014, these measures were subject to ex post evaluation. They were removed from the uncertain measure list for 2015, but he final ex ante values do not take effect until January 1, 2016, so it is not clear what values shall be used for 2015.

Values for HOU and CDF, for both CFL and linear fluorescent technologies, were revised based on an analysis of logger data included in four published EM&V studies [6,7,8,9] that included extensive loggering of lighting lamps and fixtures in commercial buildings throughout California. The detailed results of these logger studies were combined with building characteristics provided in the recently published Commercial Saturation Survey[10] in order to develop typical building wide HOU and CDF values.

The T5 NTG value was developed based on overall program results published in the WO29 and ESPI reports.

Next Planned DEER Update

The DEER team is currently in the planning stages for 2017 updates. The scope of these updates is still under development.

Uncertain Measures List and Update

To assess what measures to move off and/or add onto the Uncertain Measures List requires looking ahead to IOU portfolios and analysis of ex ante and ex post teams. The current 2015 Uncertain Measures List (http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M076/K775/76775903.PDF, Attachment 3) contains the following items for this sector and shall be prioritized in the evaluation studies. Please note that deemed lighting measures are listed here and repeated in the Lighting Roadmap, as lighting measures are being studied under the 2015 Nonresidential Downstream Deemed ESPI Impact Evaluation described below.

Table 17. 2015 Uncertain Measures Studied Under the Commercial Roadmap

Utilities	Measure	Areas of Uncertainty
PGE, SCE	Computer network and workstation power	Major concern that supply of this software is standard practice; this measure has not been previously studied

[6] Final Report, WO29: Nonresidential Downstream Lighting Impact Evaluation(WO29), Prepared for: California Public Utilities Commission, Energy Division, 2010-2012 EM&V Work Order 29 –Nonresidential Downstream Lighting, Prepared by: Itron, Inc., August 5, 2014

[7] 2013 Nonresidential Downstream Deemed ESPI Lighting Impact Evaluation Report (ESPI), Prepared for: California Public Utilities Commission, Energy Division, Prepared by: Itron, Inc., April 28, 2015

[8] Small Commercial Contract Group Direct Impact Evaluation Report (SmallCom), Prepared for: California Public Utilities Commission, Energy Division, December 11, 2009

[9] Government Partnerships Programs Direct Impact Evaluation Report, prepared by Summit Blue Consulting, Prepared for: California Public Utilities Commission, February 8, 2010

[10] Commercial Saturation and Commercial Market Share Tracking Study, Prepared for: California Public Utilities Commission, Energy Division, Prepared by: Itron, Inc., September 22, 2014

Utilities	Measure	Areas of Uncertainty
	management software	and impact assumptions need verification.
PGE	Sprinklers - low pressure nozzles and micro conversions	Energy savings estimates uncertain due to unclear measure definition; this measure has not been previously studied and impact assumptions need verification.
SCG	Pipe insulation - steam and hot water	Uncertain typical pipe internal and surrounding temperatures, install rate (measure eligibility) and level of free riders.
PGE, SCE, SDGE	Screw-in CFLs of all types with wattage values greater than 30.	Update of the gross baseline assumptions to account for the type and wattage of the lamp being replaced. Previous NTG studies have not focused on high wattage CFL lamps.
PGE, SCE, SDGE	Screw-in LED lamps including downlight replacement kits	Update baseline assumptions and net savings including replaced lamp for early retirement versus standard practice for normal replacement and replace-on-burnout; market move to LED technology and rapidly changing products and pricing requires verification of assumptions.
PGE, SCE, SDGE	LED street lights and outdoor area lighting	Baseline assumptions and net savings including replaced lamp/ballast for early retirement versus standard practice for normal replacement and replace-on-burnout; market move to LED technology requires verification of assumptions.
PGE, SCE, SDGE	Occupancy sensor lighting controls - integrated and wall/ceiling	Code changes may change standard practice.
PGE, SCE, SDGE	De-lamping of T12 lamps in existing fixtures	De-lamping may normally be a required action during retrofit of surrounding fixtures thus subject to code or other baseline consideration.

The draft 2016 Uncertain Measures List (http://www.cpuc.ca.gov/NR/rdonlyres/9F79154A-065B-4E80-B1AC-58A6E7223F91/0/Final_2015_ESPI_Uncertain_List.pdf), also includes a number of measures that are relevant for the Commercial Roadmap and are presented in the table below.

Table 18. 2016 Uncertain Measures Relevant to the Commercial Roadmap

Utilities	Measure	Areas of Uncertainty
PG&E, SCE, SDG&E	Computer network and workstation power management software	Major concern that supply of this software is standard practice; this measure has not been previously studied and impact assumptions need verification.
PG&E, and other IOUs if	Irrigation - low pressure nozzles and micro or drip conversions and/or VSD addition.	Energy savings estimates uncertain due to unclear measure definition; this measure has not been previously studied and impact assumptions need verification.

Utilities	Measure	Areas of Uncertainty
claimed		
PG&E,SCG	Pipe and tank insulation - steam and hot water pipes and high temperature tanks	Uncertain typical pipe internal and surrounding temperatures, install rate (measure eligibility), EUL (length of time insulation remains in place in good functional condition) and level of free riders.
PG&E,SCE, SDG&E	Food-service equipment: fryers, steamers, ovens of all types, and holding cabinets.	There has been insufficient investigation into field performance (including hours of use and loading), EUL, and standard practice (for gross baseline and NTG). Direction was issued to PA's to perform this work in D.11-07-030, but from the recent work paper submissions it appears the appropriate work has not been undertaken.
PG&E,SCE, SDG&E	Refrigeration case LED lighting and controls	The main areas of uncertainty are operating hours, standard practice for baseline determination and NTG. Additionally, it is unclear if the measures include application to new and replacement case situations or just retrofits of existing cases. There are likely varying values required for facilities with large, medium and small refrigeration case amounts as well as retail stores with different standard operating hours.
PG&E,SCE, SDG&E	Refrigeration case Anti-Sweat Heater (ASH) controls	The main areas of uncertainty are operating hour reductions, standard practice and NTG. Additionally, it is unclear if the measure includes application to new and replacement case situations or just retrofits of existing cases. There are likely varying values required for facilities with large, medium and small refrigeration case amounts as well as retail stores with different standard operating hours.
PG&E, SDG&E, SCG	High Efficiency Water heating for commercial and residential use – tankless/instantaneous water heaters and 0.9 and higher EF storage water heaters	The main areas of uncertainty are overall system differential water and energy use considering tank and pipe losses as well as firing efficiency, standard practice versus code baseline and NTG.
PGE, SCE, SDGE	Screw-in CFLs of all types and wattage values in non-residential use	Examine and review whether an update of the gross baseline assumptions to account for the type and wattage of the lamp being replaced is required. There is uncertainty regarding the common applications (building types and operating hours) for high wattage CFLs and NTG for high wattage CFL lamps.
PGE, SCE, SDGE	Interior LED bay and high bay lighting	Examine and review whether updating metal halide baseline assumptions to consider high output linear fluorescent technologies as part of the standard

Utilities	Measure	Areas of Uncertainty
		practice (as indicated in recently published SCE/Navigant LED research findings) is needed. There is uncertainty in the standard practice assumptions of metal halide baselines.
PGE, SCE, SDGE	LED street lights and outdoor area lighting	Baseline assumptions and net savings including replaced lamp/ballast for early retirement versus standard practice for normal replacement and replace-on-burnout; market move to LED technology requires verification of assumptions.

Program Administrators' Planned Work paper Submissions

Program Administrators submit planned work papers for the upcoming portfolio cycle to Commission staff. These work papers often use DEER data and/or methodology to add technologies that are not in DEER to the energy efficiency portfolio.

Table 19. Program Administrators' Planned Work paper Submissions

Program Administrator	Measure/Value/Parameter	Reason for the Update/New Work paper
PG&E	Deck Ovens	New data
PG&E	Vertical Hollow and Solid Shaft Pump Motors	New data
PG&E	Ultra-Low Temperature Freezer	New data
PG&E	High Efficiency DHW Boiler (>75 mBTU/h)	New data
PG&E	Vending Machine Controller – Uncooled	DEER Updates
PG&E	4 Watt Int Screw-in CFL	DEER Updates
PG&E	T12 Delamping w/ lamps and ballast retrofit 4L 4ft T12 to 3L 4ft T8	DEER Updates
PG&E	Pipe Insulation	DEER Updates
PG&E	Replace reflector incandescent with PAR38 CFRL (SMB)	DEER Updates
PG&E	CFL 7 WATT INT BARE SPIRAL 1PK	DEER Updates
PG&E	Replace >60W incandescent with CFLs in exterior areas (attached to tenant dwelling such as porch lights)	DEER Updates
PG&E	Compact Fluorescent Interior Fixture	DEER Updates
PG&E	FIXTURE INT INDUCTION - 400 WATTS BASE CASE - UP TO 250W	DEER Updates
PG&E	HP T8/T5, >585 WATT LAMP BASE CASE, 352 TO 585 WATT REPLACEMENT FIXTURE	DEER Updates
PG&E	Replace an existing 4' 32W T8	DEER Updates

Program Administrator	Measure/Value/Parameter	Reason for the Update/New Work paper
	fluorescent lamp with a 4' 28W T8 fluorescent lamp.	
PG&E	400 W interior compact fluorescent	DEER Updates
PG&E	LED Surface, Pendant, Track, Accent, and Recessed Downlight: Install < 7W LED	DEER Updates
PG&E	LED MR-16: <6 Watts	DEER Updates
PG&E	LED PAR20: ≤11 Watts	DEER Updates
PG&E	29 Watt 3-Way CFL replacing Incandescent Average Watts = 103.53	DEER Updates
PG&E	LED Candelabra <3W	DEER Updates
PG&E	LED globe: <3 Watts	DEER Updates
PG&E	LED A-Lamp 13 to < 14 watts	DEER Updates
PG&E	REFRIG CASE LTG-TIER 1 LED LIGHTBAR <= 5-FOOT UNIT NO OCC SENSOR CONTROL	DEER Updates
PG&E	LED Recessed Downlight: Install <10 W LED	DEER Updates
PG&E	20% Tuning	DEER Updates
PG&E	LED R-BR: <11 Watts	DEER Updates
PG&E	LED High/Low Bay: 40 to 131 watts, replacing 175W PS-MH	DEER Updates
SCE	Tier 2 Commercial Information Technology (IT) Advanced Power Strip (APS)	Same effort as described in SDG&E's list.
SCE	Commercial Quality Renovation: Reduce Overventilation	WP doesn't exist. Proceeding through SCE's intake process. Lab testing and building energy simulation may be performed.
SCE	Commercial Quality Renovation: Duct Insulation	WP doesn't exist. Proceeding through SCE's intake process. Lab testing and building energy simulation may be performed.
SCE	Commercial Quality Renovation: Duct Leakage	WP doesn't exist. Proceeding through SCE's intake process. Lab testing and building energy simulation may be performed.
SCE	Commercial Quality Renovation: Static Pressure Reduction and Flow Optimization	WP doesn't exist. Proceeding through SCE's intake process. Lab testing and building energy simulation may be performed.
SCE	Smart Thermostat	WP doesn't exist. Study in progress.
SCE	Indirect Evaporative DOAS	WP doesn't exist. ET study in progress.
SCE	Commercial Quality Maintenance: Economizer Repair	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial Quality Maintenance:	PG&E-led effort to update this work paper

Program Administrator	Measure/Value/Parameter	Reason for the Update/New Work paper
	Economizer Control	based on WO032.
SCE	Commercial Quality Maintenance: Programmable Thermostat	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial Quality Maintenance: Condenser Coil Cleaning	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial Quality Maintenance: Unoccupied Supply Fan Control	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial Quality Maintenance: Evaporator Coil Cleaning	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial Quality Maintenance: Refrigerant Charge	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial Quality Maintenance: VFDs on Agricultural Pumps	PG&E-led effort to update this work paper based on WO032.
SCE	Variable Refrigerant Flow Commercial Heat Pumps & Heat Recovery Systems >65kBtu/h	Existing work paper that was not approved by the ED. PG&E is leading the effort to revise the paper.
SCE	Exterior Pole Mounted LED Luminaires	WP doesn't exist. Want to move from Custom to Deemed.
SCE	LED Canopy Luminaires	WP doesn't exist. Want to move from Custom to Deemed.
SCE	LED Linear Ambient Luminaires	WP doesn't exist. Copying SDG&E's WP.
SCE	LED Stadium Lighting	WP doesn't exist. Want to move from Custom to Deemed.
SCE	LED Bollards	WP doesn't exist. Want to move from Custom to Deemed.
SCE	LED Exterior Light With Motion Sensor	Update existing WP to include other baselines. Currently PSMH/HPS.
SCE	LED Integral Lamps	Update WRR, wattage range, & cost based on Navigant's LED study.
SCE	LED Wall Packs	Update wattage range & cost based on Navigant's LED study.
SCE	LED Tube	New WP based on Customized Project trial.
SCE	LED High/Low Bay Fixtures	Update cost based on Navigant's LED study.
SCG	Pipe Insulation	New data from impact evaluation
SCG	Laminar Flow Restrictor for Health Care	New Measure
SDG&E	Water Nexus tool	Correlated saving associated with implementing water savings devices/equipment (ULF urinals, ULF toilets, faucets, etc.)
SDG&E	Tier 2 Commercial Information Technology (IT) Advanced Power	Ongoing ET field trails as requested by CS EAR team

Program Administrator	Measure/Value/Parameter	Reason for the Update/New Work paper
	Strip (APS)	
SDG&E	Slice Energy - Smart VAV controls for DDC and Pneumatic controls where supply fans have existing VFD's	Ongoing ET field trails to determine EE savings and code compliance
SDG&E	AirRite – small business (restaurants/fast food) whole facility HVAC approach (air balancing, tune ups, and controls for EE & DR)	Ongoing ET field trails to determine EE savings and code compliance
SDG&E	QM Power's Q-Sync Motors – fractional HP motors for refrigeration cases that claim higher savings than ECM's	Ongoing ET field trails to determine EE savings and code compliance
SDG&E	Pool Response – This is an IDSM project for pool pumps using a low cost controller. If effective - could be a residential rebate.	Ongoing ET field trails to determine EE savings and code compliance
SDG&E	LED Menu Boards - This is a project with EPRI and is moving very slowly. However, if completed by Q2 of 2016 it could be work paper ready	Ongoing ET field trails to determine EE savings and code compliance

2.2.2. 2013-2014 EM&V Studies

The table below summarizes the 2013-14 EM&V Studies that have been budgeted, some of which are in the process of being implemented and one that is in the planning stage. The table provides the study manager, work order under which the study is being conducted, the corresponding budget, implementation status and expected completion date for each study.

Table 20. 2013-2014 Commercial Programs EM&V Studies, Budgets, and Timing

2013-2014 Study Title	Study Manager	WO Number	Budget	Status	Completion Date
Impact					
2013-2014 Nonresidential Downstream Deemed ESPI Impact Evaluation	ED	ED_I_COM_1	$2,165,000	Underway	Q1 2016
2013-2014 Nonresidential Downstream Custom Lighting ESPI Impact	ED	ED_I_COM_1	$1,215,000	Underway	Q1 2016

2013-2014 Study Title	Study Manager	WO Number	Budget	Status	Completion Date
Evaluation					
2013-2014 Impact Evaluation of Deemed, Direct Installation and Third Party Programs	ED	ED_I_COM_1	$500,000	Planning	Q2 2017
2013-15 Impact and Process Evaluation of Commercial and Industrial Audit Programs*	ED	ED_I_COM_4	$25,000	Cancelled	
Process					
2013-2014 Direct Install Process Evaluation	ED	ED_I_COM_2	$300,000	Underway	Q2 2016
2013-2014 3P Programs Value and Effectiveness Study	ED	ED_I_COM_2	$600,000	Underway	Q4 2015
Comprehensiveness Analysis Study	ED	ED_I_COM_4	$400,000	Underway	Q1 2016

*After an initial evaluation assessment, it was decided not to continue with the 2013-15 Impact and Process Evaluation of Commercial and Industrial Audit Programs.

2.2.3. 2013-14 Study Descriptions

Below are descriptions for each of the 2013-14 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: 2013-14 Nonresidential Downstream Deemed ESPI Impact Evaluation	**Budget:** $2,165,000 (Note that a portion of this budget was reallocated from the Lighting Roadmap, as this study is evaluating lighting measures).
Expected Completion Date: Q1 2016	**Study Manager:** (ED)
Description: This study will develop ex post savings estimates of net and gross savings values for the	

Study Title: 2013-14 Nonresidential Downstream Deemed ESPI Impact Evaluation	**Budget:** $2,165,000 (Note that a portion of this budget was reallocated from the Lighting Roadmap, as this study is evaluating lighting measures).
nonresidential downstream deemed measures that were identified in the identified in the Efficiency Savings and Performance Incentive (ESPI) decision[11]. The evaluation will focus on high uncertainty measures or key measure-parameters (e.g., operating hours for LED lamps) and rely on a combination of new data collection, and existing data from relevant 2006-08 and 2010-12 impact evaluations. This study will develop separate reports for the 2013 and 2014 program years.	
Objective: • Estimate ex post net and gross lifecycle savings values for nonresidential downstream deemed measures with high uncertainty as identified in Attachment 3 of the ESPI decision.	
Key Research Questions: • What are ex post net and gross lifecycle savings values for nonresidential downstream deemed measures with high uncertainty as identified in Attachment 3 of the ESPI decision.	
Potential EM&V Methods: Phone surveys to develop NTGRs, onsites and monitoring to estimate key parameters for high uncertainty measures.	

Study Title: 2013-14 Nonresidential Downstream Custom Lighting ESPI Impact Evaluation	**Budget:** $1,215,000 (Note that this budget was reallocated from the IALC Roadmap, as this study is evaluating custom measures).
Expected Completion Date: Q1 2016	**Study Manager:** (ED)
Description: This study will develop ex post savings estimates of net and gross savings values for the nonresidential downstream custom lighting measures to support the Efficiency Savings and Performance Incentive (ESPI) decision[12]. The evaluation will focus all nonresidential downstream custom lighting measures and rely on new monitoring and verification data collection. This study will develop separate reports for the 2013 and 2014 program years.	
Objective: • Estimate ex post net and gross lifecycle savings values for nonresidential downstream custom lighting measures to support the ESPI decision.	
Key Research Questions: • What are ex post net and gross lifecycle savings values for nonresidential downstream custom lighting measures.	
Potential EM&V Methods: Phone surveys to develop NTGRs, onsites and monitoring.	

[11] D.13.09.023, Decision Adopting Efficiency Savings and Performance Incentive Mechanism. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M076/K775/76775903.PDF

[12] D.13.09.023, Decision Adopting Efficiency Savings and Performance Incentive Mechanism. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M076/K775/76775903.PDF

Study Title: 2013-14 Impact Evaluation of Deemed, Direct Installation and Third Party Programs	**Budget:** $500,000
Expected Completion Date: Q2 2017	**Study Manager:** (ED)
Description: This study will develop ex post savings estimates of net and gross savings values for the Deemed, Direct Installation and Third Party programs. The evaluation will focus on high uncertainty measures or key measure-parameters (e.g., operating hours for LED lamps) and rely on a combination of new data collection, and existing data from relevant 2010-12 and 2013-14 impact evaluations. This study will be combined with the 2015 Impact Evaluation of Deemed, Direct Installation and Third Party programs; however, interim results will be developed prior to the completion of this study focused on 2013-14 participation.	
Objective: • Estimate program group-specific gross impact parameters for measures with high uncertainty that are significant contributors to the Deemed, Direct Installation and Third Party programs. • Estimate NTGRs for key grouping of the Deemed, Direct Installation and Third Party programs (such as by program administrator and program type). • To increase the reliability of results, this evaluation will be combined with funding from the 2015 evaluation so the study will span 2013-15 participants.	
Key Research Questions: • What are the ex post gross savings values for Deemed, Direct Installation and Third Party programs • What are the NTGRs for Deemed, Direct Installation and Third Party programs	
Potential EM&V Methods: Phone surveys to develop NTGRs, onsites and monitoring to estimate key parameters for high uncertainty measures.	
Study Title: 2013-14 Process Evaluation of Direct Install Programs	Budget: $300,000
Expected Completion Date: Q2 2016	**Study Manager:** ED
Description: The direct install (DI) programs in California are diverse and touch residential, commercial and public agency customers. This study includes only those DI programs that reach commercial customers primarily those at or under 200kw of demand. SDG&E and SCE provide DI programs through their Core offerings. PG&E has third parties implement DI programs and in some instances, granting DI contractor oversight to certain advanced Local Government Partnerships (LGPs). The full scope of this study is yet to be determined, although the evaluation team expects the objectives and key research questions noted below to guide the study development. The next update to the EM&V Roadmap will update this study. The funds for study will be combined with 2015 funding for a single 2013-2015 DI study.	
Objective: • Assess which IOU program models are successful at offering DI to commercial customers • Determine which commercial DI programs are working effectively within the overall portfolio of commercial programs. • Identify specific characteristics that drive performance, both at present and in the future.	
Key Research Questions: • How do the various approaches to commercial DI program delivery compare?	

Study Title: 2013-14 Impact Evaluation of Deemed, Direct Installation and Third Party Programs	**Budget:** $500,000
• How do the programs interact within the portfolio of California commercial programs? What are areas of synergy or overlap? Are any programs that are duplicative or working at odds with each other? • What characteristics of the DI program may contribute to positive program performance? • Other questions yet to be determined.	
Potential EM&V Methods: Depth interviews of IOU staff and program implementation staff; secondary program material review; other methods TBD.	

Study Title: 2013-2014 3P Program Process Evaluation	**Budget:** $600,000
Expected Completion Date: Q4 2015	**Study Manager:** ED
Description: This study will characterize the unique value that each 3P Commercial resource program brings to the market as compared to what is offered through Core programs. This study will also explore how effectively the 3P Commercial programs are implemented, and how effectively they are being managed by the IOUs. This Study will be conducted under the Commercial Value and Effectiveness Evaluation Work Order.	
Objective: Determine the value and effectiveness of the 3P commercial programs.	
Key Research Questions: 1. What are the characteristics of the 3P Commercial programs and how do they provide value to the C&I market? 2. What need in the marketplace are these programs trying to fill? 3. How much and where do the 3P Commercial programs cross-market Core programs? 4. We include the following two research questions here for completeness and note that they will be addressed as part of their comprehensiveness evaluation effort with the results integrate into this study's report. a. How much channeling actually occurs between the 3P Commercial and Core programs? That is, what customers participate in both 3P Commercial and Core/SW programs and to what degree? b. Does the type of 3P Commercial program make a difference in terms of deeper savings (i.e. are customers installing more or fewer measures based on the implementer or sector? Are the program affecting more end-uses than others?) 5. What are the best methods to deal with program cycles and funding to develop a systematic approach to more flexible contracting? 6. How are the programs managed by the IOUs? 7. What is the nature of the 3P implementer and contractor relationship with the IOUs? 8. Why did PG&E drop some programs? Could this have been prevented? 9. How have the 3P Commercial programs responded to the best practice suggestions from the previous study?	

Study Title: 2013-2014 3P Program Process Evaluation	**Budget:** $600,000
10. How have the programs performed against savings goals (claimed) and the cost per kWh and Therm saved? 11. What is the delivery channel, measure mix and cost effectiveness of each program[13]? 12. What activities do the programs use to move from finding customers to completing energy saving projects? What is the project "close" rate? 13. How do the programs capture savings that would not have happened through the Core Programs or naturally in the market place? (From the perspective of the IOU's, 3P implementers and customers) 14. How do participants experience the program across multiple areas?	
EM&V Methods: IOU Program Staff interviews, 3P Implementation staff interviews; Case studies of 10 3P programs that will include customer surveys; secondary review	

Study Title: 2013-14 Comprehensiveness Analysis Study	**Budget:** $400,000.
Expected Completion Date: Q1 2016	**Study Manager:** (ED)
Description: This study will look across all nonresidential programs in 2010-2014 and provide insight on correlations between program structure and program success as indicated by the depth of retrofit achieved and other effectiveness metrics. Using a combination of program tracking data, CIS data, and phone interviews, the evaluation will provide quantitative and qualitative analysis on patterns of success, reasons why certain programs are most successful, and ways in which success can be extended and replicated. The evaluation will use multiple metrics to define and shed light on depth of retrofit achieved, including: savings beyond lighting measures, savings per incentive dollar spent, proportion of overall consumption saved, proportion of eligible buildings enrolled in a given program, effectiveness at promoting distributed generation and demand response, and program cost effectiveness. Findings will be broken out in multiple ways, including: measure type, program type (DI, 3P, LGP), urban/rural, size, building type, lease/own, and primary language spoken.	
Objective: • Identify meaningful metrics of success that are most relevant to overall nonresidential program and portfolio objectives looking forward • Identify nonresidential programs that are most successful based on multiple metrics of success looked at individually and together • Figure out why certain programs are being most successful • Inform how success can be extended and replicated	
Key Research Questions: • What effects are derived from looking at measure performance against metrics that indicate depth of retrofit?	

[13] There have been concerns that many 3Ps are less cost-effective than core programs because they are direct install programs that incorporate the full measure cost. The only way to make these sorts of efforts cost effective is to install marginal short-payback equipment such as lighting that is just above code and harvest the early replacement credit.

Study Title: 2013-14 Comprehensiveness Analysis Study	**Budget:** $400,000.
• What are the program drivers of high participation rates? Which jurisdictions have the highest participation when controlling for socio-economic and other variables? • Which programs are most successful in bundling deep packages of measures and why? Are they getting results? • How do the various approaches to program delivery, contracting, program design, outreach, measure mix and uptake compare across DI programs, and how do these track with program success in terms of depth of retrofit? • How beneficial is the hybrid practice of measure documentation that is used by 3P programs mixing deemed and custom process evaluation for bundling measures and providing deeper savings per strategic plan goals? • What is the size of the opportunity lost when custom projects ignore simple deemed measures?	
Potential EM&V Methods: Analysis of existing tracking data and program cost information.	

2.2.4. 2015 EM&V Studies

The table below summarizes the 2015 EM&V Studies that have been budgeted. The table provides the study manager, corresponding budget and expected completion date for each study.

Table 21. 2015 Commercial Programs EM&V Studies, Budgets, and Timing

2015 Study Title	Study Manager	Work Order	Budget	Completion Date
Impact				
2015 Nonresidential Downstream Deemed ESPI Impact Evaluation	ED	ED_I_COM_1	$1,090,000*	Q1 2017
2015 Nonresidential Downstream Custom Lighting ESPI Impact Evaluation	ED	ED_I_COM_1	$800,000**	Q1 2017
2015 Impact Evaluation of Deemed, Direct Installation and Third Party Programs	ED	ED_I_COM_1	$300,000	Q2 2017
2015 Experimental Impact Support and Comparative Impact Evaluation of Selected IOU Baseline Pilots	ED	ED_I_COM_5	$310,00***	Q2 2017
Process				
2015 Direct Install Process Evaluation	ED	ED_I_COM_2	$360,000	Q2 2016

* $700,000 of this budget has been reallocated from the Lighting roadmap budget.
** This budget has been reallocated from the IALC roadmap budget.
*** The desired budget for this project is $400,000, which would require an additional $90,000, The source of additional funds has yet to be identified.

2.2.5. 2015 Study Descriptions

Below are descriptions for each of the 2015 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: 2015 Nonresidential Downstream Deemed ESPI Impact Evaluation	**Budget:** $1,090,000 (Note that a $700,000 of this budget was reallocated from the Lighting Roadmap, as this study is evaluating lighting measures).
Expected Completion Date: Q1 2017	**Study Manager:** (ED)
Description: This study will develop ex post savings estimates of net and gross savings values for the nonresidential downstream deemed measures that were identified in the 2015 EPSI uncertain list[14]. The evaluation will focus on high uncertainty measures or key measure-parameters (e.g., operating hours for LED lamps) and rely on a combination of new data collection, and existing data from relevant 2006-08, 2010-12 and 2013-14 impact evaluations.	
Objective: • Estimate ex post net and gross lifecycle savings values for nonresidential downstream deemed measures with high uncertainty as identified in the 2015 EPSI uncertain list.	
Key Research Questions: • What are ex post net and gross lifecycle savings values for nonresidential downstream deemed measures with high uncertainty as identified in the 2015 EPSI uncertain list.	
Potential EM&V Methods: Phone surveys to develop NTGRs, onsites and monitoring to estimate key parameters for high uncertainty measures.	

Study Title: 2015 Nonresidential Downstream Custom Lighting ESPI Impact Evaluation	**Budget:** $800,000 (Note that this budget was reallocated from the IALC Roadmap, as this study is evaluating custom measures).
Expected Completion Date: Q1 2017	**Study Manager:** (ED)
Description: This study will develop ex post savings estimates of net and gross savings values for the nonresidential downstream custom lighting measures to support the Efficiency Savings and Performance Incentive (ESPI) decision[15]. The evaluation will focus all nonresidential downstream custom lighting measures and rely on new monitoring and verification data collection.	
Objective: • Estimate ex post net and gross lifecycle savings values for nonresidential downstream custom lighting measures to support the ESPI decision.	
Key Research Questions: • What are ex post net and gross lifecycle savings values for nonresidential downstream custom lighting measures.	
Potential EM&V Methods: Phone surveys to develop NTGRs, onsites and monitoring.	

Study Title: 2015 Impact Evaluation of Deemed, Direct Installation and Third Party Programs	**Budget:** $300,000
Expected Completion Date: Q2 2017	**Study Manager:** (ED)

[14] http://www.cpuc.ca.gov/NR/rdonlyres/9F79154A-065B-4E80-B1AC-58A6E7223F91/0/Final_2015_ESPI_Uncertain_List.pdf

[15] D.13.09.023, Decision Adopting Efficiency Savings and Performance Incentive Mechanism. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M076/K775/76775903.PDF

Study Title: 2015 Impact Evaluation of Deemed, Direct Installation and Third Party Programs	**Budget:** $300,000
Description: This study will develop ex post savings estimates of net and gross savings values for the Deemed, Direct Installation and Third Party programs. The evaluation will focus on high uncertainty measures or key measure-parameters (e.g., operating hours for LED lamps) and rely on a combination of new data collection, and existing data from relevant 2010-12 and 2013-14 impact evaluations. This study will be combined with the 2013-14 Impact Evaluation of Deemed, Direct Installation and Third Party programs.	
Objective: • Estimate program group-specific gross impact parameters for measures with high uncertainty that are significant contributors to the Deemed, Direct Installation and Third Party programs. • Estimate NTGRs for key grouping of the Deemed, Direct Installation and Third Party programs (such as by program administrator and program type). • To increase the reliability of results, this evaluation will be combined with funding from the 2013-14 evaluation so the study will span 2013-15 participants.	
Key Research Questions: • What are the ex post gross savings values for Deemed, Direct Installation and Third Party programs • What are the NTGRs for Deemed, Direct Installation and Third Party programs	
Potential EM&V Methods: Phone surveys to develop NTGRs, onsites and monitoring to estimate key parameters for high uncertainty measures.	

Study Title: 2015 Experimental Impact Support and Comparative Impact Evaluation of Selected IOU Baseline Pilots	**Budget:** $310,000 (Desired funding is $400,000. The additional $90,000 has yet to be identified).
Expected Completion Date: Q2 2017	**Study Manager:** (ED)
Description: This study will support and develop ex post savings estimates of net and gross savings for the 'to-code' or baseline pilots ordered in D.14-10-046. The evaluation will focus on (a) field verification and other data collection needed to support the experimental evaluation and (b) production of net and gross savings values for selected pilots using non-experimental methods. This study will be closely coordinated with the field experiments evaluation in the policy support roadmap. (Please note that the desired funding for this study would require either decreased scope to other studies in this road map or $90k of funding from another source.)	
Objective: • Support the experimental design evaluation of baseline pilots through the collection of necessary field data. • Estimate gross and net savings for measures installed through the baseline pilots for treatment and control groups for selected pilots.	
Key Research Questions: • What are the ex post gross and net savings values for measures included in the baseline pilots? • How reliable and accurate are the savings estimates arrived at using non-experimental and experimental methods?	
Potential EM&V Methods: Onsite verification and monitoring to estimate key parameters, phone surveys to estimate NTG ratios if necessary.	

Study Title: 2015 Process Evaluation of Direct Install Programs	**Budget:** $360,000
Expected Completion Date: Q2 2016	**Study Manager:** ED
Description: This is the same study as described in the 2013-2014 study. Funds for both 2013-2014 and 2015 will be combined for a single 2013-2015 DI process evaluation with a total budget of $660,000.	
Objective: See the objectives under the 2013-2014 study.	
Key Research Questions: See the research questions under the 2013-2014 study.	
Potential EM&V Methods: See the methods in the 2013-2014 study.	

2.2.6. 2016 Study Descriptions

Program Administrator Studies

Proposed 2016 Program Administrator Budget: $ 50,000

Studies led by the program administrators will use remaining 2015 funds . Additional budget of $50,000 will be used to complete the Business Energy Reports Evaluation. The 2016 Institutional Partnership studies which were described in the draft of this plan have since been withdrawn..

Energy Division Key Research Questions for 2016 and beyond

Proposed 2016 Energy Division Budget: $ 1,676,664

The Small and Medium Commercial evaluation area has been one of the primary sectors in which direct install and other program approaches using deemed savings estimates predominate. In upcoming years the small and medium commercial research area will continue to integrate with the deemed savings estimation and work paper development. The completion of current studies may reveal some new areas of interest. Evaluation adaptations emerging from the implementation of AB802 related to baseline changes and meter-based program designs may also need to be addressed in this evaluation plan for the future. Regardless, the impact and uncertain parameter updates are required.

The following are 5 continuing studies and new studies that may try to address any gaps in COM (small and medium) research for the 2016 and beyond period. The studies are in no particular order but are grouped into (a) continuing and (b) new studies. We will start with the in-progress impact and process studies with the final decision for follow up studies driven by where the final results lead us:

Continuing Studies-

1. **Update Third Party process** : Significant potential for follow up after a review of current study results. This study looks at the unique value of third party programs offered through Core programs. In addition, how are these programs implemented and managed by the IOUs.
2. **Direct Install process**: Significant potential for follow up after current study a review of current study results. These programs are very diverse but this study is only for commercial customers under 200kw of demand.

3. **Comprehensive process**: We might want to do this study on an annual basis, and the current study is also framed as leading into follow-up process evaluation work to figure out why certain program are positive or negative outlier. The study looks across all nonresidential programs in 2010-2014. Study findings will be include multiple metrics and review different measure type, program type, urban/rural, and building type.

4. **Non-residential Downstream Deemed ESPI Impact** Significant potential for follow up after a review of current study results. This study will develop ex post savings estimates of net and gross savings values for nonresidential downstream deemed measures identified in the Efficiency and Savings and Performance Incentive (ESPI) decision (D.13.09.023)

5. **Nonresidential Downstream Custom Lighting ESPI Impact** Significant potential for follow up after current study a review of current study results. This study will develop ex post savings estimates of net and gross savings values for nonresidential downstream deemed measures identified in the Efficiency and Savings and Performance Incentive (ESPI) decision (D.13.09.023)

New Studies

We are currently looking at how to build additional studies around new developments based on the 2015 final tracking data which has measures that are not on the uncertain list but significant contributors or with potential to become significant contributors in the future.

Proposed 2016 Studies

- Deemed Food Service (process)
- Deemed Ag Irrigation
- Deemed Water Heating Tankless Water heater/ Deemed Water Heating Faucet Aerator (billing analyses)

2.3. Industrial /Agriculture/Large Commercial, Non-residential New Construction

2.3.1. Background

Industrial, Agriculture, and Large Commercial Programs

Because the industrial, agriculture and large commercial (IALC) programs deliver the majority of portfolio therm savings and a large percentage of electric savings, we are dedicating significant effort to impact, process, and market characterization work in these segments. The results from the impact studies are of primary importance in supporting savings potential and goals estimates, calculating greenhouse gas reductions, and for procurement purposes. The IOUs, third party implementers and stakeholders are also interested in the answers from impact, process and market studies as these will enable us to achieve all possible cost-effective savings, fully engage the relevant markets, ensure that ratepayer funds are spent wisely and achieve greenhouse gas emissions reduction goals.

The industrial, agriculture and large commercial (IALC) sectors are diverse in terms of customer type and savings opportunities. Energy efficiency in these sectors is largely served by statewide IOU programs as well as third-party programs targeted to specific markets or measures. The primary focus of the industrial and agricultural programs has historically been the realization of direct energy savings through projects that offer incentives based on calculated savings. Accordingly, the primary evaluation focus has been on ex post measurement and verification of program and measure impacts to produce estimates of both gross and net savings (kWh, kW and therms) as well as a better understanding of the market conditions faced by customers.

Programs Included in Research Scope

The utilities individually field statewide industrial, agricultural and large commercial calculated incentive programs. In addition, there are certain statewide non-resource programs common among the IOUs, as well as numerous third party programs that serve specified markets or technology users. Calculated incentive projects that fall within the scope of this research may also be implemented by local government partnerships, institutional partnerships, and Regional Energy Networks (RENs). Rather than list each program individually, the table below shows budgets and estimated savings for the statewide programs, and rolled up estimates for the IOUs' third party programs. Any calculated incentive projects that may be implemented by the RENs fall under other types of programs, and therefore budget and savings are not included below.

The programs offered in 2015 are generally a carryover from the 2013-2014 portfolio period, which were generally similar to those offered in prior cycles. As in the 2013-2014 portfolios, in addition to energy savings the 2015 statewide programs are also directed toward meeting the energy management goals of the Strategic Plan through focused demand side management offerings and laying the groundwork for adoption of continuous energy improvement (CEI) by large, medium and small customers.

Since these sectors include customers that use large amounts of water in their activities, they provide program opportunities for combined water conservation and energy savings projects as well as opportunities for meeting the needs of agencies seeking greenhouse gas reduction through water conservation efforts. For these reasons, the IOUs were directed to include expanded efforts to address

the water/energy nexus in their agricultural and industrial programs beginning in 2013. I n 2014, a separate proceeding was initiated to address water-energy nexus issues.[16] A decision issued in 2015 adopted an avoided embedded energy water-energy cost effectiveness calculator that can be used in developing programs that benefit both utility ratepayers and water customers.[17]

Table 22. 2015 IALC Programs Savings and Budget Summary

IOU	Program Name	Estimated KWh	Estimated KW	Estimated Therms	Budget
SCE	Industrial Energy Advisor	120,509,751	0	0	$1,794,545
SCE	Industrial Calculated Incentives	68,568,511	1,495	0	$4,212,157
SCE	Industrial Deemed Incentives	0	792	0	$1,555,273
SCE	Industrial Continuous Energy Improvement	192,948,162	0	0	$887,112
SCE	Industrial Third Party	18,000,000	21,135	0	$42,823,805
SCE	Agriculture Energy Advisor	12,421,810	2,076	0	$3,172,896
SCE	Agriculture Calculated	4,535,772	361	0	$1,136,820
SCE	Agriculture Deemed	31,016,699	419	0	$836,138
SCE	Commercial Calculated	0	4,545	0	$6,297,012
SCE	Commercial CEI	38,669,945	0	0	$1,269,525
SCE	Commercial SBD	120,509,751	6,905	0	$8,739,228
PG&E	Industrial Energy Advisor	358,002	213	49,167	$3,132,289
PG&E	Industrial Calculated Incentives	27,978,459	3,734	3,337,558	$13,763,312
PG&E	Industrial Deemed Incentives	3,153,346	691	174,086	$1,204,021
PG&E	Industrial Continuous Energy Improvement	0	0	0	$589,159
PG&E	Third Party Industrial	56,200,225	6,535	2,050,215	$20,899,617
PG&E	Agricultural Calculated Incentives	24,661,234	5,242	1,501,966	$10,240,375
PG&E	AG Deemed Incentives	12,281,345	5,762	155,874	$3,815,997

[16] R. 13-12-011; link available at http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Current+Proceeding+Activity.htm.

[17] See http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Current+Proceeding+Activity.htm, Rulemaking R. 13-12-011.

IOU	Program Name	Estimated KWh	Estimated KW	Estimated Therms	Budget
PG&E	AG Third parties	14,902,779	2,123	227,964	$8,227,091
PG&E	AG Energy Advisor	23,899,261	3,369	35,604	$4,259,648
PG&E	AG CEI	0	0	0	$506,988
PG&E	SW Commercial Calculated Incentives	68,844,271	7,084	2,395,580	$25,132,514
PG&E	Commercial SBD	24,025,984	6,742	116,869	$10,237,119
PG&E	Commercial Deemed	54,697,637	9,466	909,969	$18,922,890
PG&E	Commercial Energy Advisor	7,960,408	3,104	1,217,783	$5,979,427
PG&E	Commercial HVAC	6,805,062	2,122	209,214	$18,277,223
PG&E	Commercial 3P	67,325,613	9,133	1,197,117	$51,591,182
PG&E	SW COM CEI	0	0	0	$491,754
SDG&E	SW-IND- Benchmarking	0	0	0	$14,754
SDG&E	SW IND – Audits NonRes	0	0	0	$240,589
SDG&E	SW IND – Audits CIEEP	0	0	0	$440,859
SDG&E	SW IND – CEI	0	0	0	$254,062
SDG&E	SW IND -- Pump Test Services	0	0	74,882	$160,473
SDG&E	SW IND -- Calculated Incentives	3,802,070	222	14,686	$1,444,593
SDG&E	SW-IND-Deemed Incentives	1,379,032	225	0	$564,594
SDG&E	SW-AG- Benchmarking	0	0	0	$6,533
SDG&E	SW-AG Pump Test	0	0	0	$138,307
SDG&E	SW AG – Audits	0	0	0	$106,599
SDG&E	SW-AG Calculated	1,901,035	111	37,441	$623,270
SDG&E	SW-AG Deemed	689,416	112	7,960	$257,877
SDG&E	SW COM – CEI	0	0	0	$382,462
SDG&E	SW—COM Pump Test Services	0	0	0	$159,392
SDG&E	SW COM Calculated Incentives	42,488,109	1,778	880,197	$11,082,732
SDG&E	SW-COM-Calculated Incentives-RCx	5,853,670	160	820,940	$3,231,960
SDG&E	SW-COM-Calculated Incentives-Savings by Design	12,139,049	3,405	38,898	$5,240,036
SCG	SW-IND-Energy Advisor	0	0	0	$615,730
SCG	SW-IND CE 109,061 I	0	0	0	$324,017
SCG	SW-IND-Calculated Incentives	0	0	9,900,000	$9,184,880
SCG	SW-IND-Deemed Incentives	0	0	646,582	$1,048,590

IOU	Program Name	Estimated KWh	Estimated KW	Estimated Therms	Budget
SCG	SW-AG-Energy Advisor	0	0	0	$39,703
SCG	SW-AG-CEI	0	0	0	$32,200
SCG	SW-AG-Calculated Incentives	0	0	3,327,300	$3,663,775
SCG	SW-AG-Deemed Incentives	0	0	214,744	$502,829
SCG	SW-COM CEI	0	0	0	$200,329
SCG	SW-COM-Calculated Incentives	0	0	3,836,700	$5,195,394
	Total Statewide IALC	**1,068,526,408**	**109,061**	**33,379,296**	**$315,151,656**

Table 23. 2013-2014 IALC Programs Savings and Budget Summary

IOU	Program Name	Estimated KWh	Estimated KW	Estimated Therms	Budget
SCE	Industrial Energy Advisor	0	0	0	$3,671,003
SCE	Industrial Calculated Incentives	120,509,751	14,798	0	$18,173,825
SCE	Industrial Deemed Incentives	68,568,511	19,873	0	$9,416,633
SCE	Industrial Continuous Energy Improvement	0	0	0	$1,538,537
SCE	Industrial Third Party	192,948,162	27788		$43,509,480
SCE	Agriculture Energy Advisor	18,000,000	0	0	$5,921,087
SCE	Agriculture Calculated	12,421,810	3,174	0	$3,231,235
SCE	Agriculture Deemed	4,535,772	1,437		$936,322
SCE	Commercial Calculated	150,257,234	25,441	0	$16,087,060
SCE	Commercial CEI	0	0	0	$2,609,300
SCE	Commercial SBD	85,050,000	15,120	0	$17,823,294
PG&E	Industrial Energy Advisor	1,004,736	608.00	235,036.00	$6,063,079
PG&E	Industrial Calculated Incentives	71,279,214	9,600.18	12,733,111.11	$25,398,702
PG&E	Industrial Deemed Incentives	6,344,844	1,341.66	413,704.81	$2,019,954
PG&E	Industrial Continuous Energy Improvement	0	0	0	$1,022,797
PG&E	Third Party Industrial	78,628,794	11,549.84	13,381,851.92	$50,690,708
PG&E	Agricultural Calculated Incentives	59,437,524	9,610.63	3,709,826.52	$16,463,577
PG&E	AG Deemed Incentives	61,560,923	40,567.60	1,696,087.42	$7,245,687
PG&E	AG Third parties	159,586,467	55,264.65	5,633,060.93	$20,333,052

IOU	Program Name	Estimated KWh	Estimated KW	Estimated Therms	Budget
PG&E	SW Commercial Calculated Incentives	117,724,326	15,148.76	2,309,106.96	$36,364,706
PG&E	Commercial SBD				$19,473,462
PG&E	SW COM CEI	0	0	0	$840,083
SDG&E	SW-IND- Benchmarking	0	0	0	$81,895
SDG&E	SW IND – Audits NonRes	0	0	0	$200,079
SDG&E	SW IND – Audits CIEEP	0	0	0	$795,346
SDG&E	SW IND – Audits (TA)	0	0	0	$823,388
SDG&E	SW IND – CEI	0	0	0	$900,998
SDG&E	SW IND -- Pump Test Services	0	0	0	$30,463
SDG&E	SW IND – Calculated Incentives	11,039,522	1,318	312,192	$3,338,913
SDG&E	SW-IND-Deemed Incentives	6,834,105	1027	36,428	$1,420,649
SDG&E	SW-AG- Benchmarking	0	0	0	$35,134
SDG&E	SW-AG Pump Test Services	0	0	0	$362,856
SDG&E	SW AG – Audits	0	0	0	$74,174
SDG&E	SW-Ag Audits (TA)	0	0	0	$589,343
SDG&E	SW-AG Calculated Incentives	5,519,760	659	156,096	$1,685,189
SDG&E	SW-AG Deemed Incentives	3,424,140	515	16,599	$719,800
SDG&E	SW COM – CEI	0	0	0	$1,270,010
SDG&E	SW—COM Pump Test Services	0	0	0	$70,664
SDG&E	SW COM Calculated Incentives	93,835,934	11,202	3,109,836	$26,009,238
SDG&E	SW-COM-Calculated Incentives-RCx	9,754,445	276	106,254	$2,359,543
SDG&E	SW-COM-Calculated Incentives-Savings by Design	20,851,070	8442	751,496	$10,732,410
SCG	SW-IND-Energy Advisor	0	0	0	$1,216,007
SCG	SW-IND CEI	0	0	0	$645,999
SCG	SW-IND-Calculated Incentives	0	0	21,902,488	$25,258,193
SCG	SW-IND-Deemed Incentives	0	0	2,947,836	$2,083,532

IOU	Program Name	Estimated KWh	Estimated KW	Estimated Therms	Budget
SCG	SW-AG-Energy Advisor	0	0	0	$78,013
SCG	SW-AG-CEI	0	0	0	$64,221
SCG	SW-AG-Calculated Incentives	0	0	1,496,799	$3,545,233
SCG	SW-AG-Deemed Incentives	0	0	924,465	$1,067,167
SCG	SW-COM CEI	0	0	0	$399,999
SCG	SW-COM-Calculated Incentives	0	0	5,844,240	$9,239,849
	Total Statewide IALC	1,359,117,044	274,761.32	77,716,514.67	$403,931,888

Evaluation Role in Addressing Program Challenges and Uncertainty

Custom impact evaluations continue to find that the largest uncertainties in ex ante gross impact estimation are establishing baselines, screening for measure eligibility and accurately representing true operating conditions for individual projects. Related to the baseline issue is the tendency to mischaracterize the type of projects – for example, treating projects as early retirement opportunities or add-on projects, even when preponderance of evidence might suggest natural replacement of customer systems.

Other areas for focused ex ante gross impact improvement include key metrics and factors such as a current and comprehensive assessment of the following: market characterization, measure saturation, industry standard practice, effective useful measure life, and savings persistence. The evaluation also reviews whether programs are following best practices in modeling. The ex post evaluations and companion ex ante review activities focus on improvement in these areas for calculated (i.e., non-deemed or custom) offerings.

In addition, understanding the complexities of program influence on the customer decision-making process (net to gross), remains a very salient and crucial research challenge. To address this, field research is needed to arrive at ex post savings estimates that reliably account for and attribute all program influence, yielding net impact results that clearly inform program design, goals and supply forecasting, among other areas.

Beginning in the 2010-2012 portfolio period, CPUC staff implemented an ex ante parallel review process for calculated incentive projects. The intent of this process is to conduct collaborative review with the IOUs of savings calculations and program influence before an application is approved. This is intended to improve program effectiveness through changes in implementation processes and procedures. The ultimate goal, through these activities, is to bring the program realization rate as close to 1.0 as possible, thereby reducing uncertainty with respect to realized savings.

As in prior evaluations, the 2015 ex post evaluation of savings impacts will be coordinated with the custom project ex ante review activity to optimize evaluation efforts. The impact review and results will provide useful and timely project review and program design and implementation feedback to the utilities and third party program implementers.

With respect to program implementation in these sectors, major challenges revolve around the requirements of program control, design and evaluation, given the constraints of business operations in the rapidly evolving economic and regulatory frameworks that characterize California's contemporary business climate. Overlaid on this foundational challenge are other constraints including the complexity, cost and time requirements of nonresidential calculated projects, as well as the customers' frequent requirement for relatively short payback periods. Targeted market evaluations will seek to address these challenges and conditions.

Installation of energy efficiency measures must also coincide with a window of opportunity on the customer side and be in sync with the portfolio period and associated program control and design features of the portfolio. Some of these challenges may be addressed going forward with the proposed rolling portfolio approach, [18] and through opportunities identified via process evaluations/results or other means.

Recent Evaluation Activities

Key Research Topics Addressed in 2013-2014 EM&V

Table 24. 2013-2014 IALC Programs EM&V Research Questions Summary

	Related Research Topics
Impact Studies -- CPUC	
CPUC-led Industrial/ Agricultural/ Large Commercial Impact Evaluations: Custom measures Nonresidential new construction whole building impact (Separate study 2013 program year)	• What are the energy savings? • What are the load impacts? • What percentage of the savings occurred as a result of program intervention? • Assess quality and appropriateness of IOU savings estimation procedures and methods? • Provide early and ongoing feedback to inform program improvements?
~~Nonresidential New Construction Whole Building -- Evaluation Guideline Review (study cancelled)~~	~~• Study nonresidential new construction whole building modeling in-depth~~ ~~• Provide recommendations to the IOUs and CPUC surrounding the use of occupancy and other schedules, software modeling requirements, the use of forecasting, the use of project-level M&V, and the use of code- and market-based baselines~~
Process Evaluation -- PAs	

[18] Adoption of a rolling portfolio process in 2015 and beyond is being addressed in R. 13-11-005. A link to the proceeding is available at http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Current+Proceeding+Activity.htm.

	Related Research Topics
Energy Management and Information Systems (EMIS) / Whole Building Demonstration Process	• Process evaluation to determine effective delivery of these two new offerings that rely on whole building data
Non Residential Audits Process Evaluation - Large Integrated Audit Component and Energy Advisor Component (Small Medium Business/Mid-Market, Energy Advisor) (on hold)	• Confirm and refine program theory and determine the effectiveness of program implementation for this new audit approach across both the small and large CIA market
Market Studies – PAs	
Market Characterization Study- New Market Opportunities – (Data Centers, Industrial Refrigeration, Compressed Air, Government Industrial Facilities, CHP, Water/Energy, Pumping/Others)	• Obtain market data that describes both new opportunities as well as identifies constraints and frames existing effort
Data Center Market Characterization	• Estimate the savings potential of the embedded data center space by examining end-user needs and energy savings potential of various measures
Industry Standard Practice Studies	• Review and understand what is Industry Standard Practice (ISP) in specific situations to provide guidance to EE program implementers.
Savings by Design Healthcare Baseline Study	• Complete the Title 24 updates to the Savings by Design Healthcare Baseline based on CPUC consultant recommendations.
Data Center Baseline Study	• Update the Data Center Baseline specifications to adhere to Title 24 changes

Evaluation plans providing additional specificity of the CPUC staff-led impact evaluations are available on the CPUC's Energy Efficiency Public Documents website.[19]

[19] http://www.energydataweb.com/cpuc/.

2.3.2. 2013-2014 EM&V Studies, Budgets, and Timing

Table 25. 2013-2014 IALC EM&V Studies, Budgets, and Timing

IALC Impact Studies	Study Manager	Budget	Completion Date
Nonresidential New Construction Whole Building Impact Evaluation (2013 projects)	CPUC Staff	$660,000	Q3 2015
Nonresidential New Construction Whole Building – Evaluation Guideline Review	CPUC Staff	Project Cancelled	2016
Custom Measures	CPUC Staff	$4,655,000	Q1 2016
~~Commercial and Industrial Maintenance Practices, Patterns and Persistence~~	~~CPUC Staff~~	Cancelled	
IALC Process Studies			
Non Residential Audits Process Evaluation - Large Integrated Audit Component and Energy Advisor Component (Small Medium Business/Mid-Market, Energy Advisor)	IOU	(Reallocated to other studies) ~~$120,000~~	On hold pending new audit intervention
Energy Management and Information Systems (EMIS) / Whole Building Process	~~IOU~~	$100,000	In scoping process
IALC Market Studies			
Markets, Applications, Systems, Industries (MASI) – (Integrated Design for New Construction (ZNE), Motors: Baseline Motors, Ind/Food/Ag, and Refineries, Wastewater Treatment, Chain Operations, Food Processing Opportunities, Oil & Gas:	IOU	$750,000	Completed March 2015
Savings by Design Hospital Baseline Study	PG&E	$17,000	Q4 2015
Data Center Baseline Study	PG&E	$30,000	Q4 2015
Industry Standard Practice Studies	PG&E	$89,000	As needed
Data Center Market Characterization Study: Phase 2	PG&E	$131,000	Completed Q3 2015
Total:		**$6,582,000**	

2.3.3. 2013-2014 Study Descriptions

Study Title: Impact Study – Non-Residential New Construction (2013 program year)	**Budget:** $660,000

Study Title: Impact Study – Non-Residential New Construction (2013 program year)	**Budget:** $660,000
Completion Date: Q3 2015	**Study Manager:** CPUC staff
Description: Evaluation activities for estimating the gross and net energy impacts from Whole Building projects carried out under the statewide Savings by Design program in 2013. (For 2014, these projects are rolled into the Custom Measures Impact sample population).	
Objective: Examine program performance and opportunities for improvement, and provide recommendations accordingly; review current evaluation guidelines.	
Key Research Questions: What are the realized energy savings, load reductions and factors in driving the decision to install energy efficient equipment	
Potential EM&V Methods: site visits, metering, building energy simulation models, and decision maker and design-team surveys.	

~~**Study Title:** Non-Residential New Construction – Evaluation Guidelines Review~~	~~**Budget:**~~
~~**Expected Completion Date:** cancelled~~	~~**Study Manager:** CPUC~~
Description: Assessment of Nonresidential New Construction Guidelines	
Objective: • Assess quality and appropriateness of IOU savings estimation procedures and methods.	
Key Research Questions: • Review use of occupancy and other schedules, software modeling requirements, the use of forecasting, the use of project-level M&V, and the use of code- and market-based baselines	
Potential EMV Methods: Review program manuals and rules, compare building energy simulation models, and conduct IOU, decision maker and design-team surveys.	

Study Title: Impact Study -- Custom Measures – 2013-2014	**Budget:** $4,655,000
Expected Completion Date: 2016	**Study Manager:** CPUC
Description: Ex post measurement and verification of program and measure impacts	
Objective: • To produce ex post gross and net savings estimates (kWh, kW and therms) for custom measure Claims	
Key Research Questions: • What are the realized energy savings, load reductions and factors in driving the decision to install energy efficient equipment	
Potential EM&V Methods: Field measurement, desk review, modeling, decision maker surveys	

Study Title: Non Residential Audits Process Evaluation – Large Integrated Audit Component and Energy Advisor Component	**Budget:** ~~$120,000~~ (reallocated to other studies)
Expected Completion Date: On Hold	**Study Manager:** PG&E
Description: Build on 2006-2008 nonresidential audit evaluations and add components addressing Integrated Audits and the new Statewide Energy Advisor Program that feature audit offerings.	
Objective: • Conduct process evaluation of new programs and examine the audit process as a delivery vehicle into incentive programs.	
Key Research Questions: • Confirm and refine program theory and determine the effectiveness of program implementation for this new audit approach across both the small and large CIA market.	
Potential EM&V Methods: A mixture of qualitative and quantitative methods usually associated with process evaluations.	

Study Title: Energy Management and Information Systems (EMIS) and Whole Building Process Evaluation	**Budget:** $250,000
Expected Completion Date: Cancelled	**Study Manager:** PG&E
Description: Process evaluation of these two new offerings that rely on whole building data.	
Objective: • Conduct a process evaluation of these two new program offerings in order to provide feedback to implementation efforts as well as to enhance future deployment.	
Key Research Questions: • Do customers value these offerings? • Are there any issues with implementation? • Are there significant program gaps?	
Potential EM&V Methods: A mixture of qualitative and quantitative methods usually associated with process evaluations.	

Study Title: Market Characterization and Assessment – (Integrated Design for New Construction (ZNE), Motors: Baseline Motors, Ind/Food/Ag, and Refineries, Wastewater Treatment, Chain Operations, Food Processing Opportunities, Oil & Gas: New Opportunities and Produced Water, Agriculture: Greenhouse and Irrigated Agriculture)	**Budget:** $750,000
Expected Completion Date: Q3 2014 (Completed)	**Study Manager:** SCE

Study Title: Market Characterization and Assessment – (Integrated Design for New Construction (ZNE), Motors: Baseline Motors, Ind/Food/Ag, and Refineries, Wastewater Treatment, Chain Operations, Food Processing Opportunities, Oil & Gas: New Opportunities and Produced Water, Agriculture: Greenhouse and Irrigated Agriculture)	**Budget:** $750,000
Description: Combine market characterization and wants and needs research to further define the C/I/A efficiency environment.	
Objective: Results will inform future portfolio efforts in the CIA segment via understanding opportunity, barriers, wants and needs.	
Key Research Questions: Identify growth areas and market sizing by NAICs or other criteria in combination with wants and needs research in order to enhance program delivery and measure penetration. Gather information to enhance the success of programs addressing these and related markets. Provide market data that describes new opportunities as well as constraints, and frames existing efforts within identified segments.	
Potential EM&V Methods: Interviews, surveys, secondary research	

Study Title: Savings by Design Healthcare Study	**Budget:** $17,000
Expected Completion Date: Q4 2015	**Study Manager:** PG&E
Description: This is part of a regular update of the Savings by Design Healthcare Baseline Study which provides specifications on healthcare facilities and medical office buildings design.	
Objective: The Savings by Design Healthcare Baseline Study provides specifications of how healthcare facilities are currently being built in the state of California as it pertains to the envelope, lighting, mechanical equipment, domestic or service hot water systems as well as process loads and occupancy assumptions.	
Key Research Questions: • What are the typical occupancy designations? • What are the minimum fenestration requirements? • Are there any issues with implementation? • How has Title 24 changed the requirements?	
Potential EM&V Methods: A mixture of qualitative and quantitative methods usually associated with process evaluations.	

Study Title: Data Center Market Characterization Study: Phase 2	**Budget:** $131,000
Expected Completion Date: Q4 2015 (Completed)	**Study Manager:** PG&E

Study Title: Data Center Market Characterization Study: Phase 2	**Budget:** $131,000
Description: The Data Center Market Characterization Study is designed to understand the hard-to-reach market of embedded data center that are 5,000 sq-ft or less and located in office and industrial complexes. The research is built on a collaborative of Silicon Valley Power, Northwest Energy Efficiency Alliance, City of Palo Alto, Lawrence Berkeley National Laboratory and PG&E. The study will compile data on potential EE measures, savings estimates and information on the interaction between building owners, tenants and facility managers.	
Objective: Develop an enhanced understanding of the small-to-medium data center market, including current practices, barriers to energy efficiency adoption and best practices as obtained through focus groups with data center owners and managers, equipment manufacturers and vendors.	
Key Research Questions: • What are the most likely adoptable EE measures for embedded data centers? • What is the set of field protocols for measuring their EE savings potential? • How can we test these protocols in the field?	
Potential EM&V Methods: A mixture of qualitative and quantitative methods usually associated with market characterizations.	

Study Title: Data Center Baseline Study	**Budget:** $37,000
Expected Completion Date: Q4 2015	**Study Manager:** PG&E
Description: This is part of a regular update of the Data Center Baseline Study. This document assists architects and engineers utilizing the New Construction and Retrofit Incentive Program with guidance on specifications that are consistent with Title 24-2013 and industry practice for data center construction.	
Objective: • Ensure consistency in the documentation of building new construction and performing retrofits for Data Centers under the revised Title 24 rules.	
Key Research Questions: • Are there any issues with implementation? • How has Title 24 changed the requirements for new construction and retrofits?	
Potential EM&V Methods: Primary research with customers and industry experts as well as supplemental secondary research.	

Study Title: Industry Standard Practice Studies	**Budget:** $89,000
Expected Completion Date: Ongoing	**Study Manager:** IOUs

Study Title: Industry Standard Practice Studies	**Budget:** $89,000
Description: Continuation of ongoing measure eligibility studies. The studies to date that are suggested include: (To be determined); These will include high impact measures from IALC programs. The Industry Standard Practice research completed as of November 2015 include: • Pump Off Controller/Upstream: Oil Field Artificial Lift System/Rod Beam Pump • Variable Frequency Drive/Upstream: Oil Field Artificial Lift System/Electric Submersible Pump • Variable Frequency Drive/Upstream: Oil Field Artificial Lift System/Progressive Cavity Pump • Variable Frequency Drive/Upstream: Oil Field Steam Generator/Feedwater Pump • Variable Frequency Drive/Upstream: Oil Field Steam Generator/Air Blower • Split Pass/Upstream: Oil Field Steam Generator/Split Pass • Variable Frequency Drive/Upstream: Oil Field Steam Generator/Waste Water Injection Pumps • Variable Frequency Drive/Midstream Oil: Motor 1,000-3,000/HP Oil Pipeline Pump • Wine Tank Insulation • Juice Tank Insulation	
Objective: Identify measures that have become industry standard practice.	
Key Research Questions: To help in the determination of appropriate baselines with market data primarily by determining if the measures/projects have become standard practice.	
Potential EM&V Methods: Primary research with customers and industry experts as well as supplemental secondary research.	

2015 Evaluation and Information Needs

2015 EM&V Research Studies

Table 26. 2015 IALC EM&V Research Questions Summary

	Related Research Topics
Impact Studies	
CANCELLED ~~CPUC-led Industrial/ Agricultural Process and Impact Evaluations for Industrial and Agriculture Energy Advisor Components~~ ~~• Pump tests~~ ~~• Audits~~ ~~• RCx studies~~ ~~• CEI intervention~~	~~• Role of these offerings in leading to measure installations in the absence of incentives~~ ~~• What are the energy savings~~ ~~• What are the load impacts~~ ~~• What percentage of the savings occurred as a result of program intervention~~ ~~• Role of these offerings in leading to measure installations that include incentives~~ ~~• Assess quality and appropriateness of IOU savings estimation procedures and methods~~ ~~• Provide early and ongoing feedback to inform program improvements~~

	Related Research Topics
CPUC-led Industrial/ Agricultural/ Large Commercial NRNC Energy Use Profile Evaluation: Nonresidential new construction whole building participants and nonparticipants	• What is the typical profile following construction • How does this vary by segment • How long does it take for energy use to stabilize following ramp-up in energy use associated with normal occupancy levels and other factors • Assess implications for ex ante and ex post modeling assumptions and methods • Coordinate with ex ante review team to ensure consistency of methodologies and to provide early and ongoing feedback with respect to study findings
CPUC-led Industrial/ Agricultural/ Large Commercial Customer Incentive Evaluation: Custom measures including nonresidential new construction whole building	• What are the factors that lead to incentive over- or under-payment • What are the relative effects of each factor • What steps should be taken to correct incentive over- or under-payment • Assess quality and appropriateness of IOU savings and cost reporting and relationship with incentive over- or under-payment • Provide early and ongoing feedback to inform program improvements • Coordinate with ex ante review team to ensure consistency of methodologies and to provide early and ongoing feedback with respect to study findings
CPUC-led Industrial/ Agricultural/ Large Commercial Impact Evaluations: Custom measures including nonresidential new construction whole building impact	• What are the energy savings • What are the load impacts • What percentage of the savings occurred as a result of program intervention • Assess quality and appropriateness of IOU savings estimation procedures and methods • Provide early and ongoing feedback to inform program improvements • Coordinate with ex ante review team to ensure consistency of methodologies and to provide early and ongoing feedback with respect to program performance
Process Evaluations -- PAs	
Energy Management and Information Systems (EMIS)/Whole Building Process Evaluation	• Are the current whole building demonstration efforts successful?

	Related Research Topics
• **Market Studies – PAs**	
Continuous Energy Improvement (CEI) Process Evaluation (On hold)	• What motivates companies to engage in CEI? • How do companies engage in CEI? • Are companies' goals achieved?
Embedded Data Center Market Characterization: Phase 2	• How many embedded data centers exist in PG&E territory? • What data are necessary to conduct EDC audits for IT, power and HVAC? • What qualifications are necessary to conduct audits? • What is the calculation methodology for estimating energy savings in the Embedded Data Center space?
Industry Standard Practice (ISP)	• What is considered industry standard practice in various sectors?
2015 Savings by Design Healthcare Baseline Study	• What are the typical occupancy procedures? • What are the minimum fenestration requirements? • Are there any issues with implementation? • How has Title 24 changed the requirements?
Incremental Measure Cost	• What are the average new construction IMC values by project size, climate zone (CZ) and type?
~~Measure Migration Study (Cancelled)~~	~~• How strong is the knowledge transfer between emerging technology results and programmatic changes including codes and standards?~~
Market-based Incentives for Non-residential	• How would using a locational Demand Side Management (DSM) method affect incentive rates?

Those interested in the answers to the research topics above include all stakeholders interested in achievement of direct energy savings and related benefits such as greenhouse gas reductions -- -- program planners, customers, third party implementers, vendors, state agencies (CPUC, CEC, CARB), and the IOUs. This includes the realization of savings through projects directed to the water/energy nexus as well as energy savings realized through projects addressing whole buildings.

The joint CPUC and IOU PCG for IALC studies has agreed to focus IALC impact evaluation efforts on non-deemed (custom) measures that receive incentives through the portfolio of IOU offerings. Deemed measures are mapped to and evaluated under other roadmaps.

Evaluation plans providing additional specificity of the CPUC staff-led impact evaluations are available on the CPUC's Energy Efficiency Public Documents website.[20]

[20] http://www.energydataweb.com/cpuc/.

2.3.4. 2015 EM&V Studies, Budgets, and Timing

Table 27. 2015 IALC EM&V Studies, Budgets, and Timing

IALC Impact Studies	Study Manager	Budget	Completion Date
NRNC Whole-Building Energy Use Profile Evaluation	CPUC	$100,000	2016
NRNC Customer Incentive Evaluation	CPUC	$100,000	2016
Custom project impact evaluation including whole building nonresidential new construction	CPUC	$2,500,000	2017
~~Industrial and Agriculture Energy Advisor Components~~	~~CPUC~~	Study Cancelled	~~2016~~
IPROCESS EVALUATIONS			
Energy Management and Information Systems (EMIS)/Whole Building Process Evaluation (On Hold)	PG&E	$100,000	2017
MARKET STUDIES			
~~Market Potential and Requirements for Pinch Analysis Projects~~	SDG&E	Cancelled	Cancelled
Benefits of Continuous Energy Improvement (CEI)	SCG	On Hold	On Hold
Data Center Market Characterization: Phase 3	PG&E	$100,000	Q2 2016
~~Measure, Application, Segments and Industry (MASI) (part of 2014 funding cycle)~~	~~SCE~~	~~$750,000~~	~~Complete~~
Industry Standard Practice (ISP)	IOUs	TBD	As needed
2015 Savings by Design Healthcare Baseline Study	PG&E	$22,200	Q4 2015
Incremental Measure Cost	IOU	On Hold	On Hold
Measure Migration Study	SCE	Cancelled	Cancelled
Market-based Incentives for Non-residential Programs	SCE	$200,000	2016

2.3.5. 2015 Study Descriptions

Study Title: Energy Use Profile Study – NRNC Whole-Buildings	**Budget: $100,000 (subject to revision)**
Completion Date: Q4 2016	**Study Manager:** CPUC staff
Description: Billing data-based assessment of typical building energy use profiles following completion of construction	
Objective: Inform ex ante and ex post modeling efforts and assumptions regarding stable energy use levels and implications for M&V and associated program design features	

Study Title: Energy Use Profile Study – NRNC Whole-Buildings	**Budget: $100,000 (subject to revision)**
Key Research Questions: • Propose impact modeling solutions and program design features that address building usage profiles following construction and expected longer-term energy savings	
EM&V Methods: Billing data-based load profile development for whole-building new construction, assess implications for modeling and program design	

Study Title: Incentive Study -- Custom Measures	**Budget: $100,000 (subject to revision)**
Completion Date: Q3 2016	**Study Manager:** CPUC staff
Description: Ex post assessment of customer incentive payments, given differences in ex ante and ex post conclusions for key impact estimation components, and appropriateness of ex ante cost data	
Objective: Examine and report on ex post conclusions regarding discrepancy factors that lead to over- or under-payment of incentives	
Key Research Questions: • What can and should be done to correct incentive over- and under-payment	
EM&V Methods: Mine previous ex post M&V data and reports, assess quality and accuracy of ex ante data and conclusions	

Study Title: Impact Study -- Custom Measures	**Budget: $2,500,000**
Completion Date: Q1 2017	**Study Manager:** CPUC staff
Description: Ex post measurement and verification of program and measure impacts	
Objective: • Produce ex post gross and net savings estimates (kWh, kW and therms) for custom measure Claims	
Key Research Questions: • What are the realized energy savings, load reductions and factors in driving the decision to install energy efficient equipment	
EM&V Methods: Field measurement, desk review, impact modeling, decision maker surveys	

~~**Study Title: Process and Impact Study – Energy Advisor Components**~~	~~**Budget: $500,000**~~
~~**Expected Completion Date:** 2016~~	~~**Study Manager:** CPUC~~
~~**Description:**~~ ~~• Investigate the role of these offerings in leading to measure installations in the absence of incentives~~ ~~• What are the energy savings?~~ ~~• What are the load impacts?~~ ~~• What percentage of the savings occurred as a result of program intervention?~~ ~~• Role of these offerings in leading to measure installations that include incentives~~ ~~• Assess quality and appropriateness of IOU savings estimation procedures and methods~~	

~~**Study Title: Process and Impact Study – Energy Advisor Components**~~	~~**Budget: $500,000**~~
~~• Provide early and ongoing feedback to inform program improvements~~	
~~**Objective:**~~ ~~• Produce ex post gross and net savings estimates (kWh, kW and therms) for non-incented Claims, and examine influence on incented measure installations~~	
~~**Key Research Questions:**~~ ~~• What are the realized energy savings, load reductions and factors in driving the decision to install energy efficient equipment?~~	
~~**Potential EM&V Methods:** Decision-maker surveys, attribution analysis, field measurement, desk review, impact modeling~~	

Study Title: Benefits of Continuous Energy Improvement Practices	**Budget: On Hold**
Expected Completion Date: On Hold	**Study Manager:** SCG
Description: Study mid-size manufacturing companies who have a strong commitment to CEI to: 1) Understand the characteristics of the management's values and goals 2) Understand the types of barriers when implementing CEI 3) Collect information on a company's approach to CEI (in practices/in monitoring equipment) and whether the goal is realized (energy savings as well as any other non-energy benefits for the company).	
Objective: • Behavior studies in the residential market have demonstrated significant savings through messaging and continual feedback on usage. This study will look into the possibility that a similar approach through continuous improvement practices in mid-size manufacturing companies can yield measureable benefits.	
Key Research Questions: • What motivates companies to engage in CEI? • How do companies engage in CEI? • Are companies' goals achieved?	
Potential EM&V Methods: Literature review (within US) to identify the companies currently engaging in CEI and identify similarities in characteristics/values. Conduct a survey to measure a company's satisfaction with CEI (more qualitative than quantitative).	

Study Title: Data Center Market Characterization: Phase 3	**Budget: $100,000**
Expected Completion Date: 2016	**Study Manager:** PG&E
Description: Market characterization of the embedded data center space of telecom closets and rooms 5,000 sq-ft or less.	

Study Title: Data Center Market Characterization: Phase 3	**Budget: $100,000**
Objective: • Estimate the savings potential of the embedded data center space by examining the end-user needs and energy savings potential of various measures.	
Key Research Questions: • How can Dynamic Power Management (DPM) Setup and Implementation be performed in specific customer sectors such as engineering laboratories, biotech, municipalities and universities? • • What are Server Reference Measurements for deploying DPM? • • What is the calculation methodology for estimating energy savings in the EDC space?	
Potential EM&V Methods: Field testing.	

Study Title: Industry Standard Practice	**Budget: $89,000**
Expected Completion Date: Ongoing	**Study Manager:** IOUs
Description: Continuation of 2013-2014 Cycle of Industry Standard Practice	
Objective: • To review and understand what is Industry Standard Practice in specific situations, providing guidance to EE program implementers.	
Key Research Questions: • What is considered industry standard practice in various sectors?	
Potential EM&V Methods: Interviews and secondary research.	

~~**Study Title: Measure Migration Study**~~	~~**Budget: Cancelled**~~
~~**Expected Completion Date:** Cancelled~~	~~**Study Manager:** SCE~~
Description: The study will review the current process for identifying and transitioning measures from one portfolio area to another or to remove measures based on technical or policy drivers. Some examples include transitioning ET measures to core, transitioning ISP measures out of the portfolio or to C&S or even transitioning measures from one delivery method to another such as from custom to deemed or to some hybrid designation. Implications for Potential Studies and goals addressed.	
Objective: Identify improvements to current processes for emerging technology and industry standard practice implementation.	

~~**Study Title: Measure Migration Study**~~	~~**Budget: Cancelled**~~
Key Research Questions: How strong is the knowledge transfer between emerging technology results and programmatic changes including codes and standards?	
Potential EM&V Methods: Data tracking and interviews.	

Study Title: Market Based Incentives for Nonresidential Programs	**Budget: $200,000**
Expected Completion Date: 2016	**Study Manager:** SCE
Description: The CPUC approached the IOUs to explore varying incentive rates. One example is by using locational DSM efforts which are based on varying avoided cost mechanisms. An examination of varying incentives to match varying avoided costs is therefore required.	
Objective: • Examine various scenarios for varying incentive rates.	
Key Research Questions: • How would using a locational Demand Side Management (DSM) method affect incentive rates?	
Potential EM&V Methods: Data tracking and interviews.	

Study Title: Incremental Measure Cost Study	**Budget: TBD**
Expected Completion Date: TBD	**Study Manager:** IOU/CPUC TBD
Description: Recent IMC studies have answered some questions needed to support defensible and timely reporting of IMCs for nonresidential projects but a large gap still exists between what is required for reporting and what can be cost effectively determined from the status quo.	
Objective: • Eliminate the need for collecting project specific Incremental Measure Costs (IMCs).	
Key Research Questions: • What are the average new construction IMC values by project size, climate zone (CZ) and type?	
Potential EM&V Methods: TBD	

Study Title: 2015 Savings by Design Healthcare Baseline Study	**Budget: $22,000**
Expected Completion Date: Q4 2015	**Study Manager:** PG&E

Study Title: 2015 Savings by Design Healthcare Baseline Study	**Budget: $22,000**
Description: Perform additional tweaks to the EnergyPro model for Savings by Design Healthcare as per CPUC consultant recommendations.	
Objective: • Complete the Title 24 updates to the Savings by Design Healthcare Baseline with the requested changes based on Commission Staff consultant's recommendations.	
Key Research Questions: • What are the current practices and parameters for designing hospitals and medical office buildings?	
Potential EM&V Methods: Interviews and secondary research.	

Study Title: Energy Management and Information Systems (EMIS)/Whole Building Demonstration Process Evaluation	**Budget: $100,000**
Expected Completion Date: 2017	**Study Manager:** PG&E
Description: Process evaluation of proposed energy management system program efforts.	
Objective: • Assess whether current whole building demonstration efforts are successful.	
Key Research Questions: N/A	
Potential EM&V Methods: N/A	

~~**Study Title: Market Potential and Requirements for Pinch Analysis Projects**~~	~~**Budget: Cancelled**~~
~~**Expected Completion Date:** Cancelled~~	~~**Study Manager:** SDG&E~~
Description: Pinch Analysis investigates thermodynamically feasible energy saving boundaries. Two composite curves (hot and cold stream) are drawn with the inputs from the process data and temperature. The point of closest approach between the hot and cold composite curves is the pinch point. Having found the pinch point, one can optimize the heat exchanger network (i.e. multiple heat exchangers) to save energy. This would be a market characterization study of the potential and eligibility for pinch analysis projects. Furthermore, the study will look into which costs incentives should be based on to influence customers to conduct projects.	
Objective: • To determine the market potential and eligible criteria for a pinch analysis project and to determine documents required. Research would help determine proper incentives as well.	
Key Research Questions: • What is the market potential for Pinch Analysis projects and what costs should incentives be based on?	

~~**Study Title: Market Potential and Requirements for Pinch Analysis Projects**~~	~~**Budget: Cancelled**~~
Potential EM&V Methods: Conduct surveys with customer base on potential and CPUC staff on requirements	

2.3.6. 2016 EM&V Studies, Budgets, and Timing

Research studies related to and evaluation of the 2016 Industrial, Agriculture and Large Commercial programs are being developed as of this update of the Research Roadmap. Descriptions of studies and budget allocations are preliminary and subject to change. Details will be made available in the next update of the Joint EM&V Plan.

Proposed 2016 Energy Division Budget: $ 3,982,077

The Industrial Agriculture and Large Commercial sector (largely driven by custom interventions) evaluations will continue to need significant funding to conduct annual field evaluations. The custom ex ante review processes will also continue to be integrated into the ex post processes over the next few years. Many of the water energy projects may turn up in the large industrial and the agricultural sectors and we anticipate integrated evaluations funded under this research plan. Other water evaluations may need to be conducted in other sectors.

Proposed 2016 Program Administrator Budget: $ 250,000 - $300,000

The planned program administrator studies are also highlighted in this section. Funding of SCG's Continuous Energy Improvement activities is still pending.

2016 EM&V Research Questions

Table 28. 2016 IALC Research Topics

	Related Research Topics
Impact Studies -- CPUC	
CPUC-led Industrial/ Agricultural/ Large Commercial Impact Evaluations: • Custom measures including nonresidential new construction whole building impact • Other Studies TBD •	• What are the energy savings • What are the load impacts • What percentage of the savings occurred as a result of program intervention • Assess quality and appropriateness of IOU savings estimation procedures and methods • Provide early and ongoing feedback to inform program improvements

	Related Research Topics
Program Evaluation – Water Energy	

	Related Research Topics
CPUC-led evaluation of water-energy programs as directed in D. 15-09-023	• What are the energy savings • What are the embedded energy savings • What are the load impacts • What percentage of the savings occurred as a result of program intervention • Assess quality and appropriateness of IOU savings estimation procedures and methods • Provide early and ongoing feedback to inform program improvements
	Related Research Topics
Process Studies	
• Energy Management and Information Systems (EMIS)/Whole Building Demonstration Process	• Process evaluation to determine effective delivery of these two new offerings that rely on whole building data • Do customers value these offerings? • Are there any issues with implementation? • Are there significant program gaps?
• ~~Step Up Power Down (On Hold)~~	• ~~What are the realized energy savings and load reductions resulting from behavioral and operational changes?~~ • ~~Have program participants engaged in a greater degree in downstream rebate programs?~~ • ~~Have program participants adopted energy efficient products for which they did not obtain rebates as a result of participation in SUPD?~~ • ~~Does the program result in measurable changes to the attitudes and knowledge of program participants?~~

	Related Research Topics
Market Studies -- IOU	
• ~~Embedded Data Center Market Characterization: Phase 3 (Cancelled)~~	• ~~Setting up a testing environment using a task scheduler or reservation system that turns on equipment prior to the start time and turns them off after the reservation is expired~~ • ~~Implementing reservation system technology in selected field sites~~ • ~~Reporting energy savings results~~

	Related Research Topics
• Market Based Incentives for Nonresidential Programs	• How do the IOUs and the CPUC-ED take Demand-Side Management (DSM) to the market? • Do market locations influence the determination of incentive rates? If so, how? • How should incentive regimes respond to market or measure conditions? • Understanding and estimating the locational impact or requirements of variable incentives on customer program participation
• Market Characterization Study (Food Processing, Hotel, and Restaurants)	• What % of hotels are using Networked Energy Management Systems (NEMS)? • What were the phases hotels took to deploy NEMS, which technologies were networked first and in which order? • What are the realized energy savings, load reductions and factors in driving the decision to install energy efficient equipment? • What if any types of software, SAAS, or data visualization tools are used to manage energy and why? • What are the features and key benefits?
• ~~Benefits of Continuous Energy Improvement (CEI)~~ (ON HOLD)	• What motivates companies to engage in CEI? • How do companies engage in CEI? • Are companies' goals achieved?

Table 29. 2016 IALC EM&V Studies, Budgets, and Timing

IALC Impact Studies	Study Manager	Budget	Completion Date
Custom project impact evaluation including whole building nonresidential new construction	CPUC	$TBD	2018
Program Evaluation – Water Energy	CPUC	$TBD	2018
IOU Studies	**Study Manager**	**Budget**	**Completion Date**
~~Embedded Data Center Market Characterization: Phase 3 (Cancelled)~~	~~PG&E~~	~~$100,000~~	~~2016~~
Market Based Incentive Study	SCE	$100,000	2016
Market Characterization Study (Food Processing, Hotel, and Restaurants)	IOUs	$100,000	2017

IALC Impact Studies	Study Manager	Budget	Completion Date
Energy Management and Information Systems (EMIS)/Whole Building Demonstration Process Evaluation	PG&E	$50,000	2017
~~Benefits of Continuous Energy Improvement (CEI) ON HOLD~~	~~SCG~~	~~$50,000~~	~~2016~~
~~Step Up Power Down (On Hold)~~	~~PG&E~~	~~$200,000~~	~~2017~~

2.3.7. 2016 Study Descriptions

Study Title: Impact Study -- Custom Measures	**Budget: TBD**
Completion Date: Q1 2018	**Study Manager:** CPUC staff
Description: Ex post measurement and verification of program and measure impacts	
Objective: • Produce ex post gross and net savings estimates (kWh, kW and therms) for custom measure Claims	
Key Research Questions: • What are the realized energy savings, load reductions and factors in driving the decision to install energy efficient equipment	
EM&V Methods: Field measurement, desk review, impact modeling, decision maker surveys	

Study Title: Program Evaluation – Water/Energy	**Budget: TBD**
Completion Date: Q1 2018	**Study Manager:** CPUC staff
Description: Evaluation of water/energy programs	
Objective: • Produce embedded energy and direct energy savings results for water/energy programs	
Key Research Questions: • What are the embedded and direct energy savings from projects that save energy through cold water conservation	
EM&V Methods: Field measurement, desk review, impact modeling, decision maker surveys	

Study Title: Market Based Incentives (MBI) For Nonresidential Programs Study	**Budget: $100,000**
Completion Date: 2016	**Study Manager:** SCE
Description: Policymakers and leadership of the ED and IOUs have asked various questions about how we take Demand Side Management (DSM) to the market. On the one hand, Energy Division has approached the IOUs to explore varying nonresidential incentive rates for custom EE projects as a mechanism to improve custom portfolio resource value. On the other hand, the integration of locational programs into current EE DSM portfolios has led procurement leaders on the IOU side to ask how and if market locations should influence the determination of incentive rates. The SONGS mitigation efforts is one case where generation reductions/constraints in a particular physical market may require varying	

Study Title: Market Based Incentives (MBI) For Nonresidential Programs Study	**Budget: $100,000**
incentive rates or alternative incentive structures.	
Objective: Understand and estimate the locational impact or requirements of variable incentives on customer program participation.	
• **Key Research Questions:** How do the IOUs and the CPUC-ED take Demand-Side Management (DSM) to the market? • Do market locations influence the determination of incentive rates? If so, how? • How should incentive regimes respond to market or measure conditions?	
EM&V Methods: Interviews, market studies	

Study Title: Market Characterization Study (Food Processing, Hotel, and Restaurants)	**Budget: $100,000**
Completion Date: 2017	**Study Manager:** IOUs
Description: Estimate the market potential for the new energy efficient technologies and standards in food processing, hotels, and restaurants.	
Objective: • Obtain market data that identified new opportunities for energy savings in the food processing, hotel, restaurant sectors.	
Key Research Questions: • What % of hotels are using Networked Energy Management Systems (NEMS)? • What were the phases hotels took to deploy NEMS, which technologies were networked first and in which order? • What are the realized energy savings, load reductions and factors in driving the decision to install energy efficient equipment? • What if any types of software, SAAS, or data visualization tools are used to manage energy and why? • What are the features and key benefits?	
EM&V Methods: Decision maker surveys, market sector surveys	

Study Title: Energy Management and Information Systems (EMIS)/Whole Building Demonstration Process Evaluation	**Budget: $50,000**
Expected Completion Date: 2017	**Study Manager:** PG&E
Description: Process evaluation of proposed energy management system program efforts.	
Objective: • Assess whether current whole building demonstration efforts are successful.	
• **Key Research Questions:** Do customers value these offerings? • Are there any issues with implementation? • Are there significant program gaps?	

Study Title: Energy Management and Information Systems (EMIS)/Whole Building Demonstration Process Evaluation	**Budget: $50,000**
Potential EM&V Methods: A mixture of qualitative and quantitative methods usually associated with process evaluations.	

~~**Study Title: Step Up Power Down**~~	~~**Budget: $200,000**~~
~~**Completion Date:** Q1 2017 (On Hold)~~	~~**Study Manager:** PG&E~~
~~**Description:** Process Evaluation of Step Up Power Down energy reduction behavioral initiative~~	
~~**Objective:**~~ ~~• Based on recommendations from E2E, estimate behavioral and operational energy savings from Small and Medium Business participates using quasi experimental design. conduct a quasi-experimental Establish savings estimates of behavior-based initiatives for residential and commercial customers engaged in Step Up Power Down~~	
~~**Key Research Questions:**~~ ~~• What are the realized energy savings and load reductions resulting from behavioral and operational changes?~~ ~~• Have program participants engaged in a greater degree in downstream rebate programs?~~ ~~• Have program participants adopted energy efficient products for which they did not obtain rebates as a result of participation in SUPD?~~ ~~• Does the program result in measurable changes to the attitudes and knowledge of program participants?~~	
~~**EM&V Methods:** Quasi-experimental design, decision maker surveys~~	

~~**Study Title: Benefits of Continuous Energy Improvement Practices ON HOLD**~~	~~**Budget: $50,000**~~
~~**Expected Completion Date:** 2016~~	~~**Study Manager:** SCG~~
Description: Study mid-size manufacturing companies who have a strong commitment to CEI to: 1) Understand the characteristics of the management's values and goals 2) Understand the types of barriers when implementing CEI 3) Collect information on a company's approach to CEI (in practices/in monitoring equipment) and whether the goal is realized (energy savings as well as any other non-energy benefits for the company).	
Objective: • Behavior studies in the residential market have demonstrated significant savings through messaging and continual feedback on usage. This study will look into the possibility that a similar approach through continuous improvement practices in mid-size manufacturing companies can yield measureable benefits.	
Key Research Questions: • What motivates companies to engage in CEI?	

~~**Study Title: Benefits of Continuous Energy Improvement Practices ON HOLD**~~	~~**Budget: $50,000**~~
• How do companies engage in CEI? • Are companies' goals achieved?	
Potential EM&V Methods: Literature review (within US) to identify the companies currently engaging in CEI and identify similarities in characteristics/values. Conduct a survey to measure a company's satisfaction with CEI (more qualitative than quantitative).	

Other Important Considerations

Ongoing coordination with the ex ante review activities at the Commission is required with respect to the studies listed in this roadmap and integration of these activities will continue to be a goal.

2.4. Heating, Ventilation, Air Conditioning (HVAC)

2.4.1. Background

Sector Description

The HVAC sector PCG covers the portions of the residential and non-residential Investor Owned Utilities (IOU)-run HVAC programs that achieve energy and peak demand savings and market transformation through providing incentives for customers to install high efficiency HVAC equipment and providing installation and maintenance services designed to improve the efficiency of HVAC systems. These programs include the commercial and residential upstream incentive programs that provide rebates for highly efficient HVAC equipment, and programs that support high-quality residential and commercial maintenance and installation of HVAC equipment. Other HVAC activities outside of the HVAC upstream incentives and "quality" installation and maintenance programs that are in the IOU portfolios include downstream deemed HVAC measures provided by IOU Core, third party and local government programs. HVAC replacements in Energy Upgrade California, controls and retrofit work in custom non-residential programs, and HVAC measures associated with low-income energy efficiency direct install programs are outside the scope of this HVAC research roadmap.

Programs included in the Research Scope

The HVAC Roadmap will research activities in four broad topic areas: Upstream HVAC, Quality Maintenance (QM), Quality Installation (QI) and Deemed HVAC. Program activities studied under this Roadmap are identified below, along with the ex-ante estimated savings and budgets. Since HVAC measures are generally offered as a component of a larger program, budget estimates were obtained from the reported incentive payments and estimated program administration and marketing costs. For the 2013-14 cycle, savings and incentive data were obtained from the 2013-14 tracking data. For the 2015 program cycle, forecasted savings and incentive data were obtained from 2015 Program Compliance Filings.

Upstream HVAC

Upstream HVAC programs addressed only the non-residential sector during the 2013–14 program cycle. Each IOU has a single non-residential program where the upstream measures are administered. All of PG&E's 2013–14 upstream measures are administered through Program 21015- Commercial HVAC. SCE's 2013–14 upstream measures were administered through Program SCE-13-SW-002F, Non-Residential HVAC. SDG&E's 2013–14 upstream measures were administered through Program 3224, SW-COM-Deemed Incentives-HVAC Commercial. The 2013-14 program cycle savings and estimated budget for the Upstream HVAC component of each program are listed below:

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
PGE21015	COMMERCIAL HVAC	35,077,015	5,730	104,154	$ 16,895,140
SCE-13-SW-002F	NONRESIDENTIAL HVAC PROGRAM	77,901,683	16,751	11,848	$ 26,978,799
SDGE3224	SW-COM-DEEMED INCENTIVES-HVAC COMMERCIAL	186,629	86	(1,111)	$ 103,346

Upstream rebates for residential HVAC systems were included in the 2015 Compliance Filing. The 2015 program cycle savings and estimated budget for the Upstream HVAC component of each program are listed below:

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
PGE21006	Residential HVAC	565,074	192	(3,314)	$ 1,698,754
PGE21015	COMMERCIAL HVAC	4,719,727	1,701	90,878	$ 7,772,863
SCE-13-SW-001E	Residential HVAC	201,276	206	-	$ 749,715
SCE-13-SW-002F	NONRESIDENTIAL HVAC PROGRAM	30,982,017	6,957	113,185	$ 12,414,130
SDGE3224	SW-COM-DEEMED INCENTIVES-HVAC COMMERCIAL	100,752	34	(709)	$ 47,941

Quality Maintenance

PG&E is offering QM for the residential and non-residential sectors through its core HVAC offerings. 21006 – Residential HVAC and 21015 – Commercial HVAC. Additionally, 21016 Air Care Plus, a third-party AC tune-up program administered by PECI (now ClearResult), is available to commercial PG&E customers. SCE administers all of its commercial HVAC maintenance activities through SCE-13-SW-002F Commercial Quality Maintenance SDG&E is implementing HVAC maintenance measures in the residential and commercial sectors via three different programs - SDGE3212 Residential HVAC-QI/QM, SDGE3224 SW-COM-Deemed Incentives - Commercial HVAC and SDGE3226 SW-COM-Direct Install. The 2013-14 program cycle savings and estimated budget for the Quality Maintenance component of each program are listed below:

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
PGE21006	PG&E Residential QM	2,192,733	2,236	29,447	$ 5,015,268
PGE21015	PG&E Commercial QM	10,085,877	970	621,897	$ 4,391,088
PGE21016	PG&E Air Care Plus	6,453,916	802	484,577	$ 2,046,649
SCE-13-SW-002F	SCE Commercial QM	4,463,004	1,698	19,219	$ 8,179,188
SDGE3212	SW-CALS - RESIDENTIAL HVAC-QI/QM	432,735	210	17,814	$ 168,387
SDGE3224	SDG&E Non Residential Deemed Incentive	17,948,699	7,862	(566)	$ 3,602,933

SDGE3226	SDG&E Non Residential Direct Install	7,814,166	2,584	(6,559)	$ 3,068,727

For 2015, a small amount of residential QM activity was forecasted for SCE. The 2015 program cycle savings and estimated budget for the Quality Maintenance component of each program are listed below:

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
PGE21006	PG&E Residential QM	625,100	583	18,002	$ 3,456,237
PGE21015	PG&E Commercial QM	965,614	7	61,578	$ 6,041,865
PGE21016	PG&E Air Care Plus	9,024,156	902	371	$ 1,242,027
SCE-13-SW-001E	Residential HVAC	2,837	4	94	$ 17,846
SCE-13-SW-002F	SCE Commercial QM	7,111,304	4,326	28,325	$ 7,586,076
SDGE3212	SW-CALS - RESIDENTIAL HVAC-QI/QM	5,828	8	(4)	$ 76,069
SDGE3224	SDG&E Non Residential Deemed Incentive	4,704,125	2,018	(95)	$ 1,977,214
SDGE3226	SDG&E Non Residential Direct Install	8,627,939	2,698	(287)	$ 2,544,133

Quality Installation

In the 2013-14 program cycle, QI activities were limited to residential programs. SCE administers all of its residential HVAC QI activities through the SCE-13-SW-002E Residential HVAC program. SDG&E is implementing QI measure through the SDGE 3212 SW-CALS- Residential HVAC-QI/QM program. The 2013-14 program cycle savings and estimated budget for the Quality Installation component of each program are listed below:

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
SCE-13-SW-001E	RESIDENTIAL HVAC PROGRAM	2,564,453	1,747	27,170	$ 487,151
SDGE3212	SW-CALS - RESIDENTIAL HVAC-QI/QM	21,073	11	1,676	$ 369,969

For 2015, a small amount of residential QI activity was forecasted for SCG. The 2015 program cycle savings and estimated budget for the Quality Installation component of each program are listed below:

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
SCE-13-SW-001E	RESIDENTIAL HVAC PROGRAM	1,385,181	1,664	21,766	$ 2,640,966
SCG3706	SW-CALS-Residential HVAC	24,930	42	3,758	$ 130,034
SDGE3212	SW-CALS - RESIDENTIAL HVAC-QI/QM	39,879	23	1,854	$ 295,684

Deemed HVAC

Other deemed HVAC measures are offered throughout the portfolios, through a combination of the Statewide Core programs, Third Party Programs, Institutional Partnership Programs and Local Government Partnership programs. The list of Statewide Core and Third Party programs in the 2013-14 program cycle offering deemed HVAC measures are listed below. These are not covered in the studies outlined above

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
PGE21002	PLUG LOAD AND APPLIANCES	123,446	(10)	1,288,386	$ 849,635
PGE21003	MULTIFAMILY ENERGY EFFICIENCY REBATES PROGRAM	-	-	6,713	$ 72,751
PGE21008	ENHANCE TIME DELAY RELAY	1,891,053	2,710	(5,116)	$ 1,010,725
PGE21009	DIRECT INSTALL FOR MANUFACTURED AND MOBILE HOMES	7,534,111	4,912	(41,018)	$ 3,565,132
PGE210111	LODGINGSAVERS	10,359,713	4,495		$ 3,009,347
PGE210112	SCHOOL ENERGY EFFICIENCY	(5,340)	-	14,619	$ 20,540
PGE21012	COMMERCIAL DEEMED INCENTIVES	6,548,994	1,765	414,313	$ 1,254,665
PGE210122	CASINO GREEN	64,974	27	-	$ 13,417
PGE21017	BOILER ENERGY EFFICIENCY PROGRAM	(11,016)	-	363,757	$ 313,480
PGE21018	ENERGYSMART GROCER	105,178	183		$ 90,993
PGE21022	INDUSTRIAL DEEMED INCENTIVES	25,565	7	17,604	$ 9,088
PGE210310	DAIRY INDUSTRY RESOURCE	813,150		-	$ 259,495

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
	ADVANTAGE PGM		374		
PGE21032	AGRICULTURAL DEEMED INCENTIVES	108,389	39	808	$ 30,852
PGE21035	DAIRY ENERGY EFFICIENCY PROGRAM	45,780	21	-	$ 15,594
SCE-13-SW-001B	PLUG LOAD AND APPLIANCES PROGRAM	1,760,106	2,132	(304)	$ 534,466
SCE-13-SW-001C	MULTIFAMILY ENERGY EFFICIENCY REBATE PROGRAM	12,043	5	(6)	$ 6,151
SCE-13-SW-002C	COMMERCIAL DEEMED INCENTIVES PROGRAM	15,294,881	2,644	(17,895)	$ 1,814,469
SCE-13-SW-002D	COMMERCIAL DIRECT INSTALL PROGRAM	3,264	(0)	497	$ 853
SCE-13-SW-003C	INDUSTRIAL DEEMED ENERGY EFFICIENCY PROGRAM	1,135,988	221	(9,392)	$ 159,435
SCE-13-TP-001	COMPREHENSIVE MANUFACTURED HOMES	5,130,738	2,609	(23,177)	$ 4,410,180
SCE-13-TP-003	HEALTHCARE EE PROGRAM	1,113,600	181	(1,305)	$ 85,246
SCE-13-TP-005	LODGING EE PROGRAM	331,000	51	(88)	$ 14,335
SCE-13-TP-017	ENERGY EFFICIENCY FOR ENTERTAINMENT CENTERS	363,847	336	55,622	$ 1,080,236
SCE-13-TP-018	SCHOOL ENERGY EFFICIENCY PROGRAM	14,700	29	-	$ 12,728
SDGE3203	SW-CALS-PLUG LOAD AND APPLIANCES-HEER	23,640	14	-	$ 37,147
SDGE3204	SW-CALS-PLUG LOAD AND APPLIANCES-POS REBATES	35,388	32		$ 40,593
SDGE3212	SW-CALS - RESIDENTIAL HVAC-QI/QM	423,426	194	17,773	$ 101,074
SDGE3223	SW-COM-DEEMED INCENTIVES-COMMERCIAL REBATES	3,741,477	531	177,602	$ 367,978
SDGE3224	SW-COM-DEEMED INCENTIVES-HVAC COMMERCIAL	429,363	175		$ 154,897
SDGE3226	SW-COM DIRECT INSTALL	211,974	(46)	22,287	$ 31,918
SDGE3233	SW-IND-DEEMED INCENTIVES	29,750	5	(54)	$ 3,112

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
SDGE3279	3P-RES-COMPREHENSIVE MANUFACTURED-MOBILE HOME	1,865,676	847	78,790	$ 554,622

The list of Statewide Core and Third Party programs in the 2015 program cycle offering deemed HVAC measures not otherwise covered in the studies outlined above is shown below:

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
PGE21002	Plug Load and Appliances	2,429,738	885	171,230	$ 869,098
PGE21003	Multifamily Energy Efficiency Rebates Program	-	-	5,816	$ 45,217
PGE21006	Residential HVAC	61,329	99	33,049	$ 302,658
PGE21008	Enhance Time Delay Relay	918,766	1,485	(23)	$ 657,650
PGE21009	Direct Install for Manufactured and Mobile Homes	5,411,970	3,111	(32,148)	$ 1,830,750
PGE210111	LodgingSavers	2,340,669	1,113	-	$ 800,508
PGE21012	Commercial Deemed Incentives	2,267,242	462	42,656	$ 388,018
PGE210126	K-12 Private Schools and Colleges Audit Retro	5,338	-	871	$ 1,178
PGE21015	Commercial HVAC	1,098,990	416	56,821	$ 422,886
PGE21017	Boiler Energy Efficiency Program	(90,769)	(0)	153,213	$ 149,278
PGE21018	EnergySmart Grocer	1,188,000	191	-	$ 106,232
PGE21022	Industrial Deemed Incentives	(28,681)	(4)	93,636	$ 5,602
PGE210310	Dairy Industry Resource Advantage Pgm	490,500	225	-	$ 293,919
PGE21032	Agricultural Deemed Incentives	-	-	-	$ 15,809
SCE-13-SW-001B	Plug Load and Appliances Program	789,841	849	(22)	$ 578,233
SCE-13-SW-001C	Multifamily Energy Efficiency Program	56,359	169	(11,267)	$ 461,552

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
SCE-13-SW-002C	Commercial Deemed Incentives Program	5,375,443	781	(712)	$ 657,908
SCE-13-SW-002D	Commercial Direct Install Program	258,826	(54)	32,127	$ 40,132
SCE-13-SW-002F	Nonresidential HVAC Program	3,622,277	1,289	26,683	$ 2,069,187
SCE-13-SW-003C	Industrial Deemed Energy Efficiency Program	683,078	112	(97)	$ 97,959
SCE-13-TP-001	Comprehensive Manufactured Homes Program	2,137,952	1,001	(1,009)	$ 1,703,941
SCE-13-TP-014	Commercial Utility Building Efficiency	3,271,167	2,137	-	$ 1,153,237
SCE-13-TP-018	School Energy Efficiency Program	12,052	-	-	$ 1,925
SCG3702	SCG3702-SW-CALS-Plug Load and Appliances	-	-	59,100	$ 483,536
SCG3703	SW-CALS-Plug Load and Appliances - POS	-	-	16,400	$ 100,649
SCG3704	SW-CALS-MFEER	-	-	4,000	$ 16,479
SCG3706	SW-CALS-Residential HVAC	-	-	67,900	$ 1,040,273
SCG3711	SW-COM-Deemed Incentives	-	-	50,210	$ 85,741
SCG3716	SW-IND-Deemed Incentives	-	-	960	$ 1,020
SCG3758	3P-PREPS	-	-	5,693	$ 2,509
SCG3765	3P-Manufactured Mobile Home	1,504,926	1,333	131,386	$ 2,182,388
SDGE3203	SW-CALS-Plug Load and Appliances-HEER	27,679	3	5,740	$ 86,154
SDGE3204	SW-CALS-Plug Load and Appliances-POS Rebates	86,496	132	-	$ 83,182
SDGE3211	Local-CALS - Middle Income Direct Install (MIDI)	5,116	6	1,945	$ 154,425
SDGE3212	SW-CALS – Residential HVAC-QI/QM	287,047	141	12,294	$ 86,462
SDGE3214	SW-CALS - CAHP/ESMH-E Star Manufactured Homes	66,920	19	870	$ 18,688
SDGE3223	SW-COM-Deemed Incentives-Commercial	634,506	108	120	$ 52,832

ID	Program	kWh Savings	kW Savings	therm Savings	Est Budget
	Rebates				
SDGE3224	SW-COM-Deemed Incentives-HVAC Commercial	679,919	280	-	$ 330,066
SDGE3226	SW-COM Direct Install	2,381	1	(15)	$ 24,584
SDGE3233	SW-IND-Deemed Incentives	79,096	14	13	$ 6,643
SDGE3239	SW-AG-Deemed Incentives	36,710	6	8	$ 3,157
SDGE3279	3P-Res-Comprehensive Manufactured-Mobile Home	1,870,843	1,324	137,435	$ 2,960,420

Uncertainty and Challenges to Successful Implementation

The major goal of these IOU HVAC programs is to transform the HVAC sector to increase the efficiency of equipment, improve customer practices and promote the proper installation and maintenance of HVAC units. However, the California HVAC market is currently facing challenges with poor installation quality and low compliance with HVAC related building codes and standards. Low customer awareness of the importance of optimally maintaining the systems throughout their lifecycle, causes the systems to not operate efficiently, resulting in lost energy savings. The California Energy Commission estimates that less than 10 percent of HVAC work is performed under proper building permits and that poor installation and maintenance results in HVAC system over-use by 20 to 30 percent regardless of rated efficiency.[21] Transforming the market, behavior and practices in the HVAC sector is also of critical importance because HVAC is one of the largest energy end-uses across California and is the primary driver of resource constraint during hot summer peak demand events. This has led to special emphasis on HVAC as an end-use with respect to energy savings. HVAC has a chapter of the California Long-Term Energy Efficiency Strategic Plan dedicated to it, and is the focus of one of the four "Big Bold Energy Efficiency Strategies" developed by the CPUC in 2007. HVAC is the only end-use highlighted in that way: "Heating, Ventilation and Air Conditioning (HVAC) will be transformed to ensure that its energy performance is optimal for California's climate." In 2010 as a follow-up to the HVAC chapter in the Strategic Plan the CPUC published a more detailed "HVAC Action Plan" which identified specific activities designed to achieve the goals. The Western HVAC Performance Alliance (WHPA) maintains the HVAC Action Plan, tracks progress, and sets annual goals to address activities identified in the HVAC Action Plan. The WHPA's joint effort by the IOUs and the HVAC industry comprised of an executive committee and several technical subcommittees. Additional information on the WHPA is available at http://www.performancealliance.org/.

[21] California Energy Commission, Strategic Plan to Reduce the Energy Impact of Air Conditioners (Jun 2008), http://energy.ca.gov/2008publications/CEC-00-2008-010/CEC-400-2008-10.pdf.

Emerging Evaluation and Information Needs

Despite evaluation efforts to better understand the afore mentioned gaps through the 2010-12 evaluation period, we do not yet have sufficient data about HVAC market behavior to make well-informed decisions for long-term market transformation efforts. In particular, from a Quality Maintenance perspective, the PCG is interested in knowing how current and future HVAC research can best guide programs to target and remediate the worst performing existing HVAC systems.

The utilities' proposed ex ante savings estimates have been challenged and reduced through ex ante review of IOU workpapers. Issues identified in the workpaper dispositions include establishing an appropriated baseline for HVAC efficiency and the appropriateness of assumptions used to develop energy savings estimates for the QI and QM programs.

The question of baseline covers multiple topics. First, what is the true as-found state of HVAC systems in California with respect both to their design and installation? How have the systems changed since installation, including introduction of non-condensables during service, state of charge level and other characteristics? What are the baseline practices with respect to maintenance, installation, sales, and distribution? What is the baseline level of technician skill and diligence? Finally, what is the role of codes, as not all HVAC activity involves a code-triggering event?[22] These are all important outstanding issues. While HVAC has been held up as an area of high importance, research into these pressing questions has not been sufficient in previous program cycles.

2.4.1. Ex Ante Coordination

Ex ante processes (including DEER updates, Uncertain Measures List updates, work paper reviews, and custom project reviews) incorporate data and results from the latest EM&V studies. The ex ante values that are relevant to this sector are highlighted in this section; they may also be included in other relevant chapters.

Summary of DEER 2016 Updates:

- All commercial space heating boiler measures are updated with new standard case and HVAC system type applicability
- All IEER-rated HVAC measures from DEER2015 are updated with expanded IEER rating values
- General revisions to building prototypes based on laboratory and field data.

Summary of 2015 Uncertain Measure Updates:

To assess what measures to move off and/or add onto the Uncertain Measures List requires looking ahead to IOU portfolios and analysis of ex ante and ex post teams. The current 2015 Uncertain Measures List (http://www.cpuc.ca.gov/NR/rdonlyres/9F79154A-065B-4E80-B1AC-58A6E7223F91/0/Final_2015_ESPI_Uncertain_List.pdf) contains the following items for this sector and shall be prioritized in the evaluation studies.

[22] Related to QI a building permit is required where activities related to air flow, refrigerant charge and duct sealing on a new construction or equipment replacement.

2015 Uncertain Measures

Measure Description	Comments on Need	PGE	SCE	SDGE	SCG
HVAC Quality Maintenance activities	Change in program design and maturing program offering with many new measures makes assumption for impact highly uncertain. The lack of coordination between electric and gas utility offerings further makes the assumption uncertain	X	X	X	X
HVAC mini-split system	This new technology is now widely available yet expensive with limited applicability. Performance has not been studied and free ridership is uncertain.		X		

Coordinated Efforts

Ex ante staff leads and ex post staff leads will coordinate processes, studies, and timelines to better align the flow of information between ex ante and ex post projects. Ex post evaluation studies provide data and results for ex ante updates. Planning for ex ante updates in the future will also require evaluation planning and input. Evaluation studies will need to budget time and schedule to provide input into ex ante processes, such as the DEER and the uncertain measures list. Currently, ex ante funding is budgeted under the overall ex ante contract. More information about the budget is provided in the Ex Ante Review section of this document.

Next planned DEER Update

The DEER team is currently in the planning stages for 2017 updates. The scope of these updates is still under development.

Program Administrators' Planned Work Paper Submissions

Program Administrators submit planned work papers for the upcoming portfolio cycle to Commission staff. These work papers often use DEER data and/or methodology to add technologies that are not in DEER to the energy efficiency portfolio.

PA	Sector	Tech Type	Measure/Value /Parameter	Reason for the Update/New Workpaper
SDG&E	Commercial	HVAC	Slice Energy - Smart VAV controls for DDC and Pneumatic controls where supply fans have existing VFD's	Ongoing ET field trails to determine EE savings and code compliance
SDG&E	Commercial	HVAC	AirRite – small business (restaurants/fast food) whole facility HVAC approach (air balancing, tune ups, and controls for EE & DR)	Ongoing ET field trails to determine EE savings and code compliance
SCG	Commercial	HVAC	Fan Stop Delay HVAC Chip	New Measure
SCG	Commercial	HVAC	Space Heating/Hot Water Boilers	Update to DEEER 2016
SCE	Commercial	HVAC	Commercial Quality Renovation: Reduce Overventilation	WP doesn't exist. Proceeding through SCE's intake process. Lab testing and building energy simulation may be performed.
SCE	Commercial	HVAC	Commercial Quality Renovation: Duct Insulation	WP doesn't exist. Proceeding through SCE's intake process. Lab testing and building energy simulation may be performed.
SCE	Commercial	HVAC	Commercial Quality Renovation: Duct Leakage	WP doesn't exist. Proceeding through SCE's intake process. Lab testing and building energy simulation may be performed.
SCE	Commercial	HVAC	Commercial Quality Renovation: Static Pressure Reduction and Flow Optimization	WP doesn't exist. Proceeding through SCE's intake process.

PA	Sector	Tech Type	Measure/Value /Parameter	Reason for the Update/New Workpaper
				Lab testing and building energy simulation may be performed.
SCE	Commercial	HVAC	Smart Thermostat	WP doesn't exist. Study in progress.
SCE	Commercial	HVAC	Indirect Evaporative DOAS	WP doesn't exist. ET study in progress.
SCE	Commercial	HVAC	Commercial Quality Maintenance: Economizer Repair	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial	HVAC	Commercial Quality Maintenance: Economizer Control	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial	HVAC	Commercial Quality Maintenance: Programmable Thermostat	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial	HVAC	Commercial Quality Maintenance: Condenser Coil Cleaning	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial	HVAC	Commercial Quality Maintenance: Unoccupied Supply Fan Control	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial	HVAC	Commercial Quality Maintenance: Evaporator Coil Cleaning	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial	HVAC	Commercial Quality Maintenance: Refrigerant Charge	PG&E-led effort to update this work paper based on WO032.
SCE	Commercial	HVAC	Variable Refrigerant Flow Commercial Heat Pumps & Heat Recovery Systems >65kBtu/h	Existing work paper that was not approved by the ED. PG&E is leading the effort to revise the paper.
SCE	Residential	HVAC	Quality Installation For Residential Split Systems & Packaged Units	Communicating with ED on workpaper

PA	Sector	Tech Type	Measure/Value /Parameter	Reason for the Update/New Workpaper
				update process
PG&E	Commercial	HVAC	High Performance Evaporatively Pre-Cooled Condenser	New data
PG&E	Commercial	HVAC	Indirect Evaporative Dedicated Outdoor Air System (DOAS)	New data
PG&E	Commercial	HVAC	Economizer Control Commercial	New data
PG&E	Commercial	HVAC	Condenser Coil Cleaning Commercial	New data
PG&E	Commercial	HVAC	Unoccupied Supply Fan Control Commercial	New data
PG&E	Commercial	HVAC	Evaporator Coil Cleaning Commercial	New data
PG&E	Commercial	HVAC	Refrigerant Charge Commercial	New data
PG&E	Commercial	HVAC	PTAC/PTHP Controller	DEER Updates
PG&E	Commercial	HVAC	Economizer Repair	DEER Updates
PG&E	Commercial	HVAC	Economizer Control	DEER Updates
PG&E	Commercial	HVAC	Condenser Coil Cleaning	DEER Updates
PG&E	Commercial	HVAC	Unoccupied Supply Fan Control	DEER Updates
PG&E	Commercial	HVAC	Evaporator Coil Cleaning	DEER Updates
PG&E	Commercial	HVAC	Refrigerant Charge	DEER Updates
PG&E	Commercial	HVAC	Hot water boiler (< 300 kBTUh, 84.5% AFUE, forced draft)	DEER Updates
PG&E	Commercial	HVAC	Unitary Air-Cooled Air Conditioners/Heat Pumps < 6	DEER Updates
PG&E	Commercial	HVAC	Unitary Air Cooled 135-239kBtu/h 11.5 EER or 12.3 IEER	DEER Updates
PG&E	Commercial	HVAC	HVAC_VARIABLE_REFRIG_FLOW_HEAT_PUMP_<_80_TONS	DEER Updates
PG&E	Commercial	HVAC	Package/Split Water/Evap Cooled AC <65kBtu/h 14.0 EER (Single or 3-Phase Equipment)	DEER Updates
PG&E	Commercial	HVAC	15 SEER (12.72 EER) Split-System Air	DEER Updates

PA	Sector	Tech Type	Measure/Value /Parameter	Reason for the Update/New Workpaper
			Conditioner	

Summary of Identified Researchable Questions Not Addressed by Previous Research

Key Research Questions to be addressed in 2013-2015 EM&V

Table 30. 2013-2014 HVAC EM&V Research Questions Summary with 2015 Add-on

Study Name	Research Questions [2013-2015]
Impact	
Impact Evaluation of Commercial and proposed Residential Upstream HVAC Programs	• What are the first year and lifecycle gross and net kWh, kW and therm impacts?
Impact Evaluation of Residential and Commercial Quality Installation Programs and proposed incentives for "to code" installations in the Residential sector	• What are the first year and lifecycle gross and net kWh, kW and therm impacts?
Impact Evaluation of Residential and Commercial Quality Maintenance Programs	• What are the first year and lifecycle gross and net kWh, kW and therm impacts?
Impact Evaluation of Deemed HVAC Measures	• What field data can inform DEER updates and work paper review/revisions? • What measures and parameters should be studied in future impact evaluations?
HVAC Laboratory Testing	• What are the efficiency and capacity impacts of common HVAC system faults? • Can efficiency impact data on QM service actions provide data to improve diagnostic protocols and field test procedures?
HVAC System Evaluation Whitepaper	• Is there a methodology that is acceptable that measures the aggregate HVAC improvement savings as opposed to the current HVAC component/fault(s) methodology? • Is there a way to use interval data from advanced metering technology (1.e., "Smart Meters") to determine HVAC impact load shapes?

Study Name	Research Questions [2013-2015]
	• Can savings impacts from programs be determined in a more expedient, accurate, cost-effective manner than the current methodology? • Given the complexity of HVAC systems, can individual component/fault savings be standardized with robust certainty? • What combinations of measurements (air side, refrigerant, electrical) are needed to determine, with reasonable accuracy, pre- and post-treatment system efficiency improvement?
Market	
Market Assessment to Identify Baselines and Barriers for Existing HVAC Conditions, Building Permit and Title 24 Compliance	• What are the baselines for CA HVAC industry standard practice in obtaining building permits and achieving 2008 Title 24 compliance for Residential and Commercial HVAC equipment replacements?
Market Assessment of Residential and Commercial Customer Decision-making on High Efficiency HVAC Systems, Quality Maintenance and Quality Installation	• What are the drivers behind QI/QM/high efficiency customer purchasing decision-making across various market sectors?
Comparison of AMI Billing Analysis Methods for Estimating Energy Savings from Residential and Commercial Quality Maintenance	• What are effective methods for disaggregating HVAC loads from site loads? • What are effective methods for using whole building interval data for measuring the impacts of maintenance programs? • What opportunities exist for marrying load cycling with HVAC programs to optimize site energy consumption?
HVAC Contractor & Technician Behavior Phase II	• What opportunities and challenges surrounding HVAC contractor and technician behavior remain after the completion of the Phase I project?
Commercial Market Tracking Gap Analysis	• What are the gaps in our understanding of the current commercial HVAC maintenance market and practices? • How can filling in those gaps lead to better program design and influence? • Is there a neighboring HVAC market that provides a good barometer for the influence of California HVAC programs?
HVAC Permit Database	• What types of data do local municipalities track when issuing an HVAC permit? • How is this data stored (online system, excel spreadsheet, paper files, etc.)?

Study Name	Research Questions [2013-2015]
	• What similarities exist across municipalities' data tracking? • What information do IOUs need to effectively track their HVAC programs successfulness? • Can the IOUs perform any outreach with municipalities (i.e. through their local government partnerships) to create a better system of tracking data? • Can this data be housed in a central database for all IOUs usefulness? If so, can market/sales data be housed in this database as well to have all HVAC data in one location? • What does it mean to "get a permit" in each jurisdiction?

2.4.2. Study Description and Objectives

Proposed Specific Studies for 2013-2015

NOTE: Due to budget constraints only the prospective IOU studies that are identified as having a high priority are included in Table 31 below. The available 2013-14 budget for HVAC Evaluation Measurement and Verification (EM&V) studies were allocated to the studies shown in Table 31. The studies to be addressed in 2015 are shown in Table 22.

Table 31. 2013-2014 HVAC EM&V Studies, Budgets, and Timing

Study	Estimated Budget	Study Lead	Completion Date
Impact Evaluation of Commercial Upstream HVAC Programs	$1,950,000	ED	Q1 2016
Impact Evaluation of Residential Quality Installation Programs and pilot "to code" installation programs in the Residential sector	$300,000	ED	Q3 2016
Impact Evaluation of Commercial Quality Maintenance Programs	$1,530,000	ED	Q1 2016
Impact Evaluation of Deemed HVAC Measures	$300,000	ED	Q1 2016
HVAC Laboratory Testing	$1,000,000	ED	Q1 2016
Market Assessment to Identify Baselines and Barriers for Existing HVAC Conditions, Building Permit and Title 24 Compliance	$1,450,000	ED	Q3 2016
Market Assessment of Residential and Commercial Customer Decision-making on High Efficiency HVAC Systems, Quality Maintenance and Quality Installation	$300,000	IOU	April 2015
Comparison of AMI Billing Analysis Methods for Estimating Energy Savings from Residential and Commercial Quality Maintenance	$275,000	IOU	Q4 2015
HVAC Contractor & Technician Behavior Phase II	$250,000	IOU	April 2015
Total IOU HVAC EM&V Budget	**$825,000**		

Study	Estimated Budget	Study Lead	Completion Date
Total ED HVAC EM&V Budget	**$6,530,000**		
Total HVAC EM&V Budget	**$7,355,000**		

Table 32. 2015 HVAC EM&V Studies, Budgets, and Timing

Study	Estimated Budget	Study Lead	Completion Date
Impact Evaluation of Commercial and Residential Upstream HVAC Programs	$285,497	ED	Q1 2017
Impact Evaluation of Residential and Commercial Quality Maintenance Programs	$500,000	ED	Q1 2017
Impact Evaluation of Deemed HVAC Measures	$150,000	ED	Q1 2017
HVAC Laboratory Testing	$500,000	ED	Q1 2017
Market Assessment to Identify Baselines and Barriers for Existing HVAC Conditions, Building Permit and Title 24 Compliance	$325,000	ED	Q1 2017
HVAC System Evaluation versus Measure Evaluation – White Paper	$75,000	IOU	Q2 2016
Commercial Market Tracking Gap Analysis	$175,000	IOU	Q4 2016
HVAC Permitting Characterization	$60,000	IOU	Q3 2016
HVAC Billing Analysis with AMI Data: Phase II	$350,000	IOU	Q4 2016
Total ED HVAC EM&V Budget	**$1,760,497**		
Total IOU HVAC EM&V Budget	**$660,000**		
Total HVAC EM&V Budget	**$2,420,497**		

2013 2015 Study Descriptions for HVAC Programs

Study Title: Impact Evaluation of Commercial and Residential Upstream HVAC Programs	**Budget:** $1,950,000 2015 Add-on: $285,497
Expected 2013-14 Completion Date: Q1 2016 **Expected 2015 Completion Date:** Q1 2017	**Study Manager:** ED
Description: Objectives for this study are to quantify first year and lifecycle gross and net kWh, kW and therm impacts.	
Objective: • Commercial Upstream HVAC is a major component of the HVAC portfolio and the IOUs have included upstream incentive programs for residential sector in their portfolio for 2015. • Impact evaluation of these types of programs were included in the 2010-2012 HVAC evaluations, but critical questions still need to be addressed. • New commercial HVAC equipment efficiency standards will make it more difficult to claim savings from upstream HVAC programs. • The efficiency of HVAC equipment that is incentivized through the upstream program as installed is not well known and represents an important area of uncertainty.	

Study Title: Impact Evaluation of Commercial and Residential Upstream HVAC Programs	**Budget:** $1,950,000 2015 Add-on: $285,497
• Installation quality and distribution system efficiency are not well known in the general HVAC upgrade market.	
Key Research Questions: What are the first year and lifecycle gross and net kWh, kW and therm impacts?	
EM&V Methods: • Research Plan - http://www.energydataweb.com/cpucFiles/pdaDocs/1325/HVAC_1 Upstream research plan DRAFT final Public.pdf • Cover commercial HVAC equipment promoted by upstream program. Residential HVAC equipment may be included in 2015 based on program accomplishments. • Prioritize based on participation of HVAC units that are being incentivized in the upstream program. • Will cover split systems, packaged rooftop units, PTACs, and chillers. • Field measurement of key parameters of participant HVAC equipment across a variety of commercial building types and climate zones. May also include data collection of participants and non-participant residential HVAC equipment as the program becomes more mature. • 2015 Add-on will provide additional funding for activities to reduce parameter uncertainty of uncertain measures and potentially end use metering of those measures. A 2015 plan addendum will be developed to define the 2015 activity.	

Study Title: Impact Evaluation of Residential Quality Installation Programs	**Budget:** $300,000
Expected 2013-14 Completion Date: Q3 2016	**Study Manager:** ED
Description: Objectives for this study are to quantify first year and lifecycle gross and net kWh, kW and therm impacts.	
Objective: • Quality Installation programs are a key component of the overall goals for HVAC savings and for achieving the energy efficiency goals outlined in the CPUC Strategic Plan. • Residential QI was a component of the 2010-2012 evaluation, but the commercial programs have been slow to roll out or haven't been launched. The CPUC EE Decision on 2013-2014 IOU Applications directed the IOUs to create a pilot program for to code installations. • Savings are highly uncertain, causing relatively low projected budgets and savings goals for 2013-2015. • Benefits beyond Title 24 requirements for HVAC installations for new construction or time of replacement are not well known. • With growing interest in "whole building" design, especially because of AB 758 and Energy Upgrade California, there is a need to better understand how well HVAC contractors participating in IOU programs are ensuring maximized savings to their customers though ensuring the tightness of the building envelope and other "whole building" design aspects. • Rigorous study and quantification of QI savings is needed to assess the true potential for energy savings of these programs	
Key Research Questions:	

Study Title: Impact Evaluation of Residential Quality Installation Programs	**Budget:** $300,000
What are the first year and lifecycle gross and net kWh, kW and therm impacts?	
EM&V Methods: • Research Plan - http://www.energydataweb.com/cpucFiles/pdaDocs/1374/HVAC_2 QI and Code Compliance Research Plan Year 2 QI and CCIPP - Public Version.pdf • Process evaluations of QI and Code Compliance Incentive Pilot Programs. • Desk review of QI program participants and to-code installations. • Objectives are to gain a better understanding of first year and lifecycle gross and net kWh, kW and therm impacts of QI and code compliance efforts.	

Study Title: Impact Evaluation of Residential and Commercial Quality Maintenance Programs	**Budget:** $1,530,000 2015 Add-on: 500,000 (tentative)
Expected 2013-14 Completion Date: Q1 2016 **Expected 2015 Completion Date:** Q1 2017	**Study Manager:** ED
Description: Objectives for this study are to quantify first year and lifecycle gross and net kWh, kW and therm impacts.	
Objective: • Quality Maintenance programs are a key component of the overall goals for HVAC savings and for achieving the energy efficiency goals outlined in the CPUC Strategic Plan. • Commercial QM programs were a component of the 2010-2012 evaluation, but results were inconclusive. The program participation for residential QM has been slow to ramp up, but the IOUs are projecting in most cases increased participation in these programs going forward. • New program designs for 2013-2014 introduced multiple service actions for which impact data are sparse. • Program designs continued to evolve as 2010-2012 impact data became available; impact evaluations will likely need to be updated in 2013-2015 cycle as program designs change.	
Key Research Questions: What are the first year and lifecycle gross and net kWh, kW and therm impacts?	
EM&V Methods: • Research Plan - http://www.energydataweb.com/cpucFiles/pdaDocs/1373/HVAC3 Quality Maintenance Research Plan FINAL 2013-14.pdf • Impact evaluation covers commercial QM programs, with a focus on measures and treatments that are considered to have the highest impact in projected energy savings, such as a focus on RCA, coil cleaning, economizer maintenance and repair, thermostat replacement, and supply fan control in the Commercial sector. • Calibrated simulation modeling will be used to project annual savings from monitored data and estimate savings by individual service action. • 2015 Add-on will include billing analysis of residential participating units. Based on the IOU-led AMI Study results (completed Q4 2015), the 2015 Add-on may use billing-data based approaches for commercial QM as well. • 2015 Add-on will provide funding for additional commercial site visits. A 2015 plan addendum will be developed to define the 2015 activity.	

Study Title: Impact Evaluation of Deemed HVAC Measures	**Budget:** $300,000 2015 Add-on: $150,000 (tentative)
Expected 2013-14 Completion Date: Q2 2016 **Expected 2015 Completion Date:** Q2 2017	**Study Manager:** ED
Description: Objective is to provide field data for DEER updates and work paper review/revisions; and identify measures and parameters for future impact studies.	
Objective: • 2010-2012 HVAC evaluations have focused on a subset of deemed HVAC measures. • Custom HVAC measures are covered under custom program evaluation. • Gap exists for deemed HVAC measures that are not addressed in QI, QM or upstream rebate activities. Examples include ductless mini-split air conditioners and heat pumps, HVAC controls, VFDs for HVAC applications, boilers and furnaces.	
Key Research Questions: • What field data can inform DEER updates and work paper review/revisions? • What measures and parameters should be included in future EM&V studies?	
EM&V Methods: • Year 1 Report http://www.energydataweb.com/cpucFiles/pdaDocs/1284/DeemedHVACMeasures.pdf • Scope identified evaluation gaps based on a combination of the magnitude of the savings and the uncertainty in the DEER or work paper estimates. • Uncertainty analysis of selected measures • Information to inform other studies to conduct field data collection focusing on obtaining parameter level data as required to reducing savings uncertainty. • 2015 Add-on will provide additional funding to focus on the uncertainty of simulation based measures.	

Study Title: Laboratory Testing of HVAC QM procedures	**Budget:** $1,000,000 2015 Add-on: $500,000 (tentative)
Expected Completion Date: Q1 2016 **Expected 2015 Completion Date:** Q1 2017	**Study Manager:** ED
Description: Objectives are to obtain efficiency impact data on QM service actions and provide data to improve diagnostic protocols and field test procedures.	
Objective: • HVAC QM laboratory testing is an ongoing activity spanning multiple program cycles. • Laboratory testing provides impact data and insights into HVAC system response to service actions that are not possible in a field study. • Laboratory testing is seen as an integral part of the overall QM impact evaluation procedure.	
Key Research Questions: • What are the efficiency and capacity impacts of common HVAC system faults? • Can efficiency impact data on QM service actions and provide data to improve diagnostic protocols and field test procedures?	
EM&V Methods: • Research Plan -	

Study Title: Laboratory Testing of HVAC QM procedures	**Budget:** $1,000,000 2015 Add-on: $500,000 (tentative)
http://www.energydataweb.com/cpucFiles/pdaDocs/1205/LabTesting_Research_Plan_12-4-14_HVAC5.pdf • Additional tests identified in the 2013-2014 plans but not completed will be addressed during the 2015 cycle. Results from 2013-2014 testing may also suggest additional tests for the 2015 cycle. • Tests will be conducted in qualified laboratories following AHRI, ASHRAE and/or ANSI standards as applicable. • 2015 Add-on will continue the testing as done in previous cycles. A 2015 plan addendum will be developed to define the 2015 activity.	

Study Title: Market Assessment to Identify Baselines and Barriers for Existing HVAC Conditions, Building Permit and Title 24 Compliance	**Budget:** $1,450,000 2015 Add-on: $325,000 (tentative)
Expected Completion Date: Q3 2016 **Expected 2015 Completion Date:** Q1 2017	**Study Manager:** ED
Description: Objectives are to identify baselines for CA HVAC industry standard practice in obtaining building permits and achieving 2008 Title 24 compliance for Residential and Commercial HVAC equipment replacements.	
Objective: • As stated in SB 454, the State of California is interested in investigating the failure of contractors to comply with building energy efficiency standards (Title 24, Part 6) and to obtain required building permits[23]. To improve utility energy efficiency program effectiveness, as well as to inform state policy making, this study intends to identify baselines for CA HVAC industry standard practice in obtaining building permits and achieving 2008 Title 24 compliance for Residential and Commercial HVAC equipment replacements. Both baselines are hypothesized to be low and will be estimated in this study along with the impact of permits on costs and system performance. This study will attempt to produce a rigorous estimate (both a top down and bottom up perspective) of the current permitting in the state for HVAC installation in alterations to existing buildings (change-outs); the degree of variance across jurisdictions; reasons for variance; and if there are any lessons to be learned from the differences. This study will estimate the percent of projects that obtained required building permits and comply with building energy efficiency standards (Title 24, Part 6). • Investigate permitting and compliance separately to determine whether non-permitted projects are compliant and if permitted projects are compliant. • Evaluate efficacy of HERS raters and if inspected jobs meet Title 24 requirements. • Examine barriers and awareness of HERS raters on the code requirements and inspection processes. Identify knowledge gaps where training could help HERS raters to better impact compliance with Title 24 HVAC requirements.	
Key Research Questions: What are the baselines for CA HVAC industry standard practice in obtaining	

[23] http://www.leginfo.ca.gov/pub/11-12/bill/sen/sb_0451-0500/sb_454_cfa_20110516_105446_sen_comm.html

Study Title: Market Assessment to Identify Baselines and Barriers for Existing HVAC Conditions, Building Permit and Title 24 Compliance	**Budget:** $1,450,000 2015 Add-on: $325,000 (tentative)
building permits and achieving 2008 Title 24 compliance for Residential and Commercial HVAC equipment replacements?	

EM&V Methods:

- Research Plan – http://www.energydataweb.com/cpucFiles/pdaDocs/1239/HVAC WO6 Final MAPC Research Plan_25Feb2015.pdf
- Interim Memo #1 - http://www.energydataweb.com/cpucFiles/pdaDocs/1346/HVAC6 Memo on partial Compliance_31July2015-OUT.pdf
- The research focuses on the residential sector; however, it also includes a limited sample of nonresidential HVAC change-outs to investigate the presence of a permit and compliance requirements. The research will leverage data from previous studies were known change-outs occurred or where HVAC equipment is aging and has a higher probability of being replaced. The CA 2009 Residential Appliance Saturation Study (RASS) will be basis of the residential sample. The Commercial Market Share Tracking (CMST) YR 2012 will be the basis for the non-residential sample.
- For residential permit and compliance the research team will identify eligible sample and recruit for onsite inspections (regardless of the status of the permit).
- The team will on-site survey sample of RASS program participants (permitted/unpermitted) to obtain T24 compliance baseline estimates and collect data related to Title 24 2008 compliance requirements.
- The team will phone or site survey CA building departments to obtain permits from the site survey sample.
- Once an onsite has been completed the team will overlay the permit data collected at building departments and bin the results into categories of permitted and non-permitted. A statistician will extrapolate the compliance and permit results back to the population level.
- For commercial, the project will leverage data collected from CMST, analyze the field data for compliance analysis, and research the permit status. Borrowing methods from the residential approach, the team will report by category of permit and non-permit. A statistician will extrapolate the compliance and permit results back to the population level.
- To estimate the permit rate, the above methods will inform the "bottom-up" method. A second "top-down" method will be researched. For this method the team will collect permit data (multi-mode survey) from a sample of permit departments and reported sources to obtain total permit counts. To estimate total sales the team will leverage reports and public data such as AHRI.
- The project will conduct a thorough review and analysis of the documentation available in the HERS registry.
- This analysis will request a large volume of QA/QC test (i.e., two years' worth) to measure the frequency of errors found. The frequency of errors will then be extrapolated to the population of unaudited units to estimate the overall percent of projects that may be non-compliant.
- To examine barriers and awareness of HERS raters, the team will phone a sample of raters to inform the survey guide and conduct a multi-mode (most likely online survey) with experienced HVAC HERS raters.
- 2015 Add-on will provide additional budget to existing tasks (estimating top down permit rate, project and contractor management and final reporting).

Study Title: Market Assessment to Identify Baselines and Barriers for Existing HVAC Conditions, Building Permit and Title 24 Compliance	**Budget:** $1,450,000 2015 Add-on: $325,000 (tentative)
• 2015 Add-on will add additional market actor surveys or interviews as needed. A 2015 plan addendum will be developed to define the 2015 activity. • 2015 Add-on may verify permit status for HVAC programs and identify customers' barriers to permitting and compliance.	

Study Title: Market Assessment of Residential and Commercial Customer Decision-making on High Efficiency HVAC Systems, Quality Maintenance and Quality Installation Purchases	**Budget:** $300,000
Completed: April 2015	**Study Manager:** IOU
Description: Objective is to identify the drivers behind QI/QM/high efficiency customer purchasing decision-making across various market sectors.	
Objective: • Identify how the benefits of HVAC industry standards based quality maintenance and installation, and equipment efficiency are perceived by market actors. • In the context of leveraging consensus HVAC industry standards to define minimum service quality levels, identify 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 in manner that contractors understand and can meet with the appropriate QM/QI services (seek to align perspectives between demand and supply sides similar). • Address research priorities or data needs identified in the U.C. Davis Western Cooling Efficiency Center (WCEC) HVAC customer study [results pending].	
Key Research Questions: What are the drivers behind QI/QM/high efficiency customer purchasing decision-making across various market sectors?	
EM&V Methods: • Final Report - http://www.energydataweb.com/cpucFiles/pdaDocs/1269/CDM_Report_2015-04-15_FINAL.pdf • Coordinate sample design and data collection with site surveys during "Market Assessment: Identifying Baselines and Barriers for Existing HVAC Conditions, Building Permit and Title 24 Compliance" to survey QI/QM program participants and nonparticipants.	

Study Title: Comparison of AMI Billing Analysis Methods for Estimating Energy Savings from Residential Quality Installation and Quality Maintenance	**Budget:** $275,000
Expected Completion Date: Q4 2015	**Study Manager:** IOU
Description: Objectives are to explore methods for disaggregating HVAC loads from site loads, estimating savings from whole building interval data, and exploring opportunities for marrying load cycling with HVAC programs to optimize site energy consumption.	

Study Title: Comparison of AMI Billing Analysis Methods for Estimating Energy Savings from Residential Quality Installation and Quality Maintenance	**Budget:** $275,000
Objective: • Use billing regression models and AMI data to estimate HVAC program impacts when both whole-house AMI data and HVAC end-use metered data are available, and; • Use billing regression models and AMI data to estimate HVAC program impacts when only whole-house AMI data are available (i.e., no HVAC metered data are available).	
Key Research Questions: • What are effective methods for disaggregating HVAC loads from site loads? • How can these methods be adapted to measuring energy savings resulting from QI and QM activities?	
EM&V Methods: • End-use and whole building metering of residential buildings • Regression analysis of whole building data with comparison to end-use metering • Pre/post regression analysis of whole building interval data to estimate savings from RQI and RQM program participants	

Study Title: HVAC Contractor & Technician Behavior Phase II	**Budget:** $250,000
Completed: April 2015	**Study Manager:** IOU
Description: Objectives are to further understanding of the opportunities and challenges surrounding HVAC contractor and technician behavior.	

Objective:
• The objectives of this study are to better understand HVAC:
  ○ Training Needs – training and testing criteria necessary for certifications to meet/exceed HVAC service quality levels as defined by HVAC industry standards.
  ○ Quality Installation Skills Standards – estimate impacts of program requirements for skill standards that promote technician certifications on program participation rates as well as potential incremental costs and benefits for customers.
  ○ Technician Implementation Challenges – technological, communication, business model, etc. issues that technicians encounter in the field.
  ○ Business Models – approaches to aligning business model priorities with best practices from training to deliver QI/QM to meet/exceed HVAC service quality levels as defined by HVAC industry standards.
  ○ MTIs - Operationalize five HVAC Market Transformation Indicators for future data collection.
• Determine technicians' awareness and use of industry standards.
• Determine the roll and efficacy of various types of technician training and certification.	

Key Research Questions: What opportunities and challenges surrounding HVAC contractor and technician behavior remain after the completion of the Phase I project?	
Potential EM&V Methods: • Final Report - http://www.energydataweb.com/cpucFiles/pdaDocs/1292/HVAC C&T Behavior Phase2 FINAL REPORT.pdf	

Study Title: HVAC Contractor & Technician Behavior Phase II	**Budget:** $250,000
• Interviews with HVAC Contractors • Interviews with HVAC technicians • Interviews with market actors • Interviews with program implementers • Secondary research review to inform operationalization of MTIs	

Study Title: HVAC Full System Evaluation Whitepaper	**Budget:** $75,000
Expected Completion Date: Q2 2016	**Study Manager:** IOU (Statewide HVAC, SDG&E Lead)
Description: Determine if a full-system performance approach to measurement of HVAC maintenance savings is feasible and if so, what data collection needs and methodologies are needed.	
Objective: • Present a plausible alternative to the current measure-by-measure impact evaluation approach for HVAC system maintenance programs	
Key Research Questions: • Is there a methodology that is acceptable that measures the aggregate HVAC improvement savings as opposed to the current HVAC component/fault(s) methodology? • Can savings impacts from programs be determined in a more expedient, accurate, cost-effective manner than the current methodology? • Given the complexity of HVAC systems, can individual component/fault savings be standardized with robust certainty? • What combinations of measurements (air side, refrigerant, electrical) are needed to determine, with reasonable accuracy, pre- and post-treatment system efficiency improvement?	
Potential EM&V Methods: • Literature review • Identify the pros and cons of each methodology for HVAC evaluation. • In field and laboratory testing • Interview industry and technology experts	

Study Title: Customer Targeting Pilot Evaluation	**Budget:** $175,000
Expected Completion Date: Q4 2016	**Study Manager:** IOU (Statewide HVAC, PGE Lead)
Description: California is home to a diverse customer base, spread across highly varied climates. With limited program resources, more savings may be possible by targeting customers with new data analytics capabilities made possible with the advent of AMI data.	
Objective: • Provide EM&V support to determine both process improvements and challenges in implementing customer targeting schemes. Set the stage for better marketing efforts and program planning.	
Key Research Questions: • Can customer targeting be an effective program strategy to achieve greater savings and cost	

Study Title: Customer Targeting Pilot Evaluation	**Budget:** $175,000
effectiveness? • Can new billing analysis methods be used to provide quality metrics of program success?	
Potential EM&V Methods: • Surveys and interviews with important market actors • Billing analysis methods including random coefficients modeling	

Study Title: HVAC Permitting Characterization	**Budget:** $60,000
Expected Completion Date: Q4 2016	**Study Manager:** IOU (Statewide HVAC, SCG Lead)
Description: HVAC permitting rates in California are very low. In part this may be due to different and complex permitting procedures that vary by jurisdiction. This study will review similarities and differences that exist across municipalities' HVAC permit data collection and tracking. Best practices used by Building Departments in their data collection archival and retrieval processes will be identified. Using this information, recommendations will be developed to inform standardization of permitting procedures and required data across California building jurisdictions.	
Objective: • Conduct a study that reviews how local municipalities track HVAC permit data and what data they collect and store. Use this information to provide guidance on how the IOUs can create a protocol when obtaining HVAC permit data, so that data is uniform across all IOUs for use within the HVAC programs.	
Key Research Questions: • What are the best practices used by building departments in their permitting and data collection processes? • Which data are essential to include in permitting forms and fields and which data fields may be simplified or eliminated? • What additional data should be included in permitting forms for the benefit of utility program managers and evaluation? • From understanding gained through researching the first three items, how can permitting procedures and forms be standardized and streamlined across building jurisdictions?	
Potential EM&V Methods: • Literature review and interviews. • Potential problem: the IOUs do not have any authority over local municipalities.	

Study Title: HVAC Billing Analysis with AMI Data: Phase II	**Budget:** $350,000
Expected Completion Date: Q4 2016	**Study Manager:** IOU (Statewide HVAC, SCE Lead)
Description: Initial efforts to demonstrate the feasibility of using billing analysis techniques, especially the random coefficients modeling approach, have proven promising in the residential sector. This follow-on study will shore up any open methodological questions and determine if similar strategies can be used successfully in evaluation of commercial HVAC programs.	
Objective: • Address any outstanding issues remaining from Phase I of the billing analysis research on residential programs	

Study Title: HVAC Billing Analysis with AMI Data: Phase II	**Budget:** $350,000
• Determine if similar methods can be used effectively to evaluate commercial HVAC program savings.	
Key Research Questions: • What new evaluation methodologies can best take advantage of interval data? • Are these methodologies appropriate for impact evaluation? • Is the Random Coefficients Modeling approach useful for evaluation of savings from commercial HVAC programs?	
EM&V Methods: • Billing analysis methods including random coefficients modeling	

Other Important Considerations

It will be critical to leverage Codes & Standards/Zero Net Energy, Emerging Technologies, and Workforce Education & Training (WE&T) PCGs, as well as HVAC Action Plan and Codes & Standards Action Plan, efforts to optimize information sharing for research.

2.4.3. Research Questions for 2016 and Beyond

Proposed 2016 Energy Division Budget: $2,514,996

The upcoming years for the HVAC evaluation activities will continue to explore challenges with implementing and quantifying maintenance programs. It is anticipated that the completion of current studies may reveal new areas of interest, resolve outstanding issues, and reveal market study needs for the HVAC sector. Impact and uncertain parameter updates will continue to be an important focus for this research area. Evaluation adaptations emerging from the implementation of AB802 related to baseline changes and meter-based program designs may also need to be addressed in this evaluation plan for the future.

Proposed 2016 Program Administrator Budget: $310,000

Program Administrator budget allocations to specific studies have not yet been determined.

2.5. Local Government Partnerships

New for the 2013-2015 Cycle

In 2015, this chapter was reformatted to become a LGP (local government partnerships) – only document. The Institutional (State agency) Partnerships are now covered within the Commercial chapter and a new chapter was created for the REN (Regional Energy Networks) – CCA (Community Choice Aggregators) evaluation plans.

In 2014, the Energy Division (ED) introduced a new forum, the Stakeholder Advisory Group (StAG), to provide local governments and their partnership implementers a greater voice in matters pertaining to the local government sector's evaluation, measurement, and verification (EM&V) programming and project management decisions. In addition to local governments and partnership implementers, the StAG also includes the seven State energy efficiency (EE) program administrators. Together with other experts and advocates, the StAG engages in consensus-building discussions of local government-related EM&V projects via conference call six times per year.

The StAG is a new addition to the existing PCG for IOU LGPs. The PCG is an approximately monthly forum for the investor-owned utilities (IOUs) – who oversee administration of the State's more than fifty Local Government Partnerships (LGPs) – to engage with ED and consultant staff on EM&V planning and programming decisions.

Additionally, the IOUs host various PCG-like working groups to address LGP study progress, thereby offering additional ED-IOU coordination opportunities.

2.5.1. Background

The origins of local government partnerships date to 2002. In 2002-2003, the CPUC approved local government programs for IOU contract, and some local governments (LGs) operated building retrofit programs using other public funds. In 2003-2005, the CPUC expanded funding of local governments across the four IOUs (Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SoCalGas), and San Diego Gas & Electric (SDG&E)). This approval represented a major expansion in the number of LGPs and resources directed to LG-derived EE solutions.

LGPs are structured variously within the energy efficiency portfolio as city, county, and regional government-led partnerships. Also not uncommon is a private or non-profit implementer arrangement. Implementers typically handle IOU contracting issues, assist with goal setting and achievement, disburse funds to the partner LGs, and serve as the face of the partnership to the CPUC and other entities.

In addition, since 2012, the IOU local government partnerships' capacities and coverage have incrementally expanded in response to local government requests, demonstrated increased capacity, and the regional-solutions-based REN model. In PG&E's territory, this has translated to enhancing LGP decision-making latitude to further drive direct install (DI) projects under a regional LGP-implementer model. For SDG&E's part, the IOU has initiated a Regional Energy Partnership structure within its territory that promotes information sharing and knowledge transfer among local government partners. SCE and SoCalGas have introduced to their LGPs new project management services, which include engineering and contracting expertise and have closely coordinated to more seamlessly integrate their partnership portfolios.

The local government partnerships are not Statewide programs and thus the IOUs are afforded a degree of latitude in how they administer their LGP portfolios. The four IOUs operate their LGPs on a spectrum of resource to non-resource weighting. The spectrum has PG&E at the most resource-based end, with SoCalGas and SDG&E at the other end as entirely non-resource programs. In the middle is SCE, which treats efforts to address public buildings as resource programs. All four IOUs have some non-resource programs that address State Strategic Plan goals.

The IOU LGPs are expected to address some combination of the four program areas below. Generally the IOUs participating in the four program areas are noted in parentheses within the list below.
LGP program areas:

1. Public agency building retrofits, (all IOUs)[24]
2. Small commercial direct-install (PG&E),
3. Promotion of IOU core programs through marketing and outreach, (all IOUs) and
4. Policy and compliance activities that support the State EE Strategic Plan, which include code compliance, reach code adoption, climate action planning, general plan energy policy, etc. (all IOUs)

The result of the flexibility afforded the IOUs is four partnership models with relatively large variation that reflect the strengths of each IOU, its territory, and its business plan. For example, in 2013-2014 PG&E consolidated its third-party (3P) and LGP management sections into a single branch with the intent of allowing the LGPs to better inform and drive savings attributed to small commercial direct install projects. PG&E seeks to further improve its LGPs by more practically defining the geographic borders for its various third-party DI implementers' service areas.

SCE's Energy Leader Model places emphasis on demand response (DR) capacity commitments, public building upgrades, and recognition of local officials who champion EE. SoCalGas LGPs more or less mirror those of SCE and the two IOUs share partnership implementers and coordinate compliance filings and project opportunities to achieve deeper EE savings and capture synergies. SDG&E emphasizes solutions based around policy, codes, and carbon-reduction strategies in coordination with the local business community.
Highlights from the 2015 program year include the introduction of three new LGPs in the southern part of the State. Two are joint SCE-SoCalGas LGPs, North Orange County and SANBAG[25]; and the SCE-only High Desert LGP serves communities including and around Barstow and Victorville. In addition, three County partnerships with SCE, formerly within the State Partnerships grouping, were moved to LGPs: County of Los Angeles, County of Riverside, and County of San Bernardino. As a result, the three counties are now treated consistently as LGPs by both SoCalGas and SCE.

In 2015, the ED also directed the completion of the LGP Program Year (PY) 2013-2014 Value and Effectiveness Study Report. In addition, LGP stakeholders participated in a number of collaborative CPUC-sponsored meetings and workshops in 2014 and 2015 to provide feedback and guidance for this and other LG-related studies.

---

[24] This is largely a new program area for PG&E and is in response to the Prop. 39 funding infusion for EE projects for grades K-12. Thus, the PG&E LGPs' primary public building sphere is public schools.

[25] San Bernardino Associated Governments

Error! Reference source not found. presents the 2013-2015 projected savings goals and budgets for the local government partnerships and for verarching programs in support of the partnerships.

Table 33. 2013-2015 Local Government Partnerships and Overarching Programs in Support of Partnerships* Projected Savings and Budgets

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
Local Government Partnerships										
PGE	PGE211009	East Bay	44,131,041	5,141	91,421	$19,456,758	18,259,652	2,083	46,271	$9,262,008
PGE	PGE211024	San Francisco	28,495,260	3,717	29,809	$16,490,324	10,540,727	1,155	26,812	$7,832,558
PGE	PGE211023	Silicon Valley	11,352,877	1,491	-18,092	$8,219,790	5,032,799	551	12,766	$4,074,436
PGE	PGE211010	Fresno	9,045,015	1,160	13,843	$7,755,090	4,294,406	470	10,893	$3,846,492
PGE	PGE211007	Association of Monterey Bay Area Governments (AMBAG)	10,632,068	1,356	18,499	$7,227,269	4,660,021	535	15,481	$3,581,301
PGE	PGE211011	Kern	7,617,718	986	8,460	$6,432,391	3,474,566	380	8,814	$3,194,412
PGE	PGE211021	Sierra Nevada	7,213,980	844	6,016	$4,515,785	4,058,037	444	10,294	$2,560,460
PGE	PGE211019	San Mateo County	5,242,541	676	6,425	$3,516,790	2,437,076	267	6,182	$1,744,567
PGE	PGE211022	Sonoma County	4,458,682	568	9,357	$3,436,276	2,098,403	230	5,323	$1,709,718
PGE	PGE211016	Redwood Coast	4,334,230	566	4,356	$3,107,211	1,815,363	199	4,605	$1,556,910
PGE	PGE211013	Marin County	3,965,103	509	8,097	$2,873,510	1,266,902	139	3,214	$1,334,743
PGE	PGE211020	Santa Barbara	3,097,117	301	1,801	$2,392,726	1,584,050	173	4,018	$1,184,837
PGE	PGE211018	San Luis Obispo Co.	2,039,814	266	1,265	$1,864,617	938,913	103	2,382	$936,840

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
PGE	PGE211015	Napa County	1,516,974	197	981	$1,063,347	788,263	86	2,000	$549,632
PGE	PGE211012	Madera	1,025,222	135	-790	$886,821	359,486	39	912	$445,314
PGE	PGE211014	Mendocino County	651,031	85	133	$638,186	304,512	33	772	$322,506
SCE	SCE-13-L-002G	Community Energy Leader Partnership	7,979,871	2,004	0	$3,187,506	3,720,972	236	0	$1,838,227
SCE	SCE-13-L-002L	Orange County Cities Energy Leader Partnership	4,602,923	129	0	$2,195,768	2,605,538	21	0	$1,115,409
SCE	SCE-13-L-003C	County of Los Angeles Energy Efficiency Partnership	4,043,562	638	0	$2,157,985	2,155,500	215	0	$974,519
SCE	SCE-13-L-002N	San Joaquin Valley Energy Leader Partnership	4,912,040	1,351	0	$2,234,312	1,782,304	264	0	$894,159
SCE	SCE-13-L-002O	South Bay Energy Leader Partnership	3,420,003	659	0	$1,901,476	1,597,503	398	0	$1,112,391
SCE	SCE-13-L-002Q	Ventura County Energy Leader Partnership	1,113,139	291	0	$1,324,706	1,732,500	197	0	$893,279
SCE	SCE-13-L-002F	Gateway Cities Energy Leader Partnership	2,192,740	137	0	$1,145,487	1,611,555	153	0	$676,543
SCE	SCE-13-L-	San Gabriel	3,550,121	12	0	$1,188,936	1,099,917	48	0	$583,199

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
	002M	Valley Energy Leader Partnership								
SCE	SCE-13-L-003E	County of San Bernardino Energy Efficiency Partnership	1,906,777	436	0	$983,953	927,511	127	0	$570,078
SCE	SCE-13-L-003D	County of Riverside Energy Efficiency Partnership	1,906,777	320	0	$1,013,954	927,000	167	0	$448,865
SCE	SCE-13-L-002J	Desert Cities Energy Leader Partnership	1,189,079	215	0	$878,747	694,533	177	0	$441,977
SCE	SCE-13-L-002R	Western Riverside Energy Leader Partnership	1,350,000	195	0	$863,163	774,000	126	0	$447,518
SCE	SCE-13-L-002P	South Santa Barbara County Energy Leader Partnership	1,429,737	380	0	$810,580	494,770	62	0	$362,010
SCE	SCE-13-L-002D	City of Santa Ana Energy Leader Partnership	1,257,033	314	0	$632,199	1,572,769	162	0	$529,884
SCE	SCE-13-L-002B	City of Long Beach Energy	1,476,000	254	0	$544,043	1,026,000	151	0	$282,379

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
		Leader Partnership								
SCE	SCE-13-L-002C	City of Redlands Energy Leader Partnership	1,620,000	284	0	$547,819	306,000	66	0	$173,306
SCE	SCE-13-L-002T	West Side Energy Leader Partnership	563,356	94	0	$405,647	379,180	57	0	$249,222
SCE	SCE-13-L-002K	Kern County Energy Leader Partnership	135,000	25	0	$468,659	19,717	3	0	$183,071
SCE	SCE-13-L-002H	Eastern Sierra Energy Leader Partnership	55,445	3	0	$335,038	80,100	17	0	$160,326
SCE	SCE-13-L-002S	City of Adelanto Energy Leader Partnership	694,922	111	0	$309,963	233,894	1	0	$141,699
SCE	SCE-13-L-002A	City of Beaumont Energy Leader Partnership	180,000	41	0	$188,982	139,500	20	0	$104,193
SCE	SCE-13-L-002E	City of Simi Valley Energy Leader Partnership	104,494	25	0	$163,970	162,484	9	0	$126,492
SCG	SCG3777	LGP-San Gabriel Valley COG Partnership	0	0	0	$480,505	0	0	0	$249,015
SCG	SCG3742	LGP-LA Co Partnership	0	0	0	$433,946	0	0	0	$227,492

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
SCG	SCG3783	LGP-Western Riverside Energy Partnership	0	0	0	$391,255	0	0	0	$195,427
SCG	SCG3754	LGP-Ventura County Partnership	0	0	0	$336,161	0	0	0	$171,544
SCG	SCG3776	LGP-Gateway Cities Partnership	0	0	0	$326,123	0	0	0	$174,765
SCG	SCG3747	LGP-South Bay Cities Partnership	0	0	0	$307,932	0	0	0	$156,042
SCG	SCG3744	LGP-Riverside Co Partnership	0	0	0	$294,117	0	0	0	$141,676
SCG	SCG3745	LGP-San Bernardino Co Partnership	0	0	0	$289,717	0	0	0	$142,985
SCG	SCG3750	LGP-Orange Co Partnership	0	0	0	$271,938	0	0	0	$153,703
SCG	SCG3752	LGP-Community Energy Partnership	0	0	0	$252,647	0	0	0	$139,684
SCE	SCE-13-L-002A	City of Beaumont Energy Leader Partnership	180,000	41	0	$188,982	139,500	20	0	$104,193
SCE	SCE-13-L-002E	City of Simi Valley Energy	104,494	25	0	$163,970	162,484	9	0	$126,492

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
		Leader Partnership								
SCG	SCG3777	LGP-San Gabriel Valley COG Partnership	0	0	0	$480,505	0	0	0	$249,015
SCG	SCG3742	LGP-LA Co Partnership	0	0	0	$433,946	0	0	0	$227,492
SCG	SCG3783	LGP-Western Riverside Energy Partnership	0	0	0	$391,255	0	0	0	$195,427
SCG	SCG3754	LGP-Ventura County Partnership	0	0	0	$336,161	0	0	0	$171,544
SCG	SCG3776	LGP-Gateway Cities Partnership	0	0	0	$326,123	0	0	0	$174,765
SCG	SCG3747	LGP-South Bay Cities Partnership	0	0	0	$307,932	0	0	0	$156,042
SCG	SCG3744	LGP-Riverside Co Partnership	0	0	0	$294,117	0	0	0	$141,676
SCG	SCG3745	LGP-San Bernardino Co Partnership	0	0	0	$289,717	0	0	0	$142,985
SCG	SCG3750	LGP-Orange Co Partnership	0	0	0	$271,938	0	0	0	$153,703
SCG	SCG3752	LGP-Community	0	0	0	$252,647	0	0	0	$139,684

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
		Energy Partnership								
SCG	SCG3746	LGP-Santa Barbara Co Partnership	0	0	0	$229,294	0	0	0	$123,769
SCG	SCG3748	LGP-San Luis Obispo Co Partnership	0	0	0	$214,563	0	0	0	$102,309
SCG	SCG3743	LGP-Kern Co Partnership	0	0	0	$208,464	0	0	0	$104,789
SCG	SCG3749	LGP-San Joaquin Valley Partnership	0	0	0	$194,289	0	0	0	$115,285
SCG	SCG3778	LGP-City of Santa Ana Partnership	0	0	0	$143,792	0	0	0	$79,437
SCG	SCG3781	LGP-City of Redlands Pilots	0	0	0	$120,067	0	0	0	$61,966
SCG	SCG3782	LGP-City of Beaumont Programs	0	0	0	$102,645	0	0	0	$53,770
SCG	SCG3780	LGP-City of Simi Valley Partnership	0	0	0	$98,508	0	0	0	$48,213
SCG	SCG3779	LGP-West Side Cities Partnership	0	0	0	$98,133	0	0	0	$47,822
SCG	SCG3753	LGP-Desert Cities	0	0	0	$50,600	0	0	0	$18,034

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
		Partnership								
SDGE	SDGE3272	LGP- City of Chula Vista Partnership	0	0	0	$3,564,404	0	0	0	$1,776,753
SDGE	SDGE3273	LGP- City of San Diego Partnership	0	0	0	$2,978,647	0	0	0	$1,479,552
SDGE	SDGE3274	LGP- County of San Diego Partnership	0	0	0	$2,458,250	0	0	0	$1,224,966
SDGE	SDGE3275	LGP- Port of San Diego Partnership	0	0	0	$1,730,215	0	0	0	$862,180
SDGE	SDGE3276	LGP- SANDAG Partnership	0	0	0	$1,531,845	0	0	0	$763,331
Local Government Partnership Subtotal			**190,501,692**	**25,914**	**181,582**	**$130,467,843**	**85,956,424**	**9,565**	**160,739**	**$65,059,987**
Programs Supporting Partnerships										
PGE	PGE2110051	Local Government Energy Action Resources (LGEAR)	11,207,818	1,421	20,800	$11,069,691	6,660,902	763	22,004	$5,500,535
PGE	PGE2110052	Strategic Energy Resources	0	0	0	$5,474,467	0	0	0	$2,764,003
SCE	SCE-13-L-002U	Local Government Strategic	0	0	0	$7,528,395	0	0	0	$0

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
		Planning Pilot Program								
SCE	SCE-13-L-002Rollup	Energy Leader Partnership Program	2,471,914	434	0	$1,246,707	0	0	0	$0
SCE	SCE-13-L-002I	Energy Leader Partnership Strategic Support	0	0	0	$957,085	0	0	0	$450,115
SCG	SCG3774	LGP-LG Regional Resource Placeholder	0	0	0	$644,867	0	0	0	$325,955
SCG	SCG3773	LGP-New Partnership Programs	0	0	0	$596,871	0	0	0	$299,443
SCG	SCG3755	LGP-Local Government Energy Efficiency Pilots	0	0	0	$430,000	0	0	0	$215,000
SCG	SCG3751	LGP-SEEC Partnership	0	0	0	$295,394	0	0	0	$147,698
SDGE	SDGE3278	LGP- Emerging Cities Partnership	0	0	0	$759,213	0	0	0	$378,322
SDGE	SDGE3277	LGP- SEEC Partnership	0	0	0	$345,038	0	0	0	$171,936
Programs Supporting Partnerships Subtotal			**13,679,731**	**1,854**	**20,800**	**29,347,729**	**6,660,902**	**763**	**22,004**	**10,253,007**

IOU	Program ID	Program Name	2013-2014 Program Cycle				2015 Program Cycle			
			Projected Energy Savings (kWh)	Projected Demand Reduction (kW)	Projected Gas Savings (Therm)	Projected Program Budget	Projected Energy Savings (kWh)	Projected Demand Reductio n (kW)	Projected Gas Savings (Therm)	Projected Program Budget
Total Local Government Partnerships ('000s)			**204,181**	**28**	**202**	**$159,816**	**92,617**	**10**	**183**	**$75,313**
Total EE Portfolio ('000s)			**4,521,314**	**868**	**126,755**	**$2,650,178**	**2,036,397**	**351**	**61,494**	**$1,334,194**
Percentage of Total EE Portfolio			**5%**	**3%**	**0.2%**	**6%**	**5%**	**3%**	**0.3%**	**6%**

Data taken from the California Energy Efficiency Website, August 2015. http://eestats.cpuc.ca.gov/Views/EEDataPortal.aspx/

2.5.2. Conditions Affecting Local Government Partnerships

With the U.S. economy earnestly recovering from the Great Recession, local agencies have begun to rebound from the staff layoffs that began in late 2008 and persisted until about mid-2013. The upshot of the improved economic outlook is that local agencies may be in a better position to elevate energy efficiency efforts as a priority and to put resources toward the State's climate goals. Still, some local governments in California continue to struggle financially and their ability to deliver beyond core public health and safety services remains constrained. One example, the SCE-SoCalGas Lancaster LGP, dating to 2012, will be folding as of January 2016 due to acute budget issues at the city that have led to deep staff layoffs.

Challenges in obtaining quality and affordable program evaluations within the IOU LGP sector include the absence of Statewide program uniformity that results in four IOU models with different emphases and resource-to-non-resource treatment, subpar data collection and reporting, and a vast and diverse sector with approximately 55 LGPs spanning all 58 California counties (and many more cities) except for those few counties outside an IOU territory. Thus, a starting point for effective evaluation of this sector would be to recognize and comprehend each IOU's approach to exercising its discretion in how to administer its LGP programs.

2.5.3. 2013-2014 Local Government Partnerships EM&V Studies

Error! Reference source not found. presents the EM&V studies and budgets funded through the 2013-014 cycle.

Table 34. 2013-2014 Local Government Partnerships EM&V Studies, Budgets, and Expected Dates of Completion

2013-2014 Study Area/Title	Study Type	Study Manager (Energy Division/IOU)	Budget	Completion Date
Studies Underway				
Local Government Partnerships Value and Effectiveness Study	Process	Energy Division	$250,000	Q4 2015
Targeted Process Evaluation of IOU Local Government Partnerships	Process	IOU (SCE)	$490,000	Q3 2016
Process and Effectiveness Evaluation of SCE Energy Leader Model	Process	IOU (SCE)	$225,000	Q2 2016
Studies Budgeted and Scoped, but not yet Underway				
Impact Assessment of LGPs	Impact	Energy Division	$150,000*	Q2 2017

*The budget allocated for this study is being combined with 2015 funds to complete a single 2013-2015 Impact Assessment of LGPs. For details, see the Post 2014 Local Government Partnerships EM&V Studies section below.

2.5.4. 2013-2014 Local Government Partnerships EM&V Study Descriptions

This section provides short descriptions, objectives, and key research questions of each of the 2013-2014 studies.

Study Title: Local Government Partnerships Value and Effectiveness Study	**Budget:** $250,000
Completion Date: Q4 2015	**Study Manager:** Energy Division
Description: Evaluation study assessed the value and effectiveness of the LGPs' Strategic Plan activities for 2013-2014.	
Objective: Understand the value and effectiveness of LGPs' Strategic Plan projects through a targeted assessment of the Strategic Plan projects and a broader look at the IOU management of the LGPs with regard to the projects.	
In the research questions listed below, Strategic Plan projects refer to the non-resource Strategic Plan projects funded outside of the main funding for the local government partnerships (LGP). **Key Research Questions:** The key research questions for this study are as follows: • What mechanisms do the IOUs use to determine eligibility for funding of Strategic Plan projects? • How aligned are the Strategic Plan projects with the energy efficiency and climate change goals within the Strategic Plan? • How much have the Strategic Plan projects contributed toward Strategic Plan goals? • What have LGPs and Strategic Plan projects accomplished compared to the original scopes of work for these efforts? • What barriers and challenges have the LGPs and Strategic Plan projects encountered in implementing their work scope? • What factors and metrics led to perceived "successes" within the implementation of LGP and Strategic Plan projects? • How do the IOUs administer the LGPs? • How are the Strategic Plan projects managed? • Should the CPUC use prior local governments' EE program performance—such as an energy efficiency savings threshold, or the adoption of related enabling policy language—as a prerequisite to making Strategic Plan projects funds available to local governments, and how might such a reform support Strategic Plan goals? • Can a predictive tool be developed to identify local governments that have the highest potential for success as sponsors of Strategic Plan goals? Are there correlates with effective implementation? • Across California, how does IOU program administration of their LGP portfolios impact the local governments' ability to meet Strategic Plan goals?	
EM&V Data Collection Methods: The Consultant Team collected primary data from depth interviews and an internet survey. The Consultant Team also performed extensive secondary data collection to capture the specifics around each Strategic Plan project.	

Study Title: Impact Assessment of LGPs	**Budget:** $150,000 (budget has not been spent and will be combined with 2015 budget of $280,000 for a 2013-2015 Impact Assessment of LGPs)
Expected Completion Date: Q2 2017	**Study Manager:** Energy Division
Description: See Post-2014 Studies section for a description of a programmed LGP Impact study that would address PYs 2013 through 2015.	

Study Title: Targeted Process Evaluation of IOU Local Government Partnerships	**Budget:** $490,000
Expected Completion Date: Q3 2016	**Study Manager:** IOU (SCE)
Description: PY 2013-2014 phase of ongoing process assessments of LGP activities, performance, and savings targets achievements. Budget includes both 2013-2014 funds ($365,000) and funds for a market assessment to aid post-2014 program design ($125,000).	
Objectives: The IOUs have proposed within this study to identify a set of high-priority LGPs activities that would undergo a process evaluation. This approach would identify a handful of LGPs to examine every year or two within a process study. It is expected that the process assessment scope would include municipal retrofits and Strategic Plan support activities, which have not yet been evaluated and which are non-duplicative with existing study efforts. In order to better facilitate this endeavor, the IOUs propose that determining common criteria by which LGPs can be categorized is a necessary precursor. This PY 2013-2014 would derive such LGP category criteria. It is expected that this Targeted Process Evaluation would be the first in a series of Rolling Targeted Process Evaluations, which would focus on the municipal building retrofits and Strategic Plan support activities components of the LGPs. These program areas have not yet been thoroughly evaluated; this study would assure that any duplication with existing study efforts would be minimized.	

Study Title: Targeted Process Evaluation of IOU Local Government Partnerships	**Budget:** $490,000
Key Research Questions: • How can LGPs be categorized to facilitate appropriate comparisons ("apples-to-apples")? Would IOU program management benefit from a customization of these statewide standard categories? If so, in what way? • At a high level, what have been LGPs' primary achievements and challenges? How do achievements and challenges differ by LGP category? • What are common LGP program processes? How do these practices differ by LGP category? • What processes appear most effective? How do these practices differ by LGP category? • What are opportunities for the IOUs to improve program outcomes? Do the individual IOUs need customized metrics and milestones? • For each Strategic Plan menu item, why have the IOUs struggled with assessing program performance and reporting results? Would each IOU benefit from having a customized Strategic Plan menu? • How can IOUs improve project performance reporting such as building type, building vintage, and building square footage to better inform the how the LGPs are contributing to State goals? • How many local governments have some type of Energy Management System (EMS)? How have they been using them? What achievements have the use of an EMS enabled? How many local governments link EMS data to other databases? • How have the LGs shared resources across areas and regions? Are significant LGP-to-LGP knowledge transfer lines of communication established? • To what extent do ratepayer dollars fund local government staff positions? Are staff positions within joint powers authorities or councils of governments?	

Study Title: Process and Effectiveness Evaluation of SCE's Energy Leader Model (SCE)	**Budget:** $225,000
Expected Completion Date: Q2 2016	**Study Manager:** IOU (SCE)
Description: Process Evaluation	
Objective: Study would be the first broad evaluation of the SCE Energy Leader Program (ELP) model since it was introduced in 2008. SCE seeks to demonstrate that the ELP is well received by the partners and results in its intended effect of building capacity via gradually paying greater incentive levels based on certain LG accomplishments. The CPUC seeks to learn whether the ELP effectively administers opportunities as LGP success is demonstrated. CPUC seeks to understand whether some Statewide graduated LGP model is warranted.	
Key Research Questions: • What are the value, merit, and effectiveness of SCE's ELP model in motivating achievements of, and building capacity within, LGs? • What are the factors driving success? How can SCE build on its success to improve the program?	

Study Title: Process and Effectiveness Evaluation of SCE's Energy Leader Model (SCE)	**Budget:** $225,000
What elements, if any, might be appropriate to extend statewide or, conversely, to discontinue? • How do SCE-provided technical experts facilitate capacity and savings in LGs? • What is current LG capacity? What is the likelihood that the ELP model offers a viable strategy for increasing that capacity? Are some LGs or types of LGs more likely to benefit from the ELP program model?[26]	
EM&V Methods: • Review of program documents and records • In-depth interviews with three to four key SCE and SCG program staff • In-depth interviews with up to 20 program staff and contractors from SCE and SCG[27] • Interviews with contacts for up to 18 sampled LGs	

2.5.5. Post-2014 Local Government Partnerships EM&V Studies

The CPUC has made funding available for supplementing PY 2013-2014 studies to address PY 2015 program activities as well as to undertake new studies. **Error! Reference source not found.** shows the our proposed Energy Division-led studies and one proposed IOU-study that will rely on 2015 or later funds.

Table 35. Post-2014 Local Government Partnerships EM&V Studies, Budgets, and Expected Dates of Completion

2015 Study Area/Title	Study Type	Study Manager (Energy Division/IOU)	Budget	Completion Date
Studies Proposed, but not yet Scoped				
Impact Evaluation of the LGPs	Impact	Energy Division	$280,000	Q2 2017
Local Government Partnerships Process Study: Assessing the LGP – DI Nexus	Process	Energy Division	$125,000	Q1 2017
Local Government Partnerships Process Study: Assessing Potential Organizational Reforms and Synergies	Process	Energy Division	$125,000	Q4 2017
Local Government Partnerships Process Study: Assessing Potential Structural, Regulatory, and Budgetary Reforms	Process	Energy Division	$125,000	Q4 2017

[26] Excerpted from the RIA Research Plan, September 10, 2015, pp. 2-3.

[27] A review of SCE and SCG program documents indicates that are nine staff members involved in managing SCE's non-institutional partnerships and eight staff members involved in managing SCG's partnerships.

2015 Study Area/Title	Study Type	Study Manager (Energy Division/IOU)	Budget	Completion Date
Local Government Partnerships Rolling Process Evaluations	Process	IOU	$295,000	TBD

2.5.6. Post-2014 Local Government Partnerships EM&V Study Descriptions

This section provides short descriptions, objectives, and key research questions of each of the post-2014 Local Government Partnership EM&V studies.

Study Title: Impact Evaluation of LGPs	**Budget:** $280,000 (combined with 2013-2014 budget of $150,000 for a total of $430,000 to fund a 2013-2015 Impact Evaluation of LGPs)
Expected Completion Date: Q2 2017	**Study Manager:** Energy Division
Description: This study will develop ex post savings estimates of net and gross savings values for the LGP programs for the 2013-2015 period. The evaluation will focus on high uncertainty measures or key measure-parameters (e.g., operating hours for LED lamps) and rely on a combination of new data collection, and existing data from relevant 2010-12 and 2013-14 impact evaluations. The study team will combine a 2013-2014 impact evaluation with the 2015 impact evaluation of LGPs; however, interim results will be developed prior to the completion of this study to focus on 2013-14 participation. This study will be conducted under the LGP/REN Nonresidential Downstream Impact Evaluation Work Order.	
Objectives: • Estimate LGP program group-specific gross impact parameters for measures with high uncertainty that are significant contributors to the LGP programs. • Estimate net-to-gross ratios (NTGRs) for the LGP programs as a whole and for key grouping of LGP programs (such as by program administrator, and/or by delivery mechanism [e.g., direct install versus non-direct install]). • To increase the reliability of results, this evaluation will be combined with funding from the 2015 evaluation so the study will span 2013-2015 participants.	
Key Research Questions: • What are the ex post gross savings values for LGP programs? • What are the NTGRs for LGP programs? • Sempra IOUs treat their LGPs entirely as non-resource programs. How is this arrangement working out? Does it allow for adequate tracking and performance evaluability of the Sempra LGPs? Does the arrangement create any challenges in comparing the IOUs across territories or measuring the Statewide contribution of the LGPs across the IOUs? • Sempra IOUs claim some savings from the LGPs within their core programs. What is the quantity of these savings, where to do the savings appear, how are they tracked and reported, and how evaluable are these savings?	
Potential EM&V Methods: Telephone surveys to develop NTGRs, on-site verification, and monitoring to estimate key parameters for high uncertainty measures. These data will include a combination of	

Study Title: Impact Evaluation of LGPs	**Budget:** $280,000 (combined with 2013-2014 budget of $150,000 for a total of $430,000 to fund a 2013-2015 Impact Evaluation of LGPs)
new data collection, and existing data from relevant 2010-12 and 2013-14 CPUC impact evaluations.	

Study Title: Local Government Partnerships Process Study: Assessing the LGP-DI Nexus	**Budget:** $125,000
Expected Completion Date: Q1 2017	**Study Manager:** Energy Division
Description: An examination of how the IOUs deliver Direct Install (DI) within and outside of their LGPs, PG&E's experience with regional DI and SCE's experimentation with DI and if replicating either Statewide is appropriate. Assessing SDG&E LGP-DI model and its appropriateness. Examining potential for SCG to begin delivering DI. Additionally, the study will focus on a handful of DI programs that interface with LGPs such as those across the state in small commercial, residential, and public sectors, including statewide Middle Income Direct Install (MIDI), SCE manufactured homes, SCE municipal DI, and PG&E Lodging Savers. The study will examine various DI models in place at each IOU, the result of IOU trials and innovations such as required co-pays, and IOU-local government co-branding marketing efforts, all of which would provide the CPUC a better understanding of the ties and co-dependencies between DI and LGPs, and whether small commercial savings is an appropriate LGP requirement.	
Objectives: Improve CPUC understanding of DI and LGP coordination, potential, and opportunity.	

Study Title: Local Government Partnerships Process Study: Assessing the LGP-DI Nexus	**Budget:** $125,000
Research Questions: • What is the benefit and origin of the IOUs routing DI program savings and budgets through the LGPs? • Do no-cost municipal DI offerings made available directly to LGs undermine the effectiveness of the LGPs who may have other ideas about savings and budget priorities and goals? • Should LGPs have some say in the goals or hiring and firing of the 3P program DI providers given their budget and savings ties? • Should there be an onramp period for advanced LGPs with DI implementation experience to have some first right of refusal? • What have been the barriers to LGPs coordinating Utility DI programs? (e.g., multiple 3rd Party vendors serving an LG, different 3rd Party vendors for SCE and SCG-only, etc.)? • What is the track record of DI 3P implementers with accommodating LGPs in terms of responsiveness to LGP requests, sharing data, and program coordination? • Is PG&E's limited experience of allowing LGPs to conduct limited Direct Install oversight activities yielding intended benefits? • Is PG&E's recent reorganization to remove silos by organizing their LGPs and 3P programs under the same EE management team paying off in terms of improved coordination, EE savings, and LG buy in? • Is PG&E's recent move to eliminate no-cost DI in favor of a tiered copay arrangement yielding intended benefits? • Is PG&E's recent reform to divide its territory into sub regions with their own savings goals for their LGPs' Regional Direct Install effort yielding intended benefits? • Does DI "cream skimming" negatively impact the potential for comprehensive retrofits? • Does the Direct Install program's focus on "low hanging fruit" affect the likelihood of an LG pursuing a comprehensive retrofit later given extended paybacks?	
Potential EM&V Methods: Investigate through field visits, interviews, financial and data analysis, cause and effect. Interviews with all parties within the DI-LGP sphere. Data requests and review of public filings. [*This study will be coordinated with the DI study being completed in the SM Com Sector]*	

Study Title: Local Government Partnerships Process Study: Assessing Potential Organizational Reforms and Synergies	**Budget:** $125,000
Expected Completion Date: Q4 2017	**Study Manager:** Energy Division
Description: This process study would address the function and role of the LGP implementer. The study would consider whether there is some ideal number of local governments served within an LGP, and whether market exclusivity makes sense (i.e., one LGP per county). Also would examine the appropriateness of single-LG LGP arrangement and, LGPs with the absence of designated implementer. Examine contracting issues including the potential benefit of assigned due dates. Study how LGP expectations and understanding of goals, performance, and opportunities are determined,	

Study Title: Local Government Partnerships Process Study: Assessing Potential Organizational Reforms and Synergies	**Budget:** $125,000
tracked, and communicated by the IOUs.	
Objectives: Improve Energy Division understanding of the role of the LGP implementer and LGP opportunities to contribute to their program assignments. Gauge LGPs well as satisfaction levels with existing contract arrangements, resource levels, and assigned markets and measures.	
Key Research Questions: • Are there correlations between certain LG characteristics (such as size, geography, staff experience, etc.) and likelihood of successful achievement of Strategic Plan goals? • How does it work out to have multiple LGPs within a single county? Are there natural LGP territories? Is a single local government LGP structure efficient and practical? • Should local government agencies be guaranteed a first right of refusal as LGP implementers? • Do third-party implementers staffing levels respond more easily to adding new LGP ratepayer funded staff positions than public agencies? • Across California, how does IOU program administration of their LGP portfolios affect the LGs' ability to meet Strategic Plan goals? • How frequent is the use of Strategic Plan funding to backfill local agency staff time and materials, and is this an appropriate use of these funds? • To what extent are LGPs pursuing initiatives that are similar to those being delivered at larger geographic scales (such as via third party or statewide programs)? • For areas of program overlap, what are the merits of program delivery at each scale, and what criteria could be used to determine which scale is most appropriate? • What benefit would there be to a tiered, graduated approach to LGPs statewide?	
EM&V Data Collection Methods: TBD	

Study Title: Local Government Partnerships and Local Government Relations and Affairs Process Study: Assessing Potential Structural, Regulatory, and Budgetary Reforms	**Budget:** $125,000
Expected Completion Date: Q4 2017	**Study Manager:** Energy Division
Description: Not Yet Scoped	
Objective: Improve Energy Division's understanding of LGP implementer importance and value in serving as a conduit for IOU communication and directives to partner local governments. • Improve Energy Division's understanding of IOU communication with local government officials and how such engagement impacts ability of LGPs to deliver cost-effective EE. • Improve Energy Division's understanding of the effects of IOU staff serving as local government officials and whether some restrictions are warranted. • Examine whether limitations on certain communications or required disclosures are appropriate for IOU communication local government elected leaders and high-level public agency staff.	
Key Research Questions: TBD	
EM&V Data Collection Methods: TBD	

Study Title: Local Government Partnerships Rolling Comprehensive Process Evaluations	**Budget:** $295,000
Expected Completion Date: TBD	**Study Manager:** IOU
Description: Each IOU will conduct comprehensive process evaluations on several of its LGPs each year, which it is thought would add some depth to an evaluation. By rotating to a new IOU each year, it is thought that each LGP in an IOU service territory will receive a comprehensive process evaluation every four or five years. Each IOU will oversee the evaluations for its own LGPs. One common scope of work would be used for all individual process evaluations of LGPs so that findings can be compared year after year. The specific number of LGPs to be evaluated in each year will depend on the available budget each year. To avoid duplication with existing studies, at the start of each process evaluation, the IOUs will research and disclose those issues addressed by other LGP evaluation studies either planned or in progress. For 2015, the number of LGPs to be evaluated is yet to be determined but shall specifically include the Los Angeles County Partnership, the Riverside County Partnership, and the San Bernardino County Partnership as per the direction of the Energy Division on May 20, 2015.	
Objectives: 1) Provide full documentation of each LGP's suite of activities at the time of the evaluation; 2) Provide customized recommendations to each LGP on how they can improve their progress towards their filed program objectives, taking into account the unique nature of each local government; 3) Gauge and track customer satisfaction with each evaluated LGP; 4) Document how each LGP has adopted and implemented the recommendations from the previous process evaluation.	

Study Title: Local Government Partnerships Rolling Comprehensive Process Evaluations	**Budget:** $295,000
Key Research Questions: Based upon study areas described in the California Evaluation Framework (2004**)** the following will be examined • How well does each partner (IOU, implementer, local government) understand its respective roles and responsibilities? How can they better collaborate together? • Program design, goal setting, common vision, and the improvement process, • Program staffing, staff skills, training, management and operations, institutional set-up, • Program information and information support systems, • Program targeting, marketing, and outreach efforts, • Program theories, theory assumptions, and key theory relationships – especially their causal relationships, • Program timing and timelines, • Participant satisfaction (both overall and individual components that interact with the participant in order for these to be assessed), • Quality control procedures and processes, • Reasons for unexpected low (or high) participation rates, • Reasons for overly high free riders, or too low a level of market effects, free- drivers or spillover, • Use of new practices or best practices, and intended or unanticipated market effects, among others. • And additional local research issues to be determined at the time of the project initiation meeting.	
EM&V Data Collection Methods: TBD but will conform to process evaluation methods per the California Evaluation Framework (2004)	

Ex Ante Updates

Programs and activities in this sector use ex ante savings estimates and should be aware of updates to these estimates and studies needed to improve the savings estimates. However, a section on ex ante updates is not included in this chapter. The studies planned in this sector will not likely be designed to directly inform updates to ex ante savings estimates. Please see the customer specific research plans for discussion of updates to ex ante savings estimates.

2.5.7. Other EM&V Studies that Touch on Local Government Partnerships

There are over 150 EM&V studies planned or ongoing and more than the current studies included in this specific roadmap may touch the local governments. The table below lists the other studies that may be of interest to local governments. To find out more about these studies, go to the specific roadmap shown in the table and look in the study description area by funding cycle.

Table 36. Other Studies that Relate to or Cover Local Government and IOU LGP Program Activities

N	Funding Cycle	Roadmap	Study Name	Study Type	Study Lead	Study Budget	Estimated Completion Dates	Notes on Study Relevant to LGPs
1	2013-2014	Finance	Impact Evaluation #1 – Cross-Cutting and Attribution Research	Impact	Energy Division	$350,000	Q1 2016	Will consider the attribution analysis method for local finance programs
2	2013-2014	Finance	Process Evaluation #2A – HERO Loan Program	Process	IOU	$200,000	Q2 2016	Expects to look at the role of local governments in this program
3	2013-2014	HVAC	Market Assessment to Identify Baselines and Barriers for Existing HVAC Conditions, Building Permit and Title 24 Compliance	Market	Energy Division	$1,450,000	Q3 2016	Evaluators may phone or go onsite to local government permit departments to pull permits
4	2015	HVAC	HVAC Permitting Characterization	Process	IOU (SCG)	$60,000	Q4 2016	Look at whether IOUs could perform outreach to municipalities through LGPs for better permitting system
5	2015	Residential	12 – EUC-HU Process Evaluation Phase 2	Process	IOU (PG&E)	$150,000	Q3 2016	Plans to interview local governments involved in the home retrofit and renovation marketplace
6	2013-2014	Commercial	2013-2014 Impact Evaluation of Deemed, Direct Installation and Third Party Programs	Impact	Energy Division	$500,000	Q2 2017	Impacts will include some measures installed within areas covered by the LGPs, although not specific to LGPs
7	2013-2014	Commercial	Direct Install Process Evaluation	Process	Energy Division	$300,000	Q2 2016	Expected to be rolled into a single study using both 2013-2014 and 2015 funds. See 2015 Direct Install Process Evaluation study below.
8	2013-2014	Commercial	3P Program Value and Effectiveness Study	Process	Energy Division	$600,000	Q4 2015	Study may cover third-party programs who service LGPs.
9	2015	Commercial	2015 Impact Evaluation of Deemed, Direct Installation and Third Party Programs	Impact	Energy Division	$500,000	Q2 2017	Impacts will include some measures installed within areas covered by the LGPs, although not specific to LGPs

N	Funding Cycle	Roadmap	Study Name	Study Type	Study Lead	Study Budget	Estimated Completion Dates	Notes on Study Relevant to LGPs
10	2015	Commercial	2015 Direct Install Process Evaluation	Process	Energy Division	$360,000	Q2 2016	Rolled into a single study using both 2013-2014 and 2015 funds. Goal is to characterize DI programs. The LGP survey collected some information regarding DI during the recent Internet survey with local governments. The overlap between LGPs and 3Ps and how they work together are of particular interest in this evaluation and will include examining the overall benefits of offering DI through the LGPs and 3Ps.

2.5.8. Remaining Research Questions for Post-2015

Proposed 2016 Energy Division Budget: $838,332

The Local Government Partnerships evaluation plan (this EM&V Roadmap chapter) received a sizable increase in funding in the 2015 evaluation budget. As noted in the plan, these studies are currently underway. Funds from the 2016 authorization are set aside to enable review of the program delivery in this sector and take a critical look at this sector for the future.

Besides noting the challenges in evaluating LGPs described above, the proposed studies described within this Roadmap document call for careful consideration of the differences in size, available resources, and level of experience among local governments as well as their geographic, socioeconomic, and political variations.

The LGP PY 2013-2014 Value and Effectiveness Study Report (completed in 2015) left some core study questions unaddressed. Specifically, the Value and Effectiveness Study did not fully address two prescribed research questions due to, in part, small sample sizes. A more ambitious future evaluation study might, therefore, be able to resolve these remaining research questions:

- Can a predictive tool be developed to identify LGs that have the highest potential for success as sponsors of Strategic Plan goals? Does this correlate with effective implementation?
- Across California, how does the IOUs' program administration of their LGP portfolios affect the LGs' ability to meet Strategic Plan goals?

The LGP PY 2013-2014 Value and Effectiveness Study Report also brought to light the condition that SDG&E accounts for the majority of the State's spending in the LGP Strategic Plan area. SDG&E program staff responds that their LGP program model is to one that is centered around delivering Strategic Plan activities and elevating these efforts as the priority for the partnerships. As noted above in the proposed scope for the LGP Impact Study, Sempra IOUs enjoy a non-resource LGP arrangement which, ostensibly allows for greater flexibility in the program model of the LGPs, including cost-effectiveness metrics. All of these issues raise the questions of:

- What tangible savings can SDG&E document for its LGPs?
- Does the CPUC have some priority "loading-order" for the IOU LGPs where savings should come first or not be a requirement at all?

Additionally, the LGP PY 2013-2014 Value and Effectiveness Study Report identified new research questions that could be future topics for investigation within future program evaluations. These potential new future study questions include:

- What are the consequences or penalties for Strategic Plan project failure by the LGPs?
- How are the IOUs encouraging LGPs to follow through on their completed Climate Action Plans to ensure they are adopted and implemented? What has been the effect of these incentives on the LGPs?
- What local agency contribution might be appropriate to fund Strategic Plan projects?
- Is a change to the LG Strategic Plan program model warranted such that routine Climate Action Plans could be funded via a "small grant" program while more ambitious project proposals with the

potential for replicability, knowledge transfer, and innovation would be treated as Strategic Plan pilots and reserved for qualified and experienced LGPs?

- If changes to the LG Strategic Plan program model as described above are warranted, what competency requirements should be demonstrated by LGPs to graduate from "small grant" program eligibility to qualifying to apply for a Strategic Plan pilot project?
- What criteria do the IOUs employ in ranking and selecting Strategic Plan projects and is the process impartial and defensible?
- Are non-resource program efforts, which include the LG Strategic Plan projects (addressing GHG reduction, climate change, reach codes, and data management, among others) as important as or subordinate to achieving direct energy savings?
- Do those IOUs that treat their LGPs as non-resource programs (e.g., SDG&E and SoCalGas) enjoy any competitive advantage to advancing and funding Strategic Plan Projects? Should there be any cause for concern at the CPUC that this has resulted in an uneven playing field when the overall Statewide Strategic Plan budget is allocated?

The Energy Division has a special interest in better understanding how LGP Marketing, Education & Outreach (ME&O) efforts function both as Strategic Plan efforts and as outreach activities to promote resource programs. ED counts two categories of ME&O here, which are in addition to Statewide ME&O efforts. How are these efforts coordinated to ensure a consistent, non-duplicative message? Does any double counting of benefit occur? Another theme for possible exploration within future LGP studies would be to assess the overall effectiveness of the IOU marketing and outreach strategies that leverage LGP community networks to promote energy efficiency to their constituents. Research to date has not fully explored the effectiveness of these marketing and outreach activities, how these activities are being deployed, and what if any duplication exists with Statewide ME&O efforts. Research questions that could contribute to a frame a future LGP study are:

- How do the LGPs serve as the marketing arm of the DI, 3P, and IOU core programs? What would be the impact if LGP marketing of these programs were eliminated? What is the extent of duplication between these efforts and statewide ME&O efforts?
- What types of marketing and outreach activities are presently undertaken by LGPs and to what degree do the program designs originate with the IOUs?
- What has been the overall community engagement and uptake rates, referrals to DI/3P/core programs, and resulting savings?
- How do these marketing and outreach activities vary by IOU or LGP implementer?
- What types of marketing methods and strategies have been the most and least effective? Do these results vary by sector or program model?
- How are marketing and outreach activities tracked within this sector? What additional ME&O data should be tracked, in order to inform future evaluations and decision-making?
- What are the awareness levels of these activities?

What are the engagement points, and is there effective follow-up to encourage project completion?

2.6. Regional Energy Networks and Community Choice Aggregators

2.6.1. Background

The 2015 update of the EM&V Roadmap provided for this new chapter presents the State's efforts to track and evaluate Regional Energy Network (REN) pilots and Community Choice Aggregators (CCAs). This chapter update represents the first revision of this new chapter since it was initiated in Q2 2015. These two programs represent an increasingly important position within the EE portfolio and are generally viewed as innovation drivers, targeting hard-to-reach niche markets and other untapped opportunities. As of December 2015, this chapter covers EE programs administered by the Bay Area Regional Energy Network, the Southern California Regional Energy Network, and Marin Clean Energy. These three non-IOU program administrators (PAs) have representation within the Commission's EM&V programming and policy-making group via the REN-CCA PCG-2, established in 2014. Establishment of the new PCG-2 and the introduction the RENs-CCAs chapter of the EM&V Roadmap are Energy Division efforts to accommodate the RENs and CCAs apart from the IOU LGP PCG-2 and to grant the non-IOU PAs their own EM&V programming forum.

In addition, all seven of the state's Program Administrators (PAs) share in the composition and discussion of Local Government-related EE EM&V projects via the Energy Division's Stakeholder Advisory Group (StAG) a stakeholder group of experts and advocates who meet by conference call six times per year.

RENs Background

In Guidance Decision 12-05-015, the CPUC requested that proposed REN pilots demonstrate in the applications the extent to which their activities:

1. Leverage additional state and federal resources so that energy efficiency programs are offered at lower costs to ratepayers,
2. Address the water/energy nexus,
3. Develop and deploy new and existing technologies,
4. Address workforce training issues, and
5. Address hard-to-reach customer segments such as low to moderate residential households and small- to medium-sized businesses.[28]

In Decision D.12-11-015 (November 2012), the CPUC evaluated the RENs proposals according to three criteria:

1. Provide activities that utilities cannot or do not intend to undertake,
2. Pilot activities where there is no current utility program offering, and where there is potential for scalability to a broader geographic reach, if successful, and
3. Pilot activities in hard-to-reach markets, whether or not there is a current utility program that may overlap.[29]

[28] D.12-05-015, page 149-150.

The CPUC approved both the Bay Area Regional Energy Network (BayREN), encompassing the nine Bay Area counties, and the Southern California Regional Energy Network (SoCalREN), which serves the counties of Los Angeles, San Bernardino, Riverside, Ventura, Inyo, Imperial, and Mono, as well as portions of Orange, Kern, Tulare, Santa Barbara and Kings. The Decision also outlined the relationship between the RENs and the IOUs. Specifically, RENs are reliant on the IOUs for program spending reimbursement, but are independent of IOUs for program design and delivery. The RENs as pilots are at present ineligible to direct their own ratepayer-funded EM&V work. Described below is an in-progress EM&V study that assesses the RENs' value and effectiveness and that is being overseen by the Energy Division. A companion Energy Division-led RENs impact assessment is also near completion. Combined, these two REN studies cover and inform PY 2013-2014 program activities. RENs.

CCA Background

Marin Clean Energy (MCE) also is newly authorized to administer ratepayer-funded EE programs as a Program Administrator. As the first CCA in California to undertake energy efficiency efforts, MCE is eligible but has so far not initiated an EM&V study. However, MCE has indicated that in 2016 it intends to undertake an EM&V process study covering the program years 2013-2015. (At present, Energy Division staff constraints and two in-progress Energy Division-led value and effectiveness studies, and an impact assessment prohibit Energy Division from undertaking an Energy Division-led EM&V study of MCE.)

Since the CPUC first authorized MCE in 2012 to administer EE programs, it has enjoyed healthy growth, and has annexed new service territory (the City of Richmond and Unincorporated Napa County) into the CCA. **Error! Reference source not found.** presents the projected savings and budgets of the RENs and CE for 2013-2015.

[29] D.12-11-015, page 17.

Table 37. 2013-2015 Regional Energy Networks and Community Choice Aggregator* Projected Savings and Budgets

Program Administrator	2013-2014 Program Cycle				2015 Program Cycle			
	Projected Energy Savings Goals (MWh)	**Projected Demand Savings Goals (MW)**	**Projected Gas Savings Goals (Mtherms)**	**Projected Program Budget ($000's)**	**Projected Energy Savings Goals (MWh)**	**Projected Demand Savings Goals (MW)**	**Projected Gas Savings Goals (Mtherms)**	**Projected Program Budget ($000's)**
Bay Area Regional Energy Network (BayREN)	13,249	9	931	$26,568	1,747	4	223	$13,181
Marin Clean Energy (MCE)	8,185	3	732	$4,015	1,541	0	39	$1,220
Southern California Regional Energy Network (SoCalREN)	27,206	6	405	$44,119	9,461	2	201	$20,299
RENs and MCE Total	48,640	18	2,068	$74,702	12,749	7	463	$34,700
Total EE Portfolio	4,521,314	868	126,755	$2,650,178	2,036,397	351	61,494	$1,334,194
Percentage of Total EE Portfolio	1%	2%	2%	3%	1%	2%	1%	3%

*Data taken from the California Energy Efficiency Website, August 2015. http://eestats.cpuc.ca.gov/Views/EEDataPortal.aspx/

Considerations for Regional Local Government EE Coordination in 2013-2015

The emergence of the semi-autonomous REN pilots (see D. 12-11-015 for details) and the Marin Clean Energy CCA programs calls for careful coordination between the IOUs and these new PA portfolios to avoid customer confusion and program redundancy.[30] In addition, since 2012, the IOU local government partnerships' capacities and coverage have incrementally expanded in response to local government requests, demonstrated increased capacity, and the regional-solutions-based REN model. In PG&E's territory, this has translated to enhancing LGP decision-making latitude to further drive direct install projects under a regional LGP-implementer model. For SDG&E's part, the IOU has initiated a Regional Energy Partnership structure within San Diego County that promotes information sharing and knowledge transfer among local government partners. SCE and SoCalGas have introduced to their LGPs new project management services, which include engineering and contracting expertise and have closely coordinated to more seamlessly integrate their partnership portfolios.

2.6.2. 2013-2014 RENs and CCA EM&V Studies

Error! Reference source not found. shows two Energy Division-led studies funded with 2013-2014 unds, which are both expected to be completed in 2015.

Table 38. 2013-2014 Regional Energy Networks and Community Choice Aggregator EM&V Studies, Budgets, and Expected Dates of Completion

2013-2014 Study Area/Title	Study Type	Study Manager (Energy Division/IOU)	Budget	Completion Date
Studies Underway				
PY 2013-2014 RENs Value and Effectiveness Study	Process	Energy Division	$225,000	Q4 2015
PY 2013-2014 RENs and CCA Impact Assessment	Impact	Energy Division	$300,000	Q4 2015

2.6.3. 2013-2014 RENs and CCA EM&V Study Descriptions

This section provides short descriptions, objectives, and key research questions for each of the programmed 2013-2014 RENs and CCA EM&V studies.

Study Title: PY 2013-2014 RENs Value and Effectiveness Study	**Budget:** $225,000
Expected Completion Date: Q4 2015	**Study Manager:** Energy Division

[30] Combined, the three PAs offer EE services to some seven million households, which is about 70 percent of the population serviced within the combined IOU service territory.

Study Title: PY 2013-2014 RENs Value and Effectiveness Study	**Budget:** $225,000
Description: Process evaluation	
Objective: Understand the value and effectiveness of Regional Energy Network pilots.	
Key Research Questions: **Research Questions to Inform the Value of the RENs** • What overlap, if any, is occurring between the RENs program activities and IOU programs or activities? • What are the goals of the programs or activities undertaken by the RENs? • What is the history of the programs or activities? • How are the programs or activities being implemented? • How do the costs associated with the non-resource sub-pilots and activities compare to the overall RENs portfolio of sub-pilots? **Research Questions to Inform the Effectiveness of the RENs** • What are the pros and cons of the two RENs' implementation models? • How do the RENs manage their programs? **Research Questions to Inform Policy** • Can or should the non-resource programs be scaled up or introduced to other areas of the state? • Would allowing more duplication of programs among RENs and IOUs create healthy competition or would it lead to added consumer confusion, redundancy and waste?	
EM&V Data Collection Methods: In depth interviews, secondary research, and an internet survey.	

Study Title: PY 2013-2014 RENs and CCA Impact Assessment	**Budget:** $300,000
Expected Completion Date: Q4 2015	**Study Manager:** Energy Division
Description: Goal of this study is to perform an impact assessment on specific measures offered by the RENs and CCA to develop more reliable estimates of program cost effectiveness. Study will update certain key impact parameters using primary data collection (for net-to-gross analysis) and results from recent gross ex post impact evaluations (for key nonresidential lighting measures). Furthermore, because most of the ex ante claimed savings are associated with measures that do not have recent impact evaluation findings that can be directly applied, a high level assessment of the ex ante savings assumptions, including a comparison between RENs/CCA and investor owned utility (IOU) ex ante impact assumptions, will be made to identify if there are any obvious over- or understatements of savings being claimed. In summary, study includes: a high level assessment of the gross ex ante savings values being used for all programs claiming ex ante savings; development of ex post net-to-gross ratios (NTGRs) for selected measures; and estimation of program cost effectiveness using the updated savings values developed in the gross impact assessment and NTGR analysis described	

Study Title: PY 2013-2014 RENs and CCA Impact Assessment	**Budget:** $300,000
above. This study is being conducted under the LGP/REN Nonresidential Downstream Impact Evaluation Work Order.	
Objectives: • Estimate program-specific gross impact parameters for residential and nonresidential measures with high uncertainty that are significant contributors to the REN and CCA programs. • Estimate NTGRs for each REN and CCA program for which sufficient data are available • Estimate cost effectiveness metrics for each program	
Key Research Questions: • What are the ex post gross savings values for each of the REN and CCA programs • What are the NTGRs for each of the REN and CCA programs	
Potential EM&V Methods: Phone surveys to develop NTGRs, on-site verification and monitoring to estimate key parameters for high uncertainty measures.	

2.6.4. Post-2014 REN and CCA EM&V Studies

The CPUC has programmed funding to address evaluation needs for 2015 and post-2015 program activities. **Error! Reference source not found.** shows the three proposed Energy Division-led studies and ne proposed MCE-study that will use post-2014 funds.

Table 39. 2015 Regional Energy Networks and Community Choice Aggregator EM&V Studies, Budgets, and Expected Dates of Completion

2015 Study Area/Title	Study Type	Study Manager (Energy Division/IOU)	Budget	Completion Date
Studies Proposed, but not yet Scoped				
Market Scalability Study of the RENs and MCE Multifamily Programs	Process	Energy Division	$150,000	Q1 2017
PY 2015 RENs Process Study: More Fully Assessing Program Efforts and Future Potential	Process	Energy Division	$120,000	Q1 2017
PY 2013-2015 RENs and CCA Impact Evaluation	Impact	Energy Division	$290,000	Q2 2017
PY 2013-2015 Process Study of Marin Clean Energy EE Programs	Process	MCE	$150,000	Q4 2016

2.6.5. 2015 RENs and CCA EM&V Study Descriptions

Study Title: Market Scalability Study of the RENs and MCE Multifamily Programs	**Budget:** $150,000
Expected Completion Date: Q1 2016	**Study Manager:** Energy Division
Description: Conduct an evaluation on the REN and MCE multifamily (MF) programs to rank the effectiveness and scalability of each program design and implementation approach in light of best practices identified in previous research and other jurisdictions.	
Objective: To improve program design, implementation and outreach activities/outputs and outcomes as they relate to savings, cost-effectiveness, etc.	
Key Research Questions: (to be targeted to property owners and managers) • Does the program pursue any/all MF properties, or target certain specified segments? • What are the measure, investment, and/or technical assistance needs of this market sector, by service territory? • Does the program take a whole-building, building system, opportunistic/trigger-point, or low/no-cost approach to improvements? • What is the program theory and implementation for these programs and how do they differ (if at all) across program administrators (including the IOUs)? • How do these programs interact with the other IOU or PA programs, if at all? • What is the size and distribution of eligible MF properties in each REN/CCA service territory? • Is the program scalable? If so, what kinds of implementing organization(s) is/are needed to cover those portions of IOU service areas where there are significant numbers of MF properties? • What are the estimated program, per building, and achieved savings costs exhibited by these programs? How do these costs vary if there are different types of program intervention strategies, or different target market segments required to meet program energy savings goals? By service territory, what are the projected costs of fully scaling this/these program(s) to meet market need? • Can key program design elements/components or process changes improve program outputs and outcomes, including energy savings (kW/kWh & therms), investment levels (e.g., with workable financing)? • Is the high number of MF dwelling units in the pipeline for BayREN because of close local government ties with BayREN? If so, why does this high number of retrofits not occur in SoCalREN?	
Potential EM&V Methods: TBD	

Study Title: PY 2015 RENs Process Study: More Fully Assessing Program Efforts and Future Potential	**Budget:** $120,000
Expected Completion Date: Q1 2017	**Study Manager:** Energy Division
Description: Process evaluation	
Objective: Further enhance understanding of benefit of Regional Energy Network pilots. This study	

Study Title: PY 2015 RENs Process Study: More Fully Assessing Program Efforts and Future Potential	**Budget:** $120,000
would answer remaining questions not addressed in the PY 2013-2014 study. The study would be meant to inform the appropriateness of REN next steps and program expansion to inform the CPUC's direction on the issue, including whether continued probationary status is warranted, whether the RENs should be made permanent, and whether new REN applications would be invited. Proposed study would also address program areas that the PY 2013-2014 evaluation study did not cover including the Regional Energy Center pubic agency technical assistance, and Water-Energy Nexus efforts. . The study would consider how RENs may be driving innovation within EE in California and would attempt to characterize spillover benefit from this new program administrator.	
Key Research Questions: • What is the long-term effectiveness and viability of the current REN program administrator models? • How well and how equitable is the existing practice of crediting REN savings to the IOUs and would there be benefit to considering an incentive for savings arrangement? • How equitable and effective is the existing IOU contracting requirement and would there be benefit to considering an arrangement closer to that for CCAs? • Should the CPUC continue to allow RENs, CCAs, and LGPs to exist within the same markets and territories? • Should the CPUC encourage more direct competition between RENs and IOU program activities? • Have the IOUs imitated REN programs? Have the IOUs responded with changes in the way they engage the State's local governments? • How well does the Southern California Regional Energy Center (SoCalREC) leverage local government resources and what level of local government capacity building occurs due to SoCalREC activities? • What should be the guidelines regarding the full regulatory processes by which any new proposed REN would be expect to adhere? • How would new RENs be able to leverage and borrow from the experience, models, and lessons learned from the existing RENs? • How would new RENs be funded and is there a fairness cost-barrier issue that the CPUC can reduce to ensure access to RENs by California governments of lesser means? • What special challenges would RENs in rural areas encounter apart from higher travel and contracting costs? • Are service offerings complementary for LGs participating in both LGP and REN programs?	
Potential EM&V Methods: TBD	

Study Title: PY 2013-2015 RENs and CCA Programs Impact Evaluation	**Budget:** $290,000
Expected Completion Date: Q2 2017	**Study Manager:** Energy Division

Study Title: PY 2013-2015 RENs and CCA Programs Impact Evaluation	**Budget:** $290,000
Description: This study will conduct an ex post analysis on the REN and CCA programs. The study will focus on the program-measure combinations that contribute the highest level of uncertainty in the lifecycle net savings values for the REN-CCA portfolio of programs. Likely activities include a billing analysis of any multifamily Whole Building program and a net-to-gross ratio (NTGR) analysis of any single-family Home Upgrade program. The final determination of program-measures to be evaluated will be based on cumulative participation from 2013-2015 and anticipated uncertainty surrounding the best available estimates of savings values.	
Objectives: • Estimate key impact parameters (e.g., NTGRs or gross realization rates) for program-measure combinations that contribute the highest level of uncertainty in the lifecycle net savings values for the REN-CCA portfolio of programs.	
Key Research Questions: • What are the ex post gross savings values for high uncertainty measures? • What are the NTGRs for high uncertainty measures? • Are REN non-resource activities that were not thoroughly examined in 2013-2014 impact Assessment resulting in more projects moving into IOU resource programs?	
Potential EM&V Methods: Telephone surveys to develop NTGRs, billing analysis to estimate gross savings values.	

Study Title: PY 2012-2015 MCE Process Study of Marin Clean Energy EE Programs	**Budget:** $150,000
Expected Completion Date: Q4 2016	**Study Manager:** MCE
Description: Process Evaluation	
Objective: The process study, to be led by Marin Clean Energy with oversight by Energy Division, would examine the existing and potential EE coordination activities within the MCE Service Territory for MCE's 2013-2015 EE offerings. BayREN, MCE, and PG&E all offer EE programs within the MCE service territory and the study would examine how these implementers do or do not avoid duplication and optimize opportunities and coordination for customers. The study may include examination of one or more of MCE's EE program offerings including but not limited to commercial and single family program components.	
Key Research Questions: • What value do the multiple ratepayer-funded programs in Marin Clean Energy territory provide? • How well do the implementation teams for the third-party provider (3PP) programs and the MCE programs interface? Could MCE make improvements that are beneficial to both parties?	
Potential EM&V Methods: TBD	

Ex Ante Update

Programs and activities in this sector use ex ante savings estimates and should be aware of updates to these estimates and studies needed to improve the savings estimates. However, a section on ex ante updates is not included in this chapter. The studies planned in this sector will not likely be designed to directly inform updates to ex ante savings estimates. Please see the customer specific research plans for discussion of updates to ex ante savings estimates.

2.6.6. Other EM&V Studies That Touch on RENs

There are over 150 EM&V studies planned or ongoing and more than the current studies included in this specific roadmap may touch the RENs or CCA. The table below lists the other studies that may be of interest to the RENs or CCA. To find out more about these studies, go to the specific roadmap shown in the table and look in the study description area by funding cycle.

Table 40. Other Studies that Relate to or Cover RENs and CCA Program Activities

N	Funding Cycle	Roadmap	Study Name	Study Type	Study Lead	Study Budget	Estimated Completion Date	Notes on Study Relevant to RENs or CCA
1	2013-2014	Codes & Standards	Compliance Improvement Process Evaluation for IOU Statewide Program and BayREN Codes and Standards Program	Process	Energy Division	$180,000	Q4 2013	Assessment of the BayREN delivery of their compliance improvement activities
2	2013-2014	Finance	Impact Evaluation #1 – Cross-Cutting and Attribution Research	Impact	Energy Division	$350,000	Q2 2016	Will consider the attribution analysis for local finance programs run by CCA and RENs
3	2013-2014	Finance	Impact Evaluation #3 – Regional Pilot/Program Study	Impact	Energy Division	$250,000	Q4 2016	Gross and net evaluation for regional finance programs run by CCA and RENs
4	2013-2014	Finance	Impact Evaluation #4 – Statewide Pilots; (4a) Evaluability Assessment and Study Planning and (4b) Impact Study	Impact	Energy Division	$800,000	Q4 2016 for 4a and Q4 2017 for $b	Determine data available for evaluation and calculate gross and net energy savings from each financing pilot, including those run by CCA and RENs.
5	2013-2014	Marketing Education and Outreach (ME&O)	Cross-cutting Process Evaluation	Process	Energy Division	$900,000	Q1 2016	Plans to provide feedback on ME&O efforts conducted by CSE, the IOUs, and the RENs
6	2013-2014	Residential	3A – Impact Evaluation of Comparative Energy Usage Report Problems	Impact	Energy Division	$584,342	2014 and 2015	Includes MCE comparative feedback programs

N	Funding Cycle	Roadmap	Study Name	Study Type	Study Lead	Study Budget	Estimated Completion Date	Notes on Study Relevant to RENs or CCA
7	2013-2014	Residential	6B – Focused Impact Evaluation of MF-EUC/MIDI & MFEER	Impact	Energy Division	$200,000	Q1 2016	Looks at data collection by RENs to support program impacts
8	2013-2014	Residential	8B – Focused Impact Evaluation for SF-WH Home Upgrade Basic/Flex Program	Impact	Energy Division	$300,000	2015-2016	Looks at data collection by RENs to support program impacts
9	2013-2014	Residential	6A – MF-EUC/MIDI Pilots & MFEER Program Change Process Evaluation	Process	IOUs	$250,000	2014	Looks at interactions with RENs
10	2013-2014	Residential	8A – Focused Process Evaluations for SF WH Home Upgrade Program Change	Process	IOUs	$250,000	2014	Looks at interactions with RENs
11	2015	Residential	3A – Impact Evaluation of Home Energy Report Initiatives (includes Marin Clean Energy program)	Impact	Energy Division	$420,000 which includes a $75K budget for Marin Clean Energy	Q4 2016	Includes MCE comparative feedback programs
12	2015	Residential	8B – 2015 Residential Whole House Upgrade Impact Evaluation	Impact	Energy Division	$550,000 with $200K of this budget for RENs	Q3 2017	Includes all REN Upgrade projects for both upgrade packages.

2.6.7. Remaining Research Questions for Post 2015

Proposed 2016 Energy Division Budget: $838,332

The Regional Energy Network and Community Choice Aggregator evaluation plan had a significant increase in funding in 2015 budgets. The current studies are intended to inform a Commission decision in 2016 and these funds are set aside to support additional questions specific to this sector of program delivery. Several of the studies are cross-implemented and funded in the sectors in which they are deployed (i.e. residential, small medium commercial, finance).

The PY 2013-2014 Value and Effectiveness Study of the RENs identified several areas for additional investigation in future studies. These questions have been incorporated into the proposed RENs study described above and titled *PY2015 RENs Process Study: More Fully Assessing Program Efforts and Future Potential.*

Additional potential future study questions for RENs that do not fit into a programmed study include:

- How valuable and easy to use do customers find the SoCalREN Enterprise Energy Management Information System (EEMIS) and Community Energy Efficiency Project Management System (CEEPMS) software?
- What would be the cost to scale up EEMIS training and support to a statewide level?

2.7. Lighting

2.7.1. Background

Sector or Program Area Description

As indicated in the Lighting Chapter of the California Energy Efficiency Strategy Plan, lighting comprises approximately one-fourth of California's electricity use; therefore, the widespread use of energy efficient lighting is a critical element. California's AB 1109 (known as —the Huffman Bill *) will phase-out traditional, low efficiency incandescent lamps by 2018 and help advance the Strategic Plan's goals. However, supporting strategies and implementation activities are needed to achieve the higher goal of a 60 to 80 percent reduction in energy usage for lighting.

Residential lighting comprises 22 percent of electricity use in the average California home. With more than 11 million homes and 500 million light sockets in California, there is substantial potential for energy savings and peak demand reduction.

Nonresidential lighting covers a wide range of applications including task lights on office desks and overhead lighting in industrial warehouses. In the commercial sector, lighting accounts for approximately 35 percent of electricity use. (Source: CEESP, 2011)

The Lighting Chapter of the California Energy Efficiency Strategy Plan outlined the following goals:

1. Develop and implement coordinated policies, procedures, and other market interventions that eliminate barriers, accelerate lighting market transformation* in California and provide incentives for best practice lighting technologies and systems.
2. Define and advance best practices for design, installation, operation and maintenance of integrated systems* to achieve sustainable* lighting solutions for all spaces.
3. Create widespread end user demand to purchase and use best practice lighting technologies and systems.
4. Develop research, development and demonstration (RD&D) networks to create, test, and deliver the lighting solutions needed to transform California's lighting market achieve ZNE goals.

The Lighting Chapter of the California Long Term Strategic Plan outlined a goal to reduce lighting energy consumption by 60%-80%. In order to achieve this kind of lighting energy reduction, the entire suite of IDSM options must be made available to Californians. This must include energy efficiency, demand reduction and dynamic pricing, solar and etc. options. For these Lighting programs to be successful it is important for all the participating and non-participating market actors to be part of the solution to educate and push the right purchase decisions and best installation efforts.

Lighting Portfolio of Programs for 2013-2015

For 2013-2014, the lighting portfolio of programs has been substantially reorganized in the following:

- Lighting Market Transformation Program (LMT) – No change.
- Lighting Innovation Program (New)
- Primary Lighting Program (New)

In addition to these program re-organizations, the lighting programs have been made cross-cutting programs where all lighting incentive activities and energy savings claims from both residential and non-residential programs will be reported into Primary Lighting Program.

In addition, a Lighting Innovation Program has been created to pick-up from the demarcation of the Emerging Technology lighting activities. The goal of the Lighting Innovation Program is to test both new measures/technologies in a scaled environment but also to test programmatic and marketing experiments to gain implementation knowledge.

Programs included in the Research Scope

For 2013-2014, the portfolio of lighting programs account for 12% of the total portfolio program budget and will contribute 22% and 24% of the overall program KW and kWh energy savings, respectively. Below, please find a summary of sub-program budget and planned energy savings.

Table 41. 2013-2014 Lighting Programs Savings and Budget Summary

IOU	2013-2014 Program	kW	kWh	Budget
SCE	Lighting Market Transformation Sub-Program			$670,226
SCE	Lighting Innovation Sub-Program	14,395	81,159,390	$12,666,815
SCE	Primary Lighting Sub-Program	29,715	178,487,025	$23,724,036
PG&E	Lighting Market Transformation Sub-Program			$1,326,190
PG&E	Lighting Innovation Sub-Program	425	2,438,821	$4,107,360
PG&E	Primary Lighting Sub-Program	32,792	183,792,719	$36,447,141
SDG&E	Lighting Market Transformation Sub-Program			$655,480
SDG&E	Lighting Innovation Sub-Program			$3,520,650
SDG&E	Primary Lighting Sub-Program	7,103	67,727,016	$7,997,663
	Total Statewide Lighting	**144,274**	**889,820,082**	**$228,470,485**
	% of Statewide Portfolio	22%	24%	12%

Table 42. 2015 Lighting Programs Savings and Budget Summary

IOU	2015 Program	kW	kWh	Budget
SCE	Lighting Market Transformation Sub-Program			$316,245
SCE	Lighting Innovation Sub-Program	4,550	20,022,094	$6,812,979
SCE	Primary Lighting Sub-Program	32,026	202,034,959	$28,125,015
PG&E	Lighting Market Transformation Sub-Program			$670,738
PG&E	Lighting Innovation Sub-Program			$1,692,692
PG&E	Primary Lighting Sub-Program	5,894	44,073,234	$11,188,130
SDG&E	Lighting Market Transformation Sub-Program			$334,491

IOU	2015 Program	kW	kWh	Budget
SDG&E	Lighting Innovation Sub-Program (res & non-res)			$1,727,808
SDG&E	Primary Lighting Sub-Program	3,875	29,972,409	$4,384,683
SCG	(Therms: -417,585, due to interactive effect).	0	0	0
	Total Statewide Lighting	**9,769**	**276,080,602**	**$48,439,802**
	% of Statewide Portfolio	2.5	11.9	5.4

Ex Ante Coordination

Ex ante processes (including DEER updates, Uncertain Measures List updates, work papers review, and custom projects review) incorporate data and results from the latest EM&V studies. The ex ante values that are relevant to this sector are highlighted in this section, they may also be included in other relevant chapters.

Most recent DEER Update

DEER2016 Update (effective 1/1/2016):

Revises commercial indoor lighting profiles (hours of use and peak period coincident demand) based on 2010-2012 EM&V studies (**http://www.deeresources.com/index.php/deer-versions/deer-2016#LightingProfiles**), and

Incorporates disposition lighting measures from work papers into DEER (**http://www.deeresources.com/index.php/deer-versions/deer-2016#LightingMeasures**).

The Uncertain Measures List update (effective 1/1/2016):

changes the hours of use, peak coincident demand, net to gross, and effective useful life of screw-in CFLs of all types (**http://www.deeresources.com/index.php/deer-versions/2015-uncertain-measures-update**) and

changes the baseline of T5 fluorescent lamps and fixtures replacing metal halide lamps based on recent EM&V studies (**http://www.deeresources.com/index.php/deer-versions/2015-uncertain-measures-update**).

Ex ante staff leads and ex post staff leads will coordinate processes, studies, and timelines to better align the flow of information between ex ante and ex post projects. Ex post evaluation studies provide data and results for ex ante updates. Planning for ex ante updates in the future will also require evaluation planning and input. Evaluation studies will need to budget time and schedule to provide input into ex-ante processes, such as DEER and the uncertain measure list. Currently, ex ante funding is budgeted under the overall ex ante contract. More information about the budget is provided in the Ex Ante Review section of this document.

Next planned DEER Update

For this sector the next DEER Update may revise the following ex ante values and parameters:

Table 43. Potential DEER Revisions

Measure/Value/Parameter	Reason for the revision
EMV results from the previous uncertain measures	Update DEER with best available information from evaluations
Incorporate additional updates from CLASS and CSS	DEER has not fully incorporated data from CLASS and CSS
Add to interactive effects and modeling prototype	Interactive study may add to the current DEER literature
Update lighting hours of use	Hours of use have not been updated since last metering study in 2009
Update LED data from lab test	Lab tests may have early results that may inform DEER parameters

Uncertain Measures List and 2016 Update

To assess what measures to move off and/or add onto the Uncertain Measures List requires looking ahead to IOU portfolios and analysis of ex ante and ex post teams. The current 2015 Uncertain Measures List (**http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M076/K775/76775903.PDF**, Attachment 3) contains the following items for this sector and shall be prioritized in the evaluation studies.

Table 44. 2015 Uncertain Measures to be Prioritized

Utilities	Measure	Areas of Uncertainty
PGE, SCE, SDGE	Screw-in CFLs of all types with wattage values greater than 30.	Update of the gross baseline assumptions to account for the type and wattage of the lamp being replaced. Previous NTG studies have not focused on high wattage CFL lamps.
PGE, SCE, SDGE	Screw-in LED lamps including downlight replacement kits	Update baseline assumptions and net savings including replaced lamp for early retirement versus standard practice for normal replacement and replace-on-burnout; market move to LED technology and rapidly changing products and pricing requires verification of assumptions.
PGE, SCE, SDGE	LED street lights and outdoor area lighting	Baseline assumptions and net savings including replaced lamp/ballast for early retirement versus standard practice for normal replacement and replace-on-burnout; market move to LED technology requires verification of assumptions.
PGE, SCE, SDGE	Occupancy sensor lighting controls - integrated and wall/ceiling	Code changes may change standard practice.
PGE, SCE, SDGE	De-lamping of T12 lamps in existing fixtures	De-lamping may normally be a required action during retrofit of surrounding fixtures thus subject to code or other baseline consideration.

Utilities	Measure	Areas of Uncertainty
SCE	LED night lights	Assumptions of replaced equipment and use uncertain.

The current 2016 Uncertain Measures List contains the following items for this sector and shall be prioritized in the evaluation study planning in section 1.1.6:

Table 45. 2016 Uncertain Measures to be Prioritized

IOU	Measure(s)	Discussion of uncertainty
PG&E, SCE, and SDG&E	Screw-in CFLs of all types and wattage values in non-residential use.	Examine and review whether an update of the gross baseline assumptions to account for the type and wattage of the lamp being replaced is required. There is uncertainty regarding the common applications (building types and operating hours) for high wattage CFLs and NTG for high wattage CFL lamps.
PG&E, SCE, SDG&E	Interior LED bay and high bay lighting	Examine and review whether updating metal halide baseline assumptions to consider high output linear fluorescent technologies as part of the standard practice (as indicated in recently published SCE/Navigant LED research findings) is needed. There is uncertainty in the standard practice assumptions of metal halide baselines.
PG&E, SCE, SDG&E	LED street lights and outdoor area lighting	Baseline assumptions and net savings including replaced lamp/ballast for early retirement versus standard practice for normal replacement and replace-on-burnout; market move to LED technology requires verification of assumptions.

Program Administrators' Planned Work paper Submissions

Program Administrators submit planned work papers for the upcoming portfolio cycle to Commission staff. These work papers often use DEER data and/or methodology to add technologies that are not in DEER to the energy efficiency portfolio. PGE does not plan on submitting any new work papers in 2016. SDG&E will evaluate existing work papers throughout 2016 and make individual determinations as to which need to be revised. WP revisions will be per D.15-10-028 on an "as needed" basis and at a maximum of twice a month. Work papers incorporated into DEER/READI that are available for use by SDG&E will not be updated by SDG&E unless explicitly requested by CPUC Ex-Ante Staff.

New Work paper Development for 2016

Table 46. 2016 Work papers to be Developed

Program Administrator	Measure/Value/Parameter	Reason for New Work paper

Program Administrator	Measure/Value/Parameter	Reason for New Work paper
SDG&E	LED Menu Boards - This is a project with EPRI and is moving very slowly. However, if completed by Q2 of 2016 it could be work paper ready	Ongoing ET field trails to determine EE savings and code compliance
SCE	Exterior Pole Mounted LED Luminaires	WP doesn't exist. Want to move from Custom to Deemed.
SCE	LED Canopy Luminaires	WP doesn't exist. Want to move from Custom to Deemed.
SCE	LED Linear Ambient Luminaires	WP doesn't exist. Copying SDG&E's WP.
SCE	LED Stadium Lighting	WP doesn't exist. Want to move from Custom to Deemed.
SCE	LED Bollards	WP doesn't exist. Want to move from Custom to Deemed.
SCE	LED Exterior Light With Motion Sensor	Update existing WP to include other baselines. Currently PSMH/HPS.
SCE	LED Integral Lamps	Update WRR, wattage range, & cost based on Navigant's LED study.
SCE	LED Wall Packs	Update wattage range & cost based on Navigant's LED study.
SCE	LED Tube	New WP based on Customized Project trial.
SCE	LED High/Low Bay Fixtures	Update cost based on Navigant's LED study.

Existing Work paper Updates

Table 47. Existing Work paper Updates

Program Administrator	Measure/Value/Parameter	Reason for Work paper Update
SCE	SCE13LG001.1 Screw in Exterior Compact Fluorescent Lamp (CFL)	Update costs. Remove midstream and upstream. Remove SFm. DI only.
SCE	SCE13LG007.1 Pin Based Exterior Compact Fluorescent Lamp (CFL) Fixture	Lighting update - operating hours, cost
SCE	SCE13LG017.2 Upstream Interior Integral Non-Dimmable (Screw-in) CFLs	Lighting update - operating hours, cost
SCE	SCE13LG019.2 Energy Star Ceiling Fan with CFLs	Lighting update - operating hours, cost
SCE	SCE13LG020.2 Wall Mounted Occupancy Sensors - Multifamily and Hospitality	Lighting update - operating hours, cost
SCE	SCE13LG070.2 Replace Neon Open Sign with LED Open Sign	Lighting update - operating hours, cost

Program Administrator	Measure/Value/Parameter	Reason for Work paper Update
SCE	SCE13LG071.2 LED Pool and Spa Lighting	Lighting update - operating hours, cost
SCE	SCE13LG072.2 Upstream Interior Integral 3-way, Dimmable (Screw-in) CFLs	Lighting update - operating hours, cost. Keep LT-67349 and LT-69524 only.
SCE	SCE13LG075.2 CFL Plug in Lamps	Lighting update - operating hours, cost
SCE	SCE13LG085.4 Interior Compact Fluorescent Fixture	Lighting update - operating hours, cost
SCE	SCE13LG086.2 Interior Linear Fluorescent Fixture	Savings updated in August. Update cost.
SCE	SCE13LG087.2 Fluorescent-to-Fluorescent Lamp and Ballast Retrofit	Lighting update - operating hours, cost
SCE	SCE13LG089.2 Interior Bi-Level Stairwell Lighting	Lighting update - operating hours, cost
SCE	SCE13LG090.2 Interior Induction Lighting	Lighting update - operating hours, cost
SCE	SCE13LG092.2 Fluorescent Lamp to Fluorescent Lamp	Lighting update - operating hours, cost
SCE	SCE13LG095.2 Fluorescent De-Lamping	Lighting update - operating hours, cost
SCE	SCE13LG097.2 LED street lights	Lighting update - operating hours, cost
SCE	SCE13LG098.3 Fluorescent to LED Retrofits in Reach-In Display Cases	Lighting update - operating hours, cost
SCE	SCE13LG099.2 Downstream Interior Integral Non-dimmable (Screw-in) CFLs	Lighting update - operating hours, cost
SCE	SCE13LG102.1 Exterior Induction Lighting	Lighting update - operating hours, cost
SCE	SCE13LG103.3 Interior LED Downlight Fixtures	Lighting update - operating hours, cost
SCE	SCE13LG105.3 LED Exterior Landscape Lighting Fixture	Lighting update - operating hours, cost
SCE	SCE13LG106.3 Retrofit MR16, PAR20, PAR30, and PAR38 Fixtures with LED Lamps	Lighting update - operating hours, cost
SCE	SCE13LG108.3 Exterior LED Wall Pack Fixtures	Lighting update - operating hours, cost
SCE	SCE13LG109.1 Exterior LED Lamp Replacement	Lighting update. Revise measure wattages to whole numbers.
SCE	SCE13LG111.1 LED High and Low Bay Fixtures	Lighting update - operating hours, cost
SCE	SCE13LG114.1 Exterior LED Luminaire with Integrated Occupancy Sensor	Lighting update - operating hours, cost
SCE	SCE13LG115.1 LED Residential Interior Fixtures	Lighting update - operating hours, cost

Program Administrator	Measure/Value/Parameter	Reason for Work paper Update
SCE	SCE13LG116.0 LED GU-24 Lamps	Pre Review: Waiting for cost spec. Not active in MMDB.
SCE	SCE13LG118.1 LED Troffer Retrofit Kit	Copy of PG&E's WP
SCE	SCE13LG119.0 LED Residential Exterior Fixtures	New WP
PG&E	4 Watt Int Screw-in CFL	DEER Updates
PG&E	T12 Delamping w/ lamps and ballast retrofit 4L 4ft T12 to 3L 4ft T8	DEER Updates
PG&E	Replace reflector incandescent with PAR38 CFRL (SMB)	DEER Updates
PG&E	CFL 7 WATT INT BARE SPIRAL 1PK	DEER Updates
PG&E	Replace >60W incandescent with CFLs in exterior areas (attached to tenant dwelling such as porch lights)	DEER Updates
PG&E	Compact Fluorescent Interior Fixture	DEER Updates
PG&E	FIXTURE INT INDUCTION - 400 WATTS BASE CASE - UP TO 250W	DEER Updates
PG&E	HP T8/T5, >585 WATT LAMP BASE CASE, 352 TO 585 WATT REPLACEMENT FIXTURE	DEER Updates
PG&E	Replace an existing 4' 32W T8 fluorescent lamp with a 4’ 28W T8 fluorescent lamp.	DEER Updates
PG&E	400 W interior compact fluorescent	DEER Updates
PG&E	LED Surface, Pendant, Track, Accent, and Recessed Downlight: Install < 7W LED	DEER Updates
PG&E	LED MR-16: <6 Watts	DEER Updates
PG&E	LED PAR20: ≤11 Watts	DEER Updates
PG&E	29 Watt 3-Way CFL replacing Incandescent Average Watts = 103.53	DEER Updates
PG&E	LED Candelabra <3W	DEER Updates
PG&E	LED globe: <3 Watts	DEER Updates
PG&E	LED A-Lamp 13 to < 14 watts	DEER Updates
PG&E	REFRIG CASE LTG-TIER 1 LED LIGHTBAR <= 5-FOOT UNIT NO OCC SENSOR CONTROL	DEER Updates
PG&E	LED Recessed Downlight: Install <10 W LED	DEER Updates

Program Administrator	Measure/Value/Parameter	Reason for Work paper Update
PG&E	20% Tuning	DEER Updates
PG&E	LED R-BR: <11 Watts	DEER Updates
PG&E	LED High/Low Bay: 40 to 131 watts, replacing 175W PS-MH	DEER Updates
PG&E	LED Panels	DEER Updates

2.7.2. 2013-2014 EMV&V Studies

The table below summarizes the 2013-2014 EM&V Studies that have been budgeted, some of which are in the process of being implemented and others are still in the planning stage.

Table 48. 2013-2014 Lighting EM&V Studies, Budgets, and Timing

2013-2014 Study Area/Title	Study Manager (ED/IOU)	2013-2014 Budget	Status	Completion Date
Impact				
(Lighting-7) LED Lab Test	ED	$500,000[31]	Underway	2016
(Lighting-8) Lighting Interactive Study	ED	$750,000	Underway	2015
(Lighting-9) Combined 2013-2014 Lighting Market Assessment and Focused Lighting Impact Evaluation Study	ED	$1,630,000	Underway	2015 & beyond
(Lighting-20) 2015 Nonres Lighting Market Study	ED	$200,000	Planning	2016
Process				
(Lighting-3) 2013-2014 Lighting Solution Workbook Update	IOUs	$145,090	Complete	2014
(Lighting-10) 2013-2014 Lighting Activity Workbook Update	IOUs	$24,950*	Complete	2013
(Lighting-4a) 2013-2014 Early M&E and Pilots/Trials to support Lighting Innovation: PG&E LED Midstream Trial Evaluation	IOUs	$116,743	Complete	2015
(Lighting-4b) 2013-2014 Early M&E and Pilots/Trials to support Lighting Innovation: SCE LED Midstream Pilot Evaluation	IOUs	$101,798	Complete	2015

[31] PG&E, SDG&E, and SCE are contributing $25,000 to add some additional testing of retrofit kits. This amount is not coming from EM&V funds.

2013-2014 Study Area/Title	Study Manager (ED/IOU)	2013-2014 Budget	Status	Completion Date
(Lighting-4c) 2013-2014 Early M&E and Pilots/Trials to support Lighting Innovation: PG&E Dimming Ballast and CALCTP Training Assessment	IOUs	$28,325	Complete	2015
(Lighting-11) 2013-2014 CALCTP and Manufacturer Contractor Training Assessment	IOUs	$95,000**	Underway	2015
(Lighting-12) 2013-2014 Evaluation of the San Diego Gas and Electric Lighting Field Services Effort	IOUs	$28,000	Complete	2014
(Lighting-6) 2013-2014 LED Market Characterization and Work Paper Update	IOUs	$500,000	Complete	2015
Total		**$4,119,906**		

*Lighting Innovation Program funded effort
**Jointly funded through Lighting and WE&T M&E Roadmaps ($75K from Lighting M&E Roadmap and $20K from WE&T M&E Roadmap)

2.7.3. 2013-2014 Study Descriptions

A short narrative is provided for each of the proposed studies below. For a more detailed description of each study, please refer to the appendix information in the next section.

Study Title: (Lighting-3) 2013-2014 Lighting Solutions Workbook Update	**Budget:** $145,090
Expected Completion Date: 2014	**Study Manager:** IOUs
Description: In the 2010-2012 program cycle, an initial version of the Lighting Solution Workbook was developed with completed lighting studies from 2010-2012. This Lighting Solution Workbook is used as a statewide lighting planning document. For the 2013-2014 program cycle, Cadmus updated the Workbook.	
Objective: The goal of this study is to update the Lighting Solution Workbook to further both LMT and lighting strategic plan goals. This project will also provide necessary inputs to Lighting-1 study.	
Key Research Questions: Can the Lighting Solution Workbook be updated with the completed lighting studies from 2010-2012 and updated for the 2013-2014 program cycle? Note: This project was awarded to the Cadmus Group. The Lighting Solutions Workbook Update project was completed in December 2014.	
Potential EM&V Methods:	
Potential Ex Ante Uses:	

Study Title: (Lighting-4a) 2013-2014 Early M&E and Pilots/Trials to support Lighting Innovation: PG&E LED Midstream Trial Evaluation	**Budget:** $116,743

Study Title: (Lighting-4a) 2013-2014 Early M&E and Pilots/Trials to support Lighting Innovation: PG&E LED Midstream Trial Evaluation	**Budget:** $116,743
Expected Completion Date: 2015	**Study Manager:** IOUs (PG&E-only study)
Description: This study is an evaluation of PG&E's Lighting Innovation Midstream Trial. The trial relies on midstream incentives through participating electrical distributors to increase the sales of LED retrofit lighting products into the commercial market.	
Objective: Determine how effective the trial's midstream incentive approach is for increasing the sales of energy efficient lighting in the commercial sector.	
Key Research Questions: • Are there contractors and end-users that have participated in more than one of the three key commercial sector LED programs (i.e., the midstream trial, the downstream/Trade Professional Alliance, and direct install programs)? Or is there little overlap? • How does the midstream delivery mechanism compare to the downstream/Trade Professional Alliance and direct install programs (e.g., estimated savings? Types of customers? Size and types of projects?) • Are the types of lighting measures different or similar between the midstream trial and the direct install programs? • Are the projects (e.g., size, building type) similar or different between the midstream trial, the direct install program, and the downstream program (via the Trade Professional Alliance)? Does this cannibalize or optimize the downstream program? • How satisfied are contractors, distributors, manufacturers, and end-users participating in the trial with their experience? • How likely are additional (i.e., non-participating) distributors and contractors to participate in a midstream incentive program (i.e., if the trial is expanded)?	
Potential EM&V Methods: Surveys and interviews, program tracking data analysis.	
Potential Ex Ante Uses:	

Study Title: (Lighting-4b) 2013-2014 Early M&E and Pilots/Trials to support Lighting Innovation: SCE LED Midstream Pilot Evaluation	**Budget:** $101,798
Expected Completion Date: 2015	**Study Manager:** IOUs (SCE-only study)
Description: The SCE midstream pilot engages midstream distributors, a previously unaddressed distribution channel for energy efficient lighting products. During the pilot, distributors will provide SCE-backed incentives for LED lighting products to contractors.	
Objective: This process evaluation will study program design feasibility and the effectiveness of offering incentives using a buy down strategy through distribution of energy efficient lighting products. It will seek to understand the complex commercial lighting channels and develop a strategy to best influence the specification lighting industry. In addition, the process evaluation will focus on investigating the characteristics and viability of the midstream option compared to downstream programs.	
Key Research Questions: • How does the midstream delivery mechanism compare to downstream programs (e.g., estimated savings? Types of customers? Size and types of projects?) • Is this an effective delivery mechanism (e.g., uptake, satisfaction; ease of participation) that SCE	

Study Title: (Lighting-4b) 2013-2014 Early M&E and Pilots/Trials to support Lighting Innovation: SCE LED Midstream Pilot Evaluation	**Budget:** $101,798
should consider scaling up? • What is the degree of overlap with downstream programs? Does this cannibalize or optimize/supplement the downstream program? • How satisfied are contractors, distributors, and end-users participating in the pilot with their experience? • Are current participating distributors and contractors unique from the general pool of distributors and contractors that sell lighting products to SCE businesses? • How likely are additional (i.e., non-participating) distributors and contractors to participate in a midstream incentive program (i.e., if the pilot is expanded)?	
Potential EM&V Methods: Surveys and interviews, Program tracking data analysis	
Potential Ex Ante Uses:	

Study Title: (Lighting-4c) 2013-2014 Early M&E and Pilots/Trials to support Lighting Innovation: PG&E Dimming Ballast and CALCTP Training Assessment	**Budget:** $28,325
Expected Completion Date: 2015	**Study Manager:** IOUs (PG&E-only Study)
Description: The PG&E Dimming Ballast and CALCTP Midstream Trial Program provided rebates to contractors from September 2013 to June 2014 for the installation of dimming ballasts with at least 20% task tuning that can be combined with individual or bundled control solutions. In addition, contractors were eligible to receive a bonus rebate for installations that were completed by a CALCTP-certified contractor or electrician.	
Objective: PG&E PIP requires an assessment of the Trial's midstream incentive approach for preparing the market for the Title 24 code requirements and increasing the sales of dimming ballasts and basic controls in linear fluorescent fixtures among non-residential office customers. This assessment will be qualitative in nature as pre-inspections were not performed in the Trial.	
Key Research Questions: • How satisfied are commercial lighting manufacturers and contractors participating in the trial with their experience? • What are the experiences and perceptions of PG&E sales representatives regarding the trial? • How satisfied are end-user customers regarding their experiences with the products and systems installed through the trial? • What is lighting manufacturer, contractor and end-user customer understanding of and experience with dimming ballasts and basic controls in linear fluorescent fixtures and CALCTP? • What is lighting manufacturer, contractor and end-user customer awareness and understanding of Title 24 code requirements? • What is the cost-effectiveness and pay-back of the trial? • What are the energy and non-energy benefits of complying with Title 24 code requirements?	
Potential EM&V Methods: Interviews, cost effectiveness and pay back analysis.	
Potential Ex Ante Uses:	

Study Title: (Lighting-11) 2013-2014 CALCTP and Manufacturer Contractor Training Assessment	**Budget:** $95,000
Expected Completion Date: 2015	**Study Manager:** IOUs (SCE is the statewide lead)
Description: Assessment of lighting contractor trainings including manufacturer-offered training and CALCTP.	
Objective: This assessment aims to characterize CALCTP training in context with other lighting controls training options, with a focus on manufacturer-provided training.	
Key Research Questions: • What is the lighting contractor awareness level of lighting controls training options? • What are lighting contractor opinions on the effectiveness, availability, and need for lighting controls training? • What are lighting contractor opinions on defining and measuring "work quality" and "installation quality"?	
Potential EM&V Methods: Materials from different training programs will be assessed, managers and instructors interviewed, and contractors surveyed from various training backgrounds.	
Potential Ex Ante Uses:	

Study Title: (Lighting-12) 2013-2014 Evaluation of the San Diego Gas and Electric Lighting Field Services Effort	**Budget:** $28,000
Expected Completion Date: 2014	**Study Manager:** IOUs (SDG&E only study)
Description: SDG&E contracted with Evergreen Economics to conduct field services to support the 2013-2014 lighting program, which is implemented at approximately 420 participating retailer outlets. The contractor provided management of participating retailers (including small retailers and big box retailers), and development and production of point-of-purchase materials. The contractor's performance is measured based on six Key Performance Indicators (KPIs), which are reported periodically to SDG&E via monthly reports, emails and phone calls. The final report provides findings from a review of contractor documentation on KPIs and gathers feedback from participating retailers and field service representatives.	
Objective: The overall objective of the research was to identify ways the program can maximize the sales of energy efficient lighting through consumer and retailer education and marketing. The research was primarily focused on evaluating the effectiveness of the contractor's program delivery (e.g., whether it is fulfilling its contract obligations, if SDG&E and the retailers they serve are satisfied with its performance, if there are ways in which program delivery could be improved to be more effective and/or efficient). In addition, we also attempted to provide insights about the effectiveness of program design and market feedback.	
Key Research Questions: How can the program maximize the sales of energy efficient lighting through consumer and retailer education and marketing? What is the effectiveness of the contractor's program delivery?	
Potential EM&V Methods:	
Potential Ex Ante Uses:	

Study Title: (Lighting-6) 2013-2014 LED Market Characterization and Work Paper Update Study	**Budget:** $500,000
Expected Completion Date: 2015	**Study Manager:** IOUs (SCE is the statewide lead)
Description: To update existing lighting work papers with timely data collection efforts	
Objective: • To help update key parameters and methodologies used in LED lighting work papers across the state. The research objectives of this study focus on three key topics for high priority LED product categories: • The ability of the currently used **savings estimation methods** to predict baselines (e.g., wattage reduction ratio and wattage ranges), • Non-residential baseline wattages (which inform the selection of appropriate wattage reduction ratios or wattage ranges), and • LED pricing.	
Key Research Questions by study topic include: **Savings Estimation Methods:** • Do the multipliers used in current wattage reduction ratios reflect the average delta watts achieved by non-residential customers? • Are other methods more accurate? If so, what makes them so and can that be used to improve the ratio? • If wattage reduction ratios continue to be used, how should those ratios be determined? **Nonresidential Baseline:** • Are non-residential decision-makers more inclined to replace lighting equipment before the end of its useful life in the case of LEDs vs. other replacement technologies? Is the decision making for LEDs unique such that it warrants more rigorous research on ER vs ROB baselines? • For a given LED product, what are the market baseline technologies: what the customer would have chosen if not an LED (types, wattages, performance specs)? **Pricing:** • What is the range of prices for LED products of focus (addressing both residential and non-residential measures, but limiting to the LED Quality Standard List for residential measures)? • How are LED price ranges anticipated to change as the market becomes more mature, looking forward 3 years and 5 years? • At what rate are prices changing, and how often should price assumptions be updated? • This study was awarded to Navigant.	
Potential EM&V Methods: Price web scraping and modeling, Surveys, Program tracking data analysis	
Potential Ex Ante Uses: Update key parameters and methodologies used in LED work papers.	

Study Title: (Lighting-7) LED Lab Testing	**Budget:** $500,000
Expected Completion Date: 2016	**Study Manager:** ED
Description: Similar to the CFL switching lab testing study, this study will perform lab testing to verify LED product specifications and performance. Added $25,000 from IOUs to fund testing of LED retro-fit kits.	
Objective: The goal of this study is to collect LED performance data and to validate - assumptions	
Key Research Questions: (not exhaustive)	

Study Title: (Lighting-7) LED Lab Testing	**Budget:** $500,000
• How does switching LED lights on/off impact the life and performance of the LED lights? • Are the manufacturers' specifications for LED effective useful life accurate? • Are the LED work-paper's assumptions properly stated?	
Potential EM&V Methods:	
Potential Ex Ante Uses: Update key parameters and methodologies used in LED ex ante claims	

Study Title: (Lighting-8) Lighting Interactive Study	**Budget:** $750,000
Expected Completion Date: 2015	**Study Manager:** ED
Description: To conduct an impact evaluation to isolate the interaction between efficient lighting (i.e., CFLs and LED) on other energy applications within the household.	
Objective: The goal of this study is to collect necessary data to validate the lighting interactive effect. This result will be used to update lighting work-papers and other planning documents. This is a highly contentious study topic. We are aiming to use this study result to resolve open debates.	
Key Research Questions: • Are we able to expand on the current literature by analyzing electric and natural gas billing data from lighting program participants from all three IOU electric and natural gas service territories? • Are we able to expand on the current literature by including both a residential and non-residential component by focusing analysis on the retail segment?	
Potential EM&V Methods: The proposed billing analysis will be designed to determine if there are heating energy usage increases and/or air conditioning energy usage decreases that are statistically different from zero by sector using lighting installations from historical program participants. The analysis will separately analyze former program participants in both the residential and the non-residential sectors using large samples of participants. This approach will maximize the potential to observe IE, while relying on existing information within a quasi-experimental design framework	
Potential Ex Ante Uses: Contribute to an update interactive effects in DEER and work papers for ex ante review.	

Study Title: (Lighting-9) Combined 2013-2014 Lighting Market Assessment and Focused Lighting Impact Evaluation Study	**Budget:** $1,630,000
Expected Completion Date: 2015 & beyond	**Study Manager:** ED
Description: 2013-2014 Lighting Market Assessment Study and the remaining components of the Focused Lighting Impact Evaluation for 2013-2014 Program Cycle (i.e., the nonresidential upstream and all residential impact evaluation elements) in one study. Also includes LED pricing trend analysis originally proposed to be funded by the IOU process study for 2015.	
Objective: The goals of this study are: Collecting impact evaluation data on selected lighting measures for the 2013-2014 IOU lighting programs (and providing results as rapidly as possible); and Continuing current efforts to monitor and profile market changes in the lighting sector.	
Key Research Questions: • What are the ex post savings results? • How has the composition of replacement lamps on retail store shelves changed since 2012? • What do lamp suppliers consider to be the most prominent changes in the residential lighting	

Study Title: (Lighting-9) Combined 2013-2014 Lighting Market Assessment and Focused Lighting Impact Evaluation Study	**Budget:** $1,630,000

market during 2013 and 2014 (including emerging technologies/ applications)? What are the implications of these changes for consumers and other market actors?
• What is the appropriate baseline for residential upstream LED lamps?
• What is the free ridership level for residential upstream LED lamps?
• What is the free ridership level for residential upstream CFLs?
• Of the CFLs/LEDs purchased in 2013 and 2014, how many of these were not installed and will never be installed?
• What percentage of LED lamp users report early removal or failure of LED lamps in residential applications? What are the primary reasons for removal (in addition to failure)?
• How are consumers using LED night lights in residential applications? Are LED nightlights replacing other night lights (and if so what technologies)? What are the hours of operation?
• For LED Pricing Trend Analysis
  ○ What are the past and future trends around cost of LED lamps in California retail stores?
  ○ What are the geographic differences in LED pricing in California?
  ○ What are the expected changes in market share by lamp technology based on increased availability of LED lamps and reduced pricing over 2014 levels?
  ○ What are the current (and recent past) LED lamp stock and pricing among the various retail channels in the three IOUs service territories?	

Potential EM&V Methods: Methods include a telephone survey with residential electric customers of PG&E, SCE, and SDG&E; in-store shopper intercept surveys; lighting retailer shelf surveys; in-depth interviews with lamp suppliers; tracking data analyses; lamp choice modeling; and data mining.	
Potential Ex Ante Uses: Update key parameters and methodologies for lighting measures in DEER and in work papers.	

Study Title: (Lighting-20) 2015 Nonres Lighting Market Study	**Budget:** : $200,000
Expected Completion Date: 2016	**Study Manager:** ED
Description: With commercial lighting being the largest source of energy efficiency potential in California, this study will characterize the 2015 nonresidential lighting market in California, in consideration of the current and future code and standards regulations and current emerging technologies and EPIC research.	
Objective:	
Key Research Questions:	
Potential EM&V Methods:	
Potential Ex Ante Uses:	

Study Title: (Lighting-10) 2013-2014 Lighting Activity Workbook Update	**Budget:** $24,950
Completion Date: 2013	**Study Manager:** IOUs
Description: The Lighting Activity Workbook will serve as a comprehensive database of current lighting-related research. It will be instrumental in documenting and coordinating research efforts	

Study Title: (Lighting-10) 2013-2014 Lighting Activity Workbook Update	**Budget:** $24,950
across the utilities to advance lighting energy efficiency in California and to ensure research is not repeated. The Workbook Update will include the efforts of other leading efficiency organizations as well as other technology categories. This activity is funded by PG&E Lighting Innovation Program in exchange for SCE funding a similarly priced project. Waypoint Building Group completed the initial Lighting Activity Workbook and the Update. Waypoint Building Group developed the initial Lighting Activity Workbook and completed the Workbook Update in October 2013.	
Objective: The goal of this study is to update the Lighting Activity Workbook to further both LMT and lighting strategic plan goals.	
Key Research Questions: PG&E led a statewide effort to update the Lighting Activity Workbook which documents research efforts across the utilities and other efficiency organizations, supporting the coordination of research efforts to advance lighting energy efficiency in California.	
Potential EM&V Methods:	
Potential Ex Ante Uses:	

2.7.4. 2015 EM&V Studies

Table 49. 2015 Lighting EM&V Studies, Budgets and Timeline

2015 Study Area/Title	Study Manager (ED/IOU)	2015 Budget	Completion Date
Impact			
(Lighting-16) 2015 Lighting impact evaluations and ESPI evaluations	ED	$460,000	2016
Process			
(Lighting-13)	IOUs	$225,000	
(Lighting-14) 2015 Statewide Lighting Customer Decision Study – Phase 1	IOUs	$250,000	2016
(Lighting-15) 2015 Statewide Lighting Financing Whitepaper	IOUs	$0***	N/A
Market			
(Lighting-17) 2015 In-home lighting inventory and metering study – Phase 1	ED	$500,000	2016
(Lighting-18) 2015 Shelf surveys and intercept surveys	ED	$250,000	2016
(Lighting-19) 2015 LED persistence, field experience and perception in nonresidential installations	ED	$350,000	2016
(Lighting-21) 2015 Lighting practices in residential and nonresidential ZNE	ED	$100,000	2016

2015 Study Area/Title	Study Manager (ED/IOU)	2015 Budget	Completion Date
buildings			
Total		$2,135,000	

*** Finance M&E roadmap funded effort

2.7.5. 2015 Study Descriptions

Study Title: (Lighting-13)	**Budget:** $225,000
Expected Completion Date: 2016	**Study Manager:**
Description: TBD	
Objective: TBD	
Key Research Questions:	
Potential EM&V Methods:	
Potential Ex Ante Uses:	

Study Title: (Lighting-14) 2015 Statewide Lighting Customer Decision Study	**Budget:** Phase-1 - $250,000 for 2015, Phase-2 - $100,000 for 2016 (pending 2016 M&E budget allocation)
Expected Completion Date: Phase-I - to start and end in 2016, Phase-2 - to start and end in 2016 or beyond. SCE will initiate the RFP process so a vendor can be selected for both Phase-I and Phase-2 work.	**Study Manager:** IOUs (SCE is the statewide lead)
Description: The Lighting Customer Decision Study will deliver insights into customer preferences. The latent class discrete choice study will generate purchaser groups by identifying product attribute preferences through a trade-off analysis. It will provide customer decision, product features, and latent customer segmentations for LED lamps to guide future program design.	
Objective: • The latent class discrete choice analysis will provide insights into customer decision making to guide program design with regard to product specifications and incentive levels: • Identify customer purchase priorities by LED product attribute • Classify customers into segments based on their purchase considerations • Develop market adoption models • Include halogens and advanced CFLs as a new technology option to understand whether the availability of a new baseline technology changes preferences on LEDs • Include decision scenarios related to CEC specifications	
Key Research Questions: • Given LEDs' increasing maturity, what is the current state of customer preferences for LED attributes and price? • What is the influence of halogens and advanced CFLs on customer preferences for LEDs? • What are customer preferences with regard to lamp attributes as specified by the CEC specs? • How should LED incentives be optimally allocated to maximize energy savings?	

Study Title: (Lighting-14) 2015 Statewide Lighting Customer Decision Study	**Budget:** Phase-1 - $250,000 for 2015, Phase-2 - $100,000 for 2016 (pending 2016 M&E budget allocation)
Potential EM&V Methods: This study will use a latent class discrete choice model. The LCDC technique uncovers trade-offs between product choice while considering customer heterogeneity.	
Potential Ex Ante Uses:	

Study Title: (Lighting-15) 2015 Statewide Lighting Financing Whitepaper	**Budget:** $0 (project will be funded by the Finance M&E roadmap)
Expected Completion Date: 2015	**Study Manager:** IOUs (PG&E is the statewide lead)
Description: The Lighting Action Plan (LAP) component of California's 2013 – 2015 Energy Efficiency Strategic Plan sets an ambitious goal of 60-80% reduction in the energy used for lighting by 2020. The LAP committee proposes to explore the potential for financing, a key market transformation tool in many programs, to encourage uptake of highly efficient lighting technology. Specifically, the LAP calls for development of a white paper to categorize the demand for and availability of financing options for best practice lighting technologies. This research will investigate the financing landscape for commercial lighting projects and the best designs to promote market transformation.	
Objective: • Understand the demand for and availability of financing for highly efficient lighting technologies. • Characterize how greater access to financing would influence adoption of highly efficient lighting technologies. • Gauge how availability of financing might be used in program design.	
Key Research Questions: • What is the demand for financing in the lighting sector? • What are current financing programs and products that support lighting installations? • To what extent are installers involved in arranging financing? • How can financing of lighting measures be leveraged for more comprehensive retrofits?	
Potential EM&V Methods: Interview lighting installers, manufacturer interviews, existing programs review	
Potential Ex Ante Uses:	

Study Title: (Lighting-16) 2015 Lighting impact evaluations and ESPI evaluations	**Budget:** $460,000
Expected Completion Date: 2016	**Study Manager:** ED
Description: • This study will conduct impact evaluations for the 2015 lighting programs and well as determine the savings estimates needed for the 2015 ESPI mechanism. • This study will quantify the ex-post UES, NTGR, and install rates for the upstream lighting programs, as well as any deliverables needed for the 2015 ESPI.	
Objective: The goal of this study is to collect impact evaluation data on selected lighting measures for the 2015 IOU lighting programs (and provide results as rapidly as possible).	

Study Title: (Lighting-16) 2015 Lighting impact evaluations and ESPI evaluations	**Budget:** $460,000
Key Research Questions: • What are the ex post savings results?	
Potential EM&V Methods:	
Potential Ex Ante Uses: Update key parameters and methodologies for lighting measures in DEER and in work papers.	

Study Title: (Lighting-17) 2015 In-home lighting inventory and metering study – Phase 1	**Budget:** $500,000
Expected Completion Date: 2015	**Study Manager:** ED
Description: The first phase of this study will set the stage for a rigorous lighting in-home inventory and metering study utilizing new lighting meters to inform how lights are being used in homes in the state.	
Objective: Identify the appropriate scope and methodology for an in-home lighting inventory and metering study in PG&E's, SCE's, and SDG&E's electric service territories.	
Key Research Questions: • What is the appropriate scope of this effort? • Which sampling approach will most appropriately balance the needs for representativeness and cost-effectiveness of the study? • Which metering technology (or technologies) will best serve the study objectives?	
Potential EM&V Methods: The study team will likely rely on literature reviews and in-depth interviews with industry experts to develop an appropriate scope of work and sampling approach for this study.	
Potential Ex Ante Uses: Update hours of use for lighting measures in DEER and in work papers.	

Study Title: (Lighting-18) 2015 Shelf surveys and intercept surveys	**Budget:** $250,000
Expected Completion Date: 2015	**Study Manager:** ED
Description: This study will collect data on the availability, diversity and pricing of residential lamps as well as provide insights into consumer decision-making and how that is changing over time as availability, diversity, and prices changes in this rapidly evolving market.	
Objective:	
Key Research Questions: • How has the composition of replacement lamps on retail store shelves changed since 2014? • How have lamp prices on retail store shelves changed since 2014? • What factors affect consumer decision-making regarding lamp purchases? • What lamp technologies do consumers intend to replace with their newly-purchased lamps?	
Potential EM&V Methods: The shelf surveys will gather detailed information regarding all residential replacement lamps stocked in the stores other than linear fluorescent lamps. The shopper intercept surveys will include consumers who are shopping for lamps and focus on purchasing decisions and installation intentions for the newly-purchased lamps.	
Potential Ex Ante Uses: Updated shelf pricing	

Study Title: (Lighting-19) 2015 LED persistence, field experience and perception in nonresidential installations	**Budget:** $350,000
Expected Completion Date: 2016	**Study Manager:** ED
Description: This study will focus on nonresidential LED installations and will identify the percentage of lamps removed since installation and the reason for the removal.	
Objective:	
Key Research Questions:	
Potential EM&V Methods:	
Potential Ex Ante Uses: Update baselines for lighting measures in DEER and in work papers.	

Study Title: (Lighting-21) 2015 Lighting practices in residential and nonresidential ZNE buildings	**Budget:** $100,000
Expected Completion Date: 2016	**Study Manager:** ED
Description: As the number of ZNE buildings increase in California, this study will target both residential and nonresidential ZNE buildings in California and document how lighting is being designed or implemented in these buildings.	
Objective:	
Key Research Questions:	
Potential EM&V Methods:	
Potential Ex Ante Uses:	

2.7.6. Key Research Questions for 2016 and beyond

Proposed 2016 Energy Division Budget: $2,724,579

Proposed 2016 Program Administrator Budget: $450,000

The Lighting evaluation area continues to cover a large portion of the deemed savings generated by the portfolio in residential and commercial activity. In upcoming years, the lighting research area will continue to integrate with the deemed savings estimation and work paper development. The completion of current studies may reveal some new areas of interest and market study needs for emerging usage of LEDs. Impact and uncertain parameter updates will continue to be an important focus for this research area.

The following are 11 studies that try to address any gaps in lighting research for the 2016 and beyond period. The studies are in no particular order but are grouped into (a) continuing and (b) new studies:

a. **Possible Continuing Studies**
   i. **Update LED pricing web scraping data**: it is important to include res and non-res pricing. Prices continue to decline rapidly and work papers continue to evolve, meaning that the pricing data needs to be updated continuously. Web scraping is a fast and low cost method to do this. We should also explore whether we can use NEMA data and midstream programs data to obtain information on non-res LED pricing.
   ii. **Midstream lighting WP updates**: The midstream channel may require work paper updates. We need to better understand attribution and savings claims issues. We

are collecting downstream level (end-user) information in midstream programs today, even though they function much more like upstream programs. We can't evaluate everything like a downstream program. We are looking for guidance on how to evaluate each of the streams. It is also important to evaluate the trade-off between ease of participation and data intensity. For instance, SCE is collecting a lot more information, which may be a barrier to program participation. What would the in-service rate (gross realization rate) be if we are collecting less information?

iii. **Net-To-Gross Research**: Should continue for upstream and C&I downstream markets. There will be more mid-stream approaches so perhaps NTG studies need to be done for mid-stream as well.

iv. **Lighting Market Assessment Research**: Includes shelf surveys, upstream interviews, intercepts, and web-scraping to track price trends across a wide range of product categories.

v. **Lighting decision making**: There is a continued need for assessing lighting decision making, given the changes in markets under EISA, continuous rapid price declines for LEDs, increased customer familiarity with LED, removal of most CFL incentives, and the increased market share of halogens.

b. Possible New Studies

i. **In-Home Inventory and Metering Study/Lighting hours of use**: The 2006-08 study is sorely outdated and has some findings (in particular for SDG&E) that are difficult to explain.

1. Use on-sites to improve residential lighting purchase patterns. The auditor could ask the respondents which bulbs have been purchased recently and where
2. The metering component should not focus on pinning down operating hours for specific bulb types but rather on identifying operating hours by location/room type/dwelling type.
3. Include a lighting inventory panel study, in which plans are laid out for some of the individual homes in the study to be revisited in subsequent years for a close look at changes in saturation, purchase, and storage patterns.
4. Leverage hours of use study to evaluation upstream lighting and behavior program interaction

ii. **Persistence/maintenance of control technology savings:** Most assessment of control technologies is verification of installation. There is little information about performance over time. There may be an opportunity for commissioning programs to maintain savings over time. *Is this something we should study in 2017 – or do we need to study in 2016 so we can apply in a 2017 program? We may want to get national collaboration on a study like this.*

iii. **Market characterization study for LED Troffers and T-LEDs:** There is a need to define the market for LED troffer fixtures (all non-res LED fixtures indoor and

outdoor). Manufacturer surveys to define quality (reliability) of LED troffers would also be of interest. What are the criteria for determining quality and reliability? In addition, T-LED may present a new market opportunity and this market should be characterized.

iv. **LED Impact Evaluation Studies:** Although LEDs are not on the uncertain measure list, this technology should still be studied

v. **Lighting in the Hard-to-Reach Sectors:** Have programs targeting the hard-to-reach sector picked the low hanging fruit in this sector or are they implementing comprehensive lighting retrofits? Are there any savings left on the table, if so for which measures and why? What is the awareness and understanding of the small hard-to-reach commercial sector of T24 requirements? If they did not opt for comprehensive lighting retrofits, why? How did they finance their portion of costs? If loan were facilitated, would they have implemented more lighting (including a couple of questions here from the IOU-proposed lighting finance study)? This study could look at participants from this sector over the last few years, combined with site visits and decision-maker interviews.

Program Administrator study plans for this sector were combined with Energy Division ideas.

2.8. Integrated Demand-Side Management

2.8.1. Background

Sector or Program Area Description

The CPUC directed the IOUs to promote integration of programs and technologies for customers in the Energy Efficiency (EE), Demand Response (DR), Distributed Generation (DG) and Low Income Energy Efficiency (now Energy Savings Assistance Program) proceedings leading to the current portfolio periods. These integration efforts should promote energy efficiency, demand response, and distributed generation improvements and measures. Although each proceeding continues to have separate budgets and goals, the expectation of the CPUC and the IOUs are that there is coordination across the proceedings to deliver comprehensive solutions to customers. The CPUC further emphasized the Integration directive in the Long Term Energy Efficiency Strategic Plan (Strategic Plan) with specific strategies to improve integration across IOU programs. IDSM approaches bring benefits to the customer through the delivery of the right solutions to the right customer at the right time.

Recent Policy Developments:

Since the advent of DSM, California has been at the forefront of energy conservation and environmental stewardship. This history has yielded highly developed and complex policy and programmatic mechanisms to deliver demand side management solutions via numerous proceedings and funding mechanisms. While the offerings together are a vast and rich bounty of resources, efforts to optimize across those offerings suffer from established operational and administrative features that have posed barriers to an integrated DSM approach. However, the Commission has long been aware of the benefits of integration, as evidenced in policies instituted in 2005 that required the utilities to integrate customer demand side programs. The commission recognizes the need to integrate planning and programs across energy technologies and activities which impact load on the customer-side of the meter.

The regulated utilities offer a host of demand-side management solutions. The Commission recognizes that several administrative aspects, including separate sources of funding and other inconsistent programmatic details, often makes the process of combining offerings cumbersome for participants. The Commission also recognizes that each customer touch point represents an expense of time and resources. Separate touches by each DSM offering not only compound costs unnecessarily, but are not necessarily raising awareness of DSM resource synergies; nor are they assisting customers to optimize their selections across all available DSM choices.

In late 2014 the Commission concluded that a separate stand-alone rulemaking was needed to provide the requisite platform for better coordination of certain electric vehicle, demand response, distributed generation, energy efficiency, distributed energy storage, marketing education and outreach, smart grid, rate design, and water-energy issues. On October 2, 2014, the Commission approved Order Institute Rulemaking (OIR) 14-10-003. This Rulemaking (R.14-10-003) was initiated with the intention to:

- *"…consider the development and adoption of a regulatory framework to provide policy consistency for the direction and review of demand-side resource programs"*[32].

The introduction of this new Rulemaking represented a significant step towards a unified governance of all demand side management resources in pursuit of California's energy savings, load shaping and GHG reduction goals. With this as a starting point, the considerations of the Rulemaking led to an even greater broadening of goals and scope—for the Rulemaking and for the integration of power resources in California. On September 17, 2015 the Commission issued Decision 15-09-022 adopting an Expanded Scope, a Definition, and a Goal for the Integration of Distributed Energy Resources (IDER). With this Decision, the efforts of the Rulemaking now encompass an end-to-end framework spanning all aspects of the energy production and delivery system, from the customer side to the utility side. The envisioned framework considers not only what the energy suppliers can offer customers—or integrated DSM—but also what customers can offer the grid—or integration of distributed energy resources (IDER).

In Decision 15-09-022, the Commissioner defines the integration of distributed energy resources (IDER):

- *A regulatory framework that enables customers to effectively and efficiently choose from an array of distributed energy resources. The framework is based on the impact and interaction of such resources on the system as a whole, as well as on a customer's energy usage, and on the environment.*

The IDER Proceeding seeks to create the means through which all elements contributing to the provision of power in California can interact and find optimal energy solutions, as defined by the Commission's goal for IDER.

- *To deploy distributed energy resources that provide optimal customer and grid benefits, while enabling California to reach its climate objectives.*

Integrated Demand Side Management (IDSM) Program Overview

The IDSM statewide program is a strategic planning program implemented by all four of California's energy investor owned utilities (IOUs). This program ensures that the IOUs work together and pool their actions, lessons learned, and resources to develop and promote programs and strategies that seek to provide integrated demand side energy solutions to customers in all market segments (residential, commercial, agriculture, and industrial). As a statewide program, the IDSM Program has a dedicated budget, specific objectives and goals, and the IOUs must report on the progress of these activities to Energy Division on a quarterly basis.

Below is the 2013 – 2015 IDSM program budget. While this budget allocation is small relative to other program budgets within the portfolio, it supports the core collaborative and coordination functions of the IOUs while other activities of the IDSM program are funded via other programs throughout the IOU portfolio (i.e. onsite integrated audits are funded by industrial sector programs, etc.) Note: IDSM is a statewide strategic program that touches on many programs in the IOU portfolio. Evaluation studies conducted under the IDSM Research Roadmap, while not targeting specifically identified programs, will

[32] Order Instituting Rulemaking to Create a Consistent Regulatory Framework for the Guidance, Planning, and Evaluation of Integrated Demand-Side Resource Programs. California Public Utilities Commission; Filed October 2, 2014. San Francisco, California; Rulemaking 14-10-003

have implications and be relevant for many programs including IOU energy efficiency, distributed generation, and demand response programs.

Table 50. 2013-2015 IDSM Programs and Budgets

IDSM Program Budget Summary (2013-2015)*			
Utility	**2013-2014 Budget**	**2015 Budget**	**2013-2015 Budget**
Southern California Edison	$1,355,000	$697,374	$2,052,374
Pacific Gas and Electric	$1,389,140	$714,617	$2,103,757
San Diego Gas and Electric	$415,050	$404,242	$819,292
Southern California Gas	$650,000	$581,750	$1,231,750
Total	**$3,809,190**	**$2,397,683**	**6,207,173**

*These budgets support only the core collaborative and coordination functions of the IOUs while other IDSM strategies are funded via other programs throughout the IOU's portfolio. The IDSM program is considered a strategic planning program driving energy savings via other resource incentive programs. As such, specific energy savings are not currently allocated to this program.

Core tasks supported by the IDSM program are listed below (D.09-09-047, p. 211):

1. Development of a proposed method to measure cost-effectiveness for integrated projects and programs including quantification and attribution methods that includes GHG and water reductions benefits and the potential long-term economic and electric / gas hedging benefits;
2. Development of proposed measurement and evaluation protocols for IDSM programs and projects;
3. Review IDSM enabling emerging technologies for potential inclusion in integrated programs;
4. Development of cross-utility standardized integrated audit tools using PG&E's developed audits as a starting point;
5. Track integration pilot programs to estimate energy savings, develop best practices and lessons learned and develop standard integration best practices that can be applied to all IOU programs based on pilot program evaluations and the results of additional integration promoting activities (i.e., EM&V and cost-benefit results);
6. Develop regular reports on IDSM progress and recommendations to the Commission;
7. Organize and oversee internal utility IDSM strategies by establishing internal Integration Teams with staff from EE, DR, DG, marketing, and delivery channels; and
8. Provide feedback and recommendations for the IOU's integrated marketing campaigns including how the working group will ensure that demand response marketing programs approved as category 9 programs are coordinated with energy efficiency integrated marketing efforts.

The IOUs are in various stages of completion with regard to these eight tasks, and with regard to implementing the recommendations. The results of the IDSM Omnibus Process Evaluation (completed October 2012), provides numerous recommendations for how to continue to accomplish these tasks.

The IOUs are currently considering these recommendations and how to incorporate them into their overall IDSM portfolio wide strategy as the current 2013-2015 cycle evolves as planned into a 10 year ongoing rolling portfolio. Many of the evaluation projects in this EM&V roadmap are proposed with these ends in mind.

Recent CPUC Guidance

The Guidance Decision (D.12.05.015) directs the IOUs to continue and expand integration efforts in the following areas:

- Increased Coordination: Increased coordination across different proceedings with the IDSM Task Force as lead IDSM Funding: Consideration of appropriate funding from the other proceedings to support IDSM efforts
- Increased Involvement of Stakeholders: Inclusion of stakeholders and experts in the efforts of the IDSM Task Force
- Information on IDSM Projects: Detailed information on the pilot programs and
- Projects
- Audits: Continued development of the integrated audit tool
- IDSM Marketing: Increased integrated marketing efforts and improved reporting/ communication with the Energy Division
- IDSM Tracking Databases: Improved databases for tracking integrated projects

In the Final Decision Establishing Energy Efficiency Savings and Goals Approving 2015 Energy Efficiency Programs and Budgets () the Commission provides additional guidance to the IOUs regarding IDSM. The Commission directed the IOUs to focus not only on integration of EE and DR, but to include DG in their IDSM efforts as well and to a reasonably equal degree.

"The IOUs have identified programs as IDSM programs if they support two out of the three demand side technology types (energy efficiency, demand response, and distributed generation). In most cases, the two technologies that are identified as part of an "IDSM" program are demand response and energy efficiency. We do not take issue with these definitions now. We note, however, the distributed generation should not always be the "odd man out." We elect not to provide guidance on this now, but may revisit whether to do so if we learn that distributed generation is being left by the wayside.[33]"

The IOUs are currently considering ways to incorporate these guidance decisions into their overall IDSM portfolio wide strategy as the current 2013-2015 cycle evolves as planned into a 10 year ongoing rolling portfolio.

Implementation Uncertainties and Challenges to be Addressed by Evaluation

Ultimately, customers do not think of their energy usage and service requirements in terms of the regulatory proceedings associated with the various policy initiatives in California. When it comes to energy-related programs and services for their home or business with demand side management (DSM) programs, they think in terms of comprehensive and overall Energy Savings, Cost Reductions, Operational Improvements, Greenhouse Gas Reductions, Capital Investments, and Return on Investment (ROI).

To the extent that the integration of DSM programs and offerings can lead to a smoother decision making process for customers, while lowering their costs, maximizing incentives and optimizing their return on investment, then the integration of IOU programs can be a successful strategy for utility customers and utilities alike.

Within the IOUs, the integration of utility non-residential programs among large load customers occurs when account representatives pull together various programs and incentives to create whole building integrated solutions. For smaller business and residential customers, integration is achieved through

[33] D. 14-10-046, October 16, 2014, Page 101

marketing channels via messaging. By leveraging various delivery channels across all customer segments integration of DSM programs and services can be achieved.

Evaluation and Information Needs

Coordination with, and support for the IDER Proceeding (R.014-10-003) proceeding is a critical priority to the activities conducted within this IDSM Roadmap. The concerns and issues historically addressed within the IDSM Research Roadmap align closely with those addressed by the IDER Proceeding, such as achieving better alignment of cost-effectiveness methodologies across DSM strategies, and achieving efficient, effective deployment to customers of all DSM strategies, that provides ratepayer benefits and supports California's environmental goals. A major component of the IDER proceeding is to work in a complementary fashion with the Distribution Resource Planning Proceeding (DRP) proceeding, which is focused on optimizing infrastructure and energy supply to maximize value for ratepayers and also achieve a low-carbon grid. The work of both the IDER and DRP proceedings involve coordination with multiple other CPUC proceedings, as well as the CALISO and its ESDER / DERP efforts.

The information needs addressed by this Roadmap for 2015 and beyond are informed by the IDER, and by extension also consider the needs and activities of the DRP. Moreover, the research planned here will be coordinated appropriately with activities of other proceedings, to avoid redundancy, to fill gaps and to utilize opportunities for leveraging. The IDSM Roadmap research for 2015 and beyond is intended in part, to provide direct support of research needs emerging from the IDER Proceeding, and in its endeavors to coordinate and work in a complementary fashion with the efforts of the DRP and other related proceedings. The IDER Proceeding is evolving rapidly, and related support needs have a dynamic component. Thus, we are holding back some of the 2015 evaluation funds in order to support research needs we anticipate will emerge in the future.

Further, similar to the IDER Proceeding, the issues and concerns of the IDSM Roadmap have close ties and overlap with other ongoing proceedings. For example, the Distributed Resource Planning (DRP) Proceeding is considering issues related to Locational Targeting; any work done via this Roadmap that is in relation to Locational Targeting will need to be carefully coordinated with the DRP Proceeding.

Past evaluation findings indicate a need for adequate data collection to sufficiently evaluate IDSM activities within the portfolio. There is a need for an integrated tracking database or system that includes information on the rebated EE, audit, DR, DG, and web-based smart grid programs that a building, site, account, or meter has participated in. This form of tracking is needed to better understand site level integration. If evaluations are going to evaluate the ability of integrated program design and activities to save more energy at lower cost, it will be necessary to have a truly integrated database or system.

2.8.2. 2013-2014 EM&V Studies

The table below summarizes the 2013-2014 EM&V Studies that have been budgeted, some of which are complete and others are in the process of being implemented. The table provides the study manager, work order under which the study is being conducted, the corresponding budget, implementation status and expected completion date for each study.

Table 51. 2013-2014 IDSM EM&V Studies and Budgets

Study	Study Lead (ED/IOU)	Work Order #	Budget	Completion Date
Small Commercial and Residential IDSM Market Characterization Study	IOU		$80,000	Complete 8/14
IDSM Non-residential Case Study Project	ED	ED_O_IDSM_2:	$150,000	01/16
Customer Research: IDSM Drivers and Barriers	ED	ED_O_IDSM_3	$150,000	7/15
Additional IDSM Studies Funded by Other Areas				
IDSM Inventory and IDER Support	ED	ED_D_Mkt_6	See Market Studies Roadmap	3/16
Total Budget		**$360,000**	**$360,000**	

2.8.3. 2013-2014 Study Descriptions

Below are descriptions for each of the 2013-2014 studies, which include the key research questions and EM&V methods applied.

Study Title: Small commercial and Residential IDSM Market Characterization Study	**Budget:** $80,000
Completion Date: August 2014	**Study Manager:** IOU
Description: Market Assessment for Commercial and Residential IDSM Markets	
Objective: • Based on an analysis of integrated projects and other forms of primary and secondary research we will identify demographic/firmographic or industry/segment predicators of IDSM participation. • The study will also examine customer decision-making associated with integrated projects. • The study will also investigate patterns of adoption by customer type vis a vis the adoption of integrated DSM solutions.	
Key Research Questions: • In the residential and non-residential sectors what customers are more likely to adopt an integrated solution? • What is the decision-making process behind customer participation in demand side management programs? • What channels or marketing efforts / messaging are most effective for the residential and small business segments? • What are the drivers behind customer purchasing decisions for integrated solutions?	
EM&V Methods: Literature review, in-depth interviews, analysis of marketing material and product documentation, other secondary sources, IOU tracking data analysis	

Study Title: Bottom-up Assessment of Impacts from Integrated Project/Pilots	**Budget:** $150,000
Expected Completion Date: 2015	**Study Manager:** ED

Study Title: Bottom-up Assessment of Impacts from Integrated Project/Pilots	**Budget:** $150,000
Description: Examine customer-side costs and benefits of selected IDSM projects, potentially isolate the incremental effects of an integrated approach.	
Objective: The primary objective of this study is to identify the cost and benefit parameters that change due to an integrated approach, and to understand the manner and extent that the streams of costs and benefits are affected.	
Key Research Questions: • What are the data needs to inform understanding of integrated cost- effectiveness? • Is conducting a preliminary analysis of pilot IDSM program and project cost-effectiveness analysis possible given existing data? • What are the data needs to inform understanding of integrated cost- effectiveness? • Is conducting a preliminary analysis of pilot IDSM program and project cost-effectiveness analysis possible given existing data?	
EM&V Methods: Case Studies, documentation/desk reviews, Tracking and billing data analysis, in-depth interviews	

Study Title: Customer Research: IDSM Drivers and Barriers	**Budget:** $150,000
Expected Completion Date: July 2014	**Study Manager:** ED
Description: Understand customer segments, and segment-specific drivers and barriers to IDSM uptake.	
Objective: • **Characterize the current distribution of customer characteristics, market context and particular processes leading to IDSM adoption within the residential and small commercial markets. This effort will work to refine our understanding of primary drivers and barriers related to the uptake of IDSM solutions in California's mass markets.** • Support the development of a program and marketing strategy that will leverage high levels of customer receptivity while also meeting preferences for content of IDSM information, leading to greater IDSM knowledge and higher levels of uptake • **Investigation of Need States as IDSM Driver**: ○ Investigate Barriers to IDSM and Customer Preferences for IDSM Information and Marketing.	
Key Research Questions: • Ultimately we seek to understand the underlying dynamics of customers' perceived value of DSM options; to understand how those preferences vary across individually considered DSM adoptions versus grouped or sequenced adoptions. The IOU-led IDSM small commercial and residential market characterization study collected supply-side data and conducted interviews to take a snapshot of current trends and offerings in IDSM products and services. This study builds on those findings through primary customer research. • **What are the roles and relative importance of various Need States as Drivers of IDSM uptake?** • **Do IDSM adopters have shared characteristics? What are they?** • **What paths do IDSM adopters typically follow that lead to IDSM project uptake?** • **What implications do these have on optimal approach to raising IDSM awareness and increasing IDSM uptake?**	

Study Title: Customer Research: IDSM Drivers and Barriers	**Budget:** $150,000
• What are the primary Barriers to IDSM what are effective ways to address barriers to IDSM uptake? • What are Customer Preferences and for receiving IDSM Information and Marketing material, and how do these effect receptivity? • What are residential customer preferences for IDSM information and marketing?	
EM&V Methods: • In-Depth interviews with IOU staff, • Analysis of residential UEAT usage patterns, • Computer assisted telephone interviews (CATI) surveys focused on residential customers that have recently adopted IDSM solutions, as well as a group has not, for comparison.	

Additional 2013-2014 IDSM-Related Studies Funded by Other Roadmaps

Study Title: IDSM Inventory and IDER Support	**Budget:** (funded by Market Studies)
Expected Completion Date: Q2 2016	**Study Manager:** ED
Description: This study was established soon after the IDER proceeding was initiated (October, 2014). The study has two primary components. The first component was designed to meet needs that arose in some of the early proceeding activities including workshops. The focus of the proceeding shifted during its first year of operation, and the second component of this study arose in response to that shift in focus. Thus the first component of this research is focused on integrated DSM offerings to customers, while the second component is concerned with facilitating the inter-proceeding coordination and communication requirements of the IDER proceeding. More specifically, the first component offers documentation of the current designs and delivery strategies of integrated DSM programs to customers. The investigation began with a review of approaches in place outside California, followed by an assessment of the ratepayer funded DSM offerings within California. The assessment describes major types of IDSM programmatic and promotional strategies in place; the range of designs; and particulars surrounding the distribution of those program offerings across the nation. To enhance the illustrations of some of the more typical designs, we selected specific programs examples and provided a more comprehensive characterization. The DSM programs within California were mapped to a comprehensive database that contains many descriptive elements including budget, customer segments, technologies and DSM strategies. The second component of the study conducts a policy literature review and creates a corresponding tool to track the elements of other CPUC proceedings and the activities of other government agencies, that have a direct bearing on the objectives of the IDER. This includes identifying milestones, objectives, timelines, contingencies, and interactive elements across related proceedings and agency concerns; and develops a communication and coordination facilitation tool to meet the greater demands for these fundamental functions that arise from IDER objectives.	
Objective: The goal of this project is to provide support for activities and concerns of the IDER Proceeding. The first component of this project offers a characterization of integrated DSM offerings –both outside and inside California's IOU-ratepayer funded portfolio. The second component provides information and resources to enable the highly efficient and timely coordination across proceedings and agencies associated with meeting the objectives of the IDER.	

Study Title: IDSM Inventory and IDER Support	**Budget:** (funded by Market Studies)
Key Research Questions: • What are the characteristics of the current set of integrated programs and portfolio strategies being implemented in jurisdictions outside California? What lessons-learned from these efforts might be worth consideration by policy-makers in California? • What are key descriptive and integrated characteristics of the set of DSM programs offered to IOU-ratepayers in California? What are the activities, objectives, milestones and timelines governing CPUC proceedings and the activities of other agencies that bear upon the concerns of the IDER proceeding. What are the important particulars of these elements within other proceedings? What are the likely potential interactions in these elements? What bearing do alternative outcomes have on the IDER? How would these elements be most effectively tracked and communicated?	
EM&V Methods: This effort is supported by review and analysis of secondary sources, such as policy documents, reports, databases, published research.	

2.8.4. 2015 EM&V Studies

The IDSM Roadmap Research described below for 2015 is draft only. It is intended to provide a starting point for further discussion and consideration. Coordination and assurance of complementary scoping across Roadmaps and related Proceedings is critical.

2015 Study Ideation and Prioritization

This section presents the process used to scope and prioritize Roadmap research for the 2015 Program Year. The status and results of that process are also summarized below.

The development of the studies specified in this section evolved from recent evaluation findings, CPUC direction and a process of ongoing dialogue with the IDSM PCG. The IDSM PCG is comprised of IOU, CPUC, consultants and outside stakeholders, including private sector industry representatives, independent interveners, and members of organizations with close ties to efficiency programs in California, such as the Southern California Regional Energy Network. PCG membership was solicited from all interested parties, along with a request for a brief statement of interest and expertise. The PCG has a standing bi-weekly meeting, which occurs only when relevant material has developed for the group to discuss. The group has been consistent in its interest and support for the IDSM Roadmap Research since it was originally formed to support the 2013-2014 IDSM Roadmap studies. The IDSM PCG held multiple discussions of 2015 research ideas and priorities during regularly scheduled meeting times in February of 2015, and following various discussions of findings from the 2013-14 research that occurred throughout the year.

Summary of 2015 Proposed Studies

The Roadmap Research specified here for 2015 is draft only. It is intended to provide a starting point for further discussion and consideration. Coordination and assurance of complementary scoping between studies across Roadmaps and across related Proceedings is paramount. The issues and research topics of concern to the IDSM Roadmap are closely aligned with those of the IDER proceeding (R.014-10-003), and the funding for this Roadmap is reserved in part, to provide support for proceeding activities.

However, the proceeding is dynamic and evolving and therefore we hold back some of the 2015 EM&V funds for research needs that may emerge in the future.

The table below summarizes the 2015 EM&V Studies that have been budgeted. The table provides the study manager, corresponding budget and expected completion date for each draft study proposal. Please note that while the IOU managed studies include two studies, each with a budget of $100,000, the IOU funding for the 2015 cycle is limited to a total of $100,000. Thus the IOUs will select one of their two proposed study topics to pursue further with the allocated funding.

Table 3. 2015 IDSM EM&V Studies, Budgets, and Timing

2015 Study Title	Study Lead (ED/IOU)	Work Order #	Budget	Completion Date
Market				
Tracking Database Development: Statistical Analysis and Characterization of the Adopter Population	ED	n/a	$88,000	2015
Nonresidential IDSM Market Research: Characterization of Selected Market Segments, and Customer IDSM Drivers and Barriers	ED	n/a	$200,000	2016
IDER Contextual and Market Research characterizing DER market structures, market actors, emerging/existing business models, trends and technical developments	ED	n/a	$295,000	2016
Process				
Locational Targeting Study	IOU	n/a	$100,000*	2016
EM&V Methods				
Cost-Effectiveness Whitepaper Update	IOU	n/a	$100,000	2016
Other				
IDSM OIR Support: policy research; ad-hoc tasks	ED	n/a	$200,000	2015-17

*The IOUs have $100,000 to spend on 2015 studies. To support the IDER OIR, the IOUs propose to complete one of the two proposed studies in 2015, depending on the needs and progress of the proceeding.

2.8.5. 2015 Study Descriptions

Below are descriptions for each of the 2015 studies, which include the key research questions to be addressed, and the potential EM&V methods that will be utilized. The IDSM Roadmap Research proposals described in this section are draft only. Coordination and assurance of complementary scoping between studies within this Roadmap, as well as across Roadmaps and across related proceedings is paramount.

The draft study proposals described below include one related to Locational Targeting of IDSM. The scope of this study will need to be refined to ensure it is well coordinated and complementary to work being done within the Distributed Resource Planning Proceeding (R.14-08-013). Similarly, work proposed below on the topic of cost-effectiveness is directly related to current cost effectiveness activities within the IDER proceeding.

Study Title: IDSM Tracking Database Development: Statistical Analysis and Characterization of the Adopter Population	**Budget:** $88,000
Expected Completion Date: 09/15	**Study Manager:** ED
Description: The CPUC Data Management Team and the efforts of the 2013-2014 IDSM evaluations together yield databases representing the residential and nonresidential IOU customer populations, and aspects of IDSM uptake. These databases include records of downstream ratepayer funded energy efficiency program participation; use of IOU online audit tools; and interconnection / net energy metering participation. In this Study we will update and augment these database resources with additional IOU tracking records, including demand response programs, low-income programs, AMI-enabled behavior programs (e.g. Energy Alerts and OPower Energy Reports), distributed generation programs (CSI, Self-Generation Incentive Program). We can also expand these data resources using U.S. census data. Once assembled, statistical analysis of the population can be done to identify IDSM saturations and trends over time, including trends and patterns in geography/climate, size, business type, technologies and measures, and the various demographic and economic attributes available at the census block level. This study will be coordinated closely, and perhaps cooperatively funded, with the CPUC Data Management Team.	
Objective: Create a shared resource for all evaluators; improve understanding of the current population of known IDSM adoptions; document a baseline of saturation and rates of uptake; leverage database characteristics to guide efforts to support and expand IDSM uptake. In addition, through the process of assembling an expansive tracking system we will identify any shortcomings in tracking systems that block or create unnecessary costs.	
Key Research Questions: Which customers/facilities in IOU service territory have completed an IDSM project? Which have completed DSM projects? What measures, programs and IDSM supporting technologies contributed to completed IDSM projects? Which have completed an integrated audit and which used the IOUs' integrated toolkit?	
Potential EM&V Methods: Collection and analysis of IOU customer and rate data, interconnection data, billing data, IOU energy efficiency program tracking data, distributed generation and Self-Generation Incentive Program tracking data, demand response program enrollment and event data, and smart-meter enabled behavior program enrollment data.	

Study Title: **Small Commercial Customer Research: Study of IDSM Deployment in Selected Business Segments and Ownership Structures**	Budget: $200,000

Expected Completion Date:	Study Manager: ED

Description: This is a study of IDSM uptake in selected small commercial sectors. The study will select high-need sectors for the study of IDSM opportunities, decision-making frameworks, and primary drivers and barriers to uptake. Sectors definitions will consider energy consumption, building type, business type, location, and ownership structure. Sectors will be selected for study based on a variety of attributes including:

- higher economic and/or technical potential;
- substantial barriers /drivers to IDSM uptake, with particular attention on barriers related to split incentives resulting from lease agreements; and,
- greater information needs (i.e. more significant unknowns) related to DSM uptake.

The study will consider two elements of the deployment of IDSM in selected small commercial sectors. The relative resources and focus of the study efforts across these two elements is yet to be determined:

I. Assessment of the rent/own barrier, and the related building-owner decision-making structures, decision drivers, and opportunities for market intervention.
II. An IDSM drivers and barriers assessment, including an investigation of customer (occupant) decision-making processes, perceptions of value and risk, participant transactions costs, customer wants and needs, DSM attitudes and awareness; and use of IDSM enabling technology.

Objective: Through this study we seek to understand the underlying dynamics determining uptake of various types of DSM solutions in selected small commercial sectors, including those at play in renter-occupied spaces. For small commercial sectors that we determine to be in greatest need of IDSM research and attention, we seek to:

- characterize the current distribution of customer characteristics,
- market context and particular processes leading to IDSM adoption within selected small commercial sectors.
- Identify market opportunities and intervention strategies that will be effective in promoting IDSM uptake, including in a leased-space.

Key Research Questions: We seek to understand for each selected small commercial sector, and ownership structure (i.e. owner occupied versus rental) :

- How are energy investment and retrofit decisions made? What are the primary considerations and who are the decision-makers?
- What paths do adopters typically follow that lead to IDSM project uptake, what resources are employed?
- Why do building-owners invest in IDSM solutions for leased property? What is needed to promote uptake?
- What are the roles and relative importance of various need states as drivers of IDSM uptake?
- Do IDSM adopters have shared characteristics? What are they?

- What implications do the characteristics of adopters have on optimal approaches to raising IDSM awareness and increasing IDSM uptake?

Potential EM&V Methods: Secondary research. Primary data collection including in-depth interviews, focus groups and/or surveys with owners and/or occupants of small commercial facilities.

Study Title: IDER Contextual and Market Research characterizing DER market structures, market actors, emerging/existing business models, trends and technical developments	**Budget:** $295,000
Expected Completion Date: 2016	**Study Manager:** ED

Description: Current integration policy initiatives in California, including those underway within the IDER proceeding, are concerned with valuation and sourcing of distributed energy resources. They are concerned with markets and the market actors that comprise power generation, delivery, exchange and consumption. This project is focused on characterizing key DER market elements including market structures, key market actors, emerging/existing business models, trends and technical developments.

Objective:
The output of this study should support policy making around the sourcing processes for distributed energy resources. The intention is to expand and deepen our understanding of current DER frameworks and the market actors that operate within them.
IDER considerations span customer needs and grid needs, and seek to create a means by which they can interact to reap the best solutions for both. This study seeks to provide a characterization of the current and emerging energy supply and demand market, with an emphasis on non-utility players and factors. We envision producing a map or laying out a picture reflecting the traditional system, the current system, and the emerging system, to the degree current trends are illustrative.

Key Research Questions:
The primary questions we propose to address are the following:

- What constitutes the current set of distributed energy resource sourcing options?
  - What are the pros and cons of each?
  - What contracts, tariffs, solicitation protocols, and other methods surrounding sourcing of distributed energy resources already exist?
- What are the new and emerging DER business models? What new products are being offered today, and how are they exchanged?
  - How many vendors are in this market? How big are they? Who do they serve? What are revenues/sales/growth projections?
- What frameworks do the various DER providers operate within?
- What are the key economic and technical drivers of their activities?
- How do these businesses respond to customer needs? How do they (or could they) leverage customer potential?
- How do they interact with utilities, wholesale markets and customers?
- What are the key market trends and technical developments that are driving this market or evolving it?
- What else do we need to know about these markets and market participants to support IDER?

Study Title: IDER Contextual and Market Research characterizing DER market structures, market actors, emerging/existing business models, trends and technical developments	**Budget:** $295,000
Potential EM&V Methods: Secondary research, in-depth interviews, CATI surveys, focus groups	

Study Title: Cost-effectiveness Framework Whitepaper Update*	**Budget:** $100,000
Expected Completion Date: 2016	**Study Manager:** IOU
Description: Provide updates to the 2011 IDSM Cost-effectiveness Framework whitepaper, to reflect updates to current methods and best practices.	
Objective: This whitepaper would provide an update to the 2011 IDSM cost-effectiveness framework whitepaper. This assumes that the IDSM OIR and the EMV cost effectiveness study sponsored by the CPUC have been completed. Such a study should consider IDSM approaches that include electricity and natural gas opportunities. **Additional objectives include:** This whitepaper would explore local, regional, and national perspectives on IDSM; how it is defined and perceived from the regulatory, utility, stakeholder, and customer perspective, and how those perspectives contribute to differing cost-effectiveness calculations and methodologies.	
Key Research Questions: • How is IDSM being defined nationally by utilities, regulators, stakeholders, and customers? • What are some of the best practices? What works and what lessons can be drawn for CA IOUs? • Do differing definitions and perspectives on the role and meaning of IDSM impact varying cost-effectiveness calculations and methodologies? • Based on local/regional understandings of IDSM, how is cost-effectiveness being assessed? • Revisiting the previous cost-effectiveness whitepaper, what updates have there been to assessing IDSM cost-effectiveness?	
Potential EM&V Methods: Sample Survey and program Case Studies	

*The Cost-Effectiveness Framework Whitepaper is being proposed to support the current IDER OIR (R.14-10-003). However,IDSM EM&V may be able to leverage work already being done on this topic and the project scope for the white paper update will be further developed if deemed necessary.

Study Title: Locational Targeting Study*	**Budget:** $100,000
Expected Completion Date: 20165	**Study Manager:** TBD
Description: Explore local, regional, and national locational targeting efforts, best practices, and cost-effectiveness implications of locational targeting.	
Objective: Highlight best practices and benefits of locational targeting for potential IDSM program update, grid decongestion, and peak load reduction. **Additional objectives include:** Developing a national understanding of locational targeting contributions to program cost-effectiveness.	
Key Research Questions: • How is locational targeting currently being done within CA and around the country, and how do these two efforts compare? • What IDSM program opportunities does locational targeting provide, and what are the drivers and	

Study Title: Locational Targeting Study*	**Budget:** $100,000
barriers to effective targeting? Which practices work and which do not? What are some key lessons learned? • How does locational targeting impact IDSM cost-effectiveness, and what are the current methods being used to explore this possibility? For example, what impact, if any, does locational targeting have on deferred maintenance of congested substations?	
Potential EM&V Methods: Sample Survey and Conjoint Analysis	

*If there is not a need for the Cost-Effectiveness Framework Whitepaper Update, the IOUs propose to use the remaining 2015 budget to complete this study.

Study Title: Support for IDER Proceeding and other ad hoc consulting/research tasks	**Budget:** $200,000
Expected Completion Date: n/a	**Study Manager:** ED
Description: This budget is held back to support the emerging needs of the IDER proceeding, as well as ad hoc research and tasks to support the CPUC in its management and guidance of the IDSM Research Roadmap.	
Objective: To support the emerging and ad hoc research and consulting needs of the IDSM OIR and the IDSM Research Roadmap.	
Key Research Questions: TBD	
Potential EM&V Methods: TBD	

Other Important Considerations

The Roadmap Research specified here for 2015 is preliminary and draft only. It is intended to provide a starting point for further discussion and consideration. Coordination and assurance of complementary research scoping across Roadmaps and related proceedings is paramount. The draft study proposals described above include one oriented to Locational Targeting of IDSM. The associated research scope will require refinement to ensure it is well coordinated and complementary to work being done within the IDER Proceeding (R.14-08-013). Similarly, work proposed above on the topic of cost-effectiveness is directly related to current activities within the IDER proceeding and will need to be coordinated accordingly.

Thoughts on 2016 – 2017 Evaluation Needs

Due to the pace of the IDER and DRP Proceedings as described in this section, it is not possible to identify 2016 – 2017 evaluation needs at this time. As the proceedings unfold we will update this section of the roadmap as needed and to seek public input, which will also be occurring within the respective proceedings.

2.9. Codes and Standards

2.9.1. Background

Sector or Program Area Description: Codes & Standards

The Codes and Standards (C&S) program saves energy by influencing continuous improvements in energy efficiency regulations, improving compliance with existing codes and standards, and working with local governments to develop ordinances that exceed statewide minimum requirements. Both the C&S program advocacy and compliance improvement activities extend to virtually all buildings and potentially any appliance in California.

November 2015 updates:

This update to the C&S chapter updates scope and budgets of previously planned studies as well as new studies funded with approved 2015 funds.

The C&S Evaluation Team (Commission staff, IOU staff, and consultants) identified the following research needs and high level study proposals for 2016. All research needs are yet to be prioritized for development given timing and resources available.

Programs included in the Research Scope

The Codes and Standards program accounts for 23% of the statewide projected energy savings but only 1.44% of the IOU approved budget for 2013-2015 cycle. About 86% of the program's savings are expected to come from Appliance Standards advocacy activities.

The program design has changed slightly from previous cycles. The 2013-2015 cycle has two new subprograms:

Compliance Improvement (non-resource)

The Compliance Improvement subprogram is a new subprogram that combines the previous Extension of Advocacy and Compliance Enhancement subprograms. It provides education, training, and other activities targeting building departments and other industry actors responsible for compliance with Building Energy Code and Appliance Standards requirements. Activities may include development of "best practices tools" and other infrastructure elements that serve multiple compliance improvement objectives.

Planning and Coordination (non-resource)

The Planning and Coordination Subprogram supports planning activities that improve alignment across the IOU energy efficiency portfolio with respect to future C&S program activities. This newly developed subprogram supports efforts to prepare the market for future code adoption (i.e., improve code readiness), to ensure higher code compliance rates and advance the CPUC Strategic Plan goals for achieving zero net energy.

Building and appliance standards advocacy activities comprise the majority of the budget and claimed savings approved for the 2013-2015 cycle. The reach codes subprogram design remains unchanged from 2010-2012 cycle

Uncertainty and Challenges to Successful Implementation

Much of the uncertainty and many of the challenges that the program currently faces lie in the CEC's building code and appliance standards adoption process. Since the CEC ultimately decides which codes and standards will be adopted, the savings from program efforts in supporting various codes are often at risk as the benefits from new or more stringent codes are weighed against other factors that emerge in the public process. Additionally, strategic planning for new codes and standards is challenging for the program since the IOU's agenda must largely coincide with CEC code changes priorities. Strategic alignment during the planning phases has been challenging in the past for a variety of reasons. However, the Codes and Standards Action Plan [34]has identified key processes that should help strengthen coordination among the CEC, the CPUC, and the IOUs, as well as other stakeholders.

Another challenge lies in the coordination of the C&S program with other energy efficiency programs across the utilities' portfolios. Strategic coordination between the C&S program and the wide array of utility EE programs – from new construction programs, to residential and commercial appliance programs, Emerging Technologies programs, and WE&T programs – is vital to achieving California's long-term energy efficiency goals. The purpose of the newly developed C&S Planning and Coordination subprogram is to lead strategic planning and coordination efforts within and across the utilities to help more effectively move incentive measures through EE programs and into code and support compliance improvement activities through training, outreach, and other interventions in the market.

Finally, improving code compliance is increasingly a larger goal for the C&S program, especially as code stringency increases to support the CPUC's Zero Net Energy (ZNE) goals set forth in the California Long Term Energy Efficiency Strategic Plan (2008 and 2011 update). For the C&S program, significant challenges lie in designing programs around compliance improvement given the challenges in evaluating compliance with both building codes and appliance standards and identifying the factors that lead to low compliance. Improving knowledge about compliance rates, developing better methods and data sources for evaluating compliance, and delving deeper into the measure-specific drivers of low compliance will help greatly in program planning for and execution of compliance improvement efforts.

Emerging Evaluation and Information Needs

The following are stakeholders to the C&S program whose known data and research needs to date are reflected in this chapter: CPUC, IOUs, CEC, EE voluntary programs, Emerging Technologies program, building industry, and new construction energy efficiency advocates.

It is important to realize that constrains such as resource, time and access to building department data as well as access to buildings to perform audits require that we target key sectors with manageable sample sizes. These constraints may result in studies not being able to focus on all sectors with large sample sizes in every cycle.

[34] This Action Plan is part of the implementation of the Long Term Energy Efficiency Strategic Plan, available at http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/eesp/.

The following research needs were defined based on results of previous evaluations and emerging research needs.

Key Research Questions to Be Addressed in 2013-2014 EM&V

Table 52. 2013-2014 C&S EM&V Research Questions Summary

Study Name	Research Questions [2013-2014]
Impact	
2013-2015 C&S Impact Evaluation	• What are the compliance rates for Title 24, Federal and Title 20 standards? • Is prescriptive or performance the most common method of compliance for MF buildings? What is a robust method to sample, audit and calculate compliance? • How to treat interactive effects and other effects when measuring compliance for MF buildings? • How to determine UES for MF buildings? What type of modeling tool is necessary to capture these savings? • What is a robust method for determining the baseline and impact of residential alterations? • Is it possible to determine compliance at the measure level when using a whole building compliance approach? What are the limitations? • Can Title 24 field audits collect information to improve compliance improvement efforts? • Can methods and approaches to determine baselines for building and appliance standards be aligned given available data and previous evaluation findings?
Assessment of Cost-Effectiveness Tools for C&S Program	• What is a robust method for determining cost-effectiveness and relevant inputs to a cost effectiveness calculation for the Codes and Standards program? • Are the current methods and assumptions used for determining inputs (e.g. measure EUL, measure cost forecasts, benefit streams) to the TRC cost-effectiveness calculation adequate for C&S? • What is the feasibility and cost of collecting information to inform parameters for cost-effectiveness? • Are the inputs as defined in the calculator comparable to the findings and how can they be aligned?
Process	
Compliance Improvement Process Evaluation for IOU Statewide Program and BayREN Codes and Standards Program	• What is the ongoing effect of the “best practices” report on local jurisdictions in California to improve their code enforcement practices (the report was produced by the CEP in 2010-2012)? • How is the BayREN implementing the activities proposed in the Program Implementation Plans? • How is the IOU Statewide Program implementing the activities

Study Name	Research Questions [2013-2014]
	proposed in the Program Implementation Plan? • How are the activities of the BayREN and the IOUs (PG&E more specifically) complementing each other? How they collaborating in planning, implementation? Are there areas for improvement? • What are appropriate metrics to track the improvement in code enforcement? • What are the outcomes of the BayREN and IOUs' activities? How are they contributing to compliance improvement with Title 24?
Market	
Assessment of Compliance Improvement for Previously Evaluated Codes & Standards and Barriers to Code Compliance	• To what extent has code compliance improved over time for previous codes? • What are the barriers to code compliance for recently adopted codes (i.e., 2008/2013 updates) with low compliance? • How can the C&S program more strategically address the barriers to higher compliance rates?
Analysis of 2008 Title 24 nonresidential compliance site audits	• What can be learned about installation practices when analyzing site audit data from 2010-2012 nonresidential Title 24 compliance analysis?
Underlying Assumptions for Calculation of Savings Potential for Lighting Alterations	• How do code changes affect standard practice, the level of unpermitted work, or decisions to defer or go ahead with projects? • Is the outcome determined by the change or the extent of change relative to standard practice?
Determinants of Code Compliance for Lighting Alterations	• How do code changes affect standard practice, the level of unpermitted work, or decisions to defer or go ahead with projects? • Is the outcome determined by the change or the extent of change relative to standard practice?
Code Savings Analysis using Billing Data	• Is consumption per square foot decreasing along with code changes in the residential sector? • How feasible is statistical analysis?
Determination of Code Readiness	• How can incentive program planning better incorporate intentions to move measures to code as quickly and cost efficiently as possible? • What are the barriers to better integrating incentive program planning with C&S program planning?
Methods for Title 24Improvement	• What aspects of current Title 24 Standards contribute most to the cost of implementing and complying with new standards? • How might Standards language/methods be simplified in order to facilitate standards adoption and enforcement?

2.9.2. Study Descriptions and Objectives

Proposed Specific Studies for 2013-2015

NOTE: Due to budget constraints only the prospective IOU studies that are identified as having a "High" priority are included in Table 53 & Table 54. The available 2013-2014 budget for C&S and ZNE Evaluation Measurement and Verification (EM&V) studies will be allocated to high priority studies in Table 53 & Table 54. Scoping efforts for the studies has started and due to resource constraints, it is possible that not all research questions below will be addressed this cycle.

Table 53. 2013-2015 C&S EM&V Studies, Budgets, and Timing

Codes & Standards Study	Estimated Budget	Study Lead	Completion date
2013-2014 C&S Impact Evaluation Phase 1 and 2	$3,974,000	ED	Q1 2016 (Ph1) Q3 2016 (Ph2)
Assessment of Cost-Effectiveness Tools for C&S Program - Operationalizing Appropriate Policies in Cost Effectiveness Calculations	$120,000	ED	Q2 2016
Compliance Improvement Process Evaluation for Utility Statewide Program and BayREN C&S program	$205,000	ED	Q4 2015
Assessment of Compliance Improvement for Previously Evaluated Codes & Standards and Barriers to Code Compliance; Evaluation of the Rate of IMC Decline for Selected Measures	$530,000	IOU	Q1 2016
Assessment of Standards Overlap On Program Savings – Policy Thought Paper	$30,000	IOU	Q2 2016
Determining Baselines for Building Alterations – Policy Thought Paper	$85,000	IOU	Q2 2016
Analysis of 2008 Title 24 Nonresidential Compliance Site Audits	$105,000	IOU	Q3 2016
Underlying Assumptions for Calculation of Savings Potential for Lighting Alterations	$250,000	ED	Q4 2015
Determinants of Code Compliance for Lighting Alterations	TBD	ED/IOU	TBD
Code Savings Analysis using Billing Data	$300,000	ED	Q2 2016
Determination of Code Readiness	$95, 000	IOU	Q3 2016
Envelope Cost Data Assessment	$135,000	IOU	Cancelled
Methods for Title 24 Improvement	$95,000	IOU	Q4 2016
Product Cycle Assessment	$175, 000	IOU	Cancelled
Process Evaluation for IOU C&S Trainings, Classes, and Tools	$50,000	IOU	Q3 2016
Total ED C&S EM&V Budget	**$4,849,000**		
Total IOU C&S EM&V Budget	**$1,250,000**		
Total CPUC-ED C&S EM&V Budget	**$6,099,000**		

Table 54. 2016 C&S EM&V Priorities

Codes & Standards Study	Estimated Budget	Study Lead	Completion date
2016+ C&S Impact Evaluation	TBD	ED	TBD
Compliance Rates, Barriers and Determinants	TBD	ED/IOU	TBD
Continue to improve data collection and assumptions to inform rates of turnover of existing stock to inform calculation of potential	TBD	ED/IOU	TBD
Total ED C&S EM&V Budget	**TBD**		
Total IOU C&S EM&V Budget	**TBD**		
Total CPUC-ED C&S EM&V Budget	**TBD**		

Study Descriptions – High Priority Studies

The table below shows a summary of the changes from the March 2015 version of this report.

Table 55. C&S Summary of Changes

Codes & Standards Study	Changed	Scope of Change
2013-2014 C&S Impact Evaluation	Y	Budget, scope
Assessment of Cost-Effectiveness Tools for C&S Program - Operationalizing Appropriate Policies in Cost Effectiveness Calculations	Y	Scope
Compliance Improvement Process Evaluation for Utility Statewide Program and BayREN C&S program	N	
Develop Reporting Tools for C&S Savings and Activities		Cancelled
Assessment of Compliance Improvement for Previously Evaluated Codes & Standards and Barriers to Code Compliance; Evaluation of the Rate of IMC Decline for Selected Measures	N	
Assessment of Standards Overlap On Program Savings – Policy Thought Paper	N	
Determining Baselines for Building Alterations – Policy Thought Paper	N	
Analysis of 2008 Title 24 Nonresidential Compliance Site Audits	N	
Assessment of Cost-Effectiveness Tools for C&S Program - Phase I –Policy Thought Paper	Y	Cancelled
Envelope Cost Data Assessment	Y	Cancelled
Product Cycle Assessment	Y	Cancelled
Underlying Assumptions for Calculation of Savings Potential for Lighting Alterations	Y	New Study
Determinants of Code Compliance for Lighting Alterations	Y	New Study
Code Savings Analysis using Billing Data	Y	New Study
Addition of 2016 research priorities	N/A	N/A

2.9.3. Description of planned studies for 2013-2015 as of December 2015: High Priority Studies

Study Title: 2013-2014 Codes and Standards Impact Evaluation	**Budget:** $2,940,000 for 2013-2014 2015 Add-on: $1,034,000
Expected Completion Date: Q4 2016 (Provisional, pending scoping)	**Study Manager:** ED
Description: Verify claimed savings for the C&S program' 2013-2015 cycle	
Objective: • Define existing C-E inputs to better capture the characteristics of C&A programs. • Resources allowing, align ISSM tool and CPUC Cost-effectiveness Tool (CET).	
Key Research Questions: <u>Title 24</u> • What is the impact of nonresidential alterations under the 2013 Title 24? • What is the impact of nonresidential and residential new construction under the 2013 Title 24? • What is a method to sample and analyze MF buildings? • How to determine UES for MF buildings? What type of modeling tool is necessary to capture these savings? • How to deal with interactive effects and other effects from these types of buildings? • What is a robust method to sample, audit and calculate compliance? • How to treat interactive effects and other effects when measuring compliance for MF buildings? • Is it possible to determine compliance at the measure level when using a whole building compliance approach? What are the limitations? • Can Title 24 field audits collect information to improve compliance improvement efforts? • What is the savings impact for 2005, 2008 Title 24 under the current level of construction activity? • Can methods and approaches to determine baselines for building and appliance standards be aligned given available data and previous evaluation findings? <u>Title 20</u> • What is the impact of new appliances from Federal Appliance standards adopted in 2013-2015? • What is the impact of the Title 20 battery charger standards? • What is the savings impact of key regulated products such as televisions, lighting, pool pumps, etc. using market data for the years 2013-2015? • Are there any previously evaluated Title 20 or Federal standards for which compliance should be re-evaluated? • Are savings from Title 20 Lighting appliance standards also being counted under Title 24 LPD requirements?	
Potential EM&V Methods: • Select simulation software that best represents the energy use of low-rise and the high-rise multifamily buildings, respectively, in order to evaluate the reasonableness of the savings claims. • Develop sampling methods and approach for MF buildings • Investigate applicable parameters for NOMAD for multifamily, as it may differ for parameters	

Study Title: 2013-2014 Codes and Standards Impact Evaluation	**Budget:** $2,940,000 for 2013-2014 2015 Add-on: $1,034,000
normally used for single-family buildings. • Re-run the ISSM (Integrated Standards Savings Model) model with the combination of new inputs and old values for all measures. • Engineering methods for calculation of EUS, compliance rates. • Field survey methods for appliances compliance. • Other methods necessary given the scope of the report.	

Study Title: Assessment of Cost-Effectiveness Inputs for C&S Program and Reporting Practices	**Budget:** $120,000
Expected Completion Date: Q2 2016	**Study Manager:** ED
Description: The Cost-Effectiveness calculator as currently configured may not properly capture the full benefits of the C&S program. This study will investigate the inputs to the existing cost-effective calculation and their relationship to the C&S program. This study will then serve as basis for stakeholder input as to how the existing C-E inputs need to be defined to capture the characteristics of the program.	
Objective: • Define existing C-E inputs to better capture the characteristics of C&A programs. • Resources allowing, align ISSM tool and CPUC Cost-effectiveness Tool (CET).	
Key Research Questions: • How key inputs are currently defined in the C-E methods? • Appropriate measure life • Diminishing measure costs due to code becoming common practice • Consideration of how Net Effects is defined in the calculator and its applicability to C&S • How to define benefit streams for C&S program? • How to define and capture code readiness activities? • What are the key adjustments to existing cost-effectiveness inputs?	
Potential EM&V Methods: • This project involves hiring a multi-skilled contractor to review CPUC decisions, EUL studies, incremental measure cost (IMC) studies, trends in new product costs due to commoditization, and to be fully knowledgeable about the existing cost-effectiveness calculator. • Knowledge of codes and standards costs and benefits parameters, code readiness and market transformation concepts. • The contractor should take their findings through a facilitated public process with stakeholders to gather input on the appropriate way to move forward on C&S cost-effectiveness. • Familiarity with ISSM and CPUC CET logic Knowledge of codes and standards costs and benefits parameters, code readiness and market transformation concepts. • The contractor should take their findings through a facilitated public process with stakeholders to gather input on the appropriate way to move forward on C&S cost-effectiveness. • Familiarity with ISSM and CPUC CET logic.	

Study Title: Compliance Improvement Process Evaluation for IOU Statewide Program and BayREN	**Budget:** $205,000
Expected Completion Date: Q4 2015	**Study Manager:** ED

Description: Both the IOU Statewide Program and the BayREN administered programs aim at supporting and improving compliance with Title 24. According to D.12-11-015, both program administrators should coordinate activities and avoid duplication. This study will investigate the delivery of the programs, the effectiveness of coordination and how complimentary activities were. In addition, this study will investigate the ongoing effectiveness of the Best Practices study implemented by the IOU SW Compliance Enhancement subprogram in 2010-2012.

Objective:

- This process evaluation will investigate the delivery of compliance improvement activities of the IOU SW program, most specifically PG&E, and the BayREN. This is the first time that CPUC authorized two administrators for such activities.
- How did the IOUs apply the knowledge of the Best Practices Pilot?

Key Research Questions:

- How is the BayREN implementing the activities proposed in the Program Implementation Plans?
- How is the IOU Statewide Program implementing the activities proposed in the Program Implementation Plan?
- How the activities of the BayREN and the IOUs (PG&E more specifically) complement each other?
- How they collaborate in planning, implementation? Are there areas for improvement?
- What are the metrics to determine the improvement in code enforcement and compliance?
- What are the outcomes of the BayREN and IOUs activities? How are they contributing to compliance improvement with Title 24?
- Are participating jurisdictions still following the recommendations of the BP study?
- How did the study impact non-participating jurisdictions?
- Did the process contribute to improving compliance?

Potential EM&V Methods:

- The contractor should be able to propose a method for analyzing delivery of similar but not identical services by two distinct entities. Additional methods:
- Sampling methods
- Interview and analysis methods
- Review of documentation Interview and analysis methods
- Review of documentation

Study Title: Assessment of Compliance Improvement for Previously Evaluated Codes & Standards and Barriers to Code Compliance and Evaluating the Rate of Incremental Measure Cost Decline for Selected Measures	**Budget:** $530,000
Expected Completion Date: Q1 2016	**Study Manager:** IOU

Description: Currently, there are insufficient data in how compliance improvement rates have changed over time. This study will assess select codes from previous code adoption years to determine the extent to which compliance improvement has changed. This will inform program

Study Title: Assessment of Compliance Improvement for Previously Evaluated Codes & Standards and Barriers to Code Compliance and Evaluating the Rate of Incremental Measure Cost Decline for Selected Measures	**Budget:** $530,000

strategic planning, savings determination, and program implementation around compliance improvement activities. This study will also investigate historic costs of measures covered by selected codes adopted in previous years to determine if incremental measure costs tend to decrease over time post-code adoption

Objective:

- To determine whether compliance rates improve over time and if so, whether IOU efforts influence that improvement.
- Identify 2008/2013 codes with low compliance and investigate barriers to compliance
- Identify and assess implication of definitional differences of compliance among market actors
- Provide programmatic recommendations on strategic approaches to engaging in compliance improvement interventions
- This study intends to leverage the results of, or contribute to, a related HVAC EM&V research effort to estimate baselines for HVAC installation permit and Title 24 compliance as well as a baseline for the existing conditions of HVAC systems statewide.
- Identify methods for determining incremental measure costs for meeting previously adopted codes.
- Identify methods for estimating trends in incremental measure costs.
- Develop estimates of historical trends in incremental measure costs for measures covered by targeted codes.

Key Research Questions:

- To what extent has code compliance improved over time for previous codes?
- What are the barriers to code compliance for recently adopted codes (i.e., 2008/2013 updates) with low compliance?
- How can the C&S program more strategically address the barriers to higher compliance rates?
- Is it possible to determine historical incremental costs for measures covered by previous codes?
- Can trends in historical IMCs be developed?
- To what extent have incremental measure costs decreased over time?

Potential EM&V Methods:

- Depending on scope of 2013-2014 field analysis, conduct a comparative analysis of new compliance results collected by the 2013-2014 C&S Impact Evaluation on a sample of building and appliance measures evaluated in the 2006-08 and 2010-2012 C&S Impact Evaluations against previous compliance results from those evaluations to ascertain compliance improvement figures.
- Determine whether results from the sample can be extrapolated.
- Survey participants in compliance-related utility training courses to collect observations on compliance improvement for Title 20 and Title 24 code.
- Leverage 2010-2012 Impact Evaluation results to identify 2008 T24 codes with low compliance rates
- Literature review and market actor surveys to identify 2013 T24 codes likely to have low compliance rates
- Interviews/focus groups with different market actors in building industry and in municipal

Study Title: Assessment of Compliance Improvement for Previously Evaluated Codes & Standards and Barriers to Code Compliance and Evaluating the Rate of Incremental Measure Cost Decline for Selected Measures	**Budget:** $530,000
building inspection/permitting departments to identify barriers to compliance • Sample building Title 24 Document/building plan review • Qualitative assessment to identify market intervention strategies to address compliance barriers • Recommendations for implementing market intervention strategies. • Secondary analysis on 2008 Title 24-compliant building measure cost data. • Interviews with market actors on efficiency measure costs. • Econometric and other analyses.	

Study Title: Assessment of Standards Overlap On Program Savings – Policy Thought Paper	**Budget:** $30,000
Expected Completion Date: Q2 2016	**Study Manager:** IOU
Description: Some aspects of current codes and standards overlap particular end-uses/measures. This may cause total savings from codes and standards efforts to be overstated. This study will identify the nature and magnitude of potential overlaps.	
Objective: • Identify which Title 20, Title 24, and federal standards may overlap. • Determine the magnitude of the potential overlap that may be embedded in established savings estimates by end-use/measure group. • Suggest methods for adjusting savings estimates to prevent double-counting. • Estimate the cost of adjusting savings reporting processes versus ex-post adjustment in order to address potential overlaps.	
Key Research Questions: • For what end-uses/measures does overlap in reported savings exist? • What is the magnitude of savings overlap? • What is the cost of reducing/eliminating the overlap in savings estimates versus the likely increase in savings accuracy?	
Potential EM&V Methods: Whole building versus individual code assessments for overlapping measures.	

Study Title: Determining Baselines for Building Alterations – Policy Thought Paper	**Budget:** $85,000
Expected Completion Date: Q2 2016	**Study Manager:** IOU
Description: Given the size of California's building stock the greatest potential savings from codes and standards activities involve existing buildings. Calculating Codes & Standards savings from codes triggered by building alterations can be difficult given: 1) the broad spectrum of existing equipment holding and usage prior to the alteration, 2) difficulties in determining baselines given the mix of performance and prescriptive standards that come into play, and 3) rapidly changing product adoption trends due, in part, to accelerated shifts in price/performance tradeoffs between competing technologies. Establishing realistic baselines for building alteration activities is key not only for	

Study Title: Determining Baselines for Building Alterations – Policy Thought Paper	**Budget:** $85,000
calculating savings, but also for targeting subsequent standards at performance levels appropriate for the marketplace. This whitepaper will outline and explore the ramifications of various methods for setting baselines for building alteration savings. The paper will also provide a preliminary scoping assessment of building alteration activity (by building type and region) in order to inform the development and scoping of a needed market baseline study that would be managed by ED.	
Objective: • Identify approaches to setting baselines for building alteration-related codes and standards savings calculations. • Estimate costs of implementing the various approaches into the current reporting framework. • Provide information to help scope a subsequent market baseline study for building alterations.	
Key Research Questions: • What are the possible approaches to establishing baselines for building alteration-related codes? • How can credible baselines be established for C&S efforts that mix performance and prescriptive approaches impacting the same end uses? • What is the cost of implementing each of the possible reporting approaches? • What types of building alteration activity are most problematic in terms of setting appropriate baselines? • What types of building alteration activity represent the greatest share of potential savings (by building type, region, end-use) such that a reasonable sampling plan can be designed for the subsequent market baseline study.	
Potential EM&V Methods: TBD	

Study Title: Analysis of 2008 Title 24 Nonresidential Compliance Site Audits	**Budget:** $105,000
Expected Completion Date: Q3 2016	**Study Manager:** IOU
Description: The 2010-2012 Codes and Standards Impact study found that a significant number of sampled sites had exceeded the expected T24 savings above current code requirements. This was especially true of lighting alteration projects that triggered review. This study will review the site-specific data collected by Cadmus for their Title 24 impact assessment to ascertain the characteristics of customers that exceeded code (and did not exceed code) as well as the measures that were employed by customers in the sample.	
Objective: • Determine how and why customers exceeded code requirements. • Determine characteristics of customer segments that over-complied versus those who merely met compliance minimums or failed to comply with current T24 code.	
Key Research Questions: • What are the customer and building characteristics of compliant versus non-compliant sampled buildings? • What are the reasons that customers significantly exceeded new code requirements?	
Potential EM&V Methods: Customer survey	

Study Title: Underlying Assumptions for Calculation of Savings Potential for Lighting Alterations 2	**Budget:** $250,000
Expected Completion Date: 12 months	**Study Manager:** ED
Description: Map triggers and frequency for building alterations.	
Objective: • Test the hypothesis that the frequency of lighting replacement is dependent on building and space type. Investigate factors that may determine the general frequency of lighting system replacement	
Key Research Questions: • How frequently are lighting systems replaced and why	
Potential EM&V Methods: • Develop estimates based on empirical data on the frequency of lighting system replacement and upgrades. • Analyze third-party data sets (Dodge, CoreLogic, CoStar, others?)	

Study Title: Barriers to Compliance for Lighting Alterations	**Budget:** TBD
Expected Completion Date: TBD	**Study Manager:** ED or IOU
Description: Investigate barriers to non-compliance with lighting alterations**.**	
Objective: • Investigate and document barriers to compliance with code requirements • Investigate barriers to pulling permits for lighting retrofits	
Key Research Questions: • How do code changes affect standard practice, the level of unpermitted work, or decisions to defer or go ahead with projects? • Is the outcome determined by the change or the extent of change relative to standard practice	
Potential EM&V Methods: Conduct interviews, surveys, database analysis, and site visits.	

Study Title: Determination of Code Readiness	**Budget: $95,000**
Expected Completion Date: Q3 2016	**Study Manager:** IOU
Description: An assessment of how to collect data from EE program operations that will support determination of code readiness for individual measures/end-uses in order to better coordinate initial incentive program efforts with code development efforts.	
Objective: Development of a process that better integrates planning for incentive program efforts with C&S program efforts	
Key Research Questions: • How can incentive program planning better incorporate intentions to move measures to code as quickly and cost efficiently as possible? • What are the barriers to better integrating incentive program planning with C&S program planning?	
Potential EM&V Methods: • PA survey • TBD	

Study Title: Methods for Title 24 Improvement	**Budget:** $95,000
Expected Completion Date: Q4 2016	**Study Manager:** IOU
Description: A study that examines the benefits and costs of simplifying Title 24 with the aim of improving regulatory adoption and customer compliance.	
Objective: Determine how Title 24 Standards might be simplified to enhance adoption probability and reduce compliance burdens.	
Key Research Questions: • What aspects of current Title 24 Standards contribute most to the cost of implementing and complying with new standards? • How might Standards language/methods be simplified in order to facilitate standards adoption and enforcement.	
Potential EM&V Methods: • Survey of regulatory actors • Survey of code officials	

Medium/Low Priorities

Study Title: 2013-2014 Code Savings Analysis using Billing Data	**Budget:** $50k (pilot), Add-on: $300,000 to expand analysis statewide
Expected Completion Date: 4 months	**Study Manager:** ED
Description: Comparison of engineering models and statistical analysis for savings.	
Objective: • Determine if savings from code changes can be detected as trends in whole house energy consumption • Expand analysis statewide if pilot proves feasible	
Key Research Questions: • Is consumption per square foot decreasing along with code changes in the residential sector? • How feasible is statistical analysis?	

Potential EM&V Methods:
• Billing analysis using monthly billing and/or interval meter data
 	
The data required to conduct the study include the following:2
  ○ Electric and gas billing data from homes with a service start date from May 2006 through December 2011 for the period from the service start date through 2012
  ○ Floor area data
  ○ Premise service date
  ○ Location
  ○ Other home characteristics, such as the presence of swimming pools, if available
• Pilot using one service territory (SDG&E?), by climate zone
• Conduct interviews, surveys, database analysis, and site visits.	

Study Title: Process Evaluation for IOU C&S Trainings, Classes, and Tools	**Budget:** $50,000
Expected Completion Date: Q3 2016	**Study Manager:** IUO

Study Title: Process Evaluation for IOU C&S Trainings, Classes, and Tools	**Budget:** $50,000
Description: The IOUs would like to better understand the effectiveness of the trainings offered through their C&S programs. These trainings include classes, tools, and various other program related materials that are designed to assist participants in improving C&S outcomes including compliance. A thorough study of these trainings and tools is necessary to assist programs in supplementing trainings, targeting trainings to those it will benefit most, and potentially eliminating those that add little value..	
Objective: • Examine the IOU classes, trainings, and tools. • Identify which training options provide the best value add. • Provide information to help improve these trainings.	
Key Research Questions: • Which classes, trainings, and tools provide the most substance to participants, leading to greater program success? • Does the effect of a training program vary by audience? • Does delivery method effect success? • Which approach is most cost effective or provides the most value add?	
Potential EM&V Methods: Process evaluation with in-depth interviews, online surveys, focus groups.	

Other Important Considerations

This roadmap intends to leverage the results of, or contribute to, a related HVAC EM&V research effort to estimate baselines for HVAC installation permit and Title 24 compliance as well as a baseline for the existing conditions of HVAC systems statewide.

This roadmap also intends to align C&S evaluation policies to policies for demand forecasting, setting of program goals and calculating cost-effectiveness.

Finally, as two IOU led studies were cancelled, this roadmap has unallocated funds. The PCG has not yet defined who would be leading an investigation of barriers to compliance in lighting alterations, so this study may be allocated to the IOU roadmap. The PCG will determine if there are other evaluation priorities in the upcoming year, or if we should develop studies with lower priorities

Study needs for 2016 and Beyond

Proposed 2016 Energy Division Budget: $1,047,915

The Codes & Standards study area will continue to execute the impact evaluation protocol. Evaluation adaptations emerging from the implementation of AB802 related to baseline changes and meter-based program designs may also need to be addressed in this evaluation plan for the future.

Program Administrator evaluation plans were not available for this draft.

Proposed 2016 Program Administrator Budget: $450,000

Planned studies are still under consideration. This budget includes both C&S and Zero Net Energy and new construction.

.

2.10. Zero Net Energy/New Construction

2.10.1. Background

Sector or Program Area Description

California continues to lead the nation in the design, construction and operation of zero net energy buildings. The 2014 New Buildings Institute Update identifies some 193 existing or in-progress zero net energy or ultra-low energy use non-residential buildings nationally, with California comprising about forty percent of that total. IOUs report contributing financial, technical, design and other resources to 75 out of 81 known ZNE or ultra-low energy use commercial buildings built in California since 2008. Most of these ZNE buildings are public buildings (schools, libraries, municipal buildings), but an increasing number are large buildings, exceeding 50,000 ft2 in size.[35] In the residential new homes market, a 2014 PG&E study found about one thousand "ZNE-type" homes in existence in California, including just sixteen full ZNE homes, about 950 "near-ZNE" homes and about 150 "ZNE-ready" homes. The study defined "ZNE-type" homes as exceeding Title 24 efficiency requirements by at least 40%; when dropped to a 30% threshold, the number of ZNE-type homes exceeds 10,000. TRC researchers also reported that ZNE-type homes comprised just 1% of the new homes market in 2014 and recommended a range of new program design and other activities if California is to reach its ZNE 2020 new homes goals.[36]

CPUC and IOU activities supporting market growth in ZNE buildings have included active "ZNE Commercial Action Plan" stakeholder meetings convened by Commission staff between 2010-2014, and ongoing ZNE Action Plan implementation activities since then (ZNE Early Adopter trainings for state, local governments and school building managers; the ongoing electronic ZNE Bulletin; additional ZNE building case studies and a ZNE Messaging Toolkit). [37] PG&E published a ZNE Commercial Building Monograph presenting in-depth case studies of non-residential buildings in 2014,[38] and IOU ZNE Pilot and Sustainable Communities Pilots continue to support financial, technical and design assistance to ZNE communities and buildings. In 2014, IOUs launched a new incentive design for their residential new construction program (California Advanced Homes Program), and initiated planning for a 2015 planned CAHP program element to support a targeted set of advanced builders to incorporate high performance walls and attics into their business models in advance of the expected inclusion of these measures in the 2016 Title 24 standards update. CPUC staffs plan to launch a ZNE Residential Action Plan and related stakeholder process in 2015. In addition, a wide ranging number of additional IOU emerging technologies ZNE demonstration buildings and technology tests, Energy Commission Electric Program Investment Charge (EPIC) projects and the California Solar Initiative RD&D program have demonstrated the feasibility of new technologies and approaches supporting ZNE goals and remain ongoing.[39]

---

[35] Energy Division data request to IOUs, self-reported IOU data; August 2014.

[36] "Residential ZNE Market Characterization – Final Report" (TRC, 2012).

[37] http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Zero+Net+Energy+Buildings.htm

[38] "Zero Net Energy Case Study Buildings," (Dean, 2014). http://energydesignresources.com/resources/publications/case-studies/case-studies-zne-non-residential-buildings.aspx

[39] http://www.etcc-ca.com; http://www.energy.ca.gov/research/epic/; http://www.calsolarresearch.org

Key EM&V ZNE studies that continue to support ZNE buildings and activities include the 2012 PG&E-managed studies the "Road to ZNE: Mapping Pathways to ZNE Buildings in California," and "The Technical Feasibility of Zero Net Energy Buildings in California."

Ex Ante Coordination

A section on ex ante updates is not included in this chapter. The studies planned in this sector will not likely be designed to directly inform updates to ex ante savings estimates. Please see the customer specific research plans for discussion of updates to ex ante savings estimates.

2.10.2. 2013-2014 Evaluations

Activities and Estimated Budgets

Three of five studies using 2013-2014 cycle funding continue to be fielded.

Table 56. 2013-2014 ZNE Studies, Budgets, and Timing

Study Title	Manager	Evaluator	Estimated Budget	Expected Completion
Residential ZNE Market Characterization	IOU	TRC Team	$345,284	Completed
ZNE Evaluation Methodology Study: Phase 1	IOU	TRC Team	$123,474	Q1 2016
Miscellaneous Energy Loads Study: Phase 1	IOU	Energy Solutions	$75,386	Completed
Miscellaneous Energy Loads Study: Phase 2	IOU	TBD	$100,000	Q4 2015
Miscellaneous Energy Loads Study: Phase 3	IOU	TBD	$293,364	Q4 2016
Total IOU ZNE EM&V Budget		**$937,500**		
Total CPUC-ED ZNE EM&V Budget		**N/A**		

Key Research Questions Addressed

Table 57. 2013-2014 ZNE EM&V Research Questions Summary

Study Name	Research Questions
Residential Zero Net Energy Market Characterization	• Characterize the residential ZNE-type new construction market by estimating the market sizes and exploring trends for ZNE and ZNE-type homes. • Assess residential energy rating systems and financing opportunities for ZNE-type homes. • Assess drivers, barriers, and opportunities to messaging, building, financing, and purchasing residential ZNE-type new construction. • Identify best practices in utility program design to pursue ZNE goals. • Identify limitations for implementing current definitions of ZNE. • Investigate barriers to consumer acceptance of ZNE homes to inform marketing strategies. • What are the motivations of market actors to pursue or purchase ZNE?

Study Name	Research Questions
	• What are the needs and preferences of current new home buyers? • Proposed: market survey of home-buyers, focusing on identifying: • New Home Buyer "types" for CA • Their needs/preferences and marketing messages that resonate with different “types” • (tentative) - the obstacles to homebuyer purchase of newly constructed homes versus resold homes, and policy means to address these • Proposed: Literature review/synthesis of lessons learned about market currently • What are the needs and preferences of homebuilders working towards zero net energy buildings? • Builder focus groups • Rating tools and labels - builder needs/reactions/preferences in this area • Market survey
Zero Net Energy Evaluation Methodology Study: Phase 1	• [Res ZNE Action Plan – Strategy 3.2] Develop ZNE modeling standards and criteria to enable consistent, market---driven development of integrated tools for ZNE residential projects. • Integrate data from emerging technologies research activities into ZNE tools development and evaluation approaches. • Explore and establish methodologies for evaluating new construction and retrofit ZNE residential and commercial buildings in California. • Phase 1 of this study will test the methodologies on available data for new construction residential single-family and multi-family projects pursing the 2020 ZNE goal and school projects pursuing ZNE pursuant to Prop 39. • Subsequent phases will test and finalize new construction and retrofit evaluation methodologies on building types not covered in Phase 1.
Miscellaneous Energy Loads Study: Phase 1	• Developing and prioritizing an initial list of MELs for review, based on energy consumption, relative uncertainty, and interest from IOU stakeholders. • For each selected MEL, conducting a literature review of all recent studies estimating energy consumption, including a review of their original data sources. This review evaluates both the study methodology and estimates of the power, usage, and installed base of each MEL. • Completing a comparative analysis of MEL data sources to identify best estimates of MEL energy consumption, gaps in existing information, and recommendations for further study. • Conducting a literature review of existing Non-Intrusive Load Monitoring (NILM) methods and identify their relative cost, accuracy, and applicability for future estimates of residential MEL energy consumption.

Study Name	Research Questions
Miscellaneous Energy Loads Study: Phase 2	• What are the current tools available for monitoring and collecting MEL data? What are the potential strengths and weakness of each? What level of disaggregation is currently available? • What data is currently available? And what data is being collected now and in the near future by 3rd parties and IOUs? • What are the advantages and disadvantages of aggregating MELs (i.e. subtracting HVAC, lighting, and major appliances from total load)? • What model (given available data) might best account for the relationship between household demographics and attributes, and MEL usage? • What is the ideal sample size and time frame for a future predictive model? • What is the most viable predicative analytic model that currently is used for estimating MEL usage among the customer segment most likely to purchase new homes in the CA IOU service territories? • Can one year of monitored MEL usage data for a small number of homes be used to train the model to estimate MEL usage for the targeted customer segment and climate zone group? • What level of data granularity (individual MELs or an aggregate MEL measure) is necessary to support the model? • Given constant technological and rate change, how might the predictive power of a model be affected, and are there mitigating approaches that can be used to successfully adapt a model?
Miscellaneous Energy Loads Study: Phase 3	• Scoping pending Phase 2 completion. • Likely to develop and test statistical models for disaggregating individual or aggregate plug load.

Findings

Table 58. ZNE Findings from Past Studies

Study Name	Findings
Residential ZNE Market Characterization	• The prevalence of near ZNE home and the scarcity of ZNE homes indicates that the market may be more ready to embrace near ZNE construction than ZNE construction in the short term. However, the study also found that 50 builders in 113 cities had built ZNE-type homes in the last five years. • There are various organizations working towards the ZNE goal, but they track homes using different metrics and database formats. This hinders the ability for any one organization to quantify the number of ZNE-type homes and track progress towards ZNE goals. • Builders reported that many subcontractors, and builders of code-compliant homes, do not have the knowledge needed to execute advanced building practices successfully. • Building officials reported challenges in the code compliance process,

Study Name	Findings
	both with homes built to code and those built above code. • Lenders need larger volumes of energy efficient or ZNE-type homes to make financing these products through Energy Efficient Mortgages (EEMs) or other mechanisms worth their while due to the increased paperwork and home rating requirement presented by EEMs. • Lenders noted that most homebuyers are not aware of EEMs; if they are, they usually learn about them after they have identified a home for purchase, not during the decision-making stage. • Lenders also noted that they have a shortage of appraisers with the necessary training to conduct valuations of ZNE-type homes. • Lenders reported difficulty in finding appraisers that are adequately trained to develop valuations for ZNE-type or high performance homes. • Appraisers reported that some lenders will not accept appraisers' valuations of ZNE-type homes. • Appraisers and lenders reported the need for realtor training for better understanding and promotion of the benefits of ZNE-type homes. • Builders reported they have concerns that owners will misinterpret ZNE. This was supported by feedback from owners: Among owners that reported to be aware of the term ZNE, approximately one-third interpreted ZNE as either zero bill or a home that is off-the-grid. • Builders and building industry experts recommended the use of demonstration homes. • Per the state's loading order established in the state's Energy Action Plan (CEC and CPUC 2013) and the CEC's 2013 IEPR, achieving ZNE residential new construction goals requires equitable promotion of energy efficiency and distributed generation measures, to maximize the benefits of ZNE. • Owners in this study expressed confusion over the PV leasing process. In addition, the literature indicates that roofing maintenance can cause unexpected costs for leased PV systems. • ZNE is technically feasible, but the biggest barrier is incremental cost, and builders' concern that consumers may not pay this incremental cost. • Based on interviews with high performance builders, building industry experts, and program managers, the incremental cost for a ZNE home is approximately 5-15% more than the cost to build a Code-built home. • ZNE-type owners and Energy Efficient owners, reported they were willing to pay approximately 8-12% more, and 1-10% more, respectively, for their next home to be a ZNE-type home compared to a Code-built home. • CAHP program managers noted the difficulty for programs to track progress towards ZNE using a Title 24-based metric, because it does not include all energy loads, and it does not indicate a ZNE home. The TRC team concurs that this is a challenge, after conducting market size

Study Name	Findings
	analysis for this study. • While the state agencies continue to make progress on clarifying how TDV addresses energy efficiency, there is no clear policy on how distributed generation, and PV in particular, will be addressed. • With potential changes to net energy metering, it is important that the TDV metric keep pace with future changes. • City planners reported that jurisdictions are aware of ZNE, but they generally do not see ZNE ordinances as politically viable or cost effective from builders' perspectives under current market conditions. • In addition, most planners noted that their jurisdictions are "waiting and seeing" what happens at the state level for ZNE. • Planners also noted that voluntary provisions can be politically easier to pass than mandatory requirements. • Appraisers' most noted barrier is the lack of sales data for high performance homes. They further reported that another barrier is inconsistent reporting of high performance elements by realtors in the MLS databases. • Owners may interpret ZNE based on actual energy performance, but policy makers and the PAs currently interpret ZNE based on projected energy performance. • Owners indicated that their primary driver for purchasing an Energy Efficient home or a ZNE-type home was reduced utility bills. However, builders are wary of making energy bill promises, because the actual performance can vary widely due to occupancy and behavior. • About half of builders indicated that they do not use HERS in discussions with owners, because they think it is too confusing. This was confirmed by owners, who generally could not recall what information the HERS rating provided. • This study developed a catalog of energy performances which included Code-built, Energy Efficient, ZNE-ready, near ZNE, and ZNE homes.
ZNE Evaluation Methodology Study: Phase 1	Pending project completion in Q1 2016
Miscellaneous Energy Loads Study: Phase 1	• MELs usage estimates are relatively uncertain and could significantly benefit from additional research, especially in usage. • TVs, STBs, and Computers likely represent over 50% of MEL energy use, although this will change going forward. • As TVs, STBs, and desktop computers decrease in energy use, MEL energy use will become even more distributed • NILM uses analytical methods to distinguish individual loads from a single metering point without the use of sub-metering • HVAC, water heating are easiest to assess (84-89% accuracy) • Most products can disaggregate large loads and household appliances. • 1 of 4 products can disaggregate lighting, range, microwave, and fans with 80% accuracy.

Study Name	Findings
	• It is unlikely that MELs will be able to be disaggregated, but NILMs could provide very useful information by understanding the total non-MEL load.
Miscellaneous Energy Loads Study: Phase 2	Pending project completion in Q2 2016
Miscellaneous Energy Loads Study: Phase 3	Pending project initiation and completion.

2.10.3. 2015 Evaluations

Overview

The following research needs were defined based on results of previous evaluations and emerging research needs.

Activities and Estimated Budgets

Table 59. 2015 ZNE EM&V Studies, Budgets, and Timing

Study Title	Estimated Budget	Study Lead	Complete Date
ZNE Evaluation Methodology Study: Phase 2	$112,500	IOU	Q4 2016
ZNE Compliance Options for Distributed Energy Resources: Phase 1	$112,500	IOU	Q3 2016
K-12 and Community College ZNE Retrofit Readiness Market Characterization Study	$293,416	ED	Q4 2016
State Building Decision Maker Study	$293,416	ED	Q4 2016
Total ED ZNE EM&V Budget	**$586,832**		
Total IOU ZNE EM&V Budget	**$225,000**		
Total CPUC-ED ZNE EM&V Budget	**$811,832**		

2.10.4. Descriptions

Study Title: ZNE Evaluation Methodology Study, Phase 2	**Budget:** $112,500
Expected Completion Date: Q4 2016	**Study Manager:** Pacific Gas & Electric Co.
Description: This study will continue the Phase 1 efforts to develop and finalize the ZNE Evaluation Methodologies as monitoring data for other building types becomes available from Emerging Technology projects and other data sources.	
Objectives: • Test and finalize new construction and retrofit evaluation methodologies on building types not covered in Phase 1, in particular non-residential new construction and retrofit projects. • Use and improve the catalog of energy performances developed in the Res ZNE MC. • Collect performance data from occupied ZNE-type homes and collaborate with the CEC to: (1) understand how occupant behavior can affect energy use; (2) develop ranges of energy use based on actual ZNE-type homes; and (3) improve energy modeling	

Study Title: ZNE Evaluation Methodology Study, Phase 2	**Budget:** $112,500
• Track operational issues with high-performance and ZNE-type homes.	
Key Research Questions: Develop ZNE modeling standards and criteria to enable consistent, market-driven development of integrated tools for ZNE residential projects.	
Potential EM&V Methods: TBD	

Study Title: ZNE Compliance Options for Distributed Energy Resources, Phase 1	**Budget:** $112,500
Expected Completion Date: Q3 2016	**Study Manager:** Pacific Gas & Electric Co.
Description: The finding from the Residential ZNE Market Characterization that market actors have generally not pursued community-scale DER installations in ZNE-type home developments suggests a need to investigate barriers and opportunities for such arrangements to achieve ZNE goals.	
Objectives: Explore the potential for DERs in ZNE-type homes and buildings including issues related to community scale DERs such as permitting, tariff frameworks, grid impacts, as well as how proposals such as PG&E's "Green Option" Community Solar Program could further the ZNE goals.	
Key Research Questions: • Research efforts into community-scale DERs for residential and commercial customers should explore issues such as: • Permitting requirements associated with siting and sizing the systems, • Tariff frameworks that equitably allocate costs and generation to individual units, • Least cost options that ensure grid reliability and safety, • Potential DER voltage, frequency, and other impacts on the grid, • Case studies of federal (e.g. Army and General Services Administration) approaches, and • How the above variables interact and can be leveraged to forward ZNE goals. • For example, research should explore whether community-scale DER installations sited close to the substation of the development's feeder could help to mitigate the grid impacts of the development's new load, while alleviating the need for locating DERs onsite to offset consumption. • Research should also investigate how PG&E's "Green Option" Community Solar program and/or other IOU community solar tariffs could support achievement of the ZNE residential and commercial goals. • The study should coordinate with utility distribution, transmission, and interconnection planning groups and any relevant activities in the Integrated Demand Side Resource OIR.	
Potential EM&V Methods: TBD	

Study Title: K-12 and Community College ZNE Retrofit Readiness Market Characterization Study	**Budget:** $293,416
Expected Completion Date: Q4 2016	**Study Manager:** Energy Division
Description: • In late 2014, the CPUC directed IOUs to develop a ZNE retrofit pilot project and program to leverage Proposition 39 K-12 and Community College funding through 2019. The IOUs recently submitted an ambitious pilot proposal for this, including targets to develop 13-18 ZNE buildings in that period, as well as to develop a scaled program to operate subsequent to the completion of the 2015-2019 pilot. Additional pilot elements include: marketing, education and outreach; development and	

Study Title: K-12 and Community College ZNE Retrofit Readiness Market Characterization Study	**Budget:** $293,416
dissemination of case studies; development of institutional training activities; monitoring, etc. • A challenge remains that IOUs do not currently well understand the landscape of opportunities and barriers to ZNE retrofits for educational institutions. This understanding is needed for both a successful pilot and a successful subsequent program.	
Objectives: • Characterize the K-12 and Community College ZNE retrofit opportunities and challenges, including: • Identify key market actors; drivers; budgets, funding sources and levels, common business plans and patterns of interactions. • Identify barriers and challenges • Identify leading and lagging geographic regions and market actors • Identify key supply chains and opportunities to intervene • Identify the best strategies and partners to advance ZNE retrofits in K-12 and Community Colleges	
Key Research Questions: • Where are the key opportunities to develop ZNE retrofits in educational institutions? • What are key market actor drivers, and how can these be harnessed to advance ZNE retrofit goals? • What are key barriers, and how can these be overcome, via: program design; regulatory framework updates; market actor engagement, etc. • What is the potential savings available, on a sector level and average per building based on the analysis of a representative sample size? • What is the range of educational institution and IOU costs for ZNE retrofits? • What are the best strategies and partners to advance ZNE retrofits in K-12 and Community Colleges?	
Potential EM&V Methods: TBD	

Study Title: State Building Decision Maker Study	**Budget:** $293,416
Expected Completion Date: Q4 2016	**Study Manager:** Energy Division
Description: This study seeks to provide information to guide an intervention strategy that could help move building decision makers to ZNE as they retrofit buildings. Several recent studies have provided information on commercial ZNE. However, there is still no program design, engagement strategy or the internal coordination needed to effectively and consistently advance ZNE commercial newly constructed buildings or deep retrofits. At the same time, Executive Orders mandate that state buildings move towards ZNE, yet little progress has occurred to date due to several hurdles. This study will deepen understanding of intervention strategies and/or complementary regulatory updates needed. Through understanding and overcoming current barriers and 'leading by example', state buildings can support California's ZNE Commercial 2030 goals and help advance ZNE outside of state buildings.	
Objectives: • To characterize the current set of state buildings, with a particular focus on identifying potential ZNE retrofits, and • To determine technical and organizational barriers to reaching ZNE in existing state buildings, as well as identifying paths forward toward increases in ZNE retrofit demonstrations.	
Key Research Questions: • How many and where are good candidates for ZNE retrofit demonstrations within state buildings? • What are the end-use characteristics of state buildings • Which buildings include distributed generation, what is the level of that power, and how much does	

Study Title: State Building Decision Maker Study	**Budget:** $293,416
that offset building energy usage? • What is the general trajectory towards ZNE for existing state buildings? • What are barriers to ZNE according to state building facility managers and other decision makers as well as relevant stakeholders such as regulatory and IOU staff? Which agencies could help reduce the barriers? • What are useful interventions to help move to ZNE? • What are the project approval pathways for the state agencies? How does this structure facilitate or impede moving toward ZNE? • What level of financing is required for state buildings to perform ZNE-type retrofits? What are the financing options? Which of these options are accessible to state facilities?	
Potential EM&V Methods: Mixed methods study, including qualitative data gathered through in-depth interviews as well as quantitative data from surveys and databases of building characteristics. Data collection activities could include collation and datamining of Energy Star Portfolio Manager information, depth interviews with state department decision makers, regulators and IOU staff, and an internet survey of state building facility managers.	

Research Questions to be Addressed

Table 60. 2015 ZNE EM&V Research Questions Summary

Study Name	Research Questions
ZNE Evaluation Methodology Study: Phase 2	• [Residential ZNE Market Characterization] Collect performance data from occupied ZNE-type homes and collaborate with the CEC to: (1) understand how occupant behavior can affect energy use; (2) develop ranges of energy use based on actual ZNE-type homes; and (3) improve energy modeling • [Res ZNE MC] Use and improve the catalog of energy performances developed in the Res ZNE MC. • [Res ZNE MC] Track operational issues with high-performance and ZNE-type homes.
ZNE Compliance Options for Distributed Energy Resources: Phase 1	• [Res ZNE MC] Explore the potential for DERs in ZNE-type homes including issues related to community scale DERs such as permitting, tariff frameworks, grid impacts, as well as how proposals such as PG&E's "Green Option" Community Solar Program could further the ZNE goals.
K-12 and Community College ZNE Retrofit Readiness Market Characterization Study	• Where are the key opportunities to develop ZNE retrofits in educational institutions? • What are key market actor drivers, and how can these be harnessed to advance ZNE retrofit goals? • What are key barriers, and how can they be overcome, via: program design; regulatory framework updates; market actor engagement, etc. • What is the potential savings available, on a sector level and average per building based on the analysis of a representative sample size?

Study Name	Research Questions
	• What is the range of educational institution and IOU costs for ZNE retrofits ? • What are the best strategies and partners to advance ZNE retrofits in K-12 and Community Colleges?
Commercial ZNE Market Characterization	• To characterize the current set of state buildings, with a particular focus on identifying potential ZNE retrofits, and • To determine technical and organizational barriers to reaching ZNE in existing state buildings, as well as identifying paths forward toward increases in ZNE retrofit demonstrations.

2.10.5. Key Research Questions for 2016 and beyond

Proposed 2016 Energy Division Budget $628,749

The portion of evaluation activity for Energy Division was only introduced in 2015 funding. As noted in the plan, these studies are currently underway. In upcoming years the ZNE research area will continue to integrate with the new construction, codes and standards and integrated demand side management research activities. The completion of current studies may reveal some new areas of interest, and current staff shortages are keeping the authorization for 2016 relatively small, but it may increase in the future.

Proposed 2016 Program Administrator Budget: is included in C&S $450,000

Research Questions to Address in Future Cycles

Table 61. ZNE Future Research Questions

Study Name	Research Questions
Outstanding ZNE Research Questions	• Commercial ZNE Market Characterization that builds on research priorities from Navigant's "Measure, Application, Segment, Industry (MASI): Integrated Design for New Construction Buildings" • Market Characterization research for K-12 schools and Community Colleges to support the ZNE Prop 39 pilot and subsequent program objectives. • Market Characterization research on major renovations in the commercial sector. How can Savings By Design better identify these renovation activities early enough in the value chain to move some portion of them to ZNE building /deep energy savings renovations? What type of program design is needed to support this? • [Res ZNE MC] Develop an evaluation research plan to support the State's ZNE goals • [Res ZNE Action Plan – Strategy 3.1] Complete a needs assessment of existing software tools that identifies gaps, weaknesses and potential solutions to address ZNE needs.

Study Name	Research Questions
	• Conduct and integrate research on plug loads and MELs data that is California specific. • [Res ZNE Action Plan – Strategy 5.2] Research and build data on the impact of energy production and demand response related to ZNE buildings on electric grid and gas distribution systems' stability and effectiveness. • Incorporate impacts of MELS, electric vehicles and other existing and emerging ZNE system technologies in research. • Evaluate policy needs related to distributed storage. • Assess existing micro-grid and community scale ZNE projects. • Update Grid Analysis annually and ensure ongoing coordination with other complimentary grid/distributed generation research efforts. • Grid Analysis impacts and recommendations are consistently incorporated into EPIC, CSI and IEPR planning. Grid impact analysis of ZNE in future multifamily and infill projects is included in distributed energy resources plans developed by 2015 pursuant to AB327. Targeted completion in 2016. • Support CEC's short and long term ZNE forecasting methodology.

There are two areas under consideration by the IOUs:

- Although the ED is currently conducting the 2015 Commercial ZNE Market Characterization, the focus of that study has recently shifted to focus specifically on public buildings. The IOUs have suggested also conducting a Commercial ZNE Market Characterization that aligns more with the original proposal for 2015, which was as follows: "California IOUs have still not developed a program design, engagement strategy or the internal coordination needed to effectively and consistently advance ZNE commercial newly constructed buildings or deep retrofits. This study will deepen understanding of intervention strategies and/or complementary regulatory updates needed to accomplish this and advance California's ZNE Commercial 2030 goals." This project may have a budget around $120,000.
- EM&V would like to fund the hosting and maintenance of the recently completed ZNE Scenario Analysis Tool, a web-based tool which would be made publicly available for use in education, training, design, and future research. This project may have a budget around $60,000.

2.11. Emerging Technologies Program

2.11.1. Background (Review background information for outdated information)

Sector or Program Area Description

Emerging Technologies Program (ETP) is a non-resource program aimed at increasing supply and demand for new/unproven and/or emerging/underutilized technologies. The program has three overarching goals:

- Goal 1 – Support the Increase in Technology Supply
- Goal 2 – Increase number of Measures Offered by EE Programs
- Goal 3 – Support Technology Introduction

As a non-resource program, ETP's progress is measured and monitored via applying the ETP California EM&V protocols to assess key metrics and outputs of program activity. The 2013-2014 program has three sub-programs:

1. Sub-program 1 – Technology Development Support (TDS), which encompass the following program tactics (formally referred to as program elements):
   - Technology Development Support
   - TRIO
   - Market and Behavioral Studies
2. Sup-program 2 – Technology Assessments (TA), which encompass the following program tactics:
   - Technology Assessments
   - Demonstration Showcases
   - Market and Behavioral Studies
   - Technology Test Center (SCE only)
3. Sub-program 3 - Technology Introduction Support (TIS), which encompass the following program tactics:
   - Scaled Field Placements
   - Demonstration Showcases
   - TRIP solicitations (new element) – competitive bidding process to fund third party programs that leverage innovative EE and/or IDSM technologies and approaches. These candidates will be transferred and administered by utilities' third party programs.
   - Market and Behavioral Studies

In addition, in compliance with D.12-05-015, ETP will include HVAC Technology and System Diagnostics Advocacy activities under ETP.

Programs included in the Research Scope

Table 62. 2015 ETP Savings and Budget Summary

IOU	Program Name	kWh	kW	therms	2015 Budget
SCE	SCE-13-SW-009ATechnology Development Support	N/A	N/A	N/A	$1,873,259
SCE	SCE-13-SW-009BTechnology Assessments	N/A	N/A	N/A	$4,210,158

IOU	Program Name	kWh	kW	therms	2015 Budget
SCE	SCE-13-SW-009CTechnology Introduction Support	N/A	N/A	N/A	$4,684,763
PG&E	PGE21061Technology Development Support	N/A	N/A	N/A	$1,417,703
PG&E	PGE21062Technology Assessments	N/A	N/A	N/A	$3,799,773
PG&E	PGE21063Technology Introduction Support	N/A	N/A	N/A	$741,821
SDG&E	SDGE3246SW-ET-Technology Introduction Support	N/A	N/A	N/A	$746,00
SDG&E	SDGE3247SW-ET-Technology Assessment Support	N/A	N/A	N/A	$543,000
SDG&E	SDGE3248SW-ET-Technology Deployment Support	N/A	N/A	N/A	$68,000
SCG	SCG3721SW-ET-Technology Development Support	N/A	N/A	N/A	$63,575
SCG	SCG3722SW-ET-Technology Assessment Support	N/A	N/A	N/A	$508,588
SCG	SCG3723SW-ET-Technology Introduction Support	N/A	N/A	N/A	$700,172
	Total Statewide ETP				**$19,356,812**
	% of Statewide Portfolio				2%

The ETP budget is $19,356,812; slightly less than 2% of the entire energy efficiency portfolio budget across all utilities. The ETP is a non-resource program and therefore there is no accounting for savings directly attributable to this program.

The ETP began in the late 1990s. Until 2009, the program's design was focused primarily on assessing emerging technologies. Over the history of the program, implementation efforts became more focused on moving technologies directly into the IOU portfolio. With the advent of the CPUC's adoption of the California Long Term Energy Efficiency Strategic Plan (CEESP), which recognized a role for ETP in supporting not only IOU EE programs but also the broader market, ETP staff expanded program design by incorporating five new program elements: Scaled Field Placements, Demonstration Showcases, Market & Behavioral Studies, Technology Development Support, and Business Incubation (TRIO).

The change from six program elements to three subprograms for 2013-2014 and 2015 was made to re-characterize the ETP in terms of its three major programmatic goals: 1) supporting technology development, 2) conducting technology assessments, and 3) supporting technology introduction. It is the program managers' understanding that the redesign will allow for a more holistic approach and enable the programs' accomplishments to be more easily followed and documented. The previous six program elements will now be considered "tools" in ETP's toolkit to be used to achieve the three ETP goals.

Uncertainties and Challenges to Successful Implementation

The greatest challenge being addressed by ETP is the general misunderstanding of ETP's role in the technology development lifecycle. ETP is primarily a technology testing and demonstration program,

and must rely upon technology developers (manufacturers) to produce the technologies that are then assessed by ETP. While ETP does play a role in providing feedback and suggestions to technology developers, ultimately the decision to create a new technology is not under ETP's direct influence. The biggest uncertainty is in understanding what unique value an utility emerging technology program should offer, in the overall landscape of technology development: When should ETP's efforts duplicate efforts by technology manufacturers or federal programs, and when should ETP's efforts differ?

2.11.2. 2013-2014 EM&V ETP Studies

The table below summarizes the 2013-2014 EM&V Studies that have been budgeted, some of which are in the process of being implemented and others are still in the planning stage. The table provides the study manager, work order under which the study is being conducted, the corresponding budget, implementation status and expected completion date for each study.

Research Plans for the scoped studies are available at www.energydataweb.com/cpuc/.

Table 63. 2013-2014 ETP EM&V Studies, Budgets, and Timing

2013-2014 Study Title	Study Manager	WO Number	Budget	Status	Completion Date
Impact					
N/A					
Process					
Targeted Effectiveness Study	ED	ED_O_ETP_1 ED_O_ETP_2	$391,222	In progress	Apr/2015
ETP Internal Measure Development Process Evaluation	IOUs	N/A	$185,000	In progress	April 2015
ETP Tactic Process Evaluation	IOUs	N/A	$80,000	In progress	April 2015
Market					
ETP Landscape Analysis: "Upstream" technology development	IOUs	N/A	$90,000	Not Initiated	TBD

2.11.3. 2013-2014 Study Descriptions

Below are descriptions for each of the 2013-2014 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: 2013-2014 Targeted Effectiveness Study	**Budget:** $391,222
Expected Completion Date: Q2 2015	**Study Manager:** (ED)
Description: The scope of this study will build on findings from the 2010-2012 ETP evaluation study to avoid duplication of study areas that are covered in the current study	
Objective: Assess program effectiveness and implementation to meet its mission, goals and objectives as designed (reflected in the PIPs), as a follow-up study to 2010-2012 evaluation study.	
Key Research Questions: • How does ETP choose and plan specific activities for a given technology?	

Study Title: 2013-2014 Targeted Effectiveness Study	**Budget:** $391,222
• To what extent do activities supplement existing industry and market knowledge for particular technologies? Are there redundancies or possible synergies to consider? • Is ETP effectively utilizing the available program sub-activities to support the decision for measure transfer or not? • Is ETP evaluating the aspects of a technology where their efforts can bring the most value? Are there missed opportunities? • What is the ETCC website reach? How easy is the website to use? • Does the ETCC website increase awareness of ETP activities? • Are ETCC website visitors engaging with the material (i.e., access reports, use as source for information about ET?) • What effect does the ETP information have on subscribers? • How many projects were initiated, are in progress, or were completed in 2013? How many projects were recommended for transfer to the EE portfolio? • What are the end-use types of each project? Do they align with ETP program performance metrics? Do projects align with the California Energy Efficiency Strategic Plan end-use areas? • What is the technical potential of projects recommended for adoption? • What are the claimed savings for ETP adopted measures in the 2013 database? • Which measures garnered the largest and smallest claimed savings? • Are there any trends in terms of measures and their associated savings?	
Potential EM&V Methods: ETP Evaluation Protocols	

Study Title: 2013-2014 ETP Internal Measure Development Process Evaluation	**Budget:** $185,000
Expected Completion Date: April 2015	**Study Manager:** SCE
Description: A process evaluation to improve program design	
Objective: To meet Program Manager's need to better understand EE program portfolio needs and constraints, with an emphasis on gaining an in-depth understanding the technology transfer process and identifying processes that facilitate successful transfer of measures into EE programs.	
Key Research Questions: • Who are the IOU decision-makers and what are their roles? • Where besides ETP to EE Program Managers find new measures? • What is the internal EE-program decision-making process used to develop new measures? • What is the decision-making of ETP Program Managers around creating a balanced portfolio? What factors are considered? What outside pressures influence these decisions? • What are the roles of customer research and marketing departments? How does ETP determine customers' needs? • What is the internal technology transfer process? (What are the differences across IOUs? What are the pros/cons of different processes?) • What criteria are used for offering deemed measures? • What criteria are used for custom measures? • What are the criteria for sun-setting measures? • What is ETP's role and how are technology assessments used or not used by EE in their adoption	

Study Title: 2013-2014 ETP Internal Measure Development Process Evaluation	**Budget:** $185,000
decision-making? What else would EE programs like from ETP?	
Potential EM&V Methods: Qualitative methods.	

Study Title: 2013-2014 ETP Tactic Process Evaluation: Third Party Introduction Solicitations	**Budget:** $80,000
Expected Completion Date: April 2015	**Study Manager:** (IOU)
Description: A process evaluation for the Technology Introduction Sub-program, including TRIP and other Technology Introduction Tactics	
Objective: Evaluate how TRIP is operating, selection criteria and decision making process, and identify barriers to its meeting the primary objective of "seeding" market interest. Evaluate how the other Technology Introduction sub-program tactics are operating in terms of reaching and creating demand among their target audiences.	
Key Research Questions: • What are the program designer's objectives for the third party solicitation project? • What was the utility's process for ensuring that outcome, either during or after the third party implementation of the project? (This function may reside in the Third Party Program) • Why did each utility choose to use the solicitation process that they ultimately implemented (i.e. why did they choose TRIP vs IDEEA365)? • Over what channels are the marketing and outreach efforts being conducted? What types of 3Ps do these channels typically reach? • How understandable are the outreach materials and efforts in conveying ETP's desire to introduce emerging technologies to the market, on a limited scale? • How easy is the process of submitting a proposal? • How well do the criteria align with ETP's objectives for supporting technology introduction on a limited scale? • What are the characteristics of the emerging technologies in the proposal • What are the characteristics of the bidding companies? • What is the expected impact of these proposed projects?	
Potential EM&V Methods: Qualitative methods	

Study Title: 2013-2014 ETP Landscape Analysis: "Upstream" technology development	**Budget:** $90,000
Expected Completion Date: TBD	**Study Manager:** (IOU)
Description: A market study to gain market insights	
Objective: To meet ET Program Managers' information need of better understanding the interests, constraints and decision-making of technology developers and other key ET market actors "upstream" of ETP.	
Key Research Questions: • Who is creating new IDSM technology? • What is the technology development lifecycle? • What are the objectives of the technology developers, and what needs do they have to reach	

Study Title: 2013-2014 ETP Landscape Analysis: "Upstream" technology development	**Budget:** $90,000
these objectives? What are the ways in which their objectives do and do not align with the CEEESP? • What are the gates in their stage gate model? How do they make their decisions? (How do they determine market viability? What are the criteria? What kinds of customer research do they do? How do they use that data?) • How does ETP learn about these technologies? • What challenges face the IDSM technology industry as a whole? • What are the best roles IOUs can play to support the technology development process? • What are the current funding resources in California for R&D and D&D? Is funding secure/stable? • What other entities in RDD&D landscape in California perform similar functions as ETP?	
Potential EM&V Methods: Qualitative methods. Use sources and findings from current ET Market Actors Assessment to develop this scope of work and to prevent any research duplication.	

2.11.4. 2015 EM&V ETP Studies

The table below summarizes the 2015 EM&V Studies that have been budgeted. Study descriptions are preliminary and will be refined before the next roadmap update. The table provides preliminary estimates of the study manager, corresponding budget and expected completion date for each study.

Table 64. 2015 ETP EM&V Studies, Budgets, and Timing

2013-2014 Study Title	Study Manager	Work Order	Budget	Completion Date
Impact				
N/A				
Process				
2015 Targeted Effectiveness Study	ED	TBD	$391,000	TBD
2015 Tracking Nation-wide Emerging Technology Trends	IOU	N/A	$90,000	December 2015
2015 Technology Development Support for Competitions	IOU	N/A	$60,000	December 2015
2015 Storytelling Metrics	IOU	N/A	$65,000	December 2015

2.11.5. 2015 Study Descriptions

Below are descriptions for each of the 2015 studies, which include the preliminary research questions that will be addressed, and the potential EM&V methods that may be utilized.

Study Title: 2015 Targeted Effectiveness Study	**Budget:** $391,000
Expected Completion Date: TBD	**Study Manager:** (ED)
Description: The scope of this study will build on findings from the 2013-2014 ETP evaluation study to avoid duplication of study areas that are covered in the current study.	
Objective: • This study has 3 primary **Objectives:** 1) develop outcomes and revisions to PPMs, 2) summarize and document ETP activities in 2014-2015, and 3) assess scanning and screening efforts. • **Develop outcomes and revisions to PPMs**: Earlier evaluations indicate that there is a lack of consensus regarding the anticipated outcomes of ETP. Additionally, the current Program Performance Metrics (PPMs)	

Study Title: 2015 Targeted Effectiveness Study	**Budget:** $391,000

do not offer a comprehensive framework for assessing ETP performance and value that is rooted in anticipated outcomes. We propose to support ongoing efforts between ED and the IOUs to revise ETP PPMs to better support assessing performance as well as suggesting changes to tracking data to better support performance metrics.

- **Summarize and document ETP activities in 2014-2015:** Building on the current evaluation effort, we would conduct aggregate analysis on the 2014 data. We suggest performing this task annually as an update to the proposed performance-tracking template. We will focus on a longitudinal review of ETP data (now that we have multiple years of data to track) to assess trends over time. We will explore alternative ways of looking at the date to better reflect ETP performance.
- **Assess scanning and screening efforts**: This effort would incorporate an assessment of screening and selection choices made, documenting changes made since the 2010-2012 evaluation and the quality of the process. Given that the program tactics have different outcomes, the PY2010-2012 evaluation recommended that the IOUs develop specific screening tools for each tactic. The development of specific screening tools will ensure that project selection meets expected program outcomes. General screening tools that are not outcome specific make it difficult for the ETP staff to select projects with varied intended outcomes. Collaboration across the IOUs to discuss opportunities to improve tools statewide can help with the development of outcome-specific tools. By discussing the criteria used for project selection, and why it varies across utilities, the IOUs can identify what criteria are IOU appropriate only or needed across the state. For 2015, we recommend evaluating project choices. This effort would incorporate an assessment of screening and selection choices made, documenting changes made since the 2010-2012 evaluation and the quality of the process.

Key Research Questions: TBD

Potential EM&V Methods: ETP Protocols, others TBD.

Study Title: 2015 Tracking Nation-wide Emerging Technology Trends	**Budget:** $90,000
Expected Completion Date: December 2015	**Study Manager:** (IOU)

Description: We propose a market tracking study that determines the extent of assessment activities on emerging technologies by ETP's technology assessment peers, and interviews technologists to uncover early indicators of the next "hot" emerging technology. Tracking national trends in emerging technologies serves several purposes: 1) It allows ETP to understand which emerging technologies are popular candidates for assessment by other organizations, and thus may be "oversubscribed" in terms of assessment projects: These assessments call for greater coordination to decrease duplication of effort. 2) Increasing utility interest in specific technologies heralds increased technology adoption by customers of other utilities, and provides an indicator of the state of supply chain for those technologies: a well-developed supply chain and trade ally network means a number of market barriers are being reduced, allowing the IOUs to focus on tougher market barriers. 3) It allows ETP to identify emerging technologies that may be "undersubscribed". These technologies may be those that are high risk/high reward technologies that ETP may wish to include in its portfolio. These "undersubscribed" technologies may present opportunities for ETP to lead the field, by drawing attention to promising technologies that are too innovative for consideration by other utilities. Emerging technologies will constitute an ever-increasing source of energy efficiency potential in the coming years; the recent Potentials and Goals Study estimates that emerging technologies will provide approximately 40% of the energy savings potential in 2024. Because utility DSM portfolio objectives will be set against these potentials estimates, utilities should track the market of emerging technologies to ensure either 1) that these potentials can be met, or 2) that the potentials

Study Title: 2015 Tracking Nation-wide Emerging Technology Trends	**Budget:** $90,000
estimates are updated to reflect the continual turnover in emerging technology mix.	
Objective: To produce a high-level market study showing the breadth and depth of emerging technologies being considered by ETP peer organizations. This will help ETP decide where to allocate resources for program activities based upon what market barriers are already being addressed for each type of emerging technologies.	
Key Research Questions: • Which emerging technologies are currently being assessed by peer organizations? • Which market barriers are they trying to address? • Which emerging technologies do they consider high-risk/high-reward technologies? • Are there any high-risk/high-reward technologies that peer organization have chosen not to address, and why? • Which emerging technologies should ETP add to its portfolio? Which current activities for emerging technologies currently in ETP's portfolio should be reconsidered or re-scoped, based upon prevalence of nation-wide activities?	
Potential EM&V Methods: A "heat map" of activities will be developed, similar to ones commissioned by ED in the past to survey the range of activities in behavior change. Organizations will be asked to participate in an online survey, in return for a copy of a report on the results. Source materials on emerging technologies will include technology innovation newsletters from various organizations.	

Study Title: 2015 Technology Development Support for Competitions	**Budget:** $60,000
Expected Completion Date: December 2015	**Study Manager:** (IOU)
Description: We propose a needs and wants assessment of technology entrepreneurs focused around IDSM; this will allow ETP and other utility programs to provide targeted support to help increase the supply of systems-level solutions to meet California's IDSM needs. The field of technology entrepreneurship strives to provide innovative young companies with mentoring and resources to develop new technologies. ETP has provided support to these organizations in the past, including the Cleantech Open, and DOE's First Look West (FLoW). However, this support has been mainly financial, and ETP would like to understand areas in which utility knowledge of customer needs, technology use, and regulatory context can be transferred to young companies that are interested in serving utility customers. Although TRIO provides information through workshops, there may be a need for a mentoring role by the utilities. One growth area of utility and regulatory interest, that may not be well-understood by technology developers, is in IDSM: the integration of energy efficiency, demand response, and distributed generation. This area requires systems-level solutions, which may be foreign to young entrepreneurs who are focused on constructing "widgets".	
Objective:. • To provide the SW ETP with an understanding of the needs and wants of young entrepreneurs with regards to California's regulations and mandates for integrated solutions. • To provide the SW ETP with a process through which this knowledge can be integrated with the technology development process	
Key Research Questions: • What information about the context of technology use is already taken into consideration by young technology entrepreneurs? • What is their current level of understanding of the need for integrated solutions?	

Study Title: 2015 Technology Development Support for Competitions	**Budget:** $60,000
• What is their current level of understanding about regulatory mandates for establishing energy savings claims? • What is the best forum or venue for young entrepreneurs to gain this information? • What follow-up or mentoring is necessary for young entrepreneurs to incorporate these concerns into their technology development process?	
Potential EM&V Methods: ETP will leverage existing relationships with universities and young technology entrepreneurs to conduct the needs and wants assessment.	

Study Title: Support for Emerging Technologies Program Metrics Development	**Budget:** $65,000
Expected Completion Date: December 2015	**Study Manager:** (IOU)
Description: There is need to improve current program metrics for both ongoing reporting (PPMs) as well as to guide evaluation. This study or project will complement ED led activities to define metrics for the Emerging Technologies program.	
Objective: • Propose metrics that aligns with program outputs and outcomes. • Support data tracking modification needs	
Key Research Questions: TBD	
Potential EM&V Methods: TBD	

2.11.6. Key Research Questions for 2016 and beyond

Proposed 2016 Energy Division Budget: $104,792

Energy Division has conducted a significant number of studies in the Emerging Technologies sector in the past few years. Developing new studies are not a key Energy Division priority at this time, but will continue to review and support oversight of IOU-led evaluation.

Program Administrator are not proposing any studies or budget at this time.

2.12. Finance

2.12.1. Background

Sector or Program Area Description

The Statewide Financing Program consists of a portfolio of financing efforts, including continuation of the On-Bill Financing (OBF) program, continuation of the American Recovery and Reinvestment Act (ARRA)-originated financing programs, and a set of new financing pilots for single-family and multi-family residential customers as well as for small business and broader non-residential customers. OBF and the new financing pilots are statewide efforts through the investor owned utilities, whereas the ARRA originated programs are implemented regionally. These financing offerings are intended to eventually support all types of demand-side investments, including energy efficiency, demand response, distributed generation and storage. The IOUs portion of the Financing Program totals to $154 million in budgeted costs, which represents slightly less than 10% of the total program costs proposed by the IOUs for the 2013-14 Program Cycle and a total of $34 million in budgeted costs for the 2015 Program Cycle. Additional portfolio funds have been allocated to the RENs' and MCE's finance pilots in the amount of $ 62 million for 2013-2014, and $ 47 million for 2015. The proposed savings for this Financing Program are not yet defined.

Southern California Gas (SCG) and San Diego Gas & Electric (SDG&E), collectively Sempra Utilities or SEU, lead the development of the On-Bill Financing concept in California. SEU staff designed the program by researching what other utilities had done to make OBF successful, obtaining feedback from public advisory groups, and reviewing lessons learned from similar programs SEU had tried in the past. The OBF staff worked with SEU's legal department to understand lending law requirements, and then worked with the information technology and billing departments to arrange for loan payments to appear on customer bills. SEU and SCE initiated OBF as pilot programs in 2006. These pilot program designs have since been expanded to include all types of nonresidential customers. PG&E began offering a temporary "off-bill" loan program in July 2010 before the utility had functional "on-bill" loan servicing, and launched OBF in the third quarter of 2011.

Ex Ante Coordination

Programs and activities in this sector use ex ante savings estimates and implementers should be aware of updates to these estimates and studies needed to improve the savings estimates. However, a section on ex ante updates is not included in this chapter. The studies planned in this sector will not likely be designed to directly inform updates to ex ante savings estimates. Please see the customer specific research plans for discussion of updates to ex ante savings estimates.

Programs included in the Research Scope

This research roadmap currently covers the Investor-Owned Utility (IOU)-administered Statewide On-Bill Finance Program, new Statewide Finance Pilots, and local-government American Recovery and Reinvestment (ARRA)-initiated finance programs. It also includes regional finance pilots administered by Regional Energy Networks (RENs) and Community Choice Aggregator (CCA). All of the program administrators will continue their existing OBF and ARRA-originated financing programs. The financing program budgets for the IOUs total $154,671,384 of the 2013-2014 energy efficiency program budget across all utilities and a total of $34,411,948 million in budgeted costs for the 2015 Program Cycle.

Table 65. 2013, 2014 and 2015 IOU Savings Goal and Budget Summary for Financing Programs

IOU	Program Name	kWh	kW	therms	Budget 2013-2014	Budget 2015
SCE	SCE-13-SW-007A On-Bill Financing	*	*	*	$54,325,000	$15,655,337
SCE	SCE-13-SW-007B ARRA-Originated Financing	*	*	*	$5,000,000	$639,432
SCE	SCE-13-SW-007C New Finance Pilots	*	*	*	$21,900,000	-
PG&E	PGE21091 On-Bill Financing (actual – 2014)	*	*	*	$25,751,415	$13,537,010
PG&E	PGE21092 Third-Party Financing	*	*	*	$2,000,000	$2,031,703
PG&E	PGE21093 New Financing Pilots	*	*	*	$15,500,000	-
SDG&E	SDGE3262 On-Bill Financing	*	*	*	$697,435	$284,141
SDG&E	SDGE3263 ARRA-Originated Financing	*	*	*	$2,225,224	-
SDG&E	SDGE3264 New Finance Pilots	*	*	*	$12,077,309	-
SCG	SCG3735 On-Bill Financing	*	*	*	$1,727,378	$878,579
SCG	SCG3736 ARRA-Originated Financing	*	*	*	$3,200,000	$1,385,745
SCG	SCG3737 New Finance Pilots	*	*	*	$10,467,622	-
	Total Statewide Financing				**$154,671,384**	**$34,411,948**
PG&E~	Bay Area Regional Energy Network (BayREN)	5,621,775	7,987	740,456	$22,742,750	$17,006,072
PG&E~	Marin Clean Energy (MCE)	15,232,088	3,786	1,139,754	$4,015,205	$1,220,267
SCE/SCG~	Southern California Regional Energy Network (SoCalREN)	54,321,228	25,403	0	$35,748,168	$29,203,162
	REN and MCE Sub Total				**$62,506,123**	**$47,429,501**
ALL	**Grand Total**				**$217,177,507**	**$81,841,449**

*No savings goals for 2013-2014 have been adopted due to this being the first cycle in which financing programs have been considered resource acquisition programs.
~ The budgets for the RENs finance programs may be listed in a separate roadmap but are shown here for informational purposes

In September 2013, Decision 13-09-044 was adopted to pave the way for the Statewide Finance Pilots. In November and December 2013, the IOUs filed the, identified above as "New Financing Options Program". The following Program Implementation Plans (PIPs) are further defined in this Decision:

1. CA Hub for Energy Efficiency Financing (CHEEF) PIP,
2. Single Family Sector
    a. Residential Energy Efficiency Loan (REEL)
    b. Energy Finance Line Item Charge (EFLIC) – PG&E Only,
3. Multi-Family Sector

    a. Master Metered Multifamily Financing Program (MMMFP)
4. Non-Residential Sector
    a. On-Bill Financing (OBF)
    b. Small Businesses
        i. On-Bill Repayment Small Business Loan Program),
        ii. On-Bill Repayment Small Business Lease Providers,
        iii. Off-Bill Small Business Lease Providers,
    c. Medium Business, Large Business, and Institutional
        i. Non-Residential On-Bill-Repayment without Credit Enhancement.

The funding for these Statewide Pilot Programs was delayed until July 2014 as the ability of the implementer, the California Alternative Energy and Avanced Transportation Finance Authority, to use the funds had to be authorized through the annual state budgeting cycle. Additionally, key systems will have to be established and inter-connected before program implementation can begin. The implementation of the programs will begin in February 2016. Decision 13-09-044 extended the program cycle for the pilots to the 2014-2015 period.[40]

The ARRA-originated programs include:

1. PG&E ARRA-originated Pilots
    a. California Homebuyers Fund (LLR for Single Family)
    b. emPower Central Coast (LLR for Single Family)
2. SCE ARRA-originated Pilots
    a. emPower Central Coast (LLR for Single Family)
    b. SDG&E ARRA-Originate Pilots
    c. CCSE marketing
3. SoCalGas
    a. emPower Central Coast (LLR for Single Family)

The regional finance pilots administered by RENs and CCA include the following. An asterisk indicates it if the pilot was ARRA-originated:

1. SoCalREN
    a. Energy Upgrade California Residential Loan Loss Reserve (Single Family LLR)*
    b. Non-Residential PACE: Promotion and administration for already established PACE program that uses private funding backed by LA County bonds*
    c. Promotion and management of master lease program (Public Building LLR)[41]*
    d. Promotion of public agencies of finance programs and assistance setting up revolving loan fund (Public Agency Loan Fund)*

---

[40] EM&V budgets for finance programs are currently for the 2013-2014 cycle even though the program cycle for the statewide pilots have been updated so that each pilot will run for two years from the time the first loan is enrolled, per CPUC Decision D. 15-06-008. Whether and how to update the EM&V budgets for 2015 is currently pending before the CPUC in Rulemaking 13-11-005.

[41] The Public Building LLR and Public Agency Revolving Loan Fund (c and d) were not implemented as outlined in SoCalRen's PIP. They essentially combined into one marketing and promotional program to help public agencies find financing for energy efficiency financing.

BayREN

e. Multi-Family Capital Advance Program Pilot in support of EUC
f. Commercial PACE: Support commercial PACE in the Bay Area
g. Pay as you Save*

2. Marin Clean Energy (MCE)
   a. On-Bill Repayment for Single Family (LLR)
   b. On Bill Repayment for Multi-Family and Small Commercial (LLR)
   c. Standard Offer Finance Program (designed for the Commercial and Agricultural sectors, but TBD)

Beginning in 2013, the Commission will count all savings generated by the finance programs as resource savings. This contrasts with the OBF program offered prior to 2013 that was treated as a non-resource program.

In addition, just after the funding for the Statewide Pilots was approved, the California Legislative Analyst Office (LAO) made it clear that there is an interest in understanding the relative importance of various state-funded financing efforts including the Statewide pilots, and PACE programs.[42] In 2014 the LAO stated that the research to date is unclear about how effective these financing efforts are at getting customers to undertake projects that would not have otherwise taken place or getting customers to take deeper retrofit actions. Additionally, the LAO is concerned about the duplication of efforts across these various financing mechanisms and administrators. Therefore, the LAO recommended that the CPUC, in consultation with CAEATFA, evaluate the effectiveness of all three program designs upon the completion of the Statewide pilots. In 2015 the legislature formalized this request in budget trailer bill language assigning this responsibility to CAEATFA, to be undertaken in consultation with the CPUC.

Uncertainties and Challenges to Successful Implementation

The major issues and challenges faced by the Financing Programs are:

- Increasing sales of energy efficient products and services;
- Encouraging customers to invest in projects that will achieve deeper energy savings;
- Overcoming the "first cost" barrier of energy efficiency upgrades;
- Leveraging ratepayer funds while bringing in private capital; and
- Reaching a broader set of customers and market segments.

2.12.2. 2013-2014 EM&V Studies

The table below summarizes the 2013-14 EM&V Studies that have been budgeted, some of which are in the process of being implemented and others are still in the planning stage. The table provides the study manager, work order under which the study is being conducted, the corresponding budget, implementation status and expected completion date for each study.

[42] State funds support an insurance pool to protect federally-insured residential PACE transactions from any PACE caused investment losses.

Table 66. 2013-2014 EM&V Financing Studies

2013-2014 Study Area/Title	Study Lead (ED/IOU)	Work Order #	Budget 2013-2014	Completion Date
Process				
Process Evaluation #1– On-Bill Financing– SMB & Institutional/NR	IOU	n/a	$50,000	TBD
Process Evaluation #2 A - HERO Loan Program –	IOU	n/a	$200,000	06/15
Process Evaluation #2 B – Special Project TBD	IOU	n/a	$184,285	TBD
Process Evaluation #3 A– Market Research, Process Evaluation, Baseline, Development of Program Theory & Logic Models	IOU	n/a	$507,461	07/14
Process Evaluation #4– Development of Evaluation Plans for Financing Pilot Programs	IOU	n/a	$113,505	04/14
Process Evaluation #5– Single Family Loan Program	IOU	n/a	$300,000	TBD
Process Evaluation #6– Small Business-OBR w/CE; Lease Providers w/CE On-Bill; Lease Providers with CE – Off-Bill	IOU	n/a	$300,000	TBD
Process Evaluation #7– Master Meter Multifamily	IOU	n/a	$342,500	TBD
Process Evaluation #8 – Medium, Large Business – OBR w/out CE	IOU	n/a	$325,000	TBD
Impacts				
Market Study #1: (1a) Residential and (1b) Non-Residential Markets	ED	ED_0_FIN3	$900,000	2016
Impact Evaluation #1: Cross-Cutting and Attribution Research	ED	ED_0_FIN2	$350,000	2016
Impact Evaluation #2: Multi-Phase On-Bill Financing Study	ED	ED_0_FIN4	$350,000	2016
Impact Evaluation #3: Regional Financing Study	ED	TBD	$250,000	2017

2013-2014 Study Area/Title	Study Lead (ED/IOU)	Work Order #	Budget 2013-2014	Completion Date
Impact Evaluation #4: Statewide Financing Pilot Study	ED	TBD	$800,000	2017
Additional Finance Studies Funded by Other Areas				
Comparative Finance Design Study. **This study is funded through market studies** in the Residential roadmap and is intended to fulfill the LAO's request to compare/contrast the cost and outcomes of design strategies upon completion of the pilots	ED	ED_D_Res_7	See market studies roadmap	2017
Process Evaluation - Finance Marketing, Education and Outreach. **This study is funded through the ME&O roadmap** and a description can also be found in the ME&O roadmap.	ED	ED_O_ME&O_7	See ME&O roadmap	2017

2.12.3. 2013-14 Study Descriptions

Below are descriptions for each of the 2013-14 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: Process Evaluation #1 – On-Bill Financing SMB & Government/Institutional Non-Residential	**Budget: $50,000**
Expected Completion Date: TBD	**Study Manager:** IOU
Description: Review program design, effectiveness, marketing, ease of application process	
Objective: Confirm increase in customer investments achieving deeper energy savings; evaluate criteria of lighting measures limited to </= 20% of total project cost (G & I exempt from this lighting maximum)	
Key Research Questions: • What are the program participant characteristics? Who are participating in these programs and how are they using the loan funds? What measures are they deploying? Are they achieving	

Study Title: Process Evaluation #1 – On-Bill Financing SMB & Government/Institutional Non-Residential	**Budget: $50,000**

comprehensive retrofit goals?
• Are these programs effectively implemented as planned? If not, what are the necessary improvements? If yes, what are the bright spots for these programs?
  ○ Is this program evaluable?
  ○ Can the program report both rebate/loan and loan-only project results and energy savings?
  ○ Is the QA/QC process for this program adequate to ensure quality of energy savings reporting?
• Are these financing programs interacting with other rebate programs? If yes, how?
• What are the process evaluation recommendations to date? Can these recommendations be implemented? If no, why not?
• What are the feedbacks from the implementers, contractors and customers? How can the program improve?	

Potential EM&V Methods: Focus groups, 1-on-1 interviews, surveys, billing analyses, segmentation	

Study Title: Process Evaluation #2 A – HERO Loan Program	**Budget:** $200,000
Expected Completion Date: 06/16	**Study Manager:** IOU
Description: Research evaluation of the residential HERO PACE program to understand the factors underlying its success in California, and to identify how those factors could be incorporated into IOU finance pilots and programs to maximize uptake of clean energy upgrades by addressing the barrier of upfront cost of the upgrades.	
Objective: The primary goal is to better understand what accounts for the success of the HERO program and how those learnings might be applicable to the IOU residential financing pilots and incentive programs. Secondary goals include testing various methods of attributing energy savings between overlapping finance and incentive programs, and identifying gaps in terms of market segments and unmet needs. Budget may be added to the evaluation to accommodate further work on attribution.	
Key Research Questions: To what extent is the HERO Program's success due to PACE financing, to contractor recruitment, training, and support, to making the process easy and fast for the homeowner, to policy decisions, and to other factors? How is the program marketed? Are there market segments that HERO is not addressing? Is there a statistical analysis method that can reasonably estimate the relative importance of financing and rebates in homeowners' decision-making process?	
Potential EM&V Methods: 1-on-1 interviews with sponsoring local governments, the program administrator, and contractors; surveys of HERO participants, IOU rebate participants, and the general	

Study Title: Process Evaluation #2 A – HERO Loan Program	**Budget:** $200,000
population; attribution research and analysis; and a marketing review.	

Study Title: Process Evaluation #2 B– IOU Special Evaluation Project – to-be-determined	**Budget:** $184,285
Expected Completion Date: TBD	**Study Manager:** IOU
Description: TBD – an evaluation project that will address timely and expected information needs that arise during the launch of the Financing Pilots.	
Objective: TBD	
Key Research Questions: TBD	
Potential EM&V Methods: TBD	

Study Title: Process Evaluation #3 A – Cadmus Early EM&V and Market Research	**Budget:** $507,461
Expected Completion Date: 07/2014	**Study Manager:** IOU
Description: Market Research; Process Evaluation; Baseline Study; Development of Program Theory and Logic Models; Literature Review and special Evaluation of HERO loan program to 1.) assess program design and marketing approaches; and 2.) assess overlap with other loan programs – per direction of LAO to CPUC, CEC and CAEATFA.	
Objective: Assess customer, partner and stakeholder responses to Pilot Programs; baseline study of residential customers; interviews with Financial Institution partners; develop the program theory and logic models; definition of PPMs; literature review; evaluability assessment; evaluate process of HERO program, and overlap with other loan programs.	
Key Research Questions: • Reaction to pilot marketing, application process, test elements of the logic models, awareness of the pilots. Preferences for financing relative to other EE attributes, reaction to pilot marketing, application process. • Awareness and promotion of financing, finance selling process, reaction to program offerings, pilot materials and requirements. • Barriers to financing • Customer segment value/trade-off of various loan attributes. • Per PG&E Changes	
Potential EM&V Methods: Focus groups, 1-on-1 interviews, surveys, billing analyses, segmentation, ride-alongs with contractors, review of marketing materials, analysis of program appeals vs. rebate programs incentives to define key marketing drivers.	

Study Title: Process Evaluation #4 – Freeman Sullivan/Nexant Development of Evaluation Plans	**Budget:** $113,505
Completed Date: 04/2015	**Study Manager:** IOU
Description: Assess the potential for Experimental Design to be applied in the evaluation of the new Financing Pilot programs.	
Objective: Review the designs proposed for the Financing Pilots and then – applying the concepts and requirements of Experimental Design, attempt to design an evaluation approach that could define the incremental energy savings attributable to Financing, when supporting the existing EE programs.	
Key Research Questions: Can Experimental Design be applied to successfully measure the impact of the Financing Pilots?	
Potential EM&V Methods: Working sessions including ED and IOU staff, ED Advisors, and ED and IOU evaluation consultants.	

Study Title: Process Evaluation #5– Single Family Loan Program	**Budget:** $300,000
Expected Completion Date: TBD	**Study Manager:** IOU
Description: Assess Loan Loss Reserve 20% CE; support for low & moderate income; </=70% EEMs and </= 30% non-EEMs; loan application process; contractor marketing; loan-only; data collection; QA process; effective marketing; deeper retrofit	
Objective: Determine effectiveness of program design relative to other financing options, obtain feedback on program marketing; Characterize program participants and projects; Elicit participant feedback; Evaluate consumer preferences for financing and different types of financing vehicles/program designs; Characterize contractor role in program participation; Determine success of program in making financing available to more consumers and whether more and larger energy efficiency projects are conducted as a result of the program.	
Key Research Questions: • Finance Pilot Program design and implementation: ○ Is this program effective as planned and implemented? ○ What are the characteristics of program participants and drop-outs? ○ How do the program participants use their loans to investment in their homes (i.e., what measures)? ○ Are the program marketing activities effective? If not, what improvements are needed for program participants and non-participants? ○ Is the program's end-to-end processing effective? Is the duration for this processing acceptable? What kinds of improvements are necessary? ○ Is the program education, training and outreach effective for the intended targets (i.e., financial institutions, contractors, homeowners, etc.)? If not, what improvements are	

Study Title: Process Evaluation #5– Single Family Loan Program	**Budget:** $300,000
needed? ○ How is the loan program interfacing with IOUs/RENs rebate programs? How is the loan program interfacing with contractor and financial institutions? What are the bright spots? What are the areas for improvements? • Program contractors: ○ What is the program contractors' feedback about this loan pilot? ○ Are they getting more projects as a result of the single-family loans? ○ Do they have sufficient information to market and sell these loan packages? ○ What improvements are necessary to improve the situation for the contractors? • Program participants (i.e., homeowners): ○ What are the feedbacks from the homeowner participants and non-participants? ○ Are they getting sufficient information for these loan packages to help them make a financial decision? ○ Are they investing in more and deeper energy retrofit options? ○ Are they satisfied with the finance pilot program design and delivery? ○ What improvements are necessary to improve the program outcome? • Other Rebate Program/s Interface: ○ For the other complementary rebate programs, are they receiving sufficient information to help market and promote the loan products? ○ What is their feedback? What are the needed improvements? • What improvements are necessary to improve program outcome?	
Potential EM&V Methods: Participant surveys, participant focus groups, conjoint analysis, contractor focus groups, contractor surveys, financial institutions surveys	

Study Title: Process Evaluation #6– Small Business-OBR w/CE; Lease Providers w/CE On-Bill; Lease Providers with CE-Off-Bill	**Budget:** $300,000
Expected Completion Date: TBD	**Study Manager**: IOU
Description: Assess Loan Loss Reserve 20% cap $200k per project; >/=70% EEMs and </= 30% non-EEMs; loan application process; contractor marketing; loan-only; data collection; QA process; effective marketing; deeper retrofit; with Credit Enhancement; without Credit Enhancement; Interest %>0; OBR shut-off on non-payment; transferability with customer consent	
Objective: Determine effectiveness of program design relative to other financing options, obtain feedback on marketing materials; Characterize program participants and projects; Elicit participant feedback; Evaluate consumer preferences for financing and different types of financing vehicles/program design; Characterize contractor role in program participation; Determine success of program in making financing available to more consumers and whether more and larger energy	

Study Title: Process Evaluation #6– Small Business-OBR w/CE; Lease Providers w/CE On-Bill; Lease Providers with CE-Off-Bill	**Budget:** $300,000
efficiency projects are conducted as a result of the program; determine the effect of credit enhancement and the on-bill repayment option on loan activity.	
Key Research Questions: For Small Business Financing Program, please consider all researchable questions identified above in the MMMFP REEL and EFLIC. For small businesses, there are three different loan options. Much like the Multi-family sector, these small businesses also face the split-incentive barrier. Please consider these researchable questions, on top of the relevant researchable questions identified in both the single family and multi-family sectors: Has credit enhancement increased loan activities? Has either On-Bill Repayment increased loan demand? What are the customer feedbacks for this loan program? What improvements are necessary to improve program outcome?	
Potential EM&V Methods: Participant surveys, participant focus groups, conjoint analysis, contractor focus groups, contractor surveys, financial institutions surveys	

Study Title: Process Evaluation #7– Master Meter Multifamily	**Budget:** $342,500
Expected Completion Date: TBD	**Study Manager**: IOU
Description: Define demand & interest in financing/loan programs across MF customer sectors; debt service coverage reserve </=10% loan value; >/=70% EEMs and </= 30% non-EEMs; loan application process; contractor marketing; loan-only; data collection; QA process; effective marketing; deeper retrofit; without shut-off for non-payment	
Objective: Determine effectiveness of program design, marketing materials; Characterize program participants and projects; Elicit participant feedback; Evaluate consumer preferences for financing; Characterize contractor role in program participation; Determine success of program in making financing available to more consumers and whether more and larger energy efficiency projects are conducted as a result of the program; determine how well the program is working within the context of the single-point-of-contact strategy used in the multifamily sector; determine whether the program has helped minimize the property owner versus tenant split-incentive barrier.	
Key Research Questions: For Master Metered Multi-Family Financing Program, please consider all researchable questions identified above in the single family sector. Since the MMMFP must interface with either income-qualified and lower-income qualified property owners, please consider the additional researchable questions below: • What are the characteristics of the program participants and drop-outs? Why are they participating	

Study Title: Process Evaluation #7– Master Meter Multifamily	**Budget:** $342,500
or not participating? • For program participants, how are they investing in their property using the loan amount (i.e., what gas and electrical measures)? Are the property owners making deeper and broader scoped energy retrofit as a result of the loan program? • Is the single-point-of contact strategy working in the context of the loan program? Can the property owners successfully leverage all rebate resources and financing options by leveraging the single-point of contact? • Has the loan program helped to overcome the property-owner versus tenant's standing split-incentive barriers? Are they making improvements inside the tenant units? • How is this finance program interfacing with IOUs and RENs rebate programs? • In additional to contractors, the multi-family programs may also engage utility consultants and/or Raters for these projects. We need to collect program response from these utility consultants and/or Raters. • What improvements are necessary to improve program outcome?	
Potential EM&V Methods: Participant surveys/interviews, contractor focus groups, contractor surveys, financial institutions surveys.	

Study Title: Process Evaluation #8– Medium, Large Business – OBR w/out CE	**Budget:** $325,000
Expected Completion Date: TBD	**Study Manager:** IOU
Description: Define demand & interest in financing/loan programs across customer sectors; >/=70% EEMs including DR and DG; and </= 30% non-EEMs; loan application process; contractor marketing; loan-only; data collection; QA process; effective marketing; deeper retrofit; without Credit Enhancement; Interest %>0; OBR shut-off on non-payment; transferability with customer consent	
Objective: Determine effectiveness of program design relative to other financing options, obtain feedback on marketing materials; Characterize program participants and projects; Elicit participant feedback; Evaluate consumer preferences/need for financing; Characterize contractor role in program participation; Determine success of program in making financing available to more consumers and whether more and larger energy efficiency projects are conducted as a result of the program; determine whether the program can meet/is meeting objectives without credit enhancement.	
Key Research Questions: For Medium/Large businesses and Institutions, please consider all relevant researchable questions identified in Multi-family and Small Business sectors above. • Can this loan program meet its deal flow objective without credit enhancement?	
Potential EM&V Methods: Participant surveys/interviews, participant focus groups, conjoint analysis, contractor focus groups, contractor surveys, financial institutions surveys.	

Study Title: Market Study #1: (1a) Residential and (1b) Non-Residential	**Budget:** $900,000
Expected Completion Date: Residential Study complete by Q4, 2015, Non-Residential Study complete by Q2, 2016	**Study Manager:** ED
Description: Develop a baseline for the residential and non-residential market for energy efficiency finance products in CA including both supply and demand.	
Objective: To understand the market conditions prior to the start of the finance programs, and to Inform the development of market changes over time.	
Key Research Questions: • What are the characteristics of the supply-side market for energy efficiency financing? • What are the characteristics of the demand-side market for energy efficiency financing? • What is the financial institutions' understanding of the risk related to energy efficiency financing opportunities? • What financial products and services are available for energy efficiency financing? • Do lenders offer specialized energy efficiency finance products and if so, what types of financial institutions offer them and how are they marketed? • At what rates and terms is energy efficiency financing available to different market segments of customers (residential and non-residential)? To mid-stream contractors? • Are contractors using financing to close sales (importance of financing to the sale of various kinds of jobs)? • What is the number and depth of energy efficiency projects prior to offering these energy efficiency finance programs? (Residential) • What percentage of the population has taken an energy efficiency action? (Residential) • What percentage of that population has used energy efficiency financing? (Residential) • How much of the project cost was financed? (Residential) • How accessible (in terms of products available and cost) is financing for energy efficiency projects? How accessible is financing among different customer segments? (Residential) • How aware are customers (by sector and segment) of financing options available to them? (Residential)	
Potential EM&V Methods: Interviews with financial institutions and market actors, mystery consumer research, secondary data. Potential EM&V Methods:general population residential and non-residential survey, potential questions from 2010-2012 evaluation research, leveraging other survey efforts for 2013-2014, secondary data.	

Study Title: Impact Evaluation #1 – Cross-Cutting Background and Attribution Research	**Budget:** $350, 000
Expected Completion Date: Q1, 2016 (various memos and workshops will be completed 2014 and 2015)	**Study Manager:** ED
Description: Cross-cutting background and attribution research for the statewide pilots and regional programs/pilots	
Objective: conduct cross-cutting research as well as consulting and coordination activities in support of the statewide pilot and regional program/pilot evaluations.	
Key Research Questions: • What data is available to evaluate the projects? • How should the savings for finance programs be attributed to program administrators? • How should the cost-effectiveness of the portfolio of finance programs be calculated?	
Potential EM&V Methods: Review of programs, available data and program materials; review of program logic models; prioritization of key local programs/pilots; key informant interviews, review of attribution methods; review of evaluability of programs/pilots and (if needed) discussion of alternative cost-effective methodologies.	

Study Title: Impact Evaluation #2 – Multiphase On-Bill Finance Study	**Budget:** $350,000
Expected Completion Date: Q1 2016	**Study Manager:** ED
Description: Impact assessment and lessons learned of the On-Bill Finance Program in two phases.	
Objective: Determine gross and net energy impacts of the OBF pilots and report on how the program affected the finance market and demand for energy efficiency financing; develop lessons learned for future efforts.	

Key Research Questions:
• What data is available for OBF Programs?
  ○ How much information is available on customers, contractors, programs, measures installed, and measure incentives and costs on OBF projects. This will help us to understand the potential impact analysis approaches.
• Has the OBF program changed beginning in 2013 from the prior program?
  ○ How is the OBF program progressing over time in terms of design, delivery and participation by segment? Which segments have been impacted?
• What are the energy efficient measures being financed through OBF and what are the ex-ante savings associated with these projects?
• What are the best attribution methods to address the OBF program?
  ○ Does enough information exist to assess incremental energy savings attributable to the OBF	

Study Title: Impact Evaluation #2 – Multiphase On-Bill Finance Study	**Budget:** $350,000

program?
  ○ What factors contributed to non-residential customers' decision to participate in the OBF program?
• How do the participating OBF customers perceive their program participation experience?
• What is the incremental impact of the OBF program on IOU energy savings?
  ○ What is the incremental impact of OBF on OBF program energy savings?	

Potential EM&V Methods: Est. Incr. Svgs using participant surveys and program tracking data; financial institution and market actor interviews	

Study Title: Impact Evaluation #3 – Regional Pilot/Program Study	**Budget:** $250,000
Expected Completion Date: Q4, 2016	**Study Manager:** ED
Description: Gross and net savings evaluation for the regional finance programs/pilots	
Objective: Quantify the gross and net savings from up to five different 2015 active regional financing programs/pilots.	

Key Research Questions:
• What data is available for these Programs?
  ○ How much information is available on customers, contractors, programs, measures installed, and measure incentives and costs on projects. This will help us to understand the potential impact analysis approaches.
• How is each program designed?
  ○ What are the requirements for participation? What measures qualify? What customers qualify? How is the loan repaid? What is the selection criteria? What rebate programs are they associated with, if any?
• What are the energy efficient measures being financed and what are the ex-ante savings associated with these projects?
• What are the net savings from the pilots?
  ○ Does enough information exist to assess incremental energy savings attributable to the finance pilot?
  ○ What factors contributed the customers' decision to participate in the finance program?
  ○ How influential was the finance program on the customers' decision to do a project?
• How do the participating customers perceive their finance program participation experience? What is the incremental impact of the finance pilot on any CPUC claimed energy savings?	

Potential EM&V Methods: Est. Incr. Svgs using participant surveys and program tracking data;	

Study Title: Impact Evaluation #3 – Regional Pilot/Program Study	**Budget:** $250,000
financial institution and market actor interviews; database reviews and analysis, depth interviews with program staff, program material review	

Study Title: Impact Evaluation #4 –Statewide Pilots; (4a) Evaluability Assessment and Study Planning and (4b) Impact Study	**Budget:** $800,000
Expected Completion Date: 4a by Q4, 2016, 4b by Q4, 2017	**Study Manager:** ED
Description: Assess the evaluability of the Statewide Pilots and determine the energy savings and cost-effectiveness of each.	
Objective: 1) Understand what data is available for evaluation from each pilot and recommend improvements 2) Develop an impact evaluation plan for each pilot that is feasible and grounded in the information available 3) Calculate gross and net energy savings from each pilot; estimation of incremental energy savings where possible, and the cost-effectiveness of each	

Key Research Questions:
• What data is available for these Pilots?
  ○ How much information is available on customers, contractors, programs, measures installed, and measure incentives and costs on projects. This will help us to understand the potential impact analysis approaches.
• How is each pilot designed?
  ○ What are the requirements for participation? What measures qualify? What customers qualify? How is the loan repaid? What is the selection criteria? What rebate programs are they associated with, if any?
• What are the energy efficient measures being financed and what are the ex-ante savings associated with these projects?
• What are the net savings from the pilots?
  ○ Does enough information exist to assess incremental energy savings attributable to the finance pilot?
  ○ What factors contributed the customers' decision to participate in the finance program?
  ○ How influential was the finance program on the customers' decision to do a project?
• How do the participating customers perceive their finance program participation experience?
• What is the incremental impact of the finance pilot on any CPUC claimed energy savings?	

Est. Incr. Svgs using participant surveys and program tracking data; financial institution and market actor interviews; database reviews and analysis, depth interviews with program staff, program	

Study Title: Impact Evaluation #4 –Statewide Pilots; (4a) Evaluability Assessment and Study Planning and (4b) Impact Study	**Budget:** $800,000
material review	

Additional 2013-2014 Finance-Related Studies Funded by Other Roadmaps

Study Title: Comparative Finance Design Study for: 1) Statewide Pilots and 2) Property Assessed Clean Energy (PACE)	**Budget:** Funded by Market Studies roadmap
Expected Completion Date: Q4 2017	**Study Manager:** ED (with input from the CAEATFA public and working group processes)
Description: Participate in a working group to strategize on how to set up data tracking and reporting on key metrics that allow for a comparison between the costs, benefits and effectiveness of Statewide and PACE financing designs. This study was scoped in response to LAO's interest in this area.	
Objective: 1) Participate in a working group to strategize how the various costs and benefits of each program design can be compared in an apples to apples fashion; 2) Determine how effective financing is at getting customers to undertake projects that would not have otherwise occurred; 3) Determine the degree to which these programs overlap with each other for customers; 4) Compare the costs of these projects with their benefits (including the number, type, and scale of energy efficiency upgrades and renewable energy installations funded)	
Key Research Questions: • To what degree do these three finance initiatives overlap in terms of program design and program offerings? • To what degree do these three finance initiatives overlap for customers (i.e., targeted segments)? • What are the various program measures funded through each initiative? • What is the overall participation in each program? • What are the number of measures installed through each program? • What are the incremental energy savings from each initiative? ○ Estimate of gross and net impacts • What is the energy saving overlap with IOU programs? • What is the relative impact of the programs to the contractors' business? • What is the relative value of programs? • What is the relative costs of programs? • Are customers satisfied with their experiences with the programs? • Are contractors satisified with their experiences with the programs?	
Potential EM&V Methods: working group discussions, compare NTG ratios across customers in participating in each program design, interviews with program staff and program implementers, interviews with contractors, participant surveys, comparative data analysis using program tracking	

Study Title: Comparative Finance Design Study for: 1) Statewide Pilots and 2) Property Assessed Clean Energy (PACE)	**Budget:** Funded by Market Studies roadmap
databases across each program, review and comparison of program theory/logic models, review and comparison of program implementation plans, secondary materials and data review.	

(8) Study Title: Finance ME&O Study	**Budget:** Funded by ME&O roadmap
Expected Completion Date: Part 1 in Q4 2016 and Part 2 in Q4 2017	**Study Manager:** ED
Description: This study will focus on research surrounding the marketing efforts of the Statewide Financing pilots that will roll out in 2016. Specifically, this study will look both at process issues across all stakeholders, as well as the effectiveness of the marketing efforts. We anticipate that this study would focus on marketing efforts across all parties including marketing by CSE, IOUs/RENs, CAEATFA and the strategic partners. Part 1 will focus on the first 12 months of the campaign; Part 2 will focus on the second 12 months.	
Objective: To gather insights that will: help improve messaging related to the finance programs; assess the "market facilitation" approach; help refine the processes, channels and tactics used for marketing Statewide finance efforts; and ultimately help improve ME&O efforts overall so that they better support increased uptake of financing of energy efficiency projects.	
Key Research Questions: *The evaluation team will work with the CPUC to develop the key research questions as the marketing efforts develop, but they may revolve around the following:* **Documentation and Verification:** • Document and assess the implementation process, program structure, program goals and program tracking records. • How much money was spent on marketing finance programs? Was it well spent? Were the tools and tactics used the right ones? Were the marketing efforts directed towards the appropriate stakeholders? • *Do the marketing activities align with the finance program objectives? Do they consider the full range of market actors including contractors, real estate professionals, lenders, retailers and CBO's to evaluate which can best support the pilots? • Which channels best support the pilots? • Which mediums best support the pilots? (CBOs, website, video marketing, etc.)? **Coordination/Roles:** • How did the various parties coordinate the marketing of the finance programs? How could this coordination be improved? • What role do the IOUs play and how well are they fulfilling that role? If and how are the IOUs duplicating, complementing or competing efforts? **Strategic Partners/Contractors:** • *Did strategic partner awareness and understanding of financing pilot opportunities increase? • *Did strategic partners communications with target customers (aka potential borrowers) increase? • How many contractors were touched through the marketing? Do they understand the	

(8) Study Title: Finance ME&O Study	**Budget:** Funded by ME&O roadmap

efforts? Do they feel that the marketing support was valuable?

- Is the training of contractors effective? How can it be improved?
- Did the contractors change their messaging? Do contractors believe that the marketing helped to increase the number of jobs or the size of jobs?
- What is working to engage partners/contractors? What is not working? (as close to real-time feedback as possible)
- Is the market facilitation approach, i.e. focus on partners and contractors, an effective approach to marketing finance options to customers?

Strategic Partners/Financial Institutions:

- *Did strategic partner awareness and understanding of financing pilot opportunities increase?
- *Did strategic partners communications with target customers (aka potential borrowers) increase?
- Are Financial Institutions able to use the marketing materials to promote their loan products?

Consumers (residential):

- Was the messaging on point for the audience?
- How effective is the marketing in addressing the first cost barrier?
- How do consumers respond to the marketing materials? How receptive are they to the messaging? Does the messaging address / help decrease consumers specific barriers?
- *Did target customer awareness of the availability of financing and the key differentiating benefits of the financing pilots increase? Where did it increase or amongst whom?
- Did customers move beyond awareness to early action?
- Is there any evidence of increased program participation/uptake due to the marketing efforts? Which groups or segments? (indicators: % of participants that heard about financing from various channels, motivations to participate in financing)
- *Did the volume of target customers taking initial action to seek financing increase?
- Is the concierge system needed? If so, for whom and why?

*Indicates that this is a measurement of one of the three stated objectives for the finance ME&O efforts (per the January 2015 plan).

Potential EM&V Methods: Focus groups, 1-on-1 interviews, training observations, surveys, contractor interviews, web survey, panel, marketing collateral review/content analysis, web statistics, best practice research. All survey efforts will be coordinated with other surveys where possible.

2.12.4. 2015 EM&V Studies

The table below summarizes the 2015 EM&V Studies that have been budgeted. The table provides the study manager, corresponding budget and expected completion date for each study.

Table 67. 2015 EM&V Financing Studies

2015 Study Area/Title	Study Lead (ED/IOU)	Work Order #	Budget 2015	Completion Date
Process				
Process Evaluation #3 B – Early EM&V and Market Research	IOU	n/a	$300,000	09/2015
Partner Network Best	ED	TBD	$100,000	2016

2015 Study Area/Title	Study Lead (ED/IOU)	Work Order #	Budget 2015	Completion Date
Practices				
Impact				
Non-Residential Market Study	ED	TBD	$200,000	2017
Multifamily Impact Study	ED	TBD	$250,000	2017
Ad Hoc Consulting (hold for CPUC)	ED	TBD	$128,054	2015-2017

2.12.5. 2015 Study Descriptions

Below are descriptions for each of the 2015 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: Process Evaluation #3 B – Early EM&V and Market Research	**Budget:** $300,000
Expected Completion Date: 09/15	**Study Manager**: IOU
Description:	
Objective: Define perspectives in the marketplace prior to mid-late 2015 launch of program pilots in order to: 1.) define current market conditions in which EE financing is launching; 2.) understand current limits to expansion of financing for EE projects; 3.) describe opportunities where pilot programs can generate the biggest impact.	
Key Research Questions: What are the likely strengths of the programs; vs. their weaknesses? Any problems anticipated with the pilot programs? What can be done to address or minimize those? What are the synergies or conflicts with existing EE program models? Are there any gaps or opportunities in the financing market that are not being addressed?	
Potential EM&V Methods: Focus groups, 1-on-1 interviews, surveys, evaluation of participants vs. non-participants, key stakeholders, and partners.	

Study Title: Financial Institution Partner Network Best Practices	Budget: $100,000
Expected Completion Date: 2016	**Study Manager:** ED
Description: This study would explore best practices when soliciting potential finance program partners such as financial institutions. It will also explore best practices for developing and identifying selection criteria for potential partners. These include – understanding the characteristics of transactions preferred to fund projects; the nature of energy efficiency projects in partner portfolio, the relative importance of cash flow, interest rates, and loan duration in financing EE projects versus renewables, etc.	

Study Title: Financial Institution Partner Network Best Practices	Budget: $100,000
Objective: TBD	
Key Research Questions: TBD	
Potential EM&V Methods: Secondary research, TBD	

Study Title: Non-Residential Supply Market Study	**Budget:** $200,000
Expected Completion Date: 2017	**Study Manager:** ED
Description: This study would further explore any market actor channels to the non-residential market that could not be fully explored in the 2013-2014 funded non-residential supply side market baseline. Potential channels may include commercial program implementers or contractors. In addition, this study will also examine the nature of projects being financed within the different market actor channels and help determine the different perspectives on the merits of finance from both the suppliers of financing as well as prospective borrowers.	
Objective: TBD	
Key Research Questions: TBD	
Potential EM&V Methods: Secondary research, Identify market actor channels and conduct interviews,TBD	

Study Title: Multifamily Impact Study	**Budget:** $250,000
Expected Completion Date: 2017	**Study Manager:** ED
Description: Additional funds for measuring impacts specifically from Multifamily finance program participants.	
Objective: TBD	
Key Research Questions: TBD	
Potential EM&V Methods: Secondary research, TBD	

Study Title: Ad Hoc Consulting to CPUC	**Budget**: $128,054
Expected Completion Date: 2017	**Study Manager:** ED
Description: Given that finance is a new area for the CPUC and that the CPUC is assigning a new program manager to financing EM&V in Q1 2015, these funds are set aside for any ad hoc consulting needs that may arise for the CPUC.	

Study Title: Ad Hoc Consulting to CPUC	**Budget**: $128,054
Objective: TBD	
Key Research Questions: TBD	
Potential EM&V Methods: Secondary research, TBD	

Other Important Considerations

The Financing Program is designed to provide a strategy by which customers can deploy more comprehensive energy efficiency measures in an affordable manner such that the Financing Program will allow more customers in total, and a more diverse array of customers to participate in more of the existing energy efficiency programs in a deeper – more intensive basis. EM&V studies for existing programs during 2013-14 program cycle should include questions and analysis about the processes and synergy with the Financing Program. These programs would include (but are not limited to):

Residential: Whole House Upgrade Program; (SF and MF) Multifamily Whole Building Retrofit; Multifamily (MFEER); Plug Load and Appliances (PLA). and Residential HVAC

Non-Residential: Commercial; New Construction; Industrial; Agricultural; non-residential customers in Primary Lighting program; Statewide Institutional, Local Government Partnership Programs and Non-Residential HVAC.

2.12.6. Key Research Questions for 2016 and beyond

Proposed 2016 Energy Division Budget: $419,166

Given the back log of analysis that is intended, the budget necessary for 2016 is limited. The key programs are still not going in full force. These funds will allow for a couple of additional studies and activity can be scaled as the programs get greater traction.

Program administrators do not have any proposed studies or budgets for this sector.

2.13. Marketing, Education and Outreach

2.13.1. Background

The purpose of this research roadmap is to provide a comprehensive evaluation research plan for the Marketing, Education and Outreach ("ME&O") activities that will be conducted for statewide, investor owned utility (IOU) and Regional Energy Network (REN) activities using PY13-15 cycle funds. This roadmap identifies recent and current research, describes known research needs, and proposes new research to meet those needs.

This road map is being developed under guidance from Decision D.13—12-038, which states that "…we direct all stakeholders to engage in a collaborative process to create a road map for EM&V of statewide and [IOU/REN] marketing activities. Commission staff … will take the lead in this process. The road map should include the types of information that is needed, the types of evaluations that should be conducted, and a timeline for conducting them."

This long-term research roadmap is a living document that will be maintained by the Program Coordination Group (PCG) responsible for ME&O. Updates to this document will be based on a clear understanding and knowledge of the scope and timing of research projects relevant to ME&O. Updates will reflect evolving research needs and coordination with other sector/topic area PCGs to minimize duplication of efforts and to leverage research opportunities where practical. This document and future updates will facilitate planning and coordination efforts and guide future program/policy design, implementation, and evaluation.

2.13.2. Sector or Program Area Description

In California, ME&O is used both as a strategy within each of the IOU and REN energy efficiency portfolios and as an overarching Statewide ME&O Program. The ME&O roadmap covers the following efforts:

- Statewide ME&O: The statewide umbrella brand effort implemented by the Center for Sustainable Energy (CSE) between 2013-2015
- IOU/REN ME&O: The funds used for marketing the IOU and REN energy efficiency programs as approved in D.12-11-015.

Statewide ME&O Overview

A 2009 decision (D.09-09-047) laid out the overall goals of the statewide ME&O effort, specifically saying that: "The goal of the Statewide Marketing & Outreach Program is to motivate ratepayers to take action on energy efficiency/conservation measures and behavior change. The program should aim to both increase ratepayer awareness and facilitate the ability to act and incorporate technology advances or behavior changes, using all available resources to reduce energy use and choose clean energy options. The program should increase the percentage of ratepayers reducing energy consumption. Furthermore, the program should have the flexibility to include discussion of renewable self-generation options as deemed appropriate. The program should also motivate those who are taking energy efficiency action to do more and move along a continuum to become clean energy advocates."

In 2011-2012, it was determined that Energy Upgrade California would become the new statewide brand. The statewide brand was intended to complement utility and other local marketing efforts. As clarified in D.12-05-015, the creation of a new Energy Upgrade California brand is not intended to "prevent utilities from continuing to conduct local and targeted marketing that is service territory and/or program-specific. In fact, local ME&O campaigns undertaken by utilities will coordinate with, and complement, the Energy Upgrade California umbrella brand. However statewide marketing and local marketing should still be coordinated, and the strategies for each should be designed to complement each other."

Starting in 2014, CSE began implementing and coordinating the statewide ME&O Program under the Energy Upgrade California umbrella brand with the general goal of motivating "residential and small business energy consumers to take continued action over time to better manage their energy use."[43] More specifically, as described in D. 13-12-038, Statewide ME&O, as a stand-alone program, is charged with providing "California residents and small business owners with information about energy concepts, programs, services, rates and benefits of taking action so that Californians (1) begin to understand their energy use, the opportunities available for them to act, and the benefits of their action, and (2) begin to take well informed action to better manage energy."

Objectives for statewide ME&O were laid out in D.13-12-038. They include the following:

1. Use the Energy Upgrade California brand to educate consumers about the Home Upgrade programs, why energy use matters, how California homes and businesses use energy, as well as energy efficiency, demand response, distributed generation, and energy management actions available.
2. Encourage consumers to engage with resources and tools to learn more about their energy use.
3. Inform consumers about the benefits of participating in local program opportunities, seasonal opportunities, or no/low cost actions.
4. Provide direction about how consumers can learn more about and enroll in local program opportunities and time sensitive opportunities, or how to take no/low cost actions.
5. Identify and pilot messaging and message delivery for partners that complements existing utility partnerships, including, local governments, CBOs, retailers, and realtors.
6. Identify and pilot methods to provide information to small business owners.
7. Work with a marketing firm, and use behavior research to develop a social marketing campaign.
8. Coordinate local, regional, and statewide marketing efforts, messaging, and tactics.
9. Develop an EM&V roadmap for utility local marketing, and statewide marketing to understand the impacts of local, utility- led marketing, and how local and statewide efforts can best be coordinated and complementary.[44]

[43] Energy Upgrade California 2013-2014 Marketing Plan

[44] Note that while this objective was included as part of the list of objectives for Statewide ME&O, per D. 12-05-015 the development of this roadmap is the responsibility of Commission staff, not the Statewide ME&O implementer.

IOU/REN ME&O Overview

In general, the goal of ME&O is to educate and motivate consumers to take action on energy efficiency/conservation measures and change their behavior. For the IOU and REN efforts, the "behavior" that ME&O seeks to encourage is largely participation in the existing portfolio of energy efficiency programs, although for IDSM efforts, a more holistic approach is often taken. IOU/REN ME&O activities are comprised of targeted, program-specific, and action-driven marketing activities, managed by the IOUs, Local Government Partnerships (LGPs) or RENs. For some utilities, the "local" ME&O leverages customer analytics to personalize messaging and offer relevant demand side management solutions directed at customers within each utility's service territory, or for the RENs, local geographic area. Activities are often tied to key engagement opportunities that are unique to the customer and IOU/REN, and could include items such as service turn-on or program enrollment.

The IOUs and RENs conduct ME&O within their territories to deliver specific messages which are targeted toward their customers or constituents. Objectives for the IOU and REN ME&O activities vary by individual campaign, program or effort, but generally focus on raising awareness of and participation in specific programs. While the effects of marketing are explored briefly in many of the program-specific evaluation reports, they have not been investigated holistically across the energy efficiency portfolio.

2.13.3. Summary of the Programs included in the Research Scope

This roadmap is intended to guide the evaluation of the statewide ME&O program, as well as the more localized IOU and REN efforts. The budgets allocated for the implementation of the marketing efforts are shown in the table below. Note that while the IOU and REN budgets are specific to energy efficiency funding, the statewide funds are broader, covering topics such as demand response, distributed generation, and education for water-energy savings to combat the drought.

Table 68. 2013-2014 ME&O Program Budget Summary

Program Administrator	Budget	Source
CSE	$40,492,265*	A12 08 007 et. al., Service of letter Reporting Updated Budget Information in Compliance with OP 16 in D.13-12-038
IOUs	$58,937,509	Individual IOU Budget Files (see below)
PG&E	$30,924,186	"EE 2013-14 PGE Portfolio Budget"
SCE	$19,193,591	" SCE EE Budget Placemat 2013-2014"
SDG&E	$8,858,166[a]	SDG&E April 23, 2013 Advice Letter 2448-E-A/2167-G-A[b]
SoCalGas	$8,819,732	"SCG 2013-2014 EE Program Budget"
RENs	$7,631,998	REN Revised PIPs (see below)
SoCalREN	$4,232,418	2/24/14 SoCalREN Revised PIP
BayREN	$3,399,580	BayREN Communications

[a] SDG&E (only) Budget is $7,311,096 which excludes Local Government Marketing ($1,019,682) and Third Party Program Marketing ($527,388).
[b] "Attachment C SDG&E Al 2448-E-A/2167-G-A Revised Placemats – Budget & Savings (one with and one without lighting scenario)", which was approved by the letter dated June 12, 2013 by Ed Randolph of the Energy Division , which approved Advice Letter SDG&E 2448-E/2167-G, 2448-E-A/3267-G-A, 2448-E-B/2167-G-B.
* This budget covers the 2013-2015 period.

2.13.4. Uncertainties and Challenges to Successful Implementation

There are several uncertainties and challenges to successful implementation of ME&O efforts that affect both implementation and EM&V. Some of the key challenges include:

- Crowded Media Space: Energy efficiency marketing and outreach takes place in a crowded information environment in which consumers are bombarded with messages from numerous sources. This can make it more challenging to achieve increased awareness or recognition of any one particular message because consumers' attention is compromised with all of the other messages and sources in the market. In this environment, it is challenging to determine the effectiveness of a particular ME&O campaign. With consumers exposed to multiple messages through many channels, it is difficult to determine which had the greatest impact.
- Narrowcasting: The market is characterized by "narrowcasting" in which consumers can pick and choose information sources that are of most interest. As a result, multiple channels and approaches are needed to effectively reach California consumers. Thus, ME&O campaigns must be multifaceted and utilize many different strategies to reach the target audience.
- Complex "Asks": Unlike campaigns that ask consumers to take a single action (e.g., anti-smoking campaigns), many, but not all energy efficiency ME&O efforts inform consumers about a wide range of actions that they could take to reduce usage. This list of asks will grow even further over time as water, solar and demand response related-messaging is added to the statewide and IOU/REN campaigns. The complexity of what ME&O asks consumers to do makes the task of spurring action all the more challenging.
- Multiple Transactions: Unlike campaigns that include a single transaction, , energy efficiency ME&O efforts are a targeted, sequential strategy involving multiple touches and stages and are thus more challenging because they involve building an ongoing relationship with consumers.

In addition, coordination between IOU, REN and statewide efforts presents an operational challenge. While coordination will occur, it is unclear how this will happen. As stated in D.12-05-015, "…At this point we lack the data to understand the exact challenges associated with coordinating statewide and [IOU/REN] efforts while avoiding overlap." The statewide effort is just now ramping up and has not been in effect long enough to understand how coordination could work. Additional consideration of a framework for how best to "count" and "hand off" customers and attribute action is needed over time to help implementers define the best ways to work together for different intended outcomes.

The research studies outlined in this roadmap will consider these challenges and provide information that will help IOUs, RENs, CSE and CPUC staff to address them. The specific methods will be determined during the planning process for each study. However, a critical goal is to accurately measure ME&O

exposure and establish a connection between exposure and customer awareness of and attitudes towards energy efficient actions. Many past studies measured attitudes but relied on self-reported exposure, which is fraught with measurement error. The team will draw upon the latest methods that can be used to refine existing and future ME&O messages and strategies.

2.13.5. Recent Evaluations

No process or indirect impact evaluations were conducted specifically for the 09-11 Statewide ME&O program (Engage 360) since the program was terminated prior to the end of the cycle. However, there are likely lessons learned from the planning of this program that can be of use moving forward. Moreover, there was a considerable amount of research conducted on the 06-08 Statewide ME&O program in preparation for 2009 program planning. Some of the findings and recommendations from this research remain relevant and have influenced the program planning for the 2013-14 program.

In addition, some research conducted on behalf of other residential programs is also directly relevant to the Statewide ME&O efforts. These projects are noted below:

Table 69. Summary of Relevant Past ME&O Studies

Study Title	Study Manager	Approximate Budget	Evaluator	Data Collection Date	Publication Date
2006 - 2008 Statewide Marketing and Outreach Process Evaluation	ED	Opinion Dynamics	$600K	April – May 2008	October 2008
PY2006-2008 Indirect Impact Evaluation of the Statewide Marketing and Outreach Programs	ED	Opinion Dynamics	$1.2M	May and October 2008; February 2009	February 2010
Market Segmentation Findings	ED	Opinion Dynamics	$250K	July – August 2009	December 2009
Ethnographic Research Findings	ED	Opinion Dynamics	$150K	May - July 2009	August 2009
2009 Brand Assessment Report	ED	Interbrand	TBD	August 2009	November 2009
2010 Energy Conservation and Efficiency Marketing, Education and Outreach Study – California Oversample	ED, SCE, SCG, PG&E and SDG&E	Abt SBRI and Research Into Action, Inc.	TBD	August – September 2010	June 2012
Reconsidering What We Measure: A White Paper--Residential Decision Making and Proposed Questionnaire Items	SCE and PG&E	Opinion Dynamics and Research Into Action, Inc.	$233K	N/A	August 2011
2011-2012 General Households Population Study in California	SCE and PG&E	Research Into Action, Inc. and Opinion Dynamics	TBD	January – February 2012	September 2012
10–2012 PG&E Whole House Retrofit Program Phase II Process Evaluation Study	PG&E	SBW Consulting, Inc.	$250K	May – August 2013	December 2013

Study Title	Study Manager	Approximate Budget	Evaluator	Data Collection Date	Publication Date
Energy Upgrade California Brand Assessment	CSE	Opinion Dynamics and Shelton Group	$425K	December 2012 – January 2014	February 2014

Each of the studies above addressed a number of key research objectives as outlined in the following table.

Table 70. Summary of Research Objectives Addressed through Prior ME&O Evaluation

Study Name	Objectives
2006 - 2008 Statewide Marketing and Outreach Process Evaluation	• Improve statewide marketing and outreach efforts in the future • Identify where program improvements can be made to increase the value of mass media and non-mass media efforts
PY2006-2008 Indirect Impact Evaluation of the Statewide Marketing and Outreach Programs	• Identify changes in attitudes, awareness, and knowledge of energy efficiency • Quantify net energy savings for key components of the Statewide ME&O program (Flex Your Power)
Market Segmentation Findings	• Identify unique segments for statewide outreach efforts.
Ethnographic Research Findings	• To inform 2009-2010 Marketing Strategy. • Understand residential customer decision making, interactions with, and language around energy efficiency, demand response, and solar.
2009 Brand Assessment	• Assess the brand equity and potential of Flex Your Power to meet new marketing and savings goals set forth in the California Energy Efficiency Strategic Plan (CEESP) and recent CPUC Decisions, including the opportunity to evolve the brand to represent other demand-side energy solutions such as demand response, low income energy efficiency, and distribution generation such as solar. • Determine an optimal branding approach informed by the perceptions of a representative sample of California residents
10 Energy Conservation and Efficiency Marketing, Education and Outreach Study – California Oversample	• Assess importance of energy issues • Assess attitudes and motivations regarding energy efficiency and conservation • Assess behaviors related to energy efficiency and conservation • Assess awareness and knowledge of energy-efficient products and services • Assess barriers to implementing energy efficiency practices
considering What We Measure: A White Paper--Residential Decision Making and Proposed Questionnaire Items	• Understand whether the AKAB framework facilitates thinking about and measuring how customers are influenced by energy efficiency programs • Understand whether the AKAB framework provides adequate guidance to program planners who want to influence customers to engage in more energy-efficient behaviors, including practices and purchases
12 General Population Survey	• Validate the AKAB theoretical model for single-family/renters • Measure A/K, concern and personal responsibility toward energy efficiency based on general, as opposed to program-specific concepts

Study Name	Objectives
	• Segment residential customers and identify marketing and outreach opportunities for current and future PG&E and SCE energy efficiency programs and campaigns; • Examine recent appliance and electronic product purchasing behavior to support Home Energy Efficiency Rebate (HEER) and Business and Consumer Electronics (BCE) program evaluations • Assess appliance recycling and retrofit behaviors
.2 Interim Findings: Whole House Process Evaluation	• Assess customer attitudes, motivation, and experience with the program • Assess participation barriers • Assess contractor attitudes, motivation, and experience with the program • Assess energy rater attitudes, motivation, and experience with the program • Assess the effectiveness of contractor training
.3 Energy Upgrade California Brand Assessment	• Measure awareness and elasticity of Energy Upgrade California Brand

2.13.6. Ex Ante Updates

ME&O programs are non-resource and therefore do not have ex ante savings estimates. As a result, there are no ex ante updates planned for this research area.

2.13.7. 2013-2014 EM&V Studies

The table below summarizes the 2013-14 EM&V Studies that have been budgeted, some of which are complete while others are in the process of being implemented. The table provides the study manager, work order under which the study is being conducted, the corresponding budget, implementation status and expected completion date for each study.

It is important to note that two of the completed ME&O study areas were for ad hoc consulting activities, which are listed here so that the full budget under this roadmap is accounted for. In addition, as shown below, a Finance ME&O study is funded out of the ME&O roadmap budget.

Table 71. Summary of 2013-2014 ME&O EM&V Studies, Budgets and Timelines

Study Area/Title	Study Manager	Work Order	Budget	Status	Completion Date
Statewide Verification and Integrated Effectiveness					
Early Coordination and Consulting on PPMs and Measurement Designs	ED	ED_O_ME&O_1	$49,000	Complete	February 2014
Baseline and Initial Data Collection	ED	ED_O_ME&O_2 ED_O_ME&O_3	$175,000	Complete	September 2014
Verification and Integrated Effectiveness Study • Audit & Verification	ED	ED_O_ME&O_6	$650,000	Underway	January 2016

Study Area/Title	Study Manager	Work Order	Budget	Status	Completion Date
• Ongoing Effectiveness Tracking • Causality Research					
Statewide V&E Subtotal			***$874,000***		
Cross-Cutting Process					
Cross-Cutting Process Study					
• Upfront Review of Past SW Research	ED	ED_O_ME&O_4 ED_O_ME&O_5	$50,000	Complete	January 2015
• Start-Up Background Research and Scoping			$50,000	Complete	July 2015
• Cross-Cutting Process Assessment			$800,000	Underway	March 2016
Cross-Cutting Sub-Total			***$900,000***		
Climate Credit					
Climate Credit Study	ED	ED_O_ME&O_3	$100,000	Complete	September 2014
Climate Credit Sub-Total			***$100,000***		
Finance ME&O					
Finance ME&O	ED	ED_O_ME&O_7	$402,000	Underway	2017
Finance Sub-Total			***$402,000***		
Coordination					
Ongoing Coordination and Consulting	ED	ED_O_ME&O_3	$75,000	Complete	September 2014
Coordination Sub-Total			***$75,000***		
Total ME&O Budget*			***$2,400,000***		

*Note that some funding (<10%) is also being held back for general administration, support and consulting services.

2.13.8. 2013-2014 Study Descriptions

Below are descriptions for each of the 2013-15 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: Early Coordination and Consulting on PPMs and Measurement Designs	**Budget:** $49,000

Study Title: Early Coordination and Consulting on PPMs and Measurement Designs	**Budget:** $49,000
Actual Completion Date: February 2014	**Study Manager:** (ED)
Description: This budget was used by the CPUC for early start-up and planning, as well as coordination with CSE and Lowe-Campbell Ewald.	
Objective: Build a strong foundation for evaluation by ensuring that the evaluation team is included early in the process of Statewide program development.	
Key Research Questions: • What are the key research questions of interest to the CPUC? • Who are the key staff at CSE and their partner agencies responsible for implementing the ME&O efforts? • What ME&O activities are planned for the first six months of the 2014 campaign? • What are the challenges for evaluating the proposed Program Performance Metrics (PPMs) for Statewide ME&O?	
Potential EM&V Methods: N/A	

Study Title: Baseline Study and Initial Data Collection	**Budget:** $175,000
Actual Completion Date: September 2014	**Study Manager:** (ED)
Description: This research was conducted in two phases. There was an initial study (2a) to determine if Energy Upgrade CA awareness had changed prior to the March 2014 launch of the Climate Credit campaign, which used Energy Upgrade CA visuals and messaging. The second phase of the study (2b) will involve additional data collection to get early measurements of the final Statewide ME&O PPMs. Phase 2b would occur after finalization of the metrics.	
Objective: To gather initial information related to the statewide campaign metrics.	
Key Research Questions: Phase 2a: • What is awareness of Energy Upgrade CA? • What do customers associate with Energy Upgrade CA? • Are CA residents aware of the state's policies to combat climate change? • What are the barriers to taking energy efficient actions? • What websites or sources of information are customers utilizing? Phase 2b: • What are the initial measurements for the final PPMs?	
Potential EM&V Methods: Internet and telephone surveys, secondary research, collaborative efforts with implementers (e.g., web analytics collected by implementers, tapping into implementer-	

Study Title: Baseline Study and Initial Data Collection	**Budget:** $175,000
collected data)	

Study Title: SW ME&O Verification and Integrated Effectiveness	**Budget:** $650,000
Expected Completion Date: Q1 2016	**Study Manager:** (ED)

Description: This is a multi-phase study that includes verification, as well as ongoing tracking of effectiveness across statewide ME&O efforts. The early phase (3a) provides a descriptive snapshot of program activities compared to objectives described in the marketing plans, as well as Decision (D. 13-12-038), and will primarily serve as a documentation effort. The later phases (3b and 3c) will include measurement of performance against the finalized PPMs and the nine objectives listed in D. 13-12-038. This will also include an assessment of the causal link between the statewide efforts and key ME&O metrics to the extent possible.

Objective: Phase 3a: To document ME&O activities in comparison to the program's objectives and metrics. Phase 3b and 3c: To monitor the effectiveness of statewide ME&O efforts.

Key Research Questions:

Phase 3A:

- What ME&O activities have been carried out for residential and small business customers? What messages and channels were used to reach California residents?
- How are key audiences identified and targeted?
- Do the marketing activities and plans align with the program objectives?
- What are the resources and tools promoted through SW ME&O?
- What benefits to program participation is SW ME&O communicating to customers?
- What did SW ME&O efforts tell customers about how to get information about programs, and how to participate?
- How were the marketing tactics (messages and channels) selected?
- What has the SW ME&O campaign messaging and approach offered that is unique or "differentiating" in this crowded space?
- SW ME&O is just one source of energy information for California residents. They also receive information from brands like Energy Star, as well as retailers, manufacturers, contractors, other service providers, and other ME&O. Does this confluence or duplication of messengers confuse or motivate Californians? Which audiences are more likely to act due to SW ME&O messaging? Or due to multiple messengers (ex. IOU and SW ME&O)?

What is the reach of statewide ME&O activities?Phases 3B and 3C:

- Do we see change in the key ME&O metrics over time? What effect does SW ME&O have on the target market in terms of customer awareness or attitudes about marketed issues?
- Are customers using the resources and tools promoted through SW ME&O?

Study Title: SW ME&O Verification and Integrated Effectiveness	**Budget:** $650,000
• What do consumers perceive as the benefits of taking actions promoted through SW ME&O? • Do consumers understand where to get additional information about energy management actions and behaviors? • Do consumers find the information provided through SW ME&O useful and actionable? • Among customers who are aware of Energy Upgrade California, to what extent do they view the brand as trusted "voice" about energy and energy usage in the marketplace? Do these customers think of Energy Upgrade California as a "go to" source of information? • Are customers who are exposed different in terms of key metrics such as awareness, intent to take action, etc.?	
Potential EM&V Methods: Internet panel survey and telephone surveys (across languages and res/small commercial), focus groups, observations, secondary data analysis, passive media measurement.	

Study Title: Cross-Cutting Process Evaluation	**Budget: $**900,000
Expected Completion Date: Q1 2016	**Study Manager:** (ED)
Description: This is a multi-phase study effort designed to provide recommendations and feedback for ME&O efforts conducted by CSE, the IOUs and RENs. The initial phases involve the review of past research on statewide marketing to understand lessons learned and past recommendations for improvement, including development of a program theory and logic model. Later phases will focus on documenting how ME&O activities are designed and implemented, how well efforts are going on a tactical level, the review of brand positioning and program pathways, an assessment of consumer perspectives, and an assessment of coordination across statewide and IOU/REN efforts.	
Objective: To document processes, understand customer engagement, and look at issues around coordination of ME&O implementation between various groups.	
Key Research Questions: Examples of the detailed research questions for this study include the following. Note that unless otherwise noted all questions will be asked about SW, IOU and REN efforts. • What past research has been done on or is relevant to SW ME&O? What lessons can be learned from these studies for ME&O design and implementation? • What recommendations have been made and how have they been addressed by the current SW ME&O implementer? • What is the program theory behind SW ME&O? What are the activities and outcomes envisioned by the program? • How is the SW program designed? What is the governance structure? Who is involved with program implementation? • What ME&O activities have been carried out for target audiences? What was their purpose and strategy? What tactics/tools were utilized? • How well is coordination occurring between CSE, and its sub-contractors and tactical partners	

Study Title: Cross-Cutting Process Evaluation	**Budget: $**900,000
(i.e., marketing agencies, retail partners, grant recipients, CBOs etc.)? • How well is coordination occurring between SW, IOUs and RENs on a tactical level where applicable? • What do CSE, the IOUs and RENs track to assess the effectiveness of their activities? • How do consumers engage with ME&O activities? • Does the campaign resonate with consumers? • Does their experience with statewide, IOUs or RENs increase their likelihood to take no-cost, low-cost actions? Does their experience with statewide, IOUs or RENs increase their likelihood to participate in programs? • Have the ME&O efforts been implemented as planned? If not, how has it differed and why?	
Potential EM&V Methods: Meetings with CSE and IOUs, focus groups, customer surveys or in-depth interviews, program material review, customer observations.	

Study Title: Climate Credit Study	**Budget:** $100,000
Actual Completion Date: September 2014	**Study Manager:** (ED)
Description: Follow up study to assess awareness of the Climate Credit initiative	
Objective: To assess the effectiveness of early ME&O efforts related to the California Climate Credit	
Key Research Questions: What percentage of the target population is aware of the Climate Credit? • What percentage of the target population recalls receiving the Climate Credit? • What percentage of the target population understands why they received the credit? • What percentage of the target population knows that the State is providing the credit? • Did receiving the climate credit motivate the target population to take actions to save energy in their homes? Did it motivate them to seek additional information about it?	
Potential EM&V Methods: Internet surveys in English and telephone surveys for non-English speakers.	

Study Title: Finance ME&O	**Budget:** $402,000
Expected Completion Date: Q4 2017	**Study Manager:** (ED)
Description: This study will focus on research surrounding the marketing efforts of the Statewide Financing pilots that will roll out in 2016. Specifically, this study will look both at process issues across all stakeholders, as well as the effectiveness of the marketing efforts. The study will evaluate and report upon the campaign's first 12 months of activities and will commence again to evaluate and	

Study Title: Finance ME&O	**Budget:** $402,000
report on the second 12 month campaign period.	
Objective: To gather insights that will: help improve messaging related to the finance programs; assess the "market facilitation" approach; help refine the processes, channels and tactics used for marketing Statewide finance efforts; and ultimately help improve ME&O efforts overall so that they better support increased uptake of financing of energy efficiency projects.	

Key Research Questions: *The evaluation team will work with the CPUC to develop the key research questions as the marketing efforts develop, but they may revolve around the following:*

Documentation and Verification:

- Document and assess the implementation process, program structure, program goals and program tracking records.
- How much money was spent on marketing finance programs? Was it well spent? Were the tools and tactics used the right ones? Were the marketing efforts directed towards the appropriate stakeholders?
- *Do the marketing activities align with the finance program objectives? Do they consider the full range of market actors including contractors, real estate professionals, lenders, retailers and CBO's to evaluate which can best support the pilots?
- Which channels best support the pilots?
- Which mediums best support the pilots? (CBOs, website, video marketing, etc.)?

Coordination/Roles:

- How did the various parties coordinate the marketing of the finance programs? How could this coordination be improved?
- What role do the IOUs play and are they fulfilling that role? If and how are the IOUs duplicating, complementing or competing efforts?

Strategic Partners/Contractors:

- *Did strategic partner awareness and understanding of financing pilot opportunities increase?
- *Did strategic partners communications with target customers (aka potential borrowers) increase?
- How many contractors were touched through the marketing? Do they understand the efforts? Do they feel that the marketing support was valuable?
- Is the training of contractors effective? How can it be improved?
- Did the contractors change their messaging? Do contractors believe that the marketing helped to increase the number of jobs or the size of jobs?
- What is working to engage partners/contractors? What is not working? (as close to real-time feedback as possible)
- Is the market facilitation approach, i.e. focus on partners and contractors, an effective approach to marketing finance options to customers?

Strategic Partners/Financial Institutions:

- *Did strategic partner awareness and understanding of financing pilot opportunities

Study Title: Finance ME&O	**Budget:** $402,000
increase? • *Did strategic partners communications with target customers (aka potential borrowers) increase? • Are Financial Institutions able to use the marketing materials to promote their loan products? **Consumers (residential):** • Was the messaging on point for the audience? • How effective is the marketing in addressing the first cost barrier? • How do consumers respond to the marketing materials? How receptive are they to the messaging? Does the messaging address / help decrease consumers specific barriers? • *Did target customer awareness of the availability of financing and the key differentiating benefits of the financing pilots increase? Where did it increase or amongst whom? • Did customers move beyond awareness to early action? • Is there any evidence of increased program participation/uptake due to the marketing efforts? Which groups or segments? (indicators: % of participants that heard about financing from various channels, motivations to participate in financing) • *Did the volume of target customers taking initial action to seek financing increase? • Is the concierge system needed? If so, for whom and why? *Indicates that this is a measurement of one of the four stated objectives for the finance ME&O efforts (per the November 2014 plan).	
Potential EM&V Methods: Focus groups, 1-on-1 interviews, training observations, surveys, contractor interviews, web survey, panel, marketing collateral review/content analysis, web statistics, best practice research. All survey efforts will be coordinated with other surveys where possible.	

Study Title: Ongoing Coordination and Consulting	**Budget:** $75,000
Actual Completion Date: September 2014	**Study Manager:** (ED)
Description: Ensure ongoing communications through the PCG. Ad hoc consulting as needed. Monitoring of Statewide and IOU/REN program efforts.	
Objective: Coordination and consulting.	
Key Research Questions: N/A	
Potential EM&V Methods: N/A	

2.13.9. 2015 Study Descriptions

No additional funding was provided for ME&O in 2015 as CSE's funding is intended to cover the 2013-2015 period due to the program's late start.

2.13.10. Key Research Questions for 2016 and Beyond

Proposed 2016 Energy Division Budget: **$-**

Program administrators do not have any proposed studies or budgets for this sector.

The next round of funding of evaluations for ME&O have not yet been authorized by the Commission. When these funds are approved this evaluation roadmap will be updated.

ME&O of rate structure changes: Currently, per Commission direction, the IOUs are transitioning to new energy rate tiers which are having the biggest impact on low-income users as well as on "super-users", or those who use greater than 400 percent of average baseline consumption in a month. In addition, the utilities are offering a greater selection of Time of Use rate packages, which will expand in coming years. The utilities, as well as CSE, are currently marketing these rate changes to ratepayers, and will continue to in 2016. Energy Division is currently working with the utilities on metrics for the effort.

The call to action for much of this marketing is both to change behavior and to take measures and install equipment in homes and businesses to use energy more efficiently. Energy Division proposes an additional study that will examine the effectiveness of the marketing, and measure the utilities progress in meeting the approved metrics.

Marketing Effectiveness Study

The current Verification and Effectiveness study is studying issues such as the alignment of marketing activities with ME&O program objectives, the manner in which customers are using the resources and tools promoted through statewide ME&O, and the change in key ME&O metrics over time. Further efforts to verify program activities may not be needed in the near-term once the current study is completed. However, it will be increasingly important to assess the effectiveness of statewide marketing efforts in achieving the ME&O program's overall objectives. Energy Division therefore proposes a Marketing Effectiveness study. The specifics of the study cannot be planned until the current Verification and Effectiveness study is complete, but it is likely to include both continued tracking of key metrics and targeted studies of the behavioral effects that specific marketing activities have on end-users and upstream market actors.

Potentially impacting the specific shape of this study, although not the overall need for it, are potential changes in the metrics framework for ME&O. On November 9, 2015, CSE filed Advice Letter 64, which proposes to revise the metrics that were approved in AL49. In particular, CSE proposes these updates for these two reasons:

1. CSE is proposing metrics that would shift the focus from increasing awareness of Energy Upgrade California to instead "allow CSE to better focus on increasing the effectiveness of ME&O pathways to action."
2. To pioneer tracking of hard indicators of effectiveness and consumer pathways to action. CSE does not propose setting targets for this experimental metric.

Should these new tactics be approved by the Commission, Energy Division proposes to incorporate an assessment of the achievements of the new approach into the Marketing Effectiveness study.

Process Evaluation for Post-2016 Transition

In October, 2015, the Commission issued a scoping memo for Phase 3 of R.13-11-005 regarding the future of ME&O after the end of its 2016 year of bridge funding. The memo calls for a competitive RFP to be issued in order to solicit a program implementer for 2017 and beyond. The scoping memo asks

stakeholders to respond to questions regarding the future vision, purpose, strategy, and budget for ME&O, among other things. A Commission decision is anticipated in March of 2016.

Energy Division proposes a process evaluation for this transition period, from the RFP process to the transition from the current direction of EUC to whatever new direction is decided by the Commission in 2017.

Interaction with Recent Residential Rate Reform Decision (D.15-07-001)

In July, 2015, the CPUC adopted D.15-07-001 in the residential rate reform proceeding that requires the IOUs to increase customer understanding of their bills generally, the changes to retail rates made by the decision, as well as the customer's specific rate plan and plan options. The decision also called for co-marketing to be employed in order to leverage existing IOU ME&O programs for the benefit of rate reform education.

Improved customer understanding of retail rates and the rate plans that determine a customer's final bill can be a critical element in increasing voluntary uptake of energy efficiency measures. The rate reform decision made changes to the structure of retail rates that makes average bills higher for low energy users even if they do not increase their usage. In effect, the recent decision automatically lowered – in some cases substantially – the payback period for energy efficient technology. For these reasons, it is appropriate to include residential rate reform messaging in residential EE ME&O and measure the effectiveness of the same.

Explicit co-marketing of rate reform with residential EE ME&O should be pursued to increase customer awareness of the new avoided cost incentives for EE technology. Therefore, key areas of research include: 1) measuring the extent to which co-marketing is occurring, 2) whether such co-marketing has the effect of increasing awareness and understanding of rate reform, and 3) whether that improved awareness and understanding increases voluntary take-up of EE technology.

Authorized budget for 2016 (per D.15.08.033): $880,711

2.14. Workforce Education and Training

2.14.1. Background

Sector or Program Area Description

The Statewide IOU Workforce Education and Training (WE&T) Program represents a portfolio of education, training, and workforce development planning and implementation activities. Education and training are integral in supporting the achievement of IOU energy savings targets and the workforce objectives set forth in the California Long-Term Energy Efficiency Strategic Plan (Strategic Plan). Workforce Education and Training has become an important crosscutting activity for the IOUs in an effort to not only educate and train current workers, but to prepare future workers to be better able to successfully perform the jobs needed to help achieve increased energy savings targets for the IOUs and California's clean energy goals.

The Strategic Plan, Workforce Education and Training Chapter has outlined the following goals:

1. Establish energy efficiency (EE) education and training at all levels of California's educational systems
2. Ensure that minority, low income and disadvantaged communities fully participate in training and education programs at all levels of the DSM and energy efficiency industry.

WE&T Program Overview

The Statewide IOU WE&T Program includes three pivotal Sub-Programs that form an integrated and cohesive structure for implementing WE&T curriculum and related activities in support of IOU energy savings targets and the long-term strategic goals.

The WE&T program consists of three Sub-Programs:

- WE&T Centergies Sub-Program
- WE&T Connections Sub-Program
- WE&T Planning Sub-Program

1. ***The WE&T Centergies Sub-Program*** consists of seven Energy Centers through the IOUs' service territories and is generally organized around market sectors and cross-cutting segments to facilitate workforce education and training appropriate for achieving the energy savings, demand reductions and related energy initiatives required of the IOUs through the Energy Centers. Through this program, IOUs offer classes, seminars, building performance measurement equipment and displays to educate and promote awareness of Demand Side Management (DSM) to facilitate development of a skilled workforce knowledgeable about saving energy. The Energy Centers serve as a "public face" and conduit to California utilities' local and statewide energy efficiency programs. The centers leverage IOU and industry resources to address gaps in the workforce landscape and identify new or successful local and regional workforce training models that can be migrated across the state and to underserved areas via IOU implementation or IOU administration of third-party sponsored implementation. The centers target building professionals, offer general knowledge courses and are expanding their offering of sector-specific courses and training aimed at improving energy efficient practices with key industry sectors (e.g. Building Owner Certification (BOC), LEED, and others). The Energy Centers also draw from the educational sector for resources and training to help achieve

market transformation toward a green workforce. The Energy Centers represent the largest component of this Sub-Program and provide WE&T curriculum and related deliverables—training courses, seminars, workshops, clean energy technology demonstrations, equipment efficiency testing, interactive training exhibits and lectures—to promote industry trends and developments for advancing energy efficiency as a professional discipline.

2. ***The WE&T Connections Sub-Program*** is organized around downstream and upstream relationships between the IOUs and the educational sector, entry and intro-level community-based training efforts that support workforce development in energy efficiency, energy management, and new emerging green careers. The Connections programs are curriculum- and education-driven programs offered to K-12 and post-secondary school agencies to facilitate interest in green careers. According to the program theory offered by the IOUs, WE&T Connections addresses lost opportunities in the school market by implementing a comprehensive, innovative approach that involves incorporating some of the nation's leading energy education programs. These programs are designed to:
    i. Promote green careers through energy and environmental curriculum,
    ii. Educate students on energy, water, renewable energy, demand response, distributed generation as well as greenhouse gases and impact to the environment with the goal of influencing day-to-day decisions of students and their households, and,
    iii. Educate schools/facilities on the benefits of implementing energy efficiency policies and demand response programs at their sites to impact energy use in schools and universities and to project energy and environmental leadership by example.
3. ***The WE&T Planning Sub-Program*** involves the management and execution of several strategic statewide planning tasks and resulting project implementation actions initiated by the Strategic Plan and CPUC guidance.

The WE&T program structure essentially remains the same for the 2013-2014 program cycle. However, the program focuses have evolved due to implementation of the California Workforce Education & Training Needs Assessment (WE&T Need Assessment) findings, sector strategies and additional CPUC requirements.

In 2013, at the direction of the CPUC, the statewide WE&T program team hired the Donald Vial Center for Labor in the Green Economy (DVC) to develop a comprehensive approach to WE&T for the EE programs, in line with the goals in the Strategic Plan and the Needs Assessment recommendations.[45] On May 2, 2014, DVC finalized its recommendations in the document *Workforce Issues and Energy Efficiency Programs: A Plan for California's Utilities* (Guidance Plan). In June 2015, the CPUC approved a joint IOU compliance advice letter and Program Implementation Plan (PIP) Addendum, describing which of the Guidance Plan recommendations would be initiated in 2015.[46]

Programs included in the Research Scope

Table 72. 2013-2014 WE&T Savings and Budget Summary

IOU	Program Name	kWh	kW	Therms	Budget
SCE	WE&T	7,493,281	3,048		$18,438,000

[45] D.12-11-015, Ordering Paragraph 34.

[46] PG&E 3567-G/4592-E, SDG&E 2705-E/2361-G, SCE 3179-E, SCG 4765 G

IOU	Program Name	kWh	kW	Therms	Budget
PG&E	WE&T	0			$23,600,214
SDG&E	WE&T	0			$11,071,742
SCG	WE&T	0			$6,154,553
	Total Statewide	**7,493,281**	**3,048**		**$63,491,355**
	% of Statewide Portfolio	0.5%	0.2%		3%

Table 73. 2015 WE&T Savings and Budget Summary

IOU	Program Name	kWh	kW	Therms	Budget
SCE	WE&T	964,345	162	0	$9,164,656
PG&E	WE&T	0	0	0	$12,561,342
SDG&E	WE&T	0	0	0	$5,494,244
SCG	WE&T	0	0	0	$3,128,997
	Total Statewide	**964,345**	**162**	**0**	**$30,349,245**

For 2016, the WE&T program budgets are authorized at the 2015 levels[47], and the statewide program will be primarily non-resource for all IOUs. SCE WE&T claims savings for the LivingWise program.

Table 74. 2015 WE&T Budget Breakdown by Sub-Programs

	2015 Program Cycle	Budget	Budget%
SCE			
	WE&T Centergies	$5,614,128	61%
	WE&T Connections	$3,426,167	38%
	WE&T Planning	$124,361	1%
SCE Total		**$9,164,656**	**100%**
% of Statewide WE&T Program Total		30%	
PG&E			
	WE&T Centergies	$ 9,721,801	77%
	WE&T Connections	$ 2,150,604	17%
	WE&T Planning	$ 688,937	5%
PG&E Total		**$12,561,342**	**100%**
% of Statewide WE&T Program Total		41%	
SDG&E			
	WE&T Centergies	$4,672,808	85%
	WE&T Connections	$774,065	14%
	WE&T Planning	$48,371	1%
SDG&E Total		**$5,494,244**	**100%**
% of Statewide WE&T Program Total		18%	
SCG			

[47] D.14-10-046, pp. 31-32

	2015 Program Cycle	Budget	Budget%
	WE&T Centergies	$2,548,697	81%
	WE&T Connections	$429,952	14%
	WE&T Planning	$150,348	5%
SCG Total		**$3,128,997**	**100%**
% of Statewide WE&T Program Total		10%	

Uncertainties and Challenges to Successful Implementation

Prefacing the '13-'14 studies areas, there were three essential data needs to support the WE&T initiatives:

1. Data needs to support implementation of findings from the "WE&T Needs Assessment" ordered in CPUC Decision 09-09-047, especially in the area of sector strategies (i.e., Lighting, HVAC, Whole House, etc.),
2. Data needs to support requirements specified by CPUC Decision 12-05-015 (i.e., EE programs) and 12-08-044 (i.e., Low-Income and Energy Savings Assistance (ESA) programs) to support workforce policy and program formulation strategy,
3. Data needs to support implementation of WE&T programs, especially in the area of energy savings realization and claims.

WE&T Needs Assessment Study Findings Implementation Data Needs

The Strategic Plan directed the utilities to fund a WE&T Needs Assessment to study "critical workforce needs" and to pinpoint "opportunities to help identify and fulfill those needs through collaboration and fund sharing." The Needs Assessment was completed in March 2011 and examined these key areas:

- The impact of state and federal energy efficiency policies and programs on jobs and the labor market
- The need to improve the quality of the installation of energy efficiency equipment and materials in some sectors by developing and supporting a stable and professionalized workforce
- The need to coordinate and refocus the many pieces of the training system to incorporate new energy efficiency knowledge and skills, build on the strengths of state-certified apprenticeship programs, and build pipelines into good jobs for workers from disadvantaged communities

Following the Needs Assessment, the utilities filed an advice letter with the CPUC describing program changes that would be implemented to address the needs identified in the report. In October 2011, the CPUC approved the joint IOU advice letter, which included the following proposed program changes and activities:

Table 75.. WE&T Program Proposed Changes and Activities

	Needs Assessment Topic	IOU Proposal
1.	Support Sector Strategies	Develop and initiate Sector Strategies, test some proven concepts and refine as needed
2.	Collaborate with Construction Trades	Engage with workforce organizations
3.	Support Credentials and Certifications	Seek best comprehension and retention strategy
4.	Restructure Classes	Assess feasibility of longer courses and series
5.	Support Curricula Development	IOUs have an advisory role; can advise on how

	Needs Assessment Topic	IOU Proposal
		best to make curricula accessible
6.	Inclusion of Disadvantaged Workers	Facilitate relationships with Disadvantaged groups
7.	Evaluation of Workforce Outcomes	Seek feasible metrics
8.	Collaborate with Education	This is an existing aspect of the program's strategy
9.	Career Education	Incorporate career exploration into programs
10.	Evaluation of K-12 Programs	Collect non-specific student data from schools

CPUC Decision Data Needs

In May 2012, CPUC Decision 12-05-015 was published. In this Decision, the CPUC provided guidance on the needs of the Workforce Education and Training activities. More specifically, the IOUs were asked to implement specific program design and implementation activities to address sector-specific concerns for lighting, HVAC and other industries. Subsequent to this Decision, in the low-income proceeding, the ESAP Decision 12-08-0444 separately outlined the need to collect program contractor-specific information.

To support the data needs of both Decisions 12-05-015 and 12-08-0444, the statewide WE&T study roadmap needs to consider a few very specific and complex data collection and analysis needs. As outlined in the Decision—for HVAC quality installation, CALCTP-certified installations, and any other sector strategy-induced skill standards identified, the IOUs should pursue—

1. Data or estimation of the incremental customer cost, if any, of requiring skill standards;
2. Data or estimation of the average and range of permitting/compliance costs across permitting jurisdictions in the IOUs' service territories;
3. Data or estimation of impacts, if any, mandatory skill standards would have on program participation rates;
4. Data or estimates of the incremental energy savings and customer cost savings over the life of the equipment; and
5. Any other potential benefits associated with higher standards, such as fewer call-backs, lower frequency of customers over-riding control systems, lower life-cycle costs, and increased consumer uptake of measures based on higher quality and certainty."

The above needs are further summarized by the UC Berkeley Donald Vial Center. The WE&T study plan needs to include—

- Research on the costs and benefits of contractor qualification and worker skill standards; (i.e., work-quality and job-quality data),
- Research on the labor market characteristics and business environment of contractors participating in IOU resource programs, including wages, working conditions (including health and safety conditions), employee turnover rates and other factors.

2015-2016 WE&T Inclusion Research

For 2015-2016, the statewide WE&T team has prioritized the need to explore ways in which their program may further support "disadvantaged" workers. These efforts to support disadvantaged workers are referred to as "inclusion" efforts.

The IOUs have extensive knowledge and experience related to implementing a wide range of energy efficiency programs. To better align this expertise with support for disadvantaged workers, the IOUs are

in the process of examining the inclusion landscape as it relates to workforce development in the EE and low income energy efficiency sector. This process will shed light on the implications of (some of) the recommendations from the May 2014 Guidance Plan. This effort will enable the IOUs to make more informed decisions related to the implementation of specific Guidance Plan recommendations.

The IOUs are exploring and researching the following:

(1) Examining the requirements for establishing prevailing wage classifications for field workers (i.e., Energy Specialists and Weatherization Workers) in the IOUs' ESA Programs.

(2) Undertaking a job classification and mapping review of ESA program field positions to ascertain the appropriate alignment, using available state and federal job classifications as the starting place. This activity will help to determine whether ESA workers can be placed within appropriate classifications.

(3) Identifying promising EE career pathways for disadvantaged workers which provide entry-level employment onramps as well as ongoing opportunities for advancement.

(4) Identifying viable inclusion implementers working in the IOUs' service territories who may be appropriate partners for inclusion work.

(5) Examining two electronic certified payroll reporting and labor compliance systems (LCP Tracker and Elation) that may be considered as a resource to collect job and workforce data relevant to the implementation of select EE programs administered by the IOUs.

2.14.2. 2013-2014 WE&T EM&V Studies

The table below summarizes the 2013-2014 EM&V Studies that have been budgeted, some of which are in the process of being implemented and others are still in the planning stage. The table provides the study manager, work order under which the study is being conducted, the corresponding budget, implementation status and expected completion date for each study.

Table 76. 2013-2014 WE&T EM&V Studies, Budgets, and Timing

2013-2014 Study Area/Title	Study Manager (ED/IOU)	Work Order Number	2013-2014 Budget	Completion Date
Process				
2013-2014 Statewide WE&T Program Theory	IOU	n/a	$110,000	Completed in 2014
Assessment of CALCTP and Lighting Contractor Training**	IOU	n/a	$127,008	2015
Market and Impact/Indirect Impact				
2013-2014 Workforce Market and Impact Evaluation Study, Phase 1-4*	ED	ED_0_WET_2 and ED_D_Res_6	550,000	2016

*The 2013-2014, the total budget for market and impact includes the balance of WE&T funds (i.e., $100,000) also found in the Residential Study Roadmap.
**Study is co-funded through Lighting Innovation ($106,054) and WE&T ($20,954)

2.14.3. 2013-2014 Study Descriptions

Below are descriptions for each of the 2013-2014 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: 2013-2014 Statewide WE&T Program Theory and Logic Model	**Budget:** $110,000
Expected Completion Date: Completed in 2014	**Study Manager:** IOU
Description: Focused study to update program theory and logic to reflect program changes in light of the Strategic Plan and Needs Assessment. The study reviewed all program data collection thus far and recommended improvements to ensure consistency across all Centers and to ensure data collection aligns with the program's theory and logic.	
Objective: To modify program theory and logic model to better align with the program's activities and goals. To improve data collection so that Centergies can show evidence of their program theory and goal achievement.	
Key Research Questions: • What modifications are required to the WE&T Centergies' program theory to support the Strategic Plan and Needs Assessment? • Is the data tracking system adequate to support the theory? • What are the data tracking requirements?	
Potential EM&V Methods: Interviews, Analysis, Group Discussions.	

Study Title: Assessment of CALCTP and Lighting Contractor Training	**Budget:** $127,008
Expected Completion Date: 2015	**Study Manager:** IOU
Description: This assessment aims to characterize CALCTP training in context with other lighting controls training options, with a focus on manufacturer-provided training. CALCTP training will be compared and contrasted with that of top manufacturers, resulting in findings and recommendations that will help determine the likelihood that CALCTP training supports increased energy savings in lighting projects compared to nonresidential lighting system installers who are not certified.	
Objective: Characterize and evaluate the CALCTP training; Characterize and evaluate manufacturer-offered controls training; Characterize general certification programs that include lighting controls training; Define "work quality" and "installation quality; Compare training experiences/outcomes between CALCTP and manufacturer-trained contractors	
Key Researchable Questions: See project scope for detailed research questions.	
Potential EM&V Methods: Training material review, depth interviews, analysis.	

Study Title: 2013-2014 Workforce Market and Impact Evaluation Study	**Budget:** $550,000
Expected Completion Date: 2016	**Study Manager:** ED
Description: The research will take place in four phases. The first phase will focus on if and how to collect job quality data from programs in an indirect contracting relationship with customers. The second phase will focus a contractor skill/training market characterization. The third phase will focus on a cost/benefit analysis and the fourth phase will build upon the first three phases and develop a	

Study Title: 2013-2014 Workforce Market and Impact Evaluation Study	**Budget:** $550,000
framework for rationalizing contractor training moving forward.	
Objective: determine whether the current skill standards are appropriate for resource program participation and how the IOUs can best justify future skill standards.	
Key Researchable Questions: Please refer to the detailed research plan for the comprehensive list of researchable questions by project phase.	
Potential EM&V Methods: Secondary research, depth interviews, Delphi panel.	

2.14.4. 2015 EM&V Studies

The table below summarizes the 2015 EM&V Studies that have been budgeted. The table provides the study manager, corresponding budget and expected completion date for each study. Note that the IOUs have re-prioritized their research needs and as a result have removed the two 2015 studies from the EM&V Plan. The IOU-led 2015 Job Task Analysis, Mapping, and Gap Identification Study was removed because it overlapped with a related project already underway by the WE&T program team. The IOU-led 2015 Centergies Job Quality Outcome Study was removed because studying how WE&T students are using course content, skills and information is of stronger interest to the IOUs than studying the workforce related outcomes of WE&T. The 2015 statewide IOU EM&V budget of $100,000 will be utilized to conduct a new study titled, "WE&T Student Use of Course Content, Skills, and Information Assessment".

Table 77. 2015 WE&T EM&V Studies

2015 Study Area/Title	Study Lead (ED/IOU)	Work Order #	Budget	Completion Date
Process				
WE&T Student Use of Course Content, Skills, and Information Assessment	IOU	n/a	$100,000	2016
Impact				
Building Operator Certification in Multifamily Residential Market: Impact and Outcome Study	ED	TBD	$250,000	2016
Tool Lending Library Impact Study	ED	TBD	$141,222	2016

2.14.5. 2015 Study Descriptions

Below are descriptions for each of the 2015 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: WE&T Student Use of Course Content, Skills, and Information Assessment	**Budget:** $100,000
Expected Completion Date: 2016	**Study Manager:** IOU
Description: Currently, most statewide WE&T Centergies and Connections courses that the IOUs offer have post-class evaluation forms that gather information about how students perceived the quality of the class, materials, and instructor(s). Some questionnaires include questions about whether or not the student thinks that	

Study Title: WE&T Student Use of Course Content, Skills, and Information Assessment	**Budget:** $100,000
he/she may use the information at work and how often. However, there is no follow-up to these questions. Aside from occasional testimonials from students, we don't know if students are using the course content they receive. This study will deliver key insights on how students are applying the skills and using the information they receive in WE&T courses in their jobs. Knowing if students are applying the skills and/or using the information they received would be very useful in assessing the course content and in designing or redesigning future courses. The IOUs will revisit the 2013-2014 WE&T Statewide Program Theory and Logic Model Study to provide insights into the design of this Assessment. The SCE 2006-2008 and 2009-2010 Education and Training and Outreach M&E study will also serve as a good resource for the development of key research questions for this Assessment. This study can be conducted in a few different ways. A. Pre-select a number of courses where we think that there's a high likelihood that people are using the course content. Priority can be given to multi-day courses, to courses where there's a certification or accreditation involved, to courses where the IOUs discussed course content with an employer or groups of employers, or to classes where there's a very narrow focus on a skill or set of skills. B. Conduct a broader study across all courses (or a significant number, thereof), and assess whether course participants are in fact using the course content in their jobs and how they have been using the course content. This broader approach can potentially reveal patterns in types of courses where course content is making its way into peoples' jobs.	
Objective: This study will provide statewide WE&T program managers with key information for understanding current course content, for improving content of future courses, or for prioritizing types of courses and delivery methods.	
Key Research Questions: • Why do students take the trainings? • How are trainings relevant to their jobs? • What specific information learned is translated into the workplace? • How are students using the information they receive in WE&T courses in their jobs? • If students are not using course information, why not? • What skills should WE&T be teaching to fill the gap?	
Potential EM&V Methods: Interviews, Analysis	

Study Title: Building Operator Certification in Multifamily Residential Market: Impact and Outcome Study	**Budget:** $250,000
Expected Completion Date: 2016	**Study Manager:** ED
Description: This study explores the outcomes of BOC training on residential multifamily properties. This study will build from the '10-'12 BOC impact evaluation by focusing on participants who manage residential	

Study Title: Building Operator Certification in Multifamily Residential Market: Impact and Outcome Study	**Budget:** $250,000
multifamily properties. The previous study looked at all BOC participants together and was not able to explore the nuances across the varying sectors that receive training including, but not limited to, schools, universities, military, office space and multifamily residential. This study will explore the multifamily market and may identify another sector for the deeper dive. To produce a large enough study group, we will focus the study on MF property manager participants who received BOC training in CA in 2013, 2014 and 2015.	
Objective: • Quantify the savings potential in multifamily properties from BOC training • Explore the issues involved Operations and Maintenance in the multifamily market • Understand all outcomes of BOC training on MF market	
Key Research Questions: • What are the savings per participant? Per property? Per square footage? • What barriers and opportunities are there for O&M procedures in the MF market? • What are the benefits, energy and non-energy, of BOC training for MF property managers?	
Potential EM&V Methods: Interviews, BOC participant data review, engineering analysis, on-site visits.	

Study Title: Tool Lending Library Impact Study	**Budget:** $141,222
Expected Completion Date: 2016	**Study Manager:** ED
Description: This study will quantify the savings from tool lending to customers from one PG&E Energy Center. This study will focus on the tool lending library that has the most energy saving potential, residential or non-residential. It will also focus on 1-3 specific tools that have the most energy saving potential.	
Objective: • Identify the 3 tools that have the most energy saving potential • Quantify the saving potential per tool • Explore if and how the tool lending can claim savings in the future	
Key Research Questions: • Which tools have the most savings potential? • How do participants typically use the tools? • How do the tools enable savings that would otherwise not be captured? • What are the savings per tool? Per square footage? • What evidence is needed to claim savings in the future?	
Potential EM&V Methods: Interviews, secondary research, engineering analysis, on-site visits.	

Other Important Considerations

The WE&T study roadmap is cross-cutting in nature. To accomplish the above study goals and data collection needs, this study team would need to coordinate with the following programs and study areas, at minimum:

- All residential programs with contractor skill standards and study roadmaps
- All Non-residential programs with contractor skill standards and study roadmaps
- Low-income and ESAP program and study roadmap

It is also possible that various program tracking systems may require enhancement to support the detailed contractor data collection needs, as specified by the CPUC decisions. The appropriate PCG will be formed to facilitate this coordination and discussion.

2.14.6. Thoughts on 2016 Study Needs

The IOUs are interested in better understanding the impacts of WE&T. The Statewide IOU-led "WE&T Student Use of Course Content, Skills, and Information Assessment" will contribute to the foundation needed to determine WE&T impacts. The study can begin to identify patterns in the types of courses, student profiles, or learning methods utilized in courses where course content is being implemented as part of the student's job. This study will provide WE&T program managers key information for understanding how WE&T students are using, or not using, the course content they receive. The study can also potentially lead to metrics for WE&T beyond counting classes and number of students. The IOUs may utilize 2016 IOUs EM&V budget to expand on these efforts further.

During the 2016 – 2017 evaluation period there is also interest in building on the previous research to determine the broader cost-benefits of WE&T efforts in order to develop an understanding of whether these strategies actually lead to quantifiable energy efficiency savings and non-energy benefits on a broader more general scale.

Proposed 2016 Energy Division Budget: $104,792

Energy Division has conducted a significant number of studies in the WE&T sector in the past few years and does not intend to commence new studies in 2016. We will continue to review and support oversight of IOU-led evaluation.

Proposed 2016 Program Administrator Budget: $100,000

The specific studies have not yet been defined. The budget will be used to support evaluations for this sector.

3. STUDY TYPE LONG TERM RESEARCH ROADMAPS

3.1. Impact Analysis

3.1.1. Background for the Impact Evaluation

Energy Division is responsible for quantifying the impacts and cost-effectiveness of the energy efficiency portfolio investments, tracking progress against savings goals, and providing information in order to improve savings estimates. This is accomplished through strategic review of the utilities' savings claims starting with the largest areas of impact or savings estimates with the greatest uncertainties. Energy Division uses engineering review, bill analysis, lab testing and field based monitoring to assess the savings impacts.

Impact evaluations were prioritized in the past years to focus on measures and program areas projected to have the greatest impact on the portfolio savings with the greatest uncertainties (either because they are new or because measures have uncertain parameters). This information has allowed for robust portfolio level analysis of the savings impacts as well as disaggregated reporting of program and measure level impacts.

Impact evaluations improve the accuracy of the savings assumptions and close the gap between IOU savings projections and CPUC verified savings estimates. The proposed impact evaluations will again target measures and programs that have the greatest impact on the portfolio but also demonstrate the greatest uncertainty in the savings (or cost) estimates in order to maximize the benefit of the research dollars spent.

In the upcoming years, we will continue to explore more opportunities to embed M&V and evaluation into program design and with the advent of more "meter based" program designs and evaluation impacts can be more quickly determined.

Impact Analysis included in this plan

Energy Division evaluation staff, in collaboration with the IOUs, developed long term research roadmaps by sector. Each of these roadmaps also considered an appropriate amount of funding for impact evaluation. Energy Division will further develop impact evaluation plans consistent with D.12-05-015 after the IOUs' file final portfolios, once they begin reporting savings claims, and based on Energy Division's pending uncertainty analysis, and its hire of evaluation contractors. Funds may be re-distributed or combined as appropriate to execute the work in the most efficient fashion, but results will be reported for each of the relevant sectors. The proposed budgets are based on experience in prior cycles regarding the costs of field data collection and analysis. Please see the respective sector research plans for planned impact analysis and anticipated ex ante updates.

Uncertainty Analysis and Prioritization

In preparation for the evaluations, the Energy Division and their consultants are is conducting an uncertainty analysis on the program planning data submitted by the IOUs. This information is used to generate an "uncertain measure list" which is presented each year via the Energy Savings Performance Incentive process. The uncertainty analysis identifies and quantifies the uncertainty in the program

planning estimates, and assess where EM&V resources can be applied to reduce the uncertainty in a cost effective manner. This analysis was conducted across the portfolio and by sector, and is reflected in impact plans.

3.2. Market Studies

3.2.1. Background

Program Area Description

Market Studies Overview

Market studies in previous evaluation cycles have largely been designed to meet program planning needs. Market effects studies assess the effects that programs have on the structure and functioning of energy efficiency markets, including changes in the behavior of contractors, suppliers and customers. Market characterization studies describe current market conditions in order to help inform program planning and the development of public policies. Market share tracking studies monitor changes over time in equipment sales patterns.

In addition to the above market studies, there is specific Commission direction to better measure market transformation regarding non-participant spillover[48] and to utilize market transformation indicators.[49] More generally, there is a need for coordination across program sectors on market evaluation and designing programs for market transformation.

Finally, market saturation surveys have been conducted to determine the current baseline of equipment in the commercial and residential buildings and, in some cases, develop building Energy Use Intensities (EUIs). Under Title 20, there is a state mandate requiring the IOUs to complete statewide saturation surveys with specific design characteristics. These Title 20-compliant studies have primarily been used in the CEC demand forecast and LTPP process at the CPUC. While these studies have historically been funded through the EM&V budget, given resource constraints, Commission Decision (D.) 12-11-015, approving the IOUs' 2013-2014 programs and budgets, recommends a preference for alternative funding of the Title 20 surveys.

Commission Direction on Market Transformation, Spillover and Market Effects

In October 2007, the Commission approved D.07-10- 032 which directed that "a key element of the [Long-term Energy Efficiency] Strategic Plan would be that it articulates how energy efficiency programs are or will be designed with the goal of transitioning to either the marketplace without ratepayer subsidies, or codes and standards."[50] The CPUC also stated that the Strategic Plan would incorporate the market transformation goal described above and "develop milestones to measure progress towards that goal," including the development of a "targeted timeframe for such market transition and the process for tracking progress so that it is clear at what point a program has made a successful transition or conversely, is having problems."[51]

---

[48] See, for example, D.12-11-015 which states that: "We lack recent program-specific data and analysis on spillover within California," (FOF 21) and "Commission staff should commit evaluation funding in 2013 and 2014 to study these [spillover] market effects further." (COL 47)

[49] See, for example, D.09-09-047.

[50] D.01-10-032, p.33.

[51] Ibid, p.33.

In September 2008, the Commission adopted the California Energy Efficiency Strategic Plan (CEESP) in D.08-09-040. While the Plan represents a significant advance towards the market transformation goal articulated in D.07-10-032, it did not identify the process to track progress towards market transformation. Therefore, D.08-09-040 further directed the Commission to take action on the remaining issues that need to be addressed in market transformations. Per the decision, this includes, "at a minimum, identifying the process to track progress towards defined end points for program efforts and progress metrics."[52]

In September 2009, the Commission approved the IOUs' 2010-2012 energy efficiency portfolios and budgets in D. 09-09-047. This Decision also set forth principles and a process for developing and implementing market tracking systems. Specifically, D. 09-09-047 states that:

- The IOUs shall file an Advice Letter requesting approval of program performance metrics (PPMs) for each statewide program and associated subprogram and include "key data sources and indicators for which to begin collecting market transformation baseline data."
- ED should develop detailed recommendations for market transformation indicators and measurement and present their recommendations in a workshop followed by a public comment period.
- Market transformation data and metrics should not only serve to define end points for programs and measures but also to improve existing programs.

Furthermore, D.09-09-047 modified the existing Commission definition of market transformation 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 here continuation of the same publicly-funded intervention is no longer appropriate in that specific market. *Market transformation includes promoting one set of efficient technologies, processes or building design approaches until they are adopted into codes and standards (or otherwise substantially adopted by the market), while also moving forward to bring the next generation of even more efficient technologies, processes or design solutions to the market.*[53]

In May 2010, the IOUs filed a joint Advice Letter with PPMs for the 2010-2012 statewide EE programs and an initial set of long-term MTIs.

In December 2010, the Commission issued Resolution E-4385 which approves PPMs for the 2010-2012 program cycle, identifies an initial set of long-term market transformation indicators, and directs further efforts to integrate these into EM&V activities. Pursuant to the Resolution, the Joint Utilities are directed to track and report progress against the approved PPMs on an annual basis and to work with Commission staff to finalize a subset of MTIs for subsequent data collection, tracking and reporting.

On November 7, 2011, Energy Division hosted a workshop on Market Transformation Metrics. The workshop was used to frame the topic of market transformation in the CPUC regulatory context, share and review the subset of metrics that have been identified per Resolution E-4385, and discuss revisions proposed by other stakeholders. This workshop also met the requirements in Decision 10-10-033 to

[52] D.08-09-040, p.10.

[53] D.09-09-047, p.88-89.

further refine the market transformation logic of the portfolio, develop, vet and add new indicators where gaps have been identified, and adapt to portfolio guidance or the orientation of the next program cycle programmatic objectives.

To support Commission direction on market transformation, in December 2014 the Energy Division released two White Papers on market transformation (Building a Policy Framework to Support Energy Efficiency Market Transformation in California and Guidance on Designing and Implementing Energy Efficiency Market Transformation Initiative, both available on the CPUC website, http://www.energydataweb.com/cpuc/search.aspx). Additionally, the IOUs contracted to create a report on market transformation (A Review of Effective Practices for the Planning, Design, Implementation, and Evaluation of Market Transformation Efforts) which was published on November 2013 and is available at www.calmac.org.

Programs included in the Research Scope

The Market Studies Research Roadmap evaluates EE programs in at a meta-level that considers many if not all of the utilities' programs. There are no savings associated with the research roadmap so the "Savings and Budget Summary" table provided in other roadmaps is not applicable and not shown.

Uncertainties and Challenges to Successful Implementation

Market studies span multiple program areas. In the past, market studies have been completed in discrete program sectors. Going forward, we again propose that most sector- or market-specific market studies are planned and executed in the sector- roadmaps. But we expect challenges to remain around coordination across-sectors to ensure consistency in market research, including measurement of market transformation indicators. Additionally, various market studies can consider the same sets of market actors, leading to data collection fatigue among the market actors. To help address these challenges, the CPUC plans to work collaboratively with the IOUs to pilot panel surveys for specific market actors. Also, in the 2013-2014 research, the CPUC created Excel-based tools to help roadmap leads understand what data is already available and where targeting sector-specific market studies may be beneficial. Commission staff have made these tools available to stakeholders on the CPUC's Public Documents Area. Through assuring that others have access to knowledgeable consultants around market studies, the CPUC plans to support internal ED staff and other roadmaps as they consider sector-specific market studies.

3.2.2. 2013-2014 EM&V Studies

The existing PCGs are oriented primarily to coordinating studies intended to support specific programs or sets of programs. After holding meetings during 2014, the CPUC determined that, while coordination for market studies may be difficult, it would be beneficial to move back to the sector specific PCGs planning for and managing sector-specific market studies. However, the CPUC plans to slowly transition back to sector specific market study planning and assist the sector PCGs through Excel-based tools created during 2014. At present, we are planning to disband the current Market Studies PCG after the two spillover studies currently underway are completed.

In the interim, we will continue to fund market studies and some additional studies from the 2013-2014 Market Studies budget. The budget details are below. There were two primary rationales for funding some additional studies under the 2013-2014 Market Studies Budget**:** 1) the original allocation of 2013-2014 EM&V funds failed to account for some administrative costs; to address this, budget was removed from the Strategic Plan and Policy Support budget (see section below). Doing this curtailed Strategic Plan

Action Plan activities for 2013-2014 however, so we provide $200,000 for this from 2013-2014 Market Studies budget in this roadmap update; and, 2) in completing the Market Studies Needs Assessment study in late 2014, it became clear that Energy Division staff bandwidth was extremely limited to consider market studies developed outside of the sector PCGs. To be successful, each EM&V study needs a strong champion, and this bi-furcation of effort was dampening attention to market studies. To address this tension, we assessed immediate ED staff recommendations for 2013-2014 EM&V studies against market studies recommended in the draft Market Studies Needs Assessment and allocated funds for two additional studies not recommended in the Needs Assessments: A finance study required by the Legislative Analysts Office (LAO) and an inventory of IDSM programs and opportunities, a priority suggested by the opening of a Customer Solutions Rulemaking (R. 14-10-003). These studies are described below. In addition, we agreed to the IOUs proposal to undertake a more thorough whole house market characterization study to support transition of the Energy Upgrade California Home Upgrade program to a full market transformation program.

Key Research Questions to Be Addressed in 2013-2015 EM&V

The Market Studies PCG was designed to address both coordination and specific market study gaps that are not addressed in other PCGs. Below is a summary of the original coordinating functions of the Market Studies PCG. As noted above, CPUC is currently planning on disbanding the Market Studies PCG following the completion of two spillover studies. However, before doing so we will review the identified priorities below and determine which functions may necessitate retaining a skeletal Market Studies PCG to retain the minimum needed central coordinating functions.

The original coordinating functions of the Market Studies PCG are divided into five categories:

1. *Coordinating the performance of market studies that, by their nature, span multiple program-oriented PCGs*. A good example would be a saturation study. Because saturation studies are intended to systematically inventory all of the equipment holdings within a particular population of end-users, and because different types of equipment are often targeted by different programs, saturation studies by their nature support a wide range of programs, and are thus not easily covered by program-oriented PCGs. A specific activity under this function could be to develop a matrix which links objectives of market analysis in various programs together so that data collection efforts can be streamlined and prioritized accordingly.
2. *Coordinating the performance of market studies that are viewed as being particularly important to perform consistently*, and/or systematically prioritize, across program areas. In the 2013-2014 program cycle, one good example of such a study is research into non-participant spillover. Other examples include systematically tracking MTIs and the performance of market effects studies. Such research is challenging and fairly expensive to perform, and the available funds are limited, so systematic prioritization will be important. Research into non-participant spillover is also a relatively new activity in California, so it will be important to ensure that consistent methodological standards are applied.
3. *Coordinating the performance of market studies touching the same sets of market actors*, in order to limit over-contacting and enhance efficiency. An example would be studies intended to collect data from the general population of residential HVAC contractors. In the 2010-2012 program cycle, there have been numerous different studies, supporting different programs and cross-cutting functions, that have all sought to collect data from these contractors. While these studies have been coordinated as the need arose, with more systematic coordination it may be possible to increase the

quality of the data collected in such studies while decreasing total costs and ensuring that individual contractors are not contacted repeatedly.

4. *Ensuring that needed market studies do not fall through the cracks.* Lastly, an important function of the Market Studies PCG will be simply to ensure that needed market studies are not overlooked entirely. Because of the incomplete alignment between programs and markets, there may be studies that are of significant value but are not initiated by any of the individual program-oriented PCGs.
5. *Planning market studies through 2020.* Market transformation is more than measure adoption in codes and standards. It is also persisting market change and is not measured in a one-off, impact or measure-based assessment. Rather, market transformation evaluation transcends programs and evaluates the changes in markets targeted by energy efficiency initiatives. In this regard, time-series and trend analysis is necessary to effectively measure market transformation. While specific market studies for the 2013-2014 cycle and future EM&V cycles will be detailed through the PCG process, this roadmap outlines a plan for which market studies will be strategic and necessary in future EM&V funding cycles.

Table 78. Potential Strategic Market Studies in Future EM&V Cycles

EE Program Cycle	Study name	Previously Completed
2013-2014	Residential, non-participant spillover Non-residential, non-participant spillover MTI Tracking and Development (Dropped from plan) Market Effects Studies (Dropped from Plan Commercial End-Use Survey (CEUS)[1]	--- --- --- 2010-2012 2006
2015-2017[2]	Follow-up Market Effects Studies Market Share Tracking Additional Spillover Studies Industrial End-Use Survey (IEUS) [1]	2010-2012 2013-2014 2013-2014 2010-2012 ---
2018-2020[2]	Residential Appliance Saturation Survey (RASS)	2009

[1] Currently, not included in 2013-2014 EM&V budget as will be implemented by the CEC.
[2] Post-2014 EE Program Cycles may be 2 or 3 years.

A Summary of 2013-2014 EM&V Studies, Budgets, and Timing

Table 79. 2013-2014 Market Studies EM&V Activities, Budgets, and Timing

2013-2014 Study	Study Manager (ED/IOU)	Estimated Budget	Completion Date
PCG coordination	ED/IOU	60,000	Ongoing
Market Studies Needs Assessment	ED	74,260	Final report due Q2 2015
Residential Non-Participant Spillover Study	ED	1,100,000	TBD
Non-Residential Non-Participant Spillover Study	ED	1,100,000	TBD

2013-2014 Study	Study Manager (ED/IOU)	Estimated Budget	Completion Date
Whole House Market Characterization Study	ED	400,000	TBD
Behavioral Market Characterization	ED	80,000	April 2015
Total 2013-2014 Allocated Budget		2,814,260	
IDSM Inventory Study- See IDSM Chapter for study description	ED-IDSM PCG	305,000	TBD
Comparative Finance Study for Legislative Analysts Office- See Finance Chapter for study description	ED-Finance PCG	350,000	TBD
Strategic Plan Action Plans- (See Policy Support Chapter for activity description)	ED-Strategic Plan Support	200,000	TBD
Total MS funds transferred to other studies (see relevant chapters for study or activity description).		**855,000**	
Total Remaining 2013-2014 Budget		**330,740**	
New 2015 Budget – will be placed in contingency funds due to ED staff limitations		**978,054**	

3.2.3. 2013-2014 Study Descriptions

Study Title: Market Studies Needs Assessment	**Budget:** $74,260
Expected Completion Date: Q2 2015	**Study Manager:** ED
Description: Determine the current and future needs for market studies	
Objective: Create 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	
Key Research Questions: • Within which markets does the CPUC already have good data? • Which market studies are worthwhile for the CPUC to undertake, and what is their relative priority? • What is an appropriate framework for conducting market study research, and what are the structural and communication requirements of such a framework?	
Potential EM&V Methods: Depth interviews, secondary research	

Study Title: Residential Spillover Study	**Budget:** 1,100,000
Expected Completion Date: Q4 2016	**Study Manager:** ED
Description: Assess the extent to which California's Investor Owned Utilities (IOUs) programs have resulted in program-induced participant and nonparticipant spillover in the residential market.	
Objectives: • To determine what energy efficient measures are being installed without use of program incentives, • To estimate the amount of savings that results from these measures, and • To estimate the percent of those savings that can be attributed to program interventions (i.e., the	

Study Title: Residential Spillover Study	**Budget:** 1,100,000
spillover from the program). • Additionally, to the extent possible, the study seeks to understand why customers install/purchase energy efficient measures without program incentive or rebate support.	
Key Research Questions: How much spillover is occurring in the residential market?	
Potential EM&V Methods: primary data collection through participant and nonparticipant surveys; secondary data analysis of CLASS data; trade ally depth interviews	

Study Title: Overarching Residential Non-Participant Spillover Study	**Budget:** 1,100,000
Expected Completion Date: Q4 2016	**Study Manager:** ED
Description: Assess the extent to which California's Investor Owned Utilities (IOUs) programs have resulted in program-induced participant and nonparticipant spillover in the nonresidential market.	
Objectives: • To determine what energy efficient measures are being installed without use of program incentives and determine the role of the program in their adoption (i.e., attribution); • To estimate the amount of savings that results from the program-attributed high-efficiency measures; • Estimate the spillover savings rate; and • Characterize why customers install energy efficient measures without program incentive or rebate support.	
Key Research Questions: What is the amount of non-participant spillover is happening in the non-residential sector?	
Potential EM&V Methods: primary data collection through participant and nonparticipant surveys; secondary data analysis of CMST/CSS data	

Study Title: Behavior Market Characterization	**Budget:** $80,000 from Market Studies Roadmap; $150,000 from the Residential Roadmap; $230,000 overall
Expected Completion Date: Q2 2015	**Study Manager:** ED
Description: This study is partially funded from the Market Studies roadmap (for the $80,000 shown here) and partially funded from the Residential roadmap (for $150,000) document. The study documents IOU implementation of Smart Meter policy decisions and seeks to better understand and characterize the residential behavioral market to inform future possible policy.	
Objective: • To document the cost and benefit assumptions within the Smart Meter Business Case Decisions and IOU progress in achieving these benefits to date • To characterize the markets beyond IOUs • To identify gaps in California programs found through the market characterization and provide options for the CPUC to provide guidance to or collaborate with the IOUs to develop improved interventions	
Key Research Questions: • What IOU Smart Meter/AMI projects have been approved by the CPUC?	

Study Title: Behavior Market Characterization	**Budget:** $80,000 from Market Studies Roadmap; $150,000 from the Residential Roadmap; $230,000 overall
• What IOU EE, DR, HAN, and Emerging Technology Program (ETP) behavioral pilots exist in the California residential market? • Are the IOUs on track with Smart Meter implementation and seeing the projected results? • What third party (non-IOU) EE, DR, HAN, ET, and Smart Appliances behavioral pilots/programs ("Third Party Behavioral Programs") exist in the California residential market? • How are the IOU Third Party Programs performing to date? • Are there similar non-California pilots/programs that could be used to project behavior savings potential in California? • From the viewpoint of third-party implementers, what are the barriers and trends in the residential behavioral program market? • What are the barriers, gaps and opportunities for the known third party and IOU EE/ DR behavior pilots? • Considering these gaps and opportunities, how can the CPUC guide IOUs and third party program implementers? Options are needed to help the CPUC:	
Potential EM&V Methods: Depth interviews, secondary research	

Study Title: Whole House Market Characterization and Market Indicator Measurement	**Budget:** $400,000
Expected Completion Date: Q4 2016	**Study Manager:** ED
Description: The IOUs have proposed a market characterization study to determine whether the whole house retrofit market is an ideal Market transformation (MT) candidate. As a part of this effort, the Program Administrators (PA) and Energy Division (ED) have jointly agreed to explore three target customer segments: (1) home renovation, (2) HVAC replacement, (3) whole house retrofit. The PAs have proposed that the market characterization study be conducted by ODC and include the following **Objectives:** 1) Complete market characterization work, 2) Analyze the Home Upgrade logic model from the Navigant project 3) Operationalize the Home Upgrade recommended market indicators, and 4) Perform baseline measurement and/or counter-factual baseline.	
Objective: Complete market characterization work Analyze the Home Upgrade logic model from the Navigant project Operationalize the Home Upgrade recommended market indicators Perform baseline measurement and/or counter-factual baseline	
Key Research Questions: • Is whole house retrofit market and ideal Market Transformation candidate? • Which is preferred? • A prescriptive and/or one-off measure rebate approach? • The current Advanced Home Upgrade performance based approach? • Are there additional alternate program delivery options? • Is gas saving the future of the performance approach? • Can electric savings still be obtained somehow?	

Study Title: Whole House Market Characterization and Market Indicator Measurement	**Budget:** $400,000
• If so, how? • What are current data pointing towards?	
Potential EM&V Methods: Compare NTG ratios across customers in participating in each program design, interviews with program staff and program implementers, interviews with contractors, participant surveys, comparative data analysis using program tracking databases across each program, review and comparison of program theory/logic models, review and comparison of program implementation plans, secondary materials and data review.	

3.2.4. 2015 & 2016 EM&V Market Studies

As stated above, the CPUC plans to support internal ED staff and other roadmaps as they consider sector-specific market studies. This will be a flexible support to best meet the needs of the other roadmaps and internal ED staff. As such, specific tasks are unknown. For 2015 and 2016, the ED has a budget for this support to assure that the various PCGs discuss market studies and that market studies are included across the portfolio as needed. The ED will use the budget on a task-by-task basis and augments the previous 2013-2014 budget for PCG support. For 2016 budgets, a small amount will be maintained to ensure market studies are supported within the roadmaps.

Table 80. 2015 Market Studies EM&V Activities, Budgets and Timing

2015 Study	Study Manager (ED/IOU)	Budget	Completion Date
Total Available (2013-15)		$ 330,740	
Market Studies Support and Coordination	ED	$ 100,000	Ongoing
Market Studies Support and Coordination (2016)	ED	104,792	Ongoing

3.2.5. 2015 Study Descriptions

Study Title: Market Studies Support and Coordination	**Budget:** $100,000
Expected Completion Date: Ongoing	**Study Manager:** ED
Description: This budget will allow the ED to support the needs of the various PCGs as they discuss and implement market studies. Additionally, this budget will support internal ED staff as they consider and review market studies put forward by the IOUs.	
Objective: • Assure that market studies are considered within the sector specific PCGs • Provide quick review of IOU market study plans as needed • Train in the use of the market studies tools and maintain the tools	
Key Research Questions: No specific research questions are included for this budget	
Potential EM&V Methods: Not applicable	

4. Policy Planning Long Term Research Roadmaps

4.1. Goals and Potential Analysis

4.1.1. Background

Sector Description

The Potential & Goals (PG) study assesses the energy savings potential of all sectors in order to establish goals and targets for future portfolios and to incorporate energy efficiency impacts into the demand forecast. The current 2010-2012 cycle funding will complete the 2012 Goals Study to support the post-2014 portfolio guidance, establishing goals and energy savings targets through 2024. The 2013-2014 cycle funding will kick off the 2015 and Beyond Goals Study and the 2015 cycle funding will complete the rest of the budget. A place holder of $2 million has been set aside for future goals and potential analysis, but is not included in the current contract. The description below reflects current scope of the contract.

Programs included in the Research Scope

The Potential and Goals Study uses data from all EE programs and produces a product that is relevant to all of the utilities' programs.

Uncertainties and Challenges to Successful Implementation

This section is not applicable, since this is not a program specific study.

Recent Evaluations

A Summary Research Questions, Budgets, and Timing

The scope of the 2015 and beyond Potential and Goals study will increase from the past iterations of the study and will be established and tuned as needs arise. The RFP for the study also includes developing quantitative metrics for the Strategic Plan. The potential and goals outputs need to be finalized by Q2 of 2015 to be used in the inter-agency demand forecast. Funds are currently planned to cover the entire scope. The topic of modeling potential using alternative baselines is going to be discussed among stakeholders and policy makers. The research is currently not central to the study, but focus may need to be shifted to this area in the future.

Key Research Questions Addressed

2015 and Beyond Potential and Goals Study: The Potential Study will assess energy savings potential in the four IOUs' territories for 2016 and beyond. This study quantifies all cost-effective savings at the DEER measure group level for deemed measures groups, and then identifies the level of savings expected to be adopted by the market based on the market adoption curve. Custom measure groups are modeled using a top down approach. The Goals Study will expand and refine the model to assess the potential of various delivery mechanisms impacted by statewide initiatives and of various legislative policies and new codes. The study will build and evaluate numerous scenarios in order to determine the most cost effective portfolio of delivery mechanisms. The draft study is anticipated to be completed in Q1 2015 and the final study is anticipated to be completed in Q2 2015.

Purpose of Study: This model is used by the Commission to establish energy savings targets for the 2016 and beyond portfolio cycles, and will be the basis for the 2015 Potential and Goals Study, which will establish statewide and utility specific goals for Post 2015. The utilities are using the details of the potential study to plan their 2016 and beyond portfolios. The study also informs the CEC's demand forecast for the purposes of long term procurement planning, the CAISO's transmission planning for the purpose of maintaining grid reliability, and the Greenhouse Gas Targets for AB 32 implementation.

Emerging Analysis and Information Needs

Past & Current Needs:

- The Potential and Goals Study will provide forecasted energy savings on a cumulative and lifecycle basis.
- The study will expand and refine the estimate of commercial "operating efficiency potential," or usage based behavioral potential to include building commissioning and retro-commissioning.
- The study will expand and refine the emerging technology framework, to consider a larger number of technologies, based on the ETP database, PIER program, etc.
- Refine previous estimates of potential for the industrial and agricultural markets. Potential will also be expanded to include:
    - Mining
    - Street lighting
    - Wastewater treatment
- The study will identify the impact of financing on market potential, modeling different financing scenarios that include a combination of incentives and financing.
- The study will model bundles of measures to determine the addition economic potential of whole house retrofits.
- The study will refine behavior savings attributed to energy efficiency.
- The study will align savings for C&S to Commission policy and guidance.
- The study will add embedded energy in water savings potential from the Water Energy Nexus.

Emerging Needs:

- DEER/Potential Study update: The study will need to be refreshed with updated DEER values from the previous DEER C&S Updates and DEER non-C&S Updates. Impactful results from 10-12 evaluation will also be incorporated into the study.
- Existing conditions baseline potential is becoming an emerging policy issue that needs to be addressed in this study. The study will plan out methods to identify existing conditions baseline treatments and refine the model to provide savings potential that are calculated between the new installation and existing conditions or code baselines.

Stakeholder Needs

- CPUC: The Commission needs the completed study by mid-2015d in order to consider in the post-2015 portfolio guidance proceeding. The parties are likely to want to evaluate the scenarios before adopting the post 2016 goals.
- IOUs: The IOUs need the completed PGT model by early 2015 for their portfolio planning for the post-2015 applications.
- CEC and CAISO: Need the results of the study as an input to the demand forecast in August 2015.

Key Research Questions to Be Addressed in 2015 EM&V

- DEER Update: How has the 2013-2014 Portfolio changed the planning assumptions that the potential and goals have been built on?

Table 81. 2013-2014 Potential and Goals EM&V Studies, Budgets, and Timing

Study	Estimated Budget	Study Lead (Ed/IOU)
Potential and Goals Update for 2015 and Beyond	$4,000,000	ED
Total Budget	**$4,000,000**	**ED**

4.1.2. Study Descriptions and Objectives

Study Title: Potential and Goals Study	**Budget:**
Expected Completion Date: Q2 2015	**Study Manager:** (IOU or ED) ED
Description:	
Objective: The P&G model will be refreshed with DEER updated values and expanded upon in scope to include rate payer funded programs, impacts from statewide initiatives, and impacts from legislative policies and codes and standards updates.	
Key Research Questions:	
Potential EM&V Methods:	

4.2. Policy Studies

4.2.1. Background

The policy studies roadmap includes studies on high-priority topics that will help to inform future Commission decisions and inform broader policy discussions not directly covered by the evaluation measurement and verification goals. Some policy studies have been specifically ordered by past Commission decisions while others are scoped to provide input on topics likely to inform decision-makers on future policy questions.

The studies that form the policy studies roadmap are heterogeneous and vary depending on the policy priorities identified by the Commission and staff. Depending on the need identified, they can include studies that:

- Evaluate high priority programs and pilots not included in the sector roadmaps
- Develop and test new evaluation methods and procedures
- Survey, compile, and compare the existing literature on policies in other jurisdictions

The list above is not exhaustive; the policy studies roadmap has considerable flexibility in scope in order to be able to respond to Commission and staff needs in a timely fashion.

2013-2014 Policy Studies

The table below summarizes the 2013-2014 policy studies that have been budgeted, some of which are in the process of being implemented and others are still in the planning stage. The table provides the study manager, work order under which the study is being conducted, the corresponding budget, implementation status and expected completion date for each study.

Table 82. 2013-2014 Policy Studies EM&V Activities, Budgets, and Timing

2013-2014 Study Title	Study Manager	Budget	Status	Completion Date
Incorporating Experimental Design Techniques into Energy Efficiency Program Evaluations	ED	$296,454	Planning	Q3 2016
Evaluation of Energy Efficiency Upgrades to K-12 Public Schools in IOU Territories	ED	$262,788	Planning	Q4 2016
Energy Data Atlas	ED	$1,000,000	Re-Directed	TBD

4.2.2. 2013-2014 Study Descriptions

Below are descriptions for each of the 2013-2014 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: 2013-2014 Incorporating Experimental Design Technique into Energy Efficiency Program Evaluations	**Budget:** $296,454
Expected Completion Date: Q3 2016	**Study Manager:** (ED)
Description: This study will develop recommendations for greater incorporation of experimental	

Study Title: 2013-2014 Incorporating Experimental Design Technique into Energy Efficiency Program Evaluations	**Budget:** $296,454
design techniques into program administrator program design and evaluation. It will also identify and implement high policy priority programs that may benefit from evaluation using experimental designs, including novel approaches that may not yet have been used in the California IOU territories.	
Objective: • Recommend programs or suites of programs that could benefit from experimental design evaluations in the future in order to inform future Commission policy. • Design and implement field experiment evaluations for 1-2 current IOU programs or pilots.	
Key Research Questions: • What kinds of programs and policy processes would benefit most from greater experimental evaluation? • What are the ex post net savings attributable to selected programs or pilots?	
Potential EM&V Methods: Randomized control trials, randomized encouragement trials, recruit-and-deny trials	

Study Title: 2013-2014 Evaluation of Energy Efficiency Upgrades to K-12 Public Schools in IOU Territories	**Budget:** $262,788
Expected Completion Date: Q4 2016	Study Manager: (ED)
Description: This study will develop ex post savings estimates of gross and net savings attributable to IOU programs in K-12 schools in IOU territories in California in the context of the substantial increase in energy efficiency activity from Proposition 39 funding. The study will utilize interval data to estimate the total savings in the K-12 public schools sector as well as estimates of the savings attributable to Prop 39 and IOU funding.	
Objective: Estimate ex post gross and net savings in K-12 public schools in the 2013-2014 period. Identify methods for and estimate attribution of savings to Prop 39 and to IOU programs.	
Key Research Questions: • What are total ex post savings in K-12 public schools? • What are the net savings attributable to different funding sources? • What is the incremental impact of IOU programs on the savings generated by school projects in IOU territories?	
Potential EM&V Methods: Quasi-experimental design; billing analysis.	

4.2.3. 2015 and 2016 Policy Studies

The table below summarizes the 2015 & 2016 EM&V Studies that have been budgeted. The table provides the study manager, corresponding budget and expected completion date for each study.

Table 83. 2015 & 2016 Policy Studies EM&V Activities, Budgets, and Timing

2015 Study Title	Study Manager	Budget	Completion Date
2015 Experimental Evaluation of Baseline Pilots	ED	$500,000	Q3 2016

2015 Study Title	Study Manager	Budget	Completion Date
Other Policy Analysis and EM&V Methods (AB802, M&V2.0, macro modeling, etc.)	ED	$500,000	TBD

4.2.4. 2015 Study Descriptions

Below are descriptions for each of the 2015 studies, which include the key research questions that will be addressed, and the potential EM&V methods that will be utilized.

Study Title: 2015 Experimental Evaluation of Baseline Pilots	**Budget:** $500,000
Expected Completion Date: Q3 2016	**Study Manager:** (ED)
Description: This study, along with resources from the 2013-2014 incorporating experimental design evaluation, will evaluate the uptake, net savings, and cost-effectiveness of the IOUs baseline or 'to-code' pilots. D.14-10-046 ordered the IOUs to run pilots that would be evaluated by experimental design and required third-party evaluation. Each IOU must run a pilot budgeted at up to $1 million.	
Objective: Estimate the increased uptake, net savings, and cost-effectiveness of offering incentives based on existing conditions versus a standard code baseline.	
Key Research Questions: • How much additional activity or uptake do incentives based on existing conditions produce when compared to a code baseline? • What are ex post net savings attributable to increased incentives? • What is the cost-effectiveness of offering increased incentives based on existing conditions?	
Potential EM&V Methods: Randomized control trials, randomized encouragement designs.	

4.3. Strategic Plan Updates and Support

Published in 2008, The Energy Efficiency Strategic Plan (Plan) has provided the Energy Efficiency market and California's regulatory agencies a vision and roadmap for programs that reduce the state's energy usage. Some examples of the Plan's outcomes include:

- Zero Net Energy (ZNE) is widely recognized as a statewide goal, with the Governor's office ordering all new state buildings to be ZNE.
- Per the "zero net energy" vision in the Plan, California's building codes and standards are increasingly changing to where ZNE will be the norm for new buildings in California via Title 24.
- Per the Energy Efficiency financing strategies outlined in the Plan, the CPUC now has pilots for financing major energy efficiency retrofits.
- The Plan called for an active stakeholder group to grapple with the many challenges facing the state's HVAC industry. As a result, the Western HVAC Performance Alliance was formed, and is actively working to improve the effectiveness of HVAC programs.
- Per legislation that came about because of the Plan, there is now a goal of 100 percent of low income residents in California to participate in the Energy Savings program.
- Continuous Energy Improvement is being implemented on a pilot basis, and is recognized by some as a viable energy management tool.
- The state now has a statewide marketing platform "Energy Upgrade California," as the Plan recognized the importance of statewide marketing, education, and outreach.
- The Plan continues to be used as a guidance document for energy efficiency policy direction and programs.

Since the Plan was published, however, much in the demand-side energy sector has changed. Many of the goals and strategies are no longer relevant as they have been accomplished, were unrealistic to begin with, were overly ambitious, or need an update. In addition, the market for energy efficiency and other demand side programs has changed. For instance, nearly all California homes now have Smart Meters, which can potentially give both ratepayers and utilities granular information about energy usage, while rooftop solar, demand response, energy storage and electric vehicles are poised to reinvent the way energy is managed for ratepayers.

The update described below is currently underway with budgets available from 2013-2015 EM&V allocations. A budget of $500,000 from the 2016 budget has been set aside in Energy Division funds to address future updates which have not yet been defined.

4.3.1. The 2015 Strategic Plan Update – Vision and Purpose

Plan Vision: The draft vision (per staff proposal, May 2014) for the 2015 Plan update:

Californians highly value energy, water and other resources, and are inspired to undertake sustainable consumption reduction activities as the state builds a thriving, low-carbon energy market that dramatically reduces greenhouse gas emissions.

The 2015 Plan update will emphasize a whole-building approach and continue to pursue ZNE buildings as a guiding vision. The 2015 Plan update will include vetting and synthesizing of data to produce measurable short, mid, and long-term goals, including market characterization data and the Potential and Goals study. (Whether or not the 2015 Plan update will include a cost effectiveness screen is yet to be determined).

Plan Purpose: The plan should inform post-2015 energy efficiency and other IDSM guidance documents, including a re-evaluation of the big bold goals, and should inform the IDSM proceeding. The Plan should also serve as a vision document for how to deliver seamless program offerings for energy efficiency and other demand side programs that are currently siloed. It should greatly influence R.13-11-005, the Energy Efficiency proceeding.

Proposed Factors: The 2015 Plan updating process began in 2013 with internal staff interviews and meetings, which led to the findings of this work plan. In 2012 and 2013, Commission lead staff and their consultants were interviewed regarding the need for an appropriate scope and focus of a Plan update. Recommendations identified in these interviews are summarized below.

- **Goal Setting and Metrics**: The goals will be more metrics based. The steps to establish new goals are:
    - Define metric;
    - Determine baseline;
    - Set goals for 2020 and 2025; and
    - Establish interim targets.

This work should be in tandem with the next iteration of the Potential and Goals study. When possible, the metrics should be tied to actual energy savings. Goals should be plotted over time, rather than having one goal for an endpoint (for example, energy usage will decrease 5 percent per year leading to a total reduction of 50 percent by 2024). The planning process should also consider how to leverage the areas with the greatest potential in order to maximize what is prescribed in the Potential and Goals study, while considering the impact of more stringent building codes beginning in 2019. Navigant has been hired to do this work.

- **Plan Format**: The update will have reduced prose and expanded goals. Chapter formats will be decided in meetings and discussions with staff. While the Plan update will include some implementation steps, the details of how to achieve goals will be in the action plans. Chapters will be broken down by building types, and cross cutting issues will be incorporated into those chapters. There should be a universal approach to writing each chapter and calculating and reporting metrics.
- **Coordination of On-going or Existing Work**: Chapters will leverage existing work with stakeholder groups, consultants, and Commission staff. For example, the Plan update will build upon and complement the AB 758 Action Plan and the Commission will work with the CEC on to ensure consistency. Commission staff will contribute to the creation of the AB 758 Action Plan, and will incorporate the final actions of the AB 758 Plan into the Plan update, where appropriate and as a result, the stakeholder process will be reduced. In addition, there are several Action Plans which will provide the basis for the new buildings and cross cutting areas.
- **Integrated Demand Side Management**: To continue the ZNE vision, The Plan update will include analysis and goals of non-energy efficiency factors such as distributed generation, demand response, EVs, water savings, and Smart Meter-enabled technologies. The Plan may not treat these with the same rigor as the energy efficiency technologies, but rather will ascribe “soft” goals to them extrapolated from their related proceedings and state initiatives. The Plan needs to take into account the shift of moving demand response from IOUs to third party implementers (aggregators). The Plan should develop a vision for some ideal combination of customer-owned generation, low energy devices, energy storage, and energy efficiency. It could consider how best to design a rate structure and incentives that are best for the customer. EVs should be considered as both a load

factor and as a source of energy storage. The Plan may consider exceeding the goals in the Governor's Electric Vehicle Action Plan.

The non-EE proceedings that may be used for background include:

- Alternative Fueled Vehicles (R.13-11-007)
- Demand Response (R.13-09-011)
- Distributed Generation (R.12-11-005)
- Energy Storage (R.10-12-007)
- Smart Grid (R.08-12-009)
- Water-Energy Nexus (R.13-12-011)
- Net Energy Metering Successor Tariff (R.14-07-002)
- Energy Upgrade California Marketing Education & Outreach (currently without an open proceeding)
- Residential Rate Reform (R.12-06-013)

Chapters: The 2015 Plan update, as currently envisioned, will be divided into four main chapters, with one other under consideration:

1. Commercial Buildings
    a. Existing
    b. New
2. Residential Buildings
    a. Existing
    b. New
3. Industrial (including water treatment and food processing)
4. Local Government (this could possibly be considered cross cutting).
5. Agriculture (under consideration)

These cross-cutting technologies, initiatives, and programs may be included in these chapters as appropriate:

- Lighting
- HVAC
- Workforce Education and Training
- Marketing Education and Outreach
- Low income programs
- Codes and Standards
- Customer-owned generation
- Research and Technology
- Electric vehicles
- Rates
- Behavior
- Water
- Electric vehicles
- Demand response
- Financing

In 2015, Energy Division requests a total of $600,000 for activities around the updating and the implementation of the Energy Efficiency Strategic Plan. These funds break down as follows:

Covered with 2013-2014 Funds

- **Strategic Plan Adviser ($225,000) –** These funds have already been allocated. This will fund a single advising consultant to the Strategic Plan, who will work as a project manager and analyst to assist in the 2015 update to the Plan. Herter Energy has been selected as the consultant for this, and will begin in late April or May of 2015.
- **Lighting Action Plan ($50,000) –** A continuation of the work being done by DMV Kema to continue stakeholder outreach and appropriate updates to the Lighting Action Plan.
- **Research and Technology Action Plan ($50,000) -** A continuation of the work being done by Itron to continue stakeholder outreach and appropriate updates to the Research and Technology Action Plan.
- **Residential ZNE Action Plan ($50,000) -** A continuation of the work being done by Bluepoint Planning to continue stakeholder outreach and appropriate updates to the Residential ZNE Action Plan.
- **ZNE Commercial Education and Outreach ($50,000) –** A continuation of the work being done by New Buildings Institute to continue ZNE education and outreach., namely ZNE Early Adopter activities, ZNE Commercial Stakeholder Strategic Plan update and meeting support, ZNE Bulletin, ZNE Bldg Recognition program technical support.

Continued Strategic Plan Activities through 2017 ($125,000) – This funding, will be used as needed for additional tasks. These could include (but are not limited to) additional work on the Local Government Action Plan; Production costs for the Strategic Plan (such as editing, design, and printing); Additional tasks needed for the Industrial Action Plan not covered by the current budget.

Table 84. Additional Strategic Plan Activities and Budgets

Project	Vendor	Amount	Funding Source
Strategic Plan Adviser	Pending RFP	$225,000	2013-2014
Lighting Action Plan	DNV – Kema	$50,000	From Market Studies 2013-2014 budget
Research and Tech AP	Itron	$50,000	From Market Studies 2013-2014 budget
Residential ZNE AP	Bluepoint	$50,000; (2013-2014 $25,000 (2015)	2015 (other funding for this in Market Studies 2013-2014 budget)
ZNE Commercial Education and Outreach	New Buildings Institute	$50,000 (2013-2014) $25,000 (2015)	2015 (other funding for this in Market Studies 2013-2014 budget)
Additional tasks	TBA	$75,000	2015
Total		**$600,000**	**2013-2015**

4.3.2. Action Plans

In addition to the Strategic Plan, there will be on-going work to publish and implement Action Plans on specific topics. These Action Plans are designed to (a) identify the key actions required to achieve Plan milestones; (b) secure leaders ("champions") to achieve these actions; (c)track and report on progress; and (d)feed into the development of the Strategic Action Plan Progress Reports. The Action Plans are

designed to achieve milestones identified in the Strategic Plan by working with Strategic Plan champions. They are listed below.

Codes and Standards

Currently the Commission is collaborating with the California Energy Commission and other stakeholders from the IOUS on a Codes and Standards (CS) Action Plan. This will cover both buildings (Title 24) and appliances (Title 20). The Codes and Standards Action Plan is expected to be published by the end of 2012, and its implementation will continue into 2013. Work includes:

- Work with CPUC staff on the planning and management of CS Action Plan-related activities.
- Strategize with CPUC staff on implementation adaptations needed due to changed conditions between now and the time when Strategic Plan activities were originally conceived.
- Help CPUC staff address implementation overlaps and assist with coordination of the different chapters/topics in the Strategic Plan as they relate to CS.
- Support the Action Plan Champions for CS plans.
- Work with CPUC staff in helping coordinate with other state agencies, such as California Energy Commission and the Air Resources Board.
- Provide technical and policy work supporting investor-owned utility activity on Zero Net Energy (ZNE) roadmaps and ZNE activities as they relate to CS action plans.
- Coordinate with Residential and Commercial ZNE Activities
- Other topics as may be requested by the CPUC Project Manager and related to CS action plan.

Residential Zero Net Energy New and Existing Buildings

This project supports Energy Division to develop and launch a Residential Zero Net Energy (ZNE) Building Action Plan and associated ZNE residential stakeholder engagement activities. It will also support ongoing stakeholder engagement on the residential chapter of the Strategic Plan, particularly in the area of whole house energy upgrades. The CPUC and the Energy Commission have endorsed the goal that all new residential buildings shall be zero net energy buildings by 2020. The Strategic Plan also includes ambitious milestones for upgrades of existing California homes to reduce demand from the grid by 40% by 2020. Work in this area shall include:

- Drafting, launching and maintaining the Residential Zero Net Energy Action Plan (currently underway).
- Conducting stakeholder engagement activities in the area of ZNE residential buildings, including: periodic ZNE Action Group and subgroup meetings, calls and other outreach activities; management of a ZNE Residential inter-agency Coordinating Committee, stakeholder Advisory Group, and ZNE Action Group working group leaders and champions; coordination between the ZNE Residential and other Action Plans, particularly the Research and Technology, Codes and Standards and HVAC Action Plans; and other related activities as deemed appropriate.
- Research and technical support for the creation of improved public information on ZNE residential buildings including an online database, and printed formats.
- Support for stakeholder engagement activities in the area of whole house energy upgrades
- Support for research, stakeholder engagement and other activities in the area of whole house energy upgrades; the AB758 process; AB758 Action Plans; and related comprehensive whole home upgrade programs and activities.

Industrial

To address the Strategic Plan's industrial sector goals, Energy Division (ED) is drafting the Industrial Action Plan. Based on the milestones and goals outlined in the industrial chapter of the Strategic Plan, the Industrial Action Plan identifies champions and the intermediary steps necessary to achieve maximum energy efficiency in the industrial sector. The Industrial Action Plan is the first step towards meeting the industrial sector goals. The Industrial Action Plan may be rolled into the 2013 update to the EE Strategic Plan. Planning will include working with industrial stakeholders, as well as ensuring that the Action Plan is consistent with state goals detailed in the AB32 Scoping Plan.

Research and Technology

This project supports Energy Division work related to the Strategic Plan. The contractor, Itron, is providing technical assistance to CPUC staff on the Strategic Plan Support for developing the Action Plan related to Research and Technology (RT) chapter of the Strategic Plan. In addition, this work supports the implementation of the Market Intelligence and Integrated Building Design chapters of the RT Action Plan.

CPUC support work will include:

- Working with CPUC staff on the planning and management of RT Action Plan-related activities.
- Strategizing with CPUC staff on implementation adaptations needed due to changed conditions between now and the time when Strategic Plan activities were originally conceived.
- Helping CPUC staff address implementation overlaps and assist with coordination of the different chapters/topics in the Strategic Plan as they relate to RT.
- Support the Action Plan Champions for RT plans.
- Work with CPUC staff in helping coordinate with other state agencies, such as California Energy Commission and the Air Resources Board.
- Provide technical and policy work supporting investor-owned utility activity on Zero Net Energy (ZNE) roadmaps and ZNE activities as they relate to RT action plans

Implementation support work will include:

- Appoint a part time person to coordinate the activities of the group and to keep parties engaged. This activity has been already funded with existing funds of WO 73 – estimated $ 48,000/year (20 hours/month) each chapter.
- Provide initial funding for implementation activities. These may include but not limited to:
    - Staff to carry out administrative activities of the collaborative such as invoicing, logistics, activity logs, etc.
    - Travel and per diem when necessary for parties to attend meetings and related implementation events.
    - Venue booking and other necessary costs to support meetings.

Requested implementation funding: $200,000 /year for the first year for each chapter, total $400,000/year for the first year.

The implementation activities were expected to have been funded in partnership with CIEE. As this option is no longer available, ED proposes to have this activity funded out of the Strategic Plan funds or a new WO if necessary.

Other topics may be requested by the CPUC Project Manager related to the RT action plan.

This work will be performed under the overall supervision of Energy Division. In performing these tasks, Itron will follow an administrative and coordination process developed by ED. All work performed under this work order will be subject to pre-approval by the ED Project Manager and shall be done at the ED Project Manager's discretion. These tasks are expected to be carried out throughout 2013 and target the first year of implementation of the plan.

Commercial Zero Net Energy (ZNE)

The purpose of this work is to support the CPUC with strategic planning and implementation of the ZNE Commercial Action Plan, including assisting with management and coordination of a network of key leaders in industry, nonprofits and government.

This includes consulting to the CPUC on the ongoing implementation of the ZNE Action Plan for Commercial Buildings. Support includes strategy development for market acceptance and participation in ZNE goals, providing specific technical input on critical topics and ongoing planning and coordination functions. Tasks may include:

- Participation in bi-weekly coordination meetings with CPUC to set priorities, plan quarterly meetings and workshops, and track critical policy, program and technical issues related to implementation of the Commercial Action Plan and coordination of the Champion Network
- Supporting the CPUC with planning and coordination of quarterly ZNE workshops, meetings and webinars including assistance with agenda development, event planning, development of meeting presentations and materials, facilitation of meetings and breakout sessions, and note taking and distribution to ZNE stakeholders.
- Updating the 2010-2012 ZNE Action Plan for Commercial Buildings
- Ensuring coordination amongst Action Plans
- Convening ZNE Early Adopters to share best practices
- Continuation of ZNE Bulletin

Other topics may be requested by the CPUC Project Manager related to the Commercial ZNE action plan. This work will be performed under the overall supervision of Energy Division. In performing these tasks, consultant will follow an administrative and coordination process developed by ED. All work performed under this work order will be subject to pre-approval by the ED Project Manager and shall be done at the ED Project Manager's discretion.

Energy Efficiency Financing

The 2008 Action Plans included a sprinkling of goals and strategies that touched on energy financing across all sectors; there was not a dedicated Energy Finance Action Plan.

Given that there is a yawning gap between the forecasted annual investment needed to meet the past Strategic Plan statewide goals (~$4B)[54] and the amount of (predominantly ratepayer subsidized) capital

[54] 2011. Harcourt Brown and Carey: Energy Efficiency Financing in California: Needs and Gaps. Prepared for the California Public Utilities Commission. Page 4.

that is currently invested in energy efficiency in the state (~$2B)[55], we anticipate that bold long-term plans for energy finance will be woven into the 2013 Strategic Plan Update. We also anticipate that a contractor will be hired to support this work.

Lighting

To date, this work assigned staff from KEMA to support the Energy Division with its strategic planning efforts related to lighting and the lighting action plan as well as strategic support and advice regarding the IOU's 2010 – 2012 LMT Program.

Specifically, this work involves quantifying the baseline energy use for lighting, drawing on the work from Navigant's potential and goals study and the CEC's demand forecast team. The baseline energy use must also undergo peer review from internal Energy Division consultants as well as through collaboration with the CLTC. Additionally, there may be more peer review teams formed to aid in the review process (utilities, EMV folks, stakeholders, etc.)

Once the baseline energy use is quantified, this work involves identifying what actions, through the lighting action plan, can actually drive lighting consumption down to the target levels identified in the Strategic Plan and the Lighting Chapter, as adopted by the Commission. This will involve meetings with experts and key stakeholders to define and quantify the actions that will lead to quantifiable progress towards meeting this goal.

After identifying the action that will lead to quantifiable progress, implementation of these actions must happen, and the implementation must be tracked and reported on to ensure successful completion of the actions and thus successful accomplishment of the visionary goals set forth by the Commission. This will involve developing a proper framework for project management of the implementation and scheduling routine check-ins with stakeholders to report on progress.

In order for the implementation of the actions to influence Commission proceeding, the actions must feed into the regulatory decision making cycle. This will involve assisting Energy Division write position statements that will be used to influence the eventual design of the IOU EE programs, or policy documents that may be used to influence other activity outside of the CPUC's jurisdiction.

Finally, as progress is tracked and goals eventually met or not met, this task will require multiple reporting requirements, as defined by the Energy Division Strategic Plan lead.

Table 85. 2013-2014 Strategic Plan Studies, Budgets, and Timing (from '10 – '12 budget)

Work Order	Study Lead (Ed/IOU)	Study	Estimated Budget
W0068, & 8	ED	Strategic Plan 2013 Update Support	Closed
WO071	ED	Industrial Action Plan Development	$18,000
WO072	ED	Codes and Standards Action Plan	$19,000
WO073	ED	Research and Technology Action Plan	$74,000
WO074	ED	Commercial ZNE Action Plan	$4,000
WO075	ED	EE Financing Support	$8,000

[55] Ibid.

Work Order	Study Lead (Ed/IOU)	Study	Estimated Budget
WO076	ED	CA EE Strategic Plan Staff Support	closed
WO007	ED	Lighting Action Plan	0
WO77	ED	Residential Whole House and Zero Net Energy Action Plan support	$35,000
Total			**$158,000**

4.4. Ex Ante Review and Database for Energy Efficiency Resources (DEER)

4.4.1. Background

Program Area Description

Ex ante estimates stemming from the Database for Energy Efficient Resources (DEER), along with non-DEER work papers and custom projects, serve as a starting point in the planning and forecasting of the impacts and cost-effectiveness analyses of energy efficiency programs in California. The DEER provides ex ante estimates for "deemed" energy efficiency measures which are commonly installed in the residential and non-residential market sectors. Non-DEER work papers provide ex ante estimates for deemed measures that are used or located (e.g., varied hours of use and/or climate zone) in a way that differs from the DEER. Custom projects refer to site-specific ex ante estimates that are calculated on a project-by-project basis. Custom projects usually, but not always, involve a combination of measures.

The DEER contains estimates of a measure's natural gas and electrical typical gross impacts, incremental cost, net-to-gross (the number of program participants who would have implemented the measure without the utility program), and effective useful life. The estimates are based on previous evaluation studies, pilot tests, engineering calculations, building simulations, measurement studies and surveys, econometric regressions, or a combination of approaches; ex ante estimates are not based on the real-time results of the current program cycle.

Programs included in the Research Scope

The DEER and ex ante estimates are used in all EE programs for cost-effectiveness analysis. As such, all programs are potentially included within the DEER and ex ante research scope. No additional budget is needed from the 2015 or 2016 EM&V allocation to complete ex ante and DEER scope in the next year.

Uncertainties and Challenges to Successful Implementation

One challenge facing ex ante estimates is that, to date, limited field work has been performed to study very specific and precise data points that feed into building modeling parameters (e.g., effective useful life). Additionally, market transformation and economies of scale create price volatility for many energy efficiency measures, thereby requiring updates to cost data for measures that constantly change their relative contributions to the energy efficiency portfolio. Efforts are being made to improve communication and coordination between the ex ante and evaluation teams to collect data to better inform ex ante estimates in a timely manner.

Another challenge facing ex ante estimates is the time lag in measuring and verifying program impacts and the early need for data to feed into a DEER update. Data from evaluation, measurement and verification (EM&V) studies and surveys improve the accuracy of engineering calculations and building simulations by updating changes in hours of use, energy savings baselines, measure costs, effective useful lives, and net-to-gross ratios related to equipment performance, technology advancements, and economies of scale. However, verified data from EM&V studies are often not available until several months or years after a cycle is complete. This poses a challenge for including the most recent data into a DEER update because data in a DEER update is vetted approximately one year ahead of an application deadline and finalized approximately seven months ahead of an application deadline (e.g., if a portfolio application is due in July 2014, data for the DEER update is vetted beginning in July 2013 and finalized by

December 2013). Given that ex ante estimates affect all energy efficiency programs, continuing to improve ex ante estimates for energy savings and measure costs is paramount to accurately tracking program impact and portfolio composition. Energy Division is working on synchronizing the timing of EM&V studies with DEER update data needs by increasing coordination between the EM&V and ex ante teams.

Emerging Evaluation and Information Needs

One identified need for DEER and ex ante is to narrow the gap in timing and data resources among evaluation studies, DEER, and portfolio planning efforts. A Request for Proposals was put out to procure a contractor for the 2013-2014 cycle (as well as for 2015 and beyond) to assist in updating DEER measure parameter values, review utilities' non-DEER work papers and custom projects, and to conduct research and analysis in support of Energy Division's regulatory and policy oversight. The contract has been in place since October of 2013.The contractor or contractor team under the DEER contract will be expected to work with Energy Division to address research needs consistent with this research roadmap.

Ex ante research needs can be divided into two areas: (1) improving the DEER values for existing measures, and (2) data validation support for ex ante estimates for new measures (i.e., non-DEER work papers). EM&V can be used for improving the DEER and non-DEER work paper values for in-cycle measures through impact evaluation studies.

In discussions regarding funding for ex ante research needs, the utilities identified which work papers require supporting research. This includes the HVAC Quality Maintenance program; light emitting diode (LED) effective useful life, unit energy savings, and adoption; display cases; ovens, fryers, and cookers; exhaust hoods; and power management for networked computers. Many of the identified research needs will be address by EM&V activities planned in the appropriate sectors. For example, the HVAC impact evaluation studies planned for the residential and commercial Quality Installation and Quality Maintenance programs will help develop more robust ex ante estimates for those programs in the subsequent program cycle. Similarly, the technology assessment research proposed in the residential sector will broaden the software options available for developing ex ante estimates of whole house retrofits. Further, LED lab testing and lighting market assessment activities will supplement EM&V activities in the lighting sector. These research activities will improve DEER and ex ante estimates for unit energy savings, baseline technologies, and effective useful lives for the targeted measures.

Ex ante estimates for new measures, including technologies originating in the utilities' Emerging Technologies Program, will need additional research. Ex ante estimates for new measures are commonly developed by utilities and vetted by Commission staff through the work paper development collaboration process and custom project review process. Development of ex ante values for new technologies originating in the Emerging Technologies Program should come through the work paper development collaboration process as directed by the Commission. Coordination between the emerging technology team and demand-side analysis team (at the utilities and the Commission) is needed to ensure that development of ex ante estimates is as streamlined and efficient as possible.

Key Research Questions To Be Addressed in 2013-2014 EM&V

A DEER Update Plan is currently under development. The DEER Update Plan will address 2014 codes and standards updates and may also address other needs identified by utilities, stakeholders, and Energy Division. Research needs include:

- Update load shapes
- Effective Useful Life/Remaining Useful Life updates (particularly for LEDs)
- Additional data to inform the interactive effects model
- Lab testing to supplement the HVAC Quality Maintenance site data
- Television impact evaluation
- Exhaust hoods demand-controlled ventilation
- Power Management for networked computers
- Participant costs, net-to-gross, and realized energy savings in the Whole House Upgrade program
- Commercial and residential saturation studies to determine baseline technologies
- Baseline study for refrigerated food display cases
- Operating hours, food production rates, baseline efficiency data for target population for convection ovens, conveyer ovens, fryers, and steam cookers

As identified above, a Request for Proposals is out to procure a contractor for the 2013-2014 cycle (as well as for 2015 and beyond) to assist in updating DEER measure parameter values, review utilities' non-DEER work papers and custom projects, and to conduct research and analysis in support of Energy Division's regulatory and policy oversight. Research needs will be addressed as resources and staffing are available under the new DEER contract.

EM&V studies proposed in other sectors will address some DEER and ex ante research needs. Specifically, studies planned in the HVAC, Lighting, and Residential sectors will address the following:

1. HVAC
    a. Impact evaluation of residential and commercial Quality Installation and Quality Maintenance programs;
    b. Impact evaluation of deemed HVAC measures;
    c. HVAC lab testing;
    d. Effective useful life, persistence, and measure cost updates for HVAC measures; and
    e. Minimum variable air volume box flowrate study.
2. Lighting:
    a. LED lab test;
    b. Lighting impact evaluation (includes LEDs and other emerging lighting measures/technologies, other general study support, and other ongoing work paper support);
    c. Lighting market assessment activities; and
    d. Lighting interactive effects study.
3. Residential:
    a. Technology assessment of whole house modeling software;
    b. Residential impact evaluation (includes consumer electronics, appliance recycling, appliances, cooling, building envelope, apartment pools, and other general study items);
    c. Home Energy Advisor Survey impact evaluation.

Please refer to the HVAC, Lighting and Residential research roadmaps for study descriptions and research questions proposed under those sectors.

A Summary of 2013-2014 EM&V Studies, Budgets, and Timing

Table 86. 2013-2014 Ex Ante Review and Database for DEER EM&V Studies, Budgets, and Timing

2013-2014 Study Area/Title	Study Manager (ED/IOU)	Budget	Completion Date
Impact			
DEER and All Ex Ante Regulatory Support	ED	$8,000,000*	October 2013- October 2016
Ex Ante Development and Tracking Support	ED	$3,100,000	TBD

*Funding was sourced ½ from 2010-2012 and ½ from 2013-2014 EM&V authorization

4.4.2. Study Descriptions

The study descriptions listed below cover the four work areas included in the DEER RFP currently out for bid. As such, some details, such as budget and completion date, for each work area are not available at this time.

Study Title: Work Area 1: DEER Values Updates	**Budget:** Not available, please refer to the table above for total budget amounts
Expected Completion Date: Ongoing	**Study Manager:** ED
Description: Maintain, support and update the DEER. Activities include additions and improvements to the methods used to develop DEER values, updates to parameter values based on the latest research and evaluation results, incorporation of Federal and State codes and standards updates, and additions to support ex ante values to be utilized in the IOUs portfolio planning and implementation during the contract period.	
Objective: Update DEER values with the best available information to enhance the database values' accuracy, applicability, usability, and functionality.	
Key Research Questions: Which DEER values have a high uncertainty? What codes and standards are coming into effect that will affect baseline assumptions?	
Potential EM&V Methods: Leverage the impact evaluations planned in other sectors to update DEER values.	

Study Title: Work Area 2: Non-DEER Work paper Reviews and Dispositions	**Budget:** Not available, please refer to the table above for total budget amounts
Expected Completion Date: Ongoing	**Study Manager:** ED
Description: Assist ED in the review of utility non-DEER measures work papers, including collaboration with the utilities during their draft work paper development, and preparing work paper reviews and recommendations of utility submitted work papers for ED approval.	
Objective: Assist ED in the review for reasonableness and appropriateness of IOUs non-DEER measures work papers, including collaboration with the utilities during the draft work papers development stage. Prepare work paper reviews and review dispositions of utility submitted work papers for ED approval. The reviews will consist of the non-DEER measures' ex ante parameter values such as impact, free-	

Study Title: Work Area 2: Non-DEER Work paper Reviews and Dispositions	**Budget:** Not available, please refer to the table above for total budget amounts
ridership, effective useful life, and cost.	
Key Research Questions: Are there non-DEER measures that represent a significant portion of savings claims? How can work paper reviews be streamlined to maximize efficiency for ED and IOUs?	
Potential EM&V Methods: Leverage planned market studies to help establish baseline assumptions.	

Study Title: Work Area 3: Custom Measure/Project Review and Disposition Process	**Budget:** Not available, please refer to the table above for total budget amounts
Expected Completion Date: Ongoing	**Study Manager:** ED
Description: Assist ED in the review of selected utility custom projects/measures, including preparing written review recommendations for custom projects/measures, and updating and maintaining the contents of a database of custom projects and measures.	
Objective: Assist ED in the review for reasonableness and appropriateness of the ED-selected IOUs custom measures and projects. Prepare review disposition findings for these selected projects for ED approval of the projects' ex ante parameter values.	
Key Research Questions: How can custom measure and project reviews be streamlined to maximize efficiency for ED and IOUs? What kinds of custom projects are utilities implementing? Are these project types generally similar from portfolio cycle to cycle?	
Potential EM&V Methods: Leverage planned market studies to help establish baseline assumptions. Implement surveys to determine net-to-gross for custom measures and projects.	

Study Title: Work Area 4: Analysis and Regulatory Support	**Budget:** Not available, please refer to the table above for total budget amounts
Expected Completion Date: Ongoing	**Study Manager:** ED
Description: Conduct research and analysis in support of regulatory policy and oversight. Activities will include, but are not limited to, development and implementation of an integrated approach for incorporating data from the frozen ex ante dataset with existing avoided costs values into a cost-effectiveness calculator.	
Objective: Assist ED in review and verification of utility submitted program planning cost-effectiveness calculators. Design and implement an approach to incorporate data from the Commission-approved frozen ex ante dataset and the Commission-approved avoided cost methodology into the existing cost-effectiveness calculations. Provide ED ad hoc technical support, analysis, and research.	
Key Research Questions: How can review of utilities' portfolio cost-effectiveness be streamlined and improved? What are the available approaches for developing a frozen ex ante dataset?	
Potential EM&V Methods: Coordinate with planned EM&V studies in other sectors to identify where research needs overlap.	

Study Title: Ex Ante Development and Tracking Support	**Budget:** $3,100,000
Expected Completion Date: TBD	**Study Manager:** ED

Study Title: Ex Ante Development and Tracking Support	**Budget:** $3,100,000
Description: The purpose of the Ex Ante Development and Tracking Support is to improve efficiency of internal ex ante data development processes, to provide better transparency of update efforts and modeling assumptions, and to improve coordination between ex ante, ex post, and reporting processes.	
Objective: Support ex ante activities.	
Key Research Questions: n/a	
Potential EM&V Methods: n/a	

5. Processes and Procedures Supporting the Evaluation

5.1. Management of Energy Division EM&V Effort

Oversight of the energy efficiency EM&V is the responsibility of Energy Division's Demand Side Management Evaluation Section. The supervisor and staff in this section are responsible for the development and execution of this plan in coordination with the EM&V staff at the investor owned utilities or IOUs.

Energy Division has designated staff lead roles in 12 sector/program specific areas, as reflected in the PCGs, and three study type lead roles.

- The **sector/program area leads** are responsible for tracking all studies (IOU or ED-led) in their assigned sector or program area. They are responsible for convening the project coordination group with the IOUs to coordinate research and to ensure open lines of communication for vetting plans and results from all studies. Staff frequently lead the ED studies in their sector area but may share this responsibility with other ED staff.
- **Study type coordinators** are responsible for understanding the breadth of a specific type of study being conducted to identify needs for consistency in methodology or outputs. The best example of this is the Impact Study lead. This individual is responsible for ensuring that the impact methods are consistent where appropriate and that studies are completed on time to feed portfolio wide analysis.
- **Support leads** also exist for Data management, reporting, contracting, and other areas that are necessary for keeping the EM&V activities moving forward.

Energy Division hires contractors to support the EM&V effort in two primary ways:

- Advisory Consultants provide assistance to Energy Division in overseeing the implementation of program evaluation projects and related studies conducted by various evaluation contractors. Advisory Consultants provide expert analysis and advice to Energy Division staff for on-call advice and consulting; special research projects at the request of the Energy Division contract manager and on an ad-hoc basis. Advisory Consultants are also paired with Energy Division staff that are serving as sector or study area coordinators to support them in coordinating work across the sector or study area, ensure that deliverables are on schedule and meeting expectations, and ongoing prioritization of work within the sector or study area.
- Prime Evaluation Contractors are hired by the Energy Division to lead the execution of that evaluation plan. Prime Evaluation Contractors and their subcontractors perform evaluation, measurement and verification activities with respect to energy efficiency programs implemented by the California lOUs and under the supervision of Energy Division staff.

More detailed management and organizational diagrams can be provided upon request.

5.1.1. Data Management

Background

Since Energy Division assumed responsibility for energy efficiency evaluation (post 2005 EM&V) we have developed a standardized dataset of savings information, which allows for review of savings values and informs incentive payment awards. This dataset also forms the foundation for impact evaluation and public tracking of savings, costs, goals and emissions reductions. The foundation for this activity is the data, and data standardization has been a core effort of the evaluation data team in collaboration with the IOUs over the past several years. The reporting framework is designed to enable frequent updates on the progress of savings and highlight evaluation findings. This framework ensures the timeliness and relevance of evaluation expenditures as well as summarizes accomplishments at the end of a program cycle. Together these support activities are essential to executing and realizing value from this proposed EM&V plan.

The Energy Division maintains the California Energy Efficiency Statistics website (EEStats.cpuc.ca.gov), containing the full set of IOU program tracking data and evaluation updates from the 2010-2012 program cycle, as well as program tracking data for the current 2013-15 cycle. The dynamic format of EEStats allows users to filter data for savings, expenditures and other types of data mining.[56]

Data Management Accomplishments

Significant progress has been made in data management and the systems, approaches, and knowledge have improved and continue to build on progress since the 2006-2008 cycle. The key accomplishments in this time period, and the building blocks for the next program cycle, include:

- A single data repository of Program Administrator energy efficiency tracking data has been created for centralized access by multiple users.
    - Specialized expertise in integrating the standardized dataset with other critical data systems, such as the ex-ante data set and cost effectiveness calculations.
    - The standardized dataset which better meets the needs of the multiple uses such as:
    - *Directly applicable to updating goals and potential model*
    - *Source for evaluation planning and sampling*
    - *Available for monthly, quarterly and annual reporting (or interim queries)*
    - *Adaptable to incentive mechanism variations*
    - This standardized data set and framework serves as a resource for staff and external parties and provides a consistent, centralized source of information about the expenditures, savings and cost effectiveness of the energy efficiency portfolio investments.
- Regular working meetings with the IOUs, RENs and CCAs, including an in-person reporting PCG with full PA attendance, to improve communication and understanding of data sets and processes used in meeting the CPUC's reporting requirements. These group meetings resolved several short term

[56] California Energy Efficiency Statistics – http://eestats.cpuc.ca.gov/

issues in order to meet, and incrementally improve, reporting each quarter and conform with policy direction on reporting requirements.

5.1.2. Data Management and Reporting Project List for 2013-2014

The table below summarizes the 2013-14 EM&V Projects that have been budgeted. The table provides the Project manager, the work order under which the Project is being conducted, the corresponding budget, and the implementation status.

Table 87. 2013-2014 Data Management Studies Summary

Project	Project Manager	WO Number	Budget 2013-2014	Status
Energy Division Annual Report	ED	ED_I_Data_2	$185,000	Underway
Data Management	ED	ED_I_Data_1	$1,650,000	Underway
Public Data Requests	ED	ED_I_Data_7	$150,000	Underway
CEDARS - Automated Data Submission Tool – Tracking Module	ED	ED_I_Data_4	$350,000	Underway
Total			**$2,335,000**	

5.1.3. Data and Reporting Project Descriptions for 2013-2014

The primary objectives and goals for the data and reporting activities in the 2013-2014 cycle are provided in this section.

Data Management

The total proposed budget for data management is $1.45 million.

Study Title: Data Management – 2013-14	**Budget:** $1,650,000
Expected Completion Date: Continuous through end of the current contract in 2016.	**Project Manager: (**ED)
Description: This project includes conducting the following activities: processing IOU tracking, CIS, billing, and interval data, working with evaluators to ensure they have everything needed for timely evaluations, having regular meetings with the program administrators to continue to increase data quality and coordination, responding to data requests from stakeholders, designing and managing systems to ensure efficient processing and appropriate access of data, and coordinating with the DEER/ex-ante team,.	
Objective: • Process IOU data efficiently in order to ensure high quality data. • Continue to improve data quality and data flow moving towards compliance with AB270. • Provide timely, high quality data to key parties including CPUC staff, EM&V contractors, IOUs, PAs, DEER/ExAnte team, and other stakeholders. This includes data at various levels including high level summaries, standardized and quality controlled detailed claim level data, measure level tables, and data required for EE Stats. • Manage a system whose required inputs are not overly burdensome on any party. • Manage a system that has well defined processes/procedures and appropriate change management protocols.	
Key Project Questions:	

Study Title: Data Management – 2013-14	**Budget:** $1,650,000
• Are the appropriate data being requested to adequately fulfill the data needs of CPUC staff, EM&V contractors, IOUs, PAs, DEER/ExAnte team, and other stakeholders? • How should the data be made available to these groups to ensure that each has the appropriate level of access ensuring privacy? • How should the availability of data be best communicated to the various groups? • At what levels should data be available in pre-defined, downloadable dataset? • What should the process be for providing additional support when someone requests data that is more complicated than the pre-defined reports?	

Additional detail regarding the activities conducted under the data management work order are:

- Continue the working group with the IOUs and non-utility implementers to improve the data submission and compliance with the reporting specifications.
  - Continue to improve data quality and data flow moving towards compliance with AB270.
  - Work directly with non-utility implementers (REN; CCA) to ensure they maintain systems that can meet the data specifications from their inception.
- Maintain a dataset of the customer specific data and monthly billing data from all IOUs. Compile data from associated data requests for evaluation sampling and other participant and non-participant evaluation inquiries from CPUC staff and contractors.
  - Develop a centralized repository for this data with appropriate security provisions and protocols for data retention.
  - Develop access protocols for evaluation contractors and Energy Division.
  - Develop user interfaces to enable queries by these parties.
  - Enable longitudinal (back to 2006) analysis of progress by linking the data sets from each program cycle.
- Improve integration of IOU tracking data with DEER and Ex Ante review tools and approval processes.
- Continue to improve on the power of the reported and evaluated tracking data.
  - Support CEC and CAISO and potential forecasting with better locational data (currently have zip code and address, but need to map to busbar or other relevant locational data).
  - Maintain the capability to link with publicly available Census data (including demographic data) as being added to the database under the 10-12 Macro Consumption Project to potentially improve program targeting and enable future macro-economic modeling.
  - Identify and leverage opportunities to integrate with smart grid data as it becomes available, and real time information with customers
- Continue to improve the flow of detailed tracking data through the cost effectiveness tool developed during the 2010-2012 program cycle.
  - Create queries on the output of the cost effectiveness runs to be displayed on the CPUC's EE-Stats website and in preparation for the Energy Division's Annual Report.
  - Assist with the adoption of a SQL-based cost effectiveness calculator tool.
  - Collaborate with California Energy Commission (CEC), California Air Resources Board (CARB), U.S. Department of Energy (DOE – specifically the Building Performance Database) to ensure

that regular reports required for these entities are defined in the data system and can be generated by staff automatically - and are presented in the public sphere.
    - CARB – Greenhouse gas cumulative impacts
    - CEC – Demand Forecasting – IEPR
    - DOE Building Performance Database
- Maintain and improve the data warehouse to meet the following high-level objectives:
    - Inform and require ALL evaluation contractors to meet the specifications as a requirement of their contract (IOU and ED contractors).
    - Develop security and access protocols that will:
        - Maintain only the essential data
        - Protect any customer-specific information with appropriate security protocols (TBD)
        - Define specific user cases that are appropriate for the data
- Per guidance provided in D.12-05-015 section 18.4, Energy Division and the IOUs will continue to collaborate on and improve the ease of reporting and access to program tracking data.

Reporting

This project was originally intended to fund the consultant support required for two annual reports released by the CPUC. During the 2010-2012 cycle, consultants assisted in writing two rounds of the CPUC Annual Report. Their input included:

- The development of the Evaluation Project Summary Report (EPSR) template which highlighted the findings of each work order in a standardized briefing.
- Writing EPSRs for each of their Work Orders (WO)
- Assisting the CPUC with the design of the MS Word version and online version of the report
- Developing and producing the appendices.

At this time, the requirements for future summary CPUC Annual Reports are under discussion. In addition to possibly one or more summary reports, the 2013-14 cycle requires the development of the ESPI reports. It is assumed that two ESPI reports, one for each year, are required and that these reports will roll up the evaluation findings from the EM&V Studies covering Deemed ESPI Measures and Custom ESPI Measures.

At this time, the budget and scope below assume that one summary report and two years of ESPI reports will be delivered under this project. This Road Map Plan will be updated as the scope and deliverables are better defined.

Study Title: Reporting – 2013-14	**Budget:** $185,000
Expected Completion Date: Continuous through end of the current contract in 2016.	**Project Manager:** (ED)
Description: This project provides consultant support for the development of one summary report and two ESPI reports. These funds will also be used to identify and improve the user interfaces for the report and an integrated user interface for energy efficiency including updated and live appendices of results.	
Objective: • Assist CPUC Project Managers and Road Map Leads to produce a full portfolio report providing a summary of EE program activity including both reported and ex-post achievements. • The summary report will be available online and easily navigated; provide summaries of results that are informative; and include downloadable tables of results. • Coordinate with the CPUC ESPI lead to design tables of results that present the evaluation results accurately and in an easy to understand format. • Use the system that efficiently processes ex post results (funded elsewhere) to produce tables required for reporting including scenario analysis.	
Key Project Questions: • N/A	

Study Title: CEDARS - Automated Data Submission Tool – Tracking Module	**Budget:** $350,000
Expected Completion Date: Continuous release of functionality through December 2015.	**Project Manager:** (ED)
Description: This project will kick off the design, development, and implementation of a web-based data submission tool. Functionality in the initial release, scheduled to be complete by the end of 2015, will include bulk submission of claims data, automated data quality control, claim submission status tracking, user account management, event notification, and data specification management. All non-feature development tasks related to designing and adopting the automated data submission tool will also be included in this project. Such tasks include product team coordination, user acceptance testing, user training sessions, and developing product documentation.	
Objective: • Automate data submission processing • Document data table specifications and quality control rules • Improve data quality and consistency • Provide PAs actionable, real-time QC results • Coordinate communication regarding data submission events • Enforce change management for data specifications moving forward • Reduce errors in data, data processing, and communication • Build development and operations infrastructure. • Release and fully adopt automated claims data submission tool by December 2015. • Rigorously test ADST prior to launch specifically testing for data anomalies that would reduce data quality or processing time.	
Key Project Questions:	

Study Title: CEDARS - Automated Data Submission Tool – Tracking Module	**Budget:** $350,000
• What, if any, other business processes should the product team target to automate and integrate?	

5.1.4. Data Management and Reporting Project List for 2015

The table below summarizes the 2015 Data Management and Reporting Projects that have been budgeted. All budgets shown in the table below are draft and will be revised during the planning phase. The table provides the project manager and corresponding budget.

Since it is unlikely that 2015 contracts will be in place prior to receiving 2015 IOU tracking data, the table also includes the proposed budgets that will be needed to begin this work. These budgets rely on using contingency funds for immediate needs. If the contingency funds are approved (adding budget to the overall data management activities), then $200k of the $1.37M allocated to the 2015 Data Management Road Map will be moved to the Small Commercial Road Map to help fund the Experimental Impact Support Study.

Table 88. 2015 Data Management Studies Summary

Project Title	Project Manager	Work Order	Total Budget
Data Management – 2015	ED	ED_I_Data_1	$600,000
Reporting – 2015	ED	ED_I_Data_2	$150,000
EE Stats – 2015	ED	ED_I_Data_3	$150,000
CEDARS - Automated Data Submission Tool – Tracking Module	ED	ED_I_Data_4	$350,000
CEDARS - Automated Data Submission Tool – Filings Module	ED	ED_I_Data_5	$250,000
CEDARS - Automated Data Submission Tool (TBD) – ExPost Module or CET Integration	ED	ED_I_Data_6	$120,000
Totals			$1,620,000

5.1.5. Data and Reporting Project Descriptions for 2015

Below are descriptions for three of the proposed 2015 Projects.

The other data related activities are under discussion and will be included in the next EM&V Plan update. These activities include increasing the scope of the online submission tool and producing off the shelf data sets in anticipation of common public data requests.

Study Title: Data Management – 2015	**Budget:** $600,000
Expected Completion Date: Continuous through end of the anticipated contract in 2017.	**Project Manager:** (ED)

Study Title: Data Management – 2015	**Budget:** $600,000
Description: This project will continue the majority of the activities being conducted under the 2013-14 Data Management Project including: processing IOU tracking, CIS, billing, and interval data, working with evaluators to ensure they have everything needed for timely evaluations, having regular meetings with the program administrators to continue to increase data quality and coordination, responding to data requests from stakeholders, designing and managing systems to ensure efficient processing and appropriate access of data, coordinating with the DEER/ex-ante team, conducting needs assessment of several systems/sites including EE Stats.	
Objective: • Process IOU data efficiently in order to ensure high quality data. • Provide timely, high quality data to key parties including CPUC staff, EM&V contractors, IOUs, PAs, DEER/ExAnte team, and other stakeholders. This includes data at various levels including high level summaries, standardized and quality controlled detailed claim level data, measure level tables, and data required for EE Stats. • Manage a system whose required inputs are not overly burdensome on any party. • Manage a system that has well defined processes/procedures and appropriate change management protocols.	
Key Project Questions: • Are the appropriate data being requested to adequately fulfill the data needs of CPUC staff, EM&V contractors, IOUs, PAs, DEER/ExAnte team, and other stakeholders? • How should the data be made available to these groups to ensure that each has the appropriate level of access ensuring privacy? • How should the availability of data be best communicated to the various groups? • At what levels should data be available in pre-defined, downloadable dataset? • What should the process be for providing additional support when someone requests data that is more complicated than the pre-defined reports?	

Study Title: Reporting – 2015	**Budget:** $150,000
Expected Completion Date: Continuous through end of the anticipated contract in 2017.	**Project Manager:** (ED)
Description: This budget will provide additional funds to cover similar activities to the 2013-14 Reporting Work Order. Specifically, this budget provides consultant support for the development of an additional summary report.	
Objective: • Assist CPUC Project Managers and Road Map Leads to produce an annual report providing a summary of EE program activity including both reported and ex-post reports. • The summary report will be available online and easily navigated; provide summaries of results that are informative; and include downloadable tables of results.	
Key Project Questions: • N/A	

Study Title: EE Stats – 2015	**Budget:** $150,000
Expected Completion Date: Continuous through end of the anticipated contract in 2017.	**Project Manager:** (ED)

Study Title: EE Stats – 2015	**Budget:** $150,000
Description: This project provides funds for continuing the EE Stats website until an RFP is released and a contractor chosen for 2016 and beyond. Specifically, this project will include uploading results developed by the data team in a timely way, managing all aspects of the current site including but not limited to the data request portal, IOU monthly report uploads, PIP addendum, general administration, etc. In addition, this Project will include updates/improvements to the data portal of the site per the needs assessment conducted under the Data Management Project (ED_I_Data_1) list above.	
Objective: • Continue the EE Stats website through 2015. • Maintain the current functionality of the website and expand to include 2015 data and results. • Make incremental improvements to the data portal.	
Key Project Questions: • Does the current EE Stats website fulfill regulatory requirements? • Are the needs of the CPUC and other stakeholders being met with the current EE Stats website? • Are there changes that need to be made to the data portal to improve understanding of program administrator claims and performance?	

Study Title: CEDARS - Automated Data Submission Tool – Filings Module	**Budget:** $250,000
Expected Completion Date: June 2016	**Project Manager:** (ED)
Description: This project will kick off the design, development, and implementation of a web-based submission tool for PAs to submit their portfolio application and annual budget filings . Functionality in the initial release, scheduled to be complete by 2016 Q2, will include submission cost effectiveness inputs, business and implementation plans, anticipated accomplishments, etc. that follow the format of the claims specification when applicable. Tasks include a detailed needs assessment (focusing on the needs of the reviewers/approvers of the program plans), development of web pages that include the results of the needs assessment, programming, product team coordination, user acceptance testing, user training sessions, and developing product documentation.	
Objective: • Automate program plan processing • Document data table specifications and quality control rules • Provide CPUC and other stakeholders a common platform that is easily available to review and compare program plans • Provide CPUC and other stakeholders actionable, real-time detailed and aggregated summaries of anticipated participation • Enforce change management for data specifications moving forward • Reduce errors in data, data processing, and communication • Build development and operations infrastructure	
Key Project Questions: • What data do the PAs file in applications? • What is the best way to present the information for staff and public review versus the needs for ex ante review? • How does system handle program changes mid-season?	

Study Title: CEDARS - Automated Data Submission Tool – TBD Module(s)	**Budget:** $120,000
Expected Completion Date: TBD	**Project Manager:** (ED)
Description: This project may include integrating the ex-post results into the CEDARS application or may include integrating the CET code into the CEDARS application for closer to real time review and calculation of cost effectiveness.	
Objective: • This budget is being set aside to try to fulfill one, or more, of the CPUC's additional needs for further data integration and transparency. This will be further discussed in 2016 Q1.	

5.2. Stakeholder Participation

In Decision 10-04-029 the Commission adopted a stakeholder input and review process to replace processes previously adopted in Decision 05-01-055. This process is summarized below and provides context to the Commission's delegation of responsibility to ED for weighing the value of public input versus the extra time such input would entail, as well as the addition of the Commission adopted dispute resolution process.

5.2.1. 2013-2014 EM&V Plan

This EM&V plan was developed jointly by the IOUs and ED, with a series of opportunities for stakeholder participation. Decision 12-05-11 requires ED and the IOUs to finalize and publish the plan as a report no later than 60 days after the adoption of the decision. Adoption of Decision 15.10.028 calls for an update to the plan each year as part of the rolling portfolio cycle.

There is no process for Commission adoption or for "finalizing" the plan. The plan is a project management tool and a means to provide full disclosure of this phase of the EM&V process to all interested parties. The plan is not intended to be static and will be updated annually.

Consistent with the Commission's concern that critical EM&V projects be completed on a timely basis, ED and the IOUs will continue to initiate EM&V projects as this work plan is reviewed and commented on by stakeholders.

5.2.2. Tools for Stakeholder Participation

Energy Division maintains several tools and processes to that allow stakeholders to provide input on research planning and dissemination and track progress of research projects. Quarterly Stakeholder Meetings: ED and the IOUs hold public meetings on the second Tuesday of each quarter to showcase the results of studies, answer questions, and discuss ongoing EM&V planning, spending and contracting.

- **Public Documents Area**: Energy Division and the IOUs use this site to share contracts and scopes of work for studies, research plans for studies, and interim and final deliverables. Energy Division also posts materials for the quarterly meetings on the site, see http://www.energydataweb.com/cpuc/home.aspx (also available via http://eestats.cpuc.ca.gov/)
- **Project Status Reporting (PSR)** database is where Energy Division maintains a list of all active evaluation projects. The site provides information on budgets for specific projects or study type and expected date of completion. Users can access the summary of budget expenditures to date for any Energy Division project and this information is updated on a bi-weekly basis. Site orientation is available upon request. http://www.emvpsr.com/Projects/ (also available via http://eestats.cpuc.ca.gov/)
- **IOU and ED staff:** Stakeholders can also contact IOU and ED staff with questions about particular studies or sectors. Contacts for studies and contracts are listed on the Project Status Report. ED Sector leads are listed in on page 302; "List and Contacts for 2013-2016 EM&V PCGs".

5.2.3. EM&V Project Scopes and Study Plans

Because ED's EM&V activities will be conducted through specific study plans, ED has set up a procedure for review of and comment on the scope included in those study plans and the underlying projects. As described in the following chapter, ED also requires the IOUs to post their approved EM&V project

scopes on the Public Documents Area website. Thus the process for IOU projects will follow similar procedures. The procedures below are adapted from the stakeholder input process adopted by the Commission in Decision 10-04-029.

All project scopes and study plans developed by Energy Division and the IOUs will be posted on the Energy Division public document website at www.energydataweb.com/cpuc/default.aspx. In some cases, draft study plans will be posted for public comment. Notice of posting of study plans will be sent to work order topic subscribers on the public document website (automatically)andto the applicable CPUC service list. Comments on draft study plans will be submitted to and will be publicly available on the public document website.

Energy Division and the IOUs may hold public meetings (in person, via webinar, or via webcast), separately or jointly as the case may be, to solicit input on draft study plans posted on the public document website. Parties may submit written comments on the study plans before and/or after the public meetings; these comments will be posted on the public document website. Notice of the public meetings will be sent to subscribers on the public document website automatically and to the applicable service list. Energy Division and the IOUs, working with their respective EM&V contractors, will finalize study plans, taking into consideration the parties' written comments and input during the public meetings.

The finalized study plans or project scopes will be posted on the public document website.

If a party or parties take(s) issue with a final study plan, the party or parties may file a motion with the Assigned ALJ and provide evidence for why the study plan should be changed and how. The ALJ will resolve the dispute and direct Energy Division and/or the IOUs to revise the plans accordingly via ruling.[57]

5.2.4. EM&V Project Implementation and On-going Feedback

Energy Division and the IOUs will convene a quarterly public stakeholder meeting among their staff and EM&V contractors to share key study plan ideas or methods, results and EM&V findings for portfolio improvements and identify best practices and possible improvements to evaluation methods. The meetings will take place on the second Tuesday of the first month in a quarter, from 10:00 a.m. to 2:00 p.m.

Informal public meetings to discuss EM&V work progress and results may be held by ED, the IOUs or both on an ad hoc basis if requested by ED, the IOUs, parties or members of the public.

When significant results are produced by the EM&V work, and a technical report is not immediately pending, the Energy Division and/or the IOUs will provide informal written summaries of the results to all stakeholders. These written summaries will be posted on the public document website.

[57] Decision 10-04-029 describes the dispute resolution process: "For Project-Specific EM&V Plans, if parties continue to take issue with the final work plans, a party or parties may file a motion with the assigned ALJ and provide a rationale for why the plans should be changed and how. The ALJ will resolve the dispute and direct ED and/or the IOUs to revise the plans accordingly via ruling." http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/116710.pdf.

5.2.5. Public Review of EM&V Technical Reports

Drafts[58] of any interim or final EM&V technical reports produced by Energy Division and the IOUs, working with their respective contractors, will be posted on the public document website. A notice will be distributed to the appropriate service list(s) and to subscribers (automatically) to the pertinent topic in the public document website. For this purpose, EM&V technical reports are defined as reports produced by the Energy Division and the IOUs, working with their respective contractors that document completed analysis and are identified as a milestone in the Evaluation Plan or in a study plan.

Energy Division and the IOUs will hold public meetings (in person, via webinar, or via webcast), separately or jointly as the case may be, to solicit input on the EM&V Technical Reports. Parties may submit written comments on these reports before and/or after the public meetings. Comments must be submitted to the public document website and will be publicly available. Energy Division will also review and reserves the right to provide written comments to the IOUs on their EM&V contractors' draft reports.

Energy Division and the IOUs, working with their respective EM&V contractors, will finalize the draft reports, taking into consideration the parties' written comments and/or input during the public meetings.

The final EM&V technical reports will be posted on the public document website. Responses to written comments on the draft reports will be prepared and posted at the same time or soon after the revised reports are posted. Notice of posting of final technical reports will be sent to subscribers to the relevant topics on the public document website and to the appropriate service list.

If parties continue to take issue with the final EM&V technical reports, a party or parties may file a motion with the Assigned ALJ and provide evidence for why the report is deficient and what changes to the report would be necessary to correct the deficiency. The ALJ will resolve the dispute and direct Energy Division and/or the IOUs, via ruling, to prepare an addendum to the report correcting the deficiency. The addendum will be posted on the same website where the draft reports are posted.

Within 60 days of public release of a final report, the program administrators will respond in writing to the final report findings and recommendations indicating what action, if any, will be taken as a result of study findings. The IOU responses will be posted on the public document website.

5.2.6. Public Review of Aggregate EM&V Reports

Energy Division's draft reports aggregating or summarizing the results of the EM&V technical reports, in any form, will be issued via ALJ Ruling for parties' comments and posted on the public document website..

Energy Division will hold public meetings (in person, via webinar, or via webcast), to discuss the draft report. Parties may file comments and reply comments on the draft aggregate EM&V report for a

[58] "Draft" in this context refers to a completed version of a technical report that is deemed ready for public posting by the project manager. In this case, a "draft" report is final in every sense except for the final step of allowing for stakeholder review, gathering stakeholder comments and making changes in response to stakeholder comments.

specified period following the public meetings. The comments must be posted on the public document website.

The assigned ALJ will issue a proposed decision on the draft aggregate EM&V report, revising it as needed based on parties' comments.

Parties may file comments and reply comments on the ALJ's proposed decision pursuant to Commission procedure.

The Commission will adopt a decision on the final aggregate EM&V report.

5.2.7. Dispute Resolution Process

In Decision 10-04-029, the Commission established dispute resolution methods for matters that cannot be resolved informally between ED and the IOUs. Under that process, a party may file a "Motion for EM&V Dispute Resolution" (EM&V Motion) with the assigned ALJ in R.09-11-014 or its successor for resolution of an EM&V matter. The EM&V Motion must include a statement from ED giving its side of the dispute. The ALJ may undertake any appropriate process to gather further information. The ALJ may issue a Ruling to resolve the dispute. Alternatively, in an EM&V Motion, the filing party or the ED may ask that the matter be resolved by the assigned Commission or the full Commission. In that case, the ALJ will consult with the assigned Commissioner to determine the appropriate course of action. This may include an ALJ Ruling, an assigned Commissioner Ruling, or a Commission Decision. If the ALJ and assigned Commission decide to bring the matter to the full Commission, the ALJ or assigned Commissioner will issue a PD and allow for comment under Rule 14 of the Commission's Rules of Practice and Procedure.

The EM&V Motion may be used for the following purposes only:

- Disputes over results of EM&V studies or reports;
- Dispute over selection of an EM&V contractor;
- Disputes about project-specific final EM&V work plans;
- Disputes regarding final EM&V technical reports; and
- Disputes concerning public vetting of EM&V projects.

5.3. Contracting – by Energy Division & IOUs

5.3.1. Energy Division Contracting Plan and Access Information

Energy Division will solicit technical assistance to execute this 2013-2014 evaluation plan. This includes outside support to assess progress, and evaluate, measure and verify savings from IOU energy efficiency programs and portfolios to inform savings estimates, program performance, and market status.

The solicitation will be issued from the CPUC contracts office in the upcoming months.

Multiple contracts will be needed to carry out the evaluation work for the upcoming program cycle (and likely future program cycles). For 2013-2014 we expect the contracts to be organized around a few major groupings of sectors. Likely, the two large customer segments (Residential and Non-Residential), groupings of the research roadmaps, and a third or fourth that will cover multiple cross-cutting areas. The contractors for the customer segments will be responsible for the full spectrum of evaluation needs in that segment (impact, process and market studies) as needed. Any cross-cutting areas will be more discretely defined, and may need to be contracted independently. The pending Requests for Proposals will provide detailed direction.

A new solicitation for Energy Division advisory consultants will also be made in the upcoming months. The role of the advisory consultant is to assist Energy Division staff with expert analysis and advice on research projects and evaluation, measurement and verification studies. Energy efficiency evaluation research spans a wide range of disciplines and activities, and therefore the solicitation for expertise should be likewise inclusive and with an expectation of collaboration with a wide array of consultants. The pending Requests for Proposals will provide detailed direction.

All contracts for the 2013-2014 program cycle will be handled through the CPUC Contracts Office according to state contracting rules. Solicitations will be posted on "Bidsync" http://www.bidsync.com the state contracting site managed by the California Department of General Services.

5.3.2. PG&E Contracting Plan and Access Information

The following information provides the basic process for identifying and being awarded contracting opportunities for evaluation activities with PG&E.

RFP Process

1. Submit company information to the CALMAC EM&V Contractor Contact List: http://www.calmac.org/contractorcontact.asp
2. Respond to the Request for Proposal (RFP): http://www.pge.com/b2b/purchasing/bidopportunities/
3. PG&E notifies the company of the RFP acceptance or rejection.
4. If the company is awarded the contract and already has a Master Service Agreement (MSA) in place with PG&E, then a Contract Work Authorization is issued.
5. If the company is awarded the contract and *does not* have a MSA in place, then a MSA must be signed with PG&E.

Direct Award Process

At times, it is not necessary to implement the RFP process and instead PG&E directly awards a contract to a consultant. To become part of the notification list that PG&E is seeking to direct award a contract, submit your company's information to the CALMAC EM&V Contractor Contact List:

http://www.calmac.org/contractorcontact.asp

Data Security

If the Scope of Work includes PG&E Confidential, Restricted, and/or Privileged data, then your company is required to pass a Third Party Security Review. Use only the Enterprise Secure File Transfer (ESFT) system to transmit confidential data to PG&E throughout your company's engagement.

Supplier Diversity

PG&E values and aggressively seeks to extend its supplier relationships with diverse suppliers including Women, Minority and Service Disabled Veteran-Owned Businesses (WMDVBEs) through our Supplier Diversity Program. The first step to become a PG&E certified WMDVBE is to become certified through the California Public Utilities Commission's (CPUC) Clearinghouse at http://www.suppliernetwork.net/CPUC/. At the same time, complete a PG&E supplier profile at https://cvmas10.cvmsolutions.com/pge/.

5.3.3. SCE Contracting Plan and Access Information

The following information provides the basic process for identifying and being awarded contracting opportunities for evaluation activities with PG&E.

Request for Proposal / Quote / Information (RFx)

1. Supplier Registration, submit supplier company information onto SCE supplier registration web-site.
   https://cvmas15.cvmsolutions.com/sce/
2. Request for proposal / quote / information notification sent to suppliers
3. Respond to the RFx on or before the due date both by mail or electronically.
4. Based on business needs a purchase or a master agreement may be used (see below).
5. Start the negotiation process and make award(s) to supplier(s) once negotiation is completed.

Master Agreement (MA)

A Master agreement is a perpetual set of terms and conditions between Edison and a Supplier to govern the entire relationship between the two entities across all PO's that reference it. MA's are an evergreen set of terms and conditions that lay the ground rules and the context for all contractual transactions between Edison and the Supplier.

Benefits of an MA

1. MAs make life easier for substantial and repetitive procurements by allowing common terms to be negotiated once instead for each individual PO.

2. MAs create certainty around each aspect of the relationship between Edison and the Supplier, thereby lowering risk and cost.
3. Providing efficiencies of scale: negotiating in-depth once instead of negotiating the same thing over multiple procurements.
4. Providing stability for the Supplier and SCE through long-term pricing.

Purchase Order (POs)

Purchase Orders are transactional documents that Edison uses to obtain goods and services from a Supplier. They are comprised of four main parts: the general terms & conditions, the work schedule for services, the delivery date for goods, and the price.

MAs vs. POs

Master Agreements are the preferred way of contracting at Edison. There are circumstances where the issuance of a standalone Purchase Order is appropriate. An example of this can be demonstrated if the goods or services to be procured are a onetime buy and the expectation is that no further procurements for a specific product or service are identified to continue with a given Supplier. For EM&V contracts, SCE typically uses purchase orders.

Directed Award

At times based on business needs it is not necessary to implement a RFx process and instead SCE can directly award a contract to a supplier or consultant. Specific management approvals are required for a directed award.

Customer Data Security and Privacy Compliance

If the Scope of Work includes confidential, restricted, or privileged data, then supplier is required to pass a third party security review and use only secured file transfer protocol to transmit any and all confidential data throughout supplier's engagement.

Supplier Diversity and Inclusion

At Southern California Edison (SCE), we believe in continuous improvement and aim to build upon our long-standing commitment to supplier diversity. By building programs to enhance our tools, processes, and communications, we have made supplier diversity an integral and standard part of the way we do business. We value both strengthening existing programs and processes, as well as seeking new ways to be successful in helping diverse suppliers develop the capabilities to make them even more valuable to their customers, including SCE. SCE is committed to provide opportunities for diverse business enterprises (DBE) to participate in its purchasing and contracting activities on a competitive bidding basis. The Supplier Diversity Program has four main **Objectives:**

1. To increase opportunities for DBEs to compete for SCE's business, through both direct and indirect contracting.
2. To increase both the dollar amount and percentage of materials and services the company procures from DBEs.
3. To assist DBEs, ethnic chambers, and trade business associations to better understand SCE's vision, strategy, goals, and procurement practices.
4. To increase support for achieving supplier diversity goals throughout our company.

The first step to become certified DBE is to become certified through the California Public Utilities Commission's (CPUC) clearinghouse at www.suppliernetwork.net/CPUC and register with SCE at https://cvmas15.cvmsolutions.com/sce/ at the same time.

5.3.4. SDG&E and SCG Contracting Plan and Access Information

Guidelines for Supplier Qualification

Sourcing Process

1. SoCalGas and SDG&E's Supply Management, Diverse Business Enterprise group, and individual business units will review the qualifications of interested suppliers in various ways, including review of a vendor relations portal, PEPMA, and a variety of other internal and external tools.
2. Qualified suppliers may be added to a bidder's list for the opportunity to participate in targeted RFP's at various times throughout the year.
3. Invited bidders may respond to a Request for Proposal (RFP), a Request for Quote (RFQ) or a Request for Information (RFI) when they occur.
    a. Information will be communicated with qualified suppliers before an event (RFP, RFQ or RFI) opens, either via email, phone, or via a request to register in Power Advocate (our electronic sourcing tool).

Direct Award Process

SoCalGas and SDG&E may choose to award a contract directly to a qualified supplier when requirements necessitate securing the services of a contractor with unique attributes for a specific engagement.

Supplier Diversity

SoCalGas and SDG&E are always seeking to broaden its relationships with diverse suppliers including Women, Minority and Service Disabled Veteran-Owned Businesses (WMDVBEs) through our Supplier Diversity Program. The first step in becoming a certified WMDVBE is to certify through the California Public Utilities Commission's (CPUC) Clearinghouse at http://www.suppliernetwork.net/CPUC/. SoCalGas and SDG&E also recognize qualified suppliers that are certified by a Comparable Agency Verification (CAV). CAV includes WMBE certification in good standing with the National Minority Supplier Development Council (NMSDC) and/or the Women's Business Enterprise National Council (WBENC).

If your company is not a certified WMDVBE, SoCalGas and SDG&E actively assist its suppliers with broadening their WMDVBE sub-contractor relationships.

5.4. Energy Division - IOU Collaboration

5.4.1. Process for Periodically Updating EM&V Plans and Budgets

As stated throughout this document, this EM&V plan is not intended to be static. While the IOUs and ED will earnestly use this plan as a management tool, and while, at this time, we expect to implement the projects as planned - we retain the flexibility to shift funds and refine projects when needed, as granted by the Commission in Decision 10-04-029.

The IOUs and ED will reflect changes to the plan in annual updates, to align with the rolling portfolio schedule. The plan is housed at CPUC.CA.GOV under Energy, and Energy Efficiency. A complete list of on line resources that allow stakeholders to track progress, interim changes, spending, etc., is listed in Chapter 3 of this section.

5.4.2. Process for Commission Oversight of IOU EM&V Projects

The following text is a partial restatement of a document provided to IOU EM&V staff by ED in August 2010. The purpose of the original document was to lay out ED's procedures for implementing the Commission's oversight of IOU EM&V projects per Ordering Paragraph 4 and Attachment 2 of D.10-04-029.

Ordering Paragraph 4 of Decision 10-04-029 states the following:

> *"The process for Evaluation, Measurement and Verification for the 2010 through 2012 energy efficiency portfolios adopted in Decision 09-09-047 for Southern California Edison Company, Southern California Gas Company, San Diego Gas & Electric Company, and Pacific Gas and Electric Company (collectively, IOUs) shall supersede the process adopted in Decision 05-01-055 regarding the following processes:*
>
> - *An IOU shall seek approval from Energy Division before initiating Evaluation, Measurement & Verification (EM&V) ex-ante studies, or EM&V process or formative evaluations.*[59] *The IOU management role for developing ex-ante savings estimates or EM&V process or formative evaluations shall be under the oversight of Energy Division, who shall have the authority to deny approval of projects. This authority is limited to situations where there is a conflict of interest with a contractor the IOU wishes to hire, where there is duplication or significant overlap with studies already planned or carried out by Energy Division, or where Energy Division can specify why a study is unnecessary. Energy Division's approval process for IOU's ex-ante studies, or EM&V process or formative evaluations, is limited to no more than two weeks. Any Energy Division denial of approval shall be in writing to the IOU requesting approval.*
> - *Energy Division's role for approval and involvement in IOU EM&V projects shall be as set forth in Attachment 2 of this decision.*

[59] In practice Energy Division has permitted the IOUs to proceed with projects that are under $30,000 without the approval process, however the research still must be disclosed to Energy Division. We intend to continue this practice in the 2013-2014 period.

- *Energy Division may make case-by-case exceptions to the Commission-adopted firewall policy regarding program implementers in order to collect data needed for EM&V."*

Implementation of the seven-step process outlined in Attachment 2 of D. 10-04-029 is clarified below. The numbered and italicized bullets are the steps from Attachment 2.

*1. **Project Formation**: IOUs notify ED of their intention to conduct an EM&V project and solicit input from ED on the shaping of the project. ED may choose to waive this opportunity to participate if it chooses. The point of this step is to minimize potential delays in the following steps.*

- Projects should be notified to ED through the project management system (basecamp), maintained at https://energydivision.basecamphq.com/. This system will be used by ED to track IOU projects until further notice.
- All EM&V projects that are planned or underway should be logged into basecamp for tracking purposes. This is required even under the following conditions:
  - If there is a possibility that a planned project will be cancelled or significantly modified.
  - Regardless of size and scope of the EM&V project.
  - Regardless of the source of funding for the EM&V project.
  - If the project has already been started.
  - If the project has already been approved by an ED staff person.
- Hereafter, EM&V projects should be logged into basecamp prior to seeking official approval from Energy Division staff.
- The IOUs may skip step 1 if the project is included in ED's EM&V work plan and is the proposed project is not significantly modified from the project envisioned by the EM&V work plan.
- As each IOU EM&V project is logged into basecamp it will be assigned to an ED staff analyst. If needed, the assigned ED staff will follow-up with the EM&V project contact person for clarification.

*2. **Project Description:** Once the need for a project has been determined, the IOUs will prepare a project description (basically a high level scope of work, following the template developed in 2011).*

- When the IOU is ready to seek approval from ED for an EM&V project it will do so by uploading to basecamp a detailed project description following the format and standards specified by ED.

*3. **Project Tracking**: The project description will be uploaded to the Energy Division's project tracking system.*

- This step is subsumed under step 1 above

*4. **Project Review and Approval**: the project description will be available for review and approval by Energy Division for one calendar week.*

- ED will prioritize its review of projects and will reserve its review for projects of high importance (such as evaluations of strategic plan programs, "Big Bold Energy Efficiency Strategy" programs, and programs/measures with high forecasted savings) or projects that are clearly good candidates for coordination between IOUs and ED.
- Within two weeks, ED will notify the IOUs if they intend hold the project to conduct a more detailed review and/or if ED requires more information on the project from the IOUs before approval can proceed. A reason for holding the project will be provided.

- ED will provide the IOU with a letter of contractor rejection stating the specific conflict problem behind rejection of a proposed contractor, and provide an opportunity for discussion or conflict resolution before a final contractor decision is made. The IOU shall have two weeks from the date of receiving the letter of contractor rejection to discuss the issue, or file a "Motion for EM&V dispute resolution" or request for ADR. Otherwise, ED may finalize the selection of contractor.
- If two weeks pass and ED has not already indicated that the project is approved or ED has not already held the project for further review, then the project will be considered approved and Energy Division's opportunity to review the project will be considered waived.
- When a project is formally submitted for review and approval by ED via basecamp, the assigned ED staff person will review the submitted material to determine if it meets the expected standards for project approval cited under step 2 above.–hIf these standards are not met, the assigned ED staff person will notify the IOU staff person submitting the project approval request and may request clarification or additional information within the two week review period. –fIf the standards are met, the assigned ED staff will review the documentation and will either approve or deny the project.
- If the project is denied[60], ED will respond in writing.
- If the assigned ED staff determines that the EM&V project should be publically vetted, he/she will inform the IOU and the IOU will upload all pertinent project documentation, as directed by the assigned ED staff, to ED's EM&V public document website located at www.energydataweb.com/cpuc.
- Regardless of whether ED requires public vetting of the IOU EM&V project, the final, ED approved scope of work will be posted to the public document website after ED's approval.

*5. **Project Initiation:** Once the ED review and approval is completed (or waived) the IOUs may begin implementing the project in accordance with the project description.*

- If the assigned ED staff provides no comment, questions, denial or approval within two weeks, then the EM&V project will be considered approved by default.

*6. **Project RFP and Proposals:** If the project requires competitive bidding, the IOUs will upload the RFP to the Energy Division project tracking system. If the project involves consultant proposals, the proposals will be uploaded to the Energy Division project tracking system.*

- These documents may be uploaded to basecamp at the time that the IOU requests formal approval or the IOU can wait until receiving approval before drafting and uploading these documents.
- RFPs must be uploaded before they are issued, and proposals must be uploaded when they are received. Proposals will be subject to review by ED staff and their advisory consultants. Proposals

[60] Per D. 10-04-029, "ED shall have the authority to deny approval of projects. However, this authority is limited to situations where: 1) there is a conflict of interest with a contractor the IOU wishes to hire; or 2) There is duplication or significant overlap with studies already planned or carried out by ED; or 3) ED can specifically articulate why a study is unnecessary or inappropriately conducted by the IOUs." (p.17)

will not be reviewed by Energy Division EM&V contractors. Proposals that contain proprietary and/or confidential information will be treated with the appropriate level of confidentiality.

7. Contractor Selection: *If the project involves hiring a contractor, whether by competitive or directed bid, the IOUs will notify ED of their preferred contractor and other contractors who were considered and/or who submitted bids. ED will make the final selection of all EM&V contractors.*

- The scope of the review of contractors will be focused on conflicts of interest per D.10-04-029
- ED will notify the IOU if the preferred contractor is accepted or if ED intends to select a different contractor.[61]

5.4.3. Forums for Energy Division and IOU Collaboration

In Decision 10-04-029, the Commission adopted policies with the intent of establishing a more collaborative relationship between the IOU and ED staff. Specifically, Decision 10-04-029 adopted the following policies that are pertinent to the process for ED and IOU collaboration:

- Requires ED and IOU staff to conduct EM&V projects in a transparent manner, including: open, truthful, and timely communication; regular meetings to provide updates on projects; inclusion of ED and IOUs in all stages of all projects; sharing of data as it becomes available; and tracking of all projects in an easily accessible tracking system.
- Requires ED and the IOUs to attempt to resolve disagreements informally, and collaborate where possible, before seeking formal dispute resolution.
- Requires ED and the IOUs to design EM&V projects to be streamlined, to comply with Commission mandated schedules, and to avoid duplication of effort.
- Requires ED and the IOUs to follow professional standards for ethics and technical best practices.
- Grants ED and the IOUs flexibility to plan and implement EM&V in phases while continuously optimizing the EM&V portfolio and emphasizing the flow of EM&V results to program managers for program improvements.
- Requires avoiding unnecessarily duplicative data collection and analysis and identifying ways in which EM&V can be organized and implemented to meet multiple needs in a cost-effective manner.
- Affirmation of ED's authority to review, approve and oversee IOU EM&V activities.
- Clarification that ED may conduct some formative evaluations within their portfolio of EM&V projects.
- A requirement that the IOUs collaborate with ED in the development of non-DEER savings work papers.
- A stakeholder input process that supersedes the process adopted in D.05-01-055.
- Delegation to ED to determine which projects should be subject to the stakeholder input process.

[61] Energy Division has, to date, deferred selection of evaluation contractors to the IOUs for IOU-led 2010-2012 evaluations and research studies, unless the selected contractor has a clear conflict of interest.

- A dispute resolution process that involves mediation by the ALJ Division.
- A requirement that all EM&V-related projects, regardless of funding source, adhere to the same policies and procedures as EM&V funded projects.
- Allows ED to use program implementers as a vehicle for collecting EM&V data.

In order to establish an administrative framework for effective collaboration between the IOUs and ED EM&V staff and ensure the greatest chance of realizing these Commission policy goals, ED has drafted administrative procedures, which are intended to supplement the Commission's EM&V policy goals with essential implementation detail.

5.4.4. Monthly ED/IOU Meetings

ED and the IOU EM&V staffs will meet during regular monthly meetings (Project Coordination Group Level 1) to coordinate the overall EM&V effort. These meetings have been a forum to manage high level administrative and policy issues, including creation of the 2013-2014 EM&V plan. Project level and sector level planning are handled in project coordination groups, described in the following section:

- The meeting will continue to be held on the second Tuesday of every month from 10 AM – 2 PM. The meeting can be extended to 5 PM, as needed.
- This meeting is held by ED and IOU staff that comprise the overall management of EM&V and is the first, of the three-levels of Project Coordination Groups (PCGs).

5.4.5. Project Coordination Groups

ED and IOU staff will convene in Project Coordination Groups (PCGs) to coordinate and plan EM&V activities. The structure and scope of PCGs for the IOU and ED staff is described in this section.

Background and Overview of PCGs

What are Project Coordination Groups?

Project Coordination Groups (PCGs) are a research collaboration structure between the Energy Division, IOUs, Program Administrators, and their respective representatives to develop credible, reliable, timely and actionable EM&V information and data. By working together on shared EM&V projects and following mutually agreed upon standards for transparency, respect, and communication, ED and the IOUs envision better research and program outcomes including greater cost-efficiencies, more reliable results, broader stakeholder buy-in, and fewer disputed issues. Where multiple Program Administrators (PAs) are relevant to a particular sector or study area, the PCG may include PA EM&V representatives to join the ED-IOU meetings. In other instances, PCGs may have non-administrator participants from the general public. Such instances should be allowed when it is necessary for the particular to the meeting agenda, does not detract from the group's ability to make timely decisions regarding EM&V, and does not raise a conflict of interest.

Why Do We Need PCGs?

Decision 09-09-047 expressed the Commission's desire..."to make near-term improvements in order to streamline EM&V processes, and enhance timeliness, transparency and consistency across EM&V work products" (D.09-09-047 at 301) and "to take a fresh look at several aspects of our EM&V activity in

California for the upcoming program cycle, to reduce unnecessary burden on staff and other resources, and streamline our EM&V processes." (D.09-09-047 at 294).

Furthermore, Decision 10-04-029 requires ED and IOU staff to,

> "…conduct EM&V projects in a transparent manner, including: open, truthful, and timely communication, regular meetings to provide updates on projects, inclusion of ED and IOUs in all stages of all projects, sharing of data as it becomes available, and tracking of all projects in an easily accessible tracking system….(p. 11-5)

How Are PCGs Organized and What Work Products Will They Deliver?

The following three-level PCG structure is intended to strike a balance between topic area PCGs and more detailed-oriented project coordination through subgroups where necessary:

Level 1: Resources/Strategy/Planning Group

Level 1 PCG (or PCG-1) scope includes the full IOU-ED evaluation portfolio, and is currently the ED-IOU monthly administrative, planning, and policy issue-oriented PCG. This PCG-1 is responsible for:

- Cross-Portfolio Evaluation discussion and planning;
- Resolution of EM&V policy issues;
- Overarching and cross-cutting issues;
- Budget allocations and changes;
- Representation includes ED, Program Administrator (IOU and CCA) managers.

Work product: Joint EM&V Plan and annual updates to the plan

Level 2: Sector/Area-Level Study Management Groups

Level 2 PCG (or PCG-2) scope includes a general topic or sector of programmatic activity (e.g. Residential, HVAC, Financing, ETP, or Lighting) for which multiple EM&V projects inform savings estimates, program performance, and market status or trends.

The general responsibilities of the PCG-2 are to plan, implement and monitor a long term, cross cutting research roadmap for the defined topic or sector. General research planning for the sector or topic includes:

- Identify coverage of the sector or topic;
- Develop and maintain a long term EM&V roadmap;
- Understand scope and timing of the individual projects (e.g. research questions, key outputs, and dates) for projects within the defined sector/topic area;
- Monitor the research gaps and coordinate with other PCGs to minimize overlap and leverage field research opportunities.

Work product(s): Sector/Topic area Research Roadmap; summary of evaluation findings in brief Evaluation Project Summary Reports; Sector sections of the Energy Efficiency Progress Evaluation Report

Level 3: Research Project Teams

Level 3 PCG (or PCG-3)scope is limited to specific projects that ED and the IOUs agree need a detailed-level of input from both sides throughout the planning, execution and finalization process. PCG-3's are

not relevant for every project and will be formed on an as-needed basis. The PCG-3 was initially envisioned in the 2010-2012 joint ED-IOU Plan and is mainly responsible for:

- Individual studies (identified to need Level 3 engagement);
- Project specific scoping;
- Vetting of instruments, deliverables;
- Function as a project advisory group.

Work product(s): Individual Research Plans; Final Research Reports

Guidelines for Effective PCGs

Effective PCGs are determined by their composition, operation and communication protocols:

- PCG composition (e.g. the appropriate members/participants in the PCGs)
- PCG facilitation (led by ED lead with shared responsibility with the members as needed)
- PCG communication (set protocols for agendas, meeting notes and use of tools for inventory and tracking progress on research, reviewing ED Annual Report)
- PCG roles and responsibilities (understand scope of work, charter for the group)
- PCG work product (example: development and monitoring of a Long Term Research Roadmap, providing relevant evaluation results summary to the ED Annual Report (EPSR)

In addition, how the PCG delivers data and information will play a large role in its effectiveness. Key questions that the PCG must address include:

- Who needs what information from the PCG, including information needs of program staff as well as internal and external stakeholders?;
- When does the PCG need to provide the information?;
- How will the information be delivered by the PCG?;
- Where will the PCG house the information (for example: a disciplined use of Basecamp or similar communication tools)?

Regarding Basecamp (internal on-line platform for sharing documents), the PCGs will exercise discipline in the use of the Basecamp to facilitate communication, document shared understanding, and memorialize decisions made for the planning, design and execution of the studies. The implementation of the Basecamp protocols is expected to be self-policed by the PCG members and the ED -PCG Lead.

PCG effectiveness will be strengthened by managing PCG meeting and reporting consistency:

- PCGs will commit to regular meetings to provide updates. They will also commit to consistency while providing meaningful updates on a regular basis at an agreed-on schedule. This may vary given the nature of the sector and studies.
- PCGs will also commit to data sharing and all project tracking via Basecamp and the Project Status Reporting websites.

List and Contacts for EM&V PCGs

The following table lists the sector and program area project coordination groups (level 2 PCGs) and their lead Energy Division contacts, as of the finalization of this plan.

Table 89. Energy Division Program Sector Contacts

Program Sectors	Sector Contact	Contact
Code &Standards	Paula Gruendling	PG1@cpuc.ca.gov
ZNE / New Construction	Cathy Fogel	CF1@cpuc.ca.gov
Emerging Technologies Programs (ETP)	Paula Gruendling	PG1@cpuc.ca.gov
Residential, HER & RNC	Peter Franzese	PCF@cpuc.ca.gov
Heating, Ventilation , Air Conditioning (HVAC)	Lola Odunlami	CF1@cpuc.ca.gov
Finance	Jen Caron	jennifer.caron@cpuc.ca.gov
Local Government Partnership, REN and CCA	Jeremy Battis	JBE@cpuc.ca.gov
Small & Medium Commercial	Mona Dzvova	mdd@cpuc.ca.gov
Lg. Commercial & NRNC	Kay Hardy	KEH@cpuc.ca.gov
Industrial and Agriculture, CEI	Kay Hardy	KEH@cpuc.ca.gov
Integrated Demand-Side Management (IDSM)	Lisa Paulo	PCF@cpuc.ca.gov
Lighting	Jeorge Tagnipes	jst@cpuc.ca.gov
Marketing, Education &Outreach (ME&O)	Rory Cox	RC6@cpuc.ca.gov
Work, Education &Training (WE&T)	Lisa Paulo	LP1@cpuc.ca.gov PCF@cpuc.ca.gov
Market Studies / Spillover	Cathy Fogel Jeorge Tagnipes (Spillover)	CF1@cpuc.ca.gov jst@cpuc.ca.gov

APPENDIX A. SUMMARY OF EM&V STUDIES

To review high level summaries of the EM&V studies proposed details and how they build on past research - visit the Project Status Reporting website via the Energy Efficiency Stats website (eestats.cpuc.ca.gov). The site is available under the tab *Evaluation* and *Evaluation Status and Budget.* The Project Status Reporting interface provides access to project level information to track all EM&V projects (milestones, budgets and contacts) included in this plan.

APPENDIX B. GUIDELINES FOR CPUC-ED AND CALIFORNIA IOU EM&V REPORTS

Guidelines for CPUC-ED & California IOU

Evaluation Measurement & Verification Reports

Style Guidelines

1. **Be clear.** People often overestimate their own writing abilities, including technical experts. Consider using a professional technical writer, or at a minimum have your draft reviewed by a professional copy editor. You may have done some great research, but unless it's well written, no one will ever know. A good rule of thumb is to read the first sentence of every paragraph and make sure the first sentence represents the main idea in the paragraph, and that the sequencing of the paragraphs flow. Achieving consistency in content, structure, and voice is extremely important when there are multiple contributors to a research project.
2. **Be concise.** Reports should be as short as possible, ideally 50-60 pages. Appendices can be as long as necessary. Executive Summaries should be a maximum of 4 pages.
3. **Use graphics appropriately.** Graphics are attention grabbing therefore reserve their use for clarity and/or impact. Label graphics carefully and always include the sample size "N". The best graphics don't require any explanation in the report to convey a clear message. Employ quality control: Text should match graphics and grammar and spelling should be checked.
4. **Avoid repetition.** We realize that you may have used content from other documents as a starting point. Carefully review those pasted items and ensure that when concepts are repeated, it is for the explicit purpose of clarifying or emphasizing a point. Otherwise, keep repetition to a minimum.

Content Guidelines

1. **Respect multiple audiences.** Main audiences for reports include EE program, CPUC, and IOU staffs. However, all final EM&V reports are publicly available. Do not assume everyone reading the report will be familiar with program details, measures, evaluation methods or terminology. Please explain briefly, while maintaining readability. Consider including a glossary of terms and acronyms.
2. **Explain study scope.** Clearly state the study scope, goals, and limitations and address how this research will add to the current understanding of the subject. Provide an executive summary that allows the reader to remember and recognize the key reasons, conclusions and recommendations of the research effort.

3. **Use trained researchers to report data.** Researchers should have appropriate training and experience to effectively review and report on qualitative data. Poor analysis of qualitative data can lead to inaccurate and misleading conclusions.

4. **Identify all sources of data.** Data need not be quantitative, but all sources need to be very well-identified. Qualitative data are fine, but need to be properly reported and analyzed. Ensure that data sources and reference materials are appropriate. Wikipedia and blogs are not appropriate citations or references for information included in evaluation reports.

5. **Indicate sample sizes and descriptive statistics.** When reporting results and summary statistics, whether in graphics or in the narrative, always include the sample size "N", standard deviation, min/max, and standard error. The questions on which data tables and data reporting are built need to be in the footnotes or in a table so the reader can properly interpret data in the context of what was originally asked.

6. **Differentiate between conclusions and recommendations.** Ensure that conclusions are (1) very tightly tied to data and (2) logical results emerge from the data and analysis. Recommendations are often helpful but it is important that they also be well-tied to data and data sources. When providing recommendations, identify caveats while distinguishing ideas, opinions, possibilities, and suggestions, from true data-driven recommendations. For example, use words such as "should" or "must" for a recommendation and words such as "can" or "may" for a suggestion.

7. **Explain clearly how the need for each recommendation is supported by your findings.** Specify the measurable benefit that should be the result of following a recommendation. If there are no data showing a need, and if you cannot state a measurable benefit or improvement, do not make that recommendation.

8. **Don't over utilize the "Other" category.** Too often fill-in-the-blank responses or pre-codes are poorly handled resulting in high percentages of responses falling into the "other" category. Too often these responses are ignored and/or not properly analyzed, and therefore represent wasted time and research dollars. Typically, these responses are the result of (1) poor interviewing (2) a bad coding system or (3) a researcher who does not take the time to investigate why a high incidence of "other" is occurring.

9. **Respect confidential data.** Ensure that the report protects all confidential customer information as appropriate.

End of Document