PROCESS EVALUATION:

CPACS PROGRAM 2007-2008

Submitted To:

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1.0 EXECUTIVE SUMMARY

This document represent the results and recommendations of a review of Southern California Edison's (SCE) Comprehensive Packaged Air Conditioning System (CPACS) Program for the period 2006-2008. The evaluation applied standard process evaluation methodologies but was unique in its timing and approach. SCE's EM&V staff requested Energy Market Innovations, Inc. (EMI) to perform a Rapid-Feedback evaluation of the CPACS Program in the second year of the program implementation period (2007). As the project title states, the intent of this evaluation was to identify and assess program performance issues and feed them back to the Program for addressing in a manner that the Program could make informed decisions.

The initial Rapid-Feedback evaluation took place in April and May of 2007 and was reported in June (see the Appendix 1 for the initial assessment report). EMI followed up this evaluation beginning in mid 2008. This second assessment identified if and how the initial recommendations were addressed as well as any additional program performance issues.

The initial assessment identified program performance issues that centered on the program management contractor's (PMC) challenges to adequately forecast and ramp up this complex and potentially comprehensive program.

SCE launched the CPACS Program in 2006 to reduce electricity consumption through the promotion of high efficiency packaged air conditioning systems and high quality installation and service of commercial and residential air conditioning equipment. This resource acquisition program proposed a multichannel approach to:

- Deliver cost-effective energy savings and peak demand reduction with integrated activities that balance short- and long-term strategies
- Promote selection and proper installation of premium efficiency equipment
- Increase the proficiency of contractors to deliver high quality energy efficiency services
- Increase efficiency in existing packaged air conditioning systems
- Incorporate emerging technologies
- Set conditions for long-term change.

The Program struggled to ramp up in 2006 and was not meeting goal as of the spring of 2007. EMI's evaluation, which involved a series of Program participant interviews and data review offer the following recommendations:

Short-term high priority recommendations

- ***Develop an issue management and resolution process*** – A handful of technical issues related to measure installation protocols and savings estimates were negatively affecting the program's success.
- ***Develop a fall production strategy*** – There was no clear strategy to maintain and *enhance contractor interest during* the 2007 summer months, and sustain program *momentum* and *expansion* when the repair and maintenance season starting in the fall.
- ***Focus on increasing participation of already-recruited contractors*** – Data showed a nearly exclusive participation by a handful of contractors. There was no indication of why the remaining enrolled and trained contractors were not participating.
- ***Develop a defensible production activities forecast*** – There was little confidence in PMC's immediate production forecasting and management.

- ***Clarify role and expectations*** – Roles, responsibilities, and expectations of the HVAC contractors and verification service providers were not fully developed and poorly documented.

Long-term strategic recommendations

The CPACS Program was a good candidate for a more ***market-based strategy.*** A strategy would be:

- ***Highly informed*** – The Program can benefit from a solid understanding of market players and their barriers to participation, in addition to understanding HVAC technology and other market factors.
- ***Entrepreneurial*** – The utility must engage the California Public Utility Commission, key stakeholders, and trade allies to make investments and take risks.
- ***Strategically nimble*** – The utility and its partners must make quick, informed decisions based on market information. Players must understand when market conditions require a change in strategy and /or tactics.

The ultimate goal of this strategy is the development of a vibrant nexus of *smart* HVAC contractors and *smart* end users pushing and pulling demand for quality installation of high-efficiency HVAC equipment and tune-up services.

EMI reevaluated the Program in 2008 through a series of interviews, data review, and additional research. It was apparent that the SCE Program Manager and the PMC management team had aggressively addressed the initial recommendations during the fall 2007 and winter of 2007/2008. The CPACS Program made significant changes to its approach and processes that included:

- More robust program planning and production planning,
- Specific roles, responsibilities, and expectations,
- An issue identification and management process, and
- A concise set of Program performance metrics and accompanying reporting process.

The results in Program's performance is reflected in the following table:

	2006 – 2008 Total Performance			
Measures	Original Goal (units)	Revised Goal (units)	Actual (units)	%
Commercial RCA	40,000	31,556	26,949	85
Commercial condenser coil cleaning	30,000	19,963	31,934	160
Evaporator coil cleaning	24,000	15,820	24,902	157
Commercial Economizer Retrofit	5,000	513	0	0
Commercial early retirement	14,000	8,259	1,205	15
Residential RCA	28,796	23,508	79,373	338
Residential condenser coil cleaning	14,398	12,073	71,619	593
Residential RCA New Construction	5,000	3,544	4,542	128
Residential duct sealing	4,001	8,298	12,113	146
Residential early Retirement w/QI	8,000	5,591	2,319	41

The revised goals indicate a reduction from the original proposed production; they reflect a more accurate picture of how the market could realistically respond to the Program logic and market actors.

While the initial assessment focused on PMC performance challenges, the 2008 review identified a new set of issues. The issues identified during the 2007-2008 evaluation and addressed in this report are truly multi-dimensional, they can be categorized as ***technical/economic***, ***market-based*** and ***organizational*** in nature.

Technical/Economic Issues

Savings Estimation Uncertainty –Industry literature indicates a potential and significant reduction in HVAC savings potential, in particular through RCA and duct sealing. This reduction in real savings potential, combined with increasing measures installation costs, can significantly impact program cost-effectiveness.

Recommendation: Work Papers for residential and commercial RCA have been completed but appear inconclusive and of little value for planning purposes. It is recommended that these work paper be readdressed utilizing a broad industry per review.

Unverified E3 Calculations — The CPACS Program's PMC E3 spreadsheets appeared to have been reviewed for completeness, but the process did not appear to assess the savings assumptions thoroughly.

Recommendation: SCE should take appropriate actions to ensure the accuracy of program results prior to program filing with the CPUC and before setting program performance goals.

VSP Technology Uncertainties – Installation data from the CPACS Program and similar utility HVAC programs point to uncertainties regarding the replicability and stability of the VSP platforms. Uncertainties exist around the validity of savings assumptions as coded into the platforms, overall software stability, data transfer quality control, and platform calibration.

Recommendation: SCE should coordinate with the other IOUs, California Energy Commission, CPUC, and VSPs to quantify system and process uncertainties. These studies should lead to the development of processes or protocols that support improving the reliability of VSP field verification and ensure that measures are installed appropriately via post-installation review/inspection.

Market Issues

Inadequate Market Characterization and Saturation Information – The 2006-2008 CPACS Program was designed and implemented without an adequate understanding of the complexity of the HVAC marketplace and its key players, or detailed savings potential. However, the CPACS Program does not have the market intelligence necessary to effectively address immediate and long-term savings goals, particularly in the commercial sector.

Recommendation: To be effective in the residential and commercial HVAC market, CPACS needs access to current and detailed HVAC saturation data for its service area as well as general market characterization information.

Organizational Issues

In the course of this evaluation, it became apparent that some internal SCE business processes appeared to be inherently unsupportive of, or hindering the CPACS Program's progress toward meeting its savings goals cost-effectively. These processes can be characterized as "back office", that is, SCE functions that directly or indirectly support the DSM programs. These business processes included elements of

Marketing, Business Services Procurement, Market Research, Quality Assurance and Engineering Support functions. While generally outside the scope of this evaluation, the issues generally centered on an apparent misalignment or misunderstanding of joint DSM goals, poorly defined roles and unclear responsibilities.

Recommendation: SCE must make significant management investments in these "back office" issues to fully characterize them and develop plans to resolve them.

It is EMI's belief that the Rapid Feedback Program assessment is a valuable evaluation, planning and implementation tool. The CPACS Program responded to the initial feedback as evidenced by the significant increase in performance. This evaluation afforded the Program the opportunity to further identify performance issues, which if addressed, should afford incremental increases in savings and productivity.

2.0 INTRODUCTION

In June 2007, Energy Market Innovations (EMI) completed a Rapid Feedback Evaluation of Southern California Edison's (SCE) Comprehensive Packaged Air Conditioning System (CPACS) Program for the period 2006-2007. That project identified program performance issues and provided a variety of recommendations.

As a result of that evaluation, the CPACS Program addressed many of the recommendations and identified additional program performance enhancements. This report evaluates the CPACS Program for the 2007-2008 period. It summarizes program changes and accomplishments, and identifies recommendations for further program enhancements. The report is organized as follows:

- **Background** – This section provides a program description with a statewide context, a summary of the 2006-2007 Rapid Feedback Evaluation and recommendations.
- **2007-2008 CPACS Program Evaluation –** This section outlines the goals and tasks of this follow-up process evaluation including the Program's response tot he initial recommendations.
- **Recommendations** – This section identifies additional issues and recommendations for program performance improvements.
- **Appendix** - The appendices provides the June 2008 Rapid Feedback Evaluation Report

3.0 BACKGROUND

3.1 California Air Conditioning Energy Demand

Air conditioning is one of California's largest energy-consuming end uses and the single largest contributor to peak demand. The air conditioning market is complex and highly fragmented among many market delivery channels, and end-users generally misunderstand energy efficiency benefits of high efficiency HVAC equipment and quality installation and maintenance.

Section 6 of the June 2, 2008, California Energy Efficiency Strategic Plan (CEESP - Rulemaking 06-04-010) characterizes the air conditioning market. This excerpt contextualizes the industry within which the CPACS Program operates.

> *In 1976, 25% of new California homes had central air conditioning. Today, it is 95%, and new home size has increased by more than half. This has resulted in a greater than seven-fold increase in the electricity capacity to meet this load. By 2006, peak demand for residential air conditioning units was 14,316 MW. When small commercial air conditioning is added to the residential share, this represents 30% of California's total peak power demand in summer—with an enormous and costly impact on the need for generation, transmission and distribution resources and a concurrent reduction of utility load factors.*
>
> *…Installation and maintenance practices suffered substantially as the HVAC industry struggled to provide qualified technicians and took advantage of market conditions that rarely valued quality installation and maintenance. Studies show that 15-50% of central air conditioning systems were not being properly installed. Californians have paid a large price for this failure by the industry to*

ensure installation quality and the commensurate erosion in performance. Research shows that it has led to a 20-30% increase in the peak energy needed to provide consumers with the cooling and comfort they demand on hot summer afternoons and an estimated 30% increase in carbon emissions.

The CEESP also identifies several specific high-level market characteristics:

- *Limited market penetration of advanced air conditioning technologies optimized for the needs of California's climate*
- *Market players that undervalue the [energy efficiency] benefits of quality [HVAC] installation and maintenance*
- *Inconsistent and ineffective compliance, enforcement, and verification of existing building standards [Title 24]*
- *Building industry design and construction practices that do little to integrate building performance to reduce cooling loads*

3.2 CPACS Program Description

The Comprehensive Packaged Air Conditioning System (CPACS) Program is one of several California investor-owned utility (IOU) programs designed to deliver energy savings from this complex market. SCE launched the program in 2006 to reduce electricity consumption through the promotion of high efficiency packaged air conditioning systems and high quality installation and service of commercial and residential air conditioning equipment. Residential and commercial air conditioning is responsible for approximately 30 percent of peak demand in California. Research indicates that packaged air conditioning and related energy efficiency activities can reduce air conditioning consumption by 10 to 20 percent.

This resource acquisition program used a multichannel approach to:

- Deliver cost-effective energy savings and peak demand reduction with integrated activities that balance short- and long-term strategies
- Promote selection and proper installation of premium efficiency equipment
- Increase the proficiency of contractors to deliver high quality energy efficiency services
- Increase efficiency in existing packaged air conditioning systems
- Incorporate emerging technologies
- Set conditions for long-term change.

The program's overall goals were to:

- Install approximately 440,000 tons of high efficiency residential and commercial equipment (equivalent to approximately 40,000 residential units and 46,153 commercial retrofit units)
- Provide efficiency services to 55,000 residential units and 40,000 commercial units
- Train an additional 180 installation and service technicians
- Increase consumer awareness of air conditioning energy efficiency opportunities and the California Cool 14 identity
- Coordinate packaged air conditioning energy efficiency activities with other programs and IOUs.

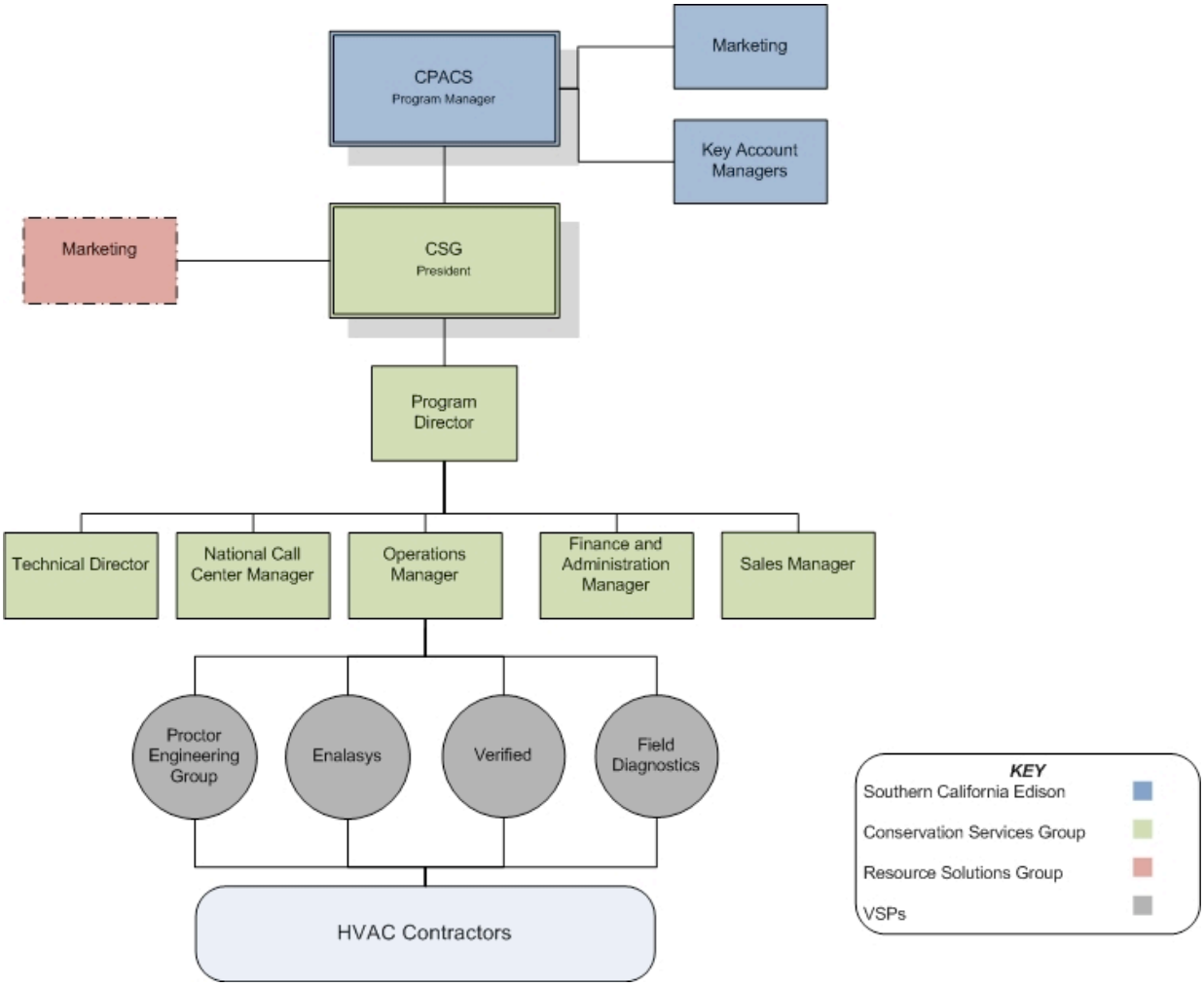
The CPACS Program's approach addressed market barriers and technical opportunities through upstream (manufacturers and distributors), midstream (HVAC contractors) and downstream (commercial and residential customers) strategies:

- ***Upstream***: Stimulate sales of premium efficiency packaged air conditioning equipment
- ***Midstream***: Train and incent contractors to select, install, and service new and existing equipment

- ***Downstream:*** Create customer demand for higher efficiency equipment, early retirement of less efficient units, and cooperative promotions to take advantage of joint marketing opportunities and seasonal selling and service cycles.

Conservation Services Group (CSG) served as program management contractor (PMC). CSG contracted Verification Services Providers (VSPs) to interface with the installation and service contractors. CPACS ensured that CSG coordinated its efforts with SCE Marketing and Key Accounts functions and provided current data on program results. CPACS Program staff also provided some limited coordination with other market players and other Edison programs. This organization is shown in Figure 1 below.

Figure 1: 2006-2007 CPACS Program Organization



3.3 2006-2007 CPACS Program Rapid Feedback Evaluation

In April 2007, SCE contracted with EMI to conduct a Rapid Feedback Evaluation of its CPACS Program to identify issues related to program design, processes, and performance.

The evaluation's goals were to:

- ***Assess Near-term Performance*** – Conduct a rigorous, but expedited review of program performance
- ***Identify Program Issues and Offer Recommendations*** – Identify near-term process or market issues that may hinder the ultimate success of SCE's efforts, and provide near-term recommendations to address these issues.

To achieve these goals, EMI focused on three tasks:

- ***Task 1: Program Documentation*** – EMI documented the program per the conceptual program plan. Documentation included: (1) a review of all CPACS Program materials and databases and program-related literature; (2) development of a visual representation of the program organization, including identification of all relevant vendors and contractors; and (3) documentation of the program theory using logic models.

- ***Task 2: Review Program Performance*** – EMI conducted in-depth in-person and phone interviews with the following key program players:

  - SCE CPACS Program implementation staff
  - Program implementer [Conservation Services Group (CSG)]
  - Program marketing subcontractor [Resource Solutions Group (RSG)]
  - Verification Service Providers (VSP)
  - Participating HVAC contractor (American Synergy Company, SEARS, Energyseal, Inc., AAA Express Heating and Air, and others)

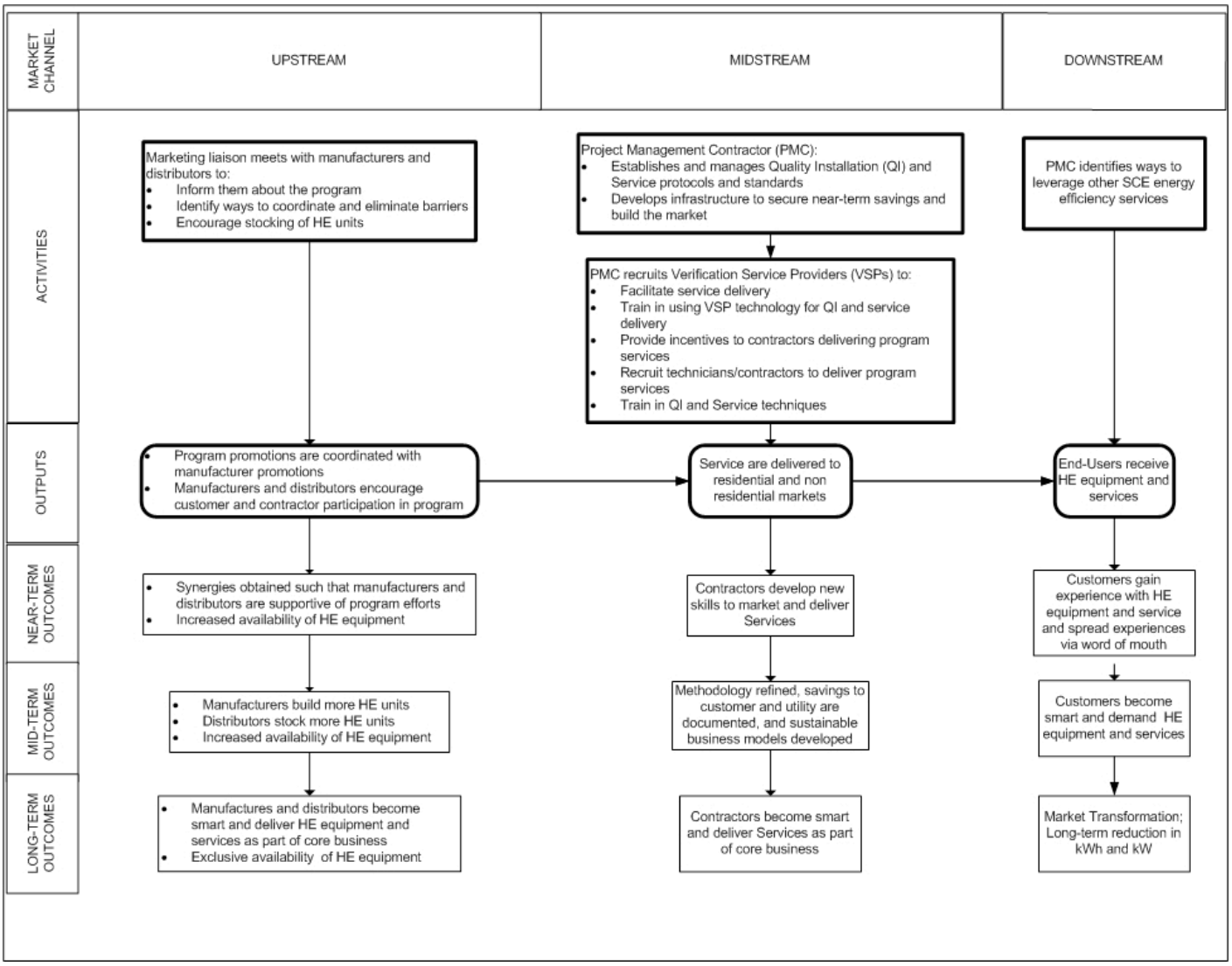
  Interviews focused on roles and responsibilities, planning, metrics, performance, reporting, and barriers to success.

- ***Task 3: Summary Assessment and Briefings*** – EMI prepared and presented summaries of program activity to SCE staff, identified near-term priority issues and recommended program improvements.

3.3.1 2006-2007 CPACS Program Logic Model

Figure 2 below represents the program logic model for the CPACS Program for 2006-2007. This logic model was based on EMI's understanding of the program design. It was derived from the initial Program Implementation Plan and conversations with SCE and CSG staff. The figure contrasts the elements of the original logic model, as filed with the CPUC, with the logic elements that were implemented by the end of the 2006-2007 CPACS Program review in bold.

Figure 2: 206 – 2007 CPACS Program Logic



Further detail is presented in ***Phase I Rapid Feedback Evaluation Summary: CPACS Program***, June 28, 2007. (See Appendix)

3.3.2 2006-2007 CPACS Program Performance

CPACS Program performance at the time of the 2006 – 2007 review is shown in Figures 3 and 4 against the original program forecast. The graphs reflect the challenges of ramping up a relatively new program in a highly complex market. These complexities are described in Section 3.3.3

Figure 3 – 2007 Non residential savings actual and forecast

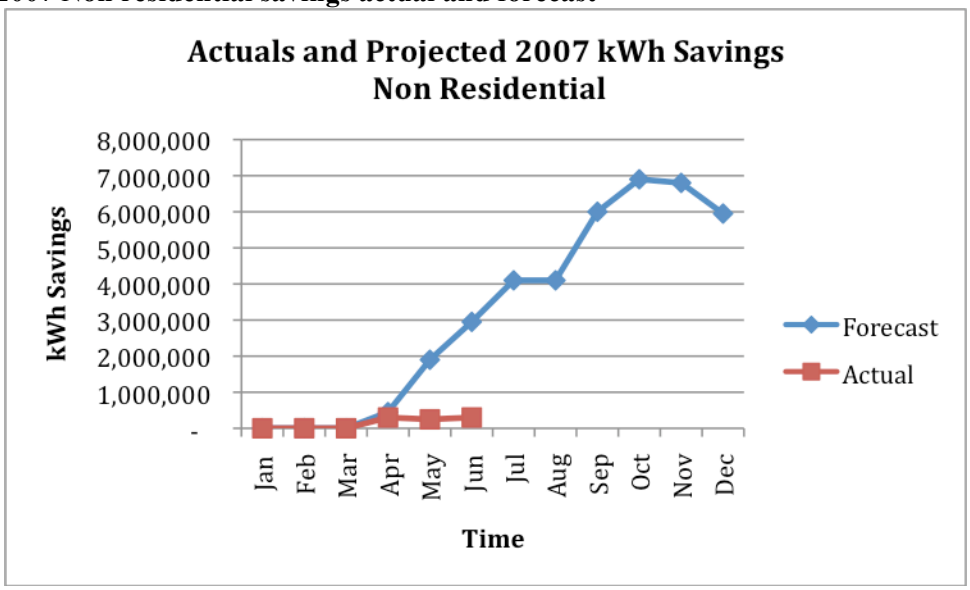
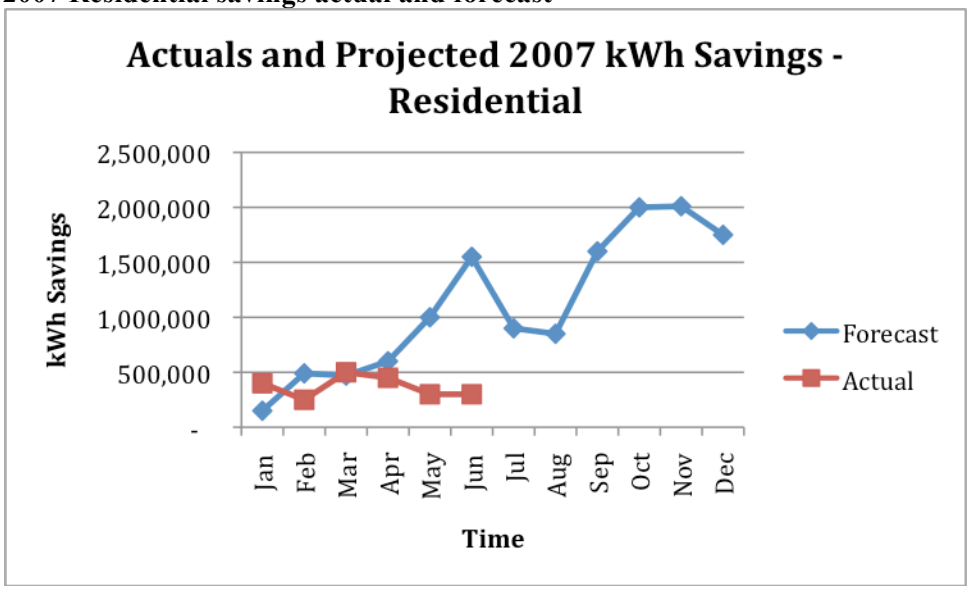


Figure 4 – 2007 Residential savings actual and forecast



3.3.3 2006 – 2007 CPACS Program Rapid Feedback Evaluation Recommendations

The evaluation recommended the following near-term and long-term program improvements. EMI gave all of these recommendations equal priority.

Near-term Strategic Recommendations

- ***Develop an issue management and resolution process*** – A handful of technical issues related to VSP protocols and savings estimates negatively affecting the program's success. EMI understood

that CSG and SCE communicated regularly. However, there was no formal process and little documentation to support how they raised and prioritized issues what decisions they made. EMI recommended that SCE/CSG develop a transparent process for understanding and prioritizing program issues, review issues more carefully, and create an issue management and resolution strategy. EMI recommended that SCE lead this process.

- ***Develop a fall production strategy*** – The fall repair season arrived shortly after Phase I began, so CSG immediately had to develop plans to keep market players interested in the program. Specifically, CSG needed a clear strategy to maintain and *enhance contractor interest during* the 2007 summer months, and sustain program *momentum* and *expansion* when the repair and maintenance season started in the fall.

- ***Focus on increasing participation of already-recruited contractors*** – CSG-reported data showed a nearly exclusive participation by a handful of contractors. There was no indication of why the remaining enrolled and trained contractors were not participating. CSG's production strategy appeared to be focused on additional contractor recruitment. EMI recommended the program investigate existing contractor barriers to participation and develop strategies to re-engage less active contractors.

- ***Tracking of production activities forecast*** – While CSG was optimistic about reaching longer-term energy savings goals; they were not meeting their original or revised goals. CSG considered April 2007 production as "a good month" and expected to double this performance in May. Neither was the case. SCE needed confidence in CSG's immediate production forecasting and management. EMI recommended that CSG provide a well-documented and clear plan of how it would calculate and meet production goals.

- ***Clarify role and expectations of VSPs*** -- VSP management issues are complex and interrelated and need to be addressed, but a number of management options are available to SCE/CSG. If the VSPs are to remain integral to the success of the CPACS program, we recommend that there be increased clarity of VSP roles, responsibilities, and performance expectations.

Long-term Strategic Recommendations

Program Concept – EMI suggested that the CPACS Program was a good candidate for a more ***market-based strategy.*** In simple terms, such a strategy would be:

- ***Highly informed*** – SCE must have a solid understanding of market players and their barriers to participation, in addition to understanding HVAC technology and other market factors.
- ***Entrepreneurial*** – The utility must engage the California Public Utility Commission (CPUC) and trade allies to make investments and take risks.
- ***Strategically nimble*** – The utility and its partners must make quick, informed decisions based on market information. Players must understand when market conditions require a change in strategy and /or tactics.

The ultimate goal of this strategy would be the development of a vibrant nexus of *smart*[1] HVAC contractors and *smart* end users pushing and pulling demand for quality installation of high-efficiency

[1] *Smart* is used here to characterize HVAC contractors that have identified the profitability of selling and servicing high efficiency HVAC equipment. *Smart* end users can be characterized as identifying the value of buying and maintaining high efficiency HVAC units.

HVAC equipment and tune-up services. If conceptualized and implemented appropriately, EMI predicted the approach would generate long-term savings.

4.0 2007-2008 CPACS PROGRAM EVALUATION

Between August 2007 and mid-2008, SCE addressed the Rapid Feedback Evaluation's recommendations that could be resolved within the programmatic and contractual bounds of the CPACS Program. EMI was asked to continue to review the Program's activities and results and prepare a follow- up evaluation. This section presents that evaluation and is organized as follows:

- 2007 – 2008 CPACS Program evaluation goals and tasks
- Program update and responses to the 2006–2007 Rapid Feedback Evaluation Recommendations
- 2007 – 2008 CPACS Program evaluation results

Recommendations resulting from this evaluation are summarized in Section 5.

4.1 2007 – 2008 CPACS Program Evaluation Goals and Tasks

The 2007 – 2008 CPACS Program evaluation's goals were to:

- ***Assess Near-term Performance*** – Continue the rigorous, but expedited real time review of program performance

- ***Identify Program Issues and Offer Recommendations*** – Identify any additional near-term process or market issues that may hinder the success of SCE's efforts, and provide near-term recommendations to address these issues.

To achieve these goals, EMI performed the following tasks:

- ***Program Documentation*** – Document changes to the program logic and organization resulting from or following the 2006 – 2007 evaluation.

- ***Review Program Performance*** – Conduct in-person and phone interviews with key program players and reviewed program metrics.

- ***Contractor Surveys*** – Solicit input from contractors who had enrolled in the program in order to identify and understand barriers to participation and identify suggestions for increasing near-and long-term participation among this group.

- ***Long-term Program Options Assessment*** – Review other, similar programs designed to capture energy savings from residential and commercial HVAC tune-ups in order to create an alternative program model for SCE.

- ***Long-term Program Evaluation Strategy Design*** – Identify the optimal program evaluation approach, including specific data needs, performance metrics, and timing.

4.2 Program Update and Responses to the 2006–2007 Rapid Feedback Evaluation Recommendations

SCE and CSG refined the CPACS program in response to the 2006-2007 Rapid Feedback Evaluation's recommendations. These changes are summarized in the following sections and represented in an updated Program logic (Figures 4), revised Program organization (Figure 5) and resulted in the overall performance reflected in Table 1.

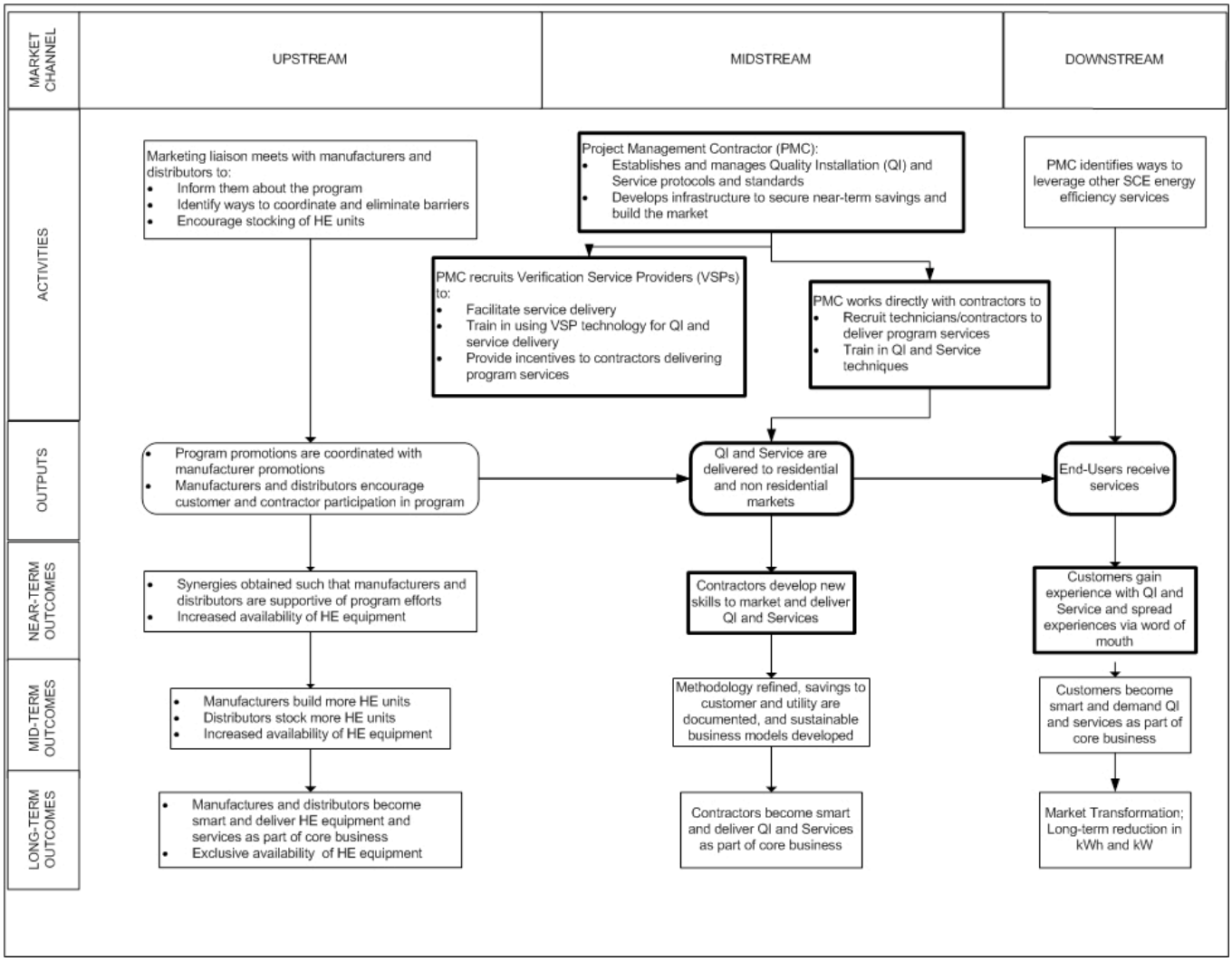
4.2.1 Program Logic Model

CPACS restructured the program in 2007. Figure 5 below shows the amended original program logic model. The original scope was broad and ambitious, including addressing all market channels: manufacturers and distributors, HVAC contractors, and end users. The solid boxes indicate fully implemented logic processes.

The apparent incompleteness shown in Figure 5 does not equate to program failure. The recommendations identified in the Rapid Feedback Evaluation, the collaborative relationship developed between SCE and CSG, and the substantial management investment by both SCE and CSG during 2007 – 2008 point to the success evidenced in the savings displayed in Table 1 below. For example, the program's use of contractor intelligence gathering and program metrics analysis allowed for more informed decision-making regarding service delivery and incentives. In addition, program marketing to manufacturers and distributors basically was dropped due to limited success, and marketing to end-users was severely reduced, again due to limited response and lack of a measurable connection between marketing investments and savings. The program focused on entrepreneurial delivery options with the Game and Non-VSP Pilot[2]. These informed decisions correspond to an appropriate and necessary refocusing of the program and reflect nimbleness and market responsiveness.

[2] The Game was a refinement of contractor incentives focusing on a tiered reward to the top producers. The CPACS Non-VSP Pilot was a small study to better understand the technical capabilities of large HVAC contractors to verify QI and QM through internal QA/QC procedures.

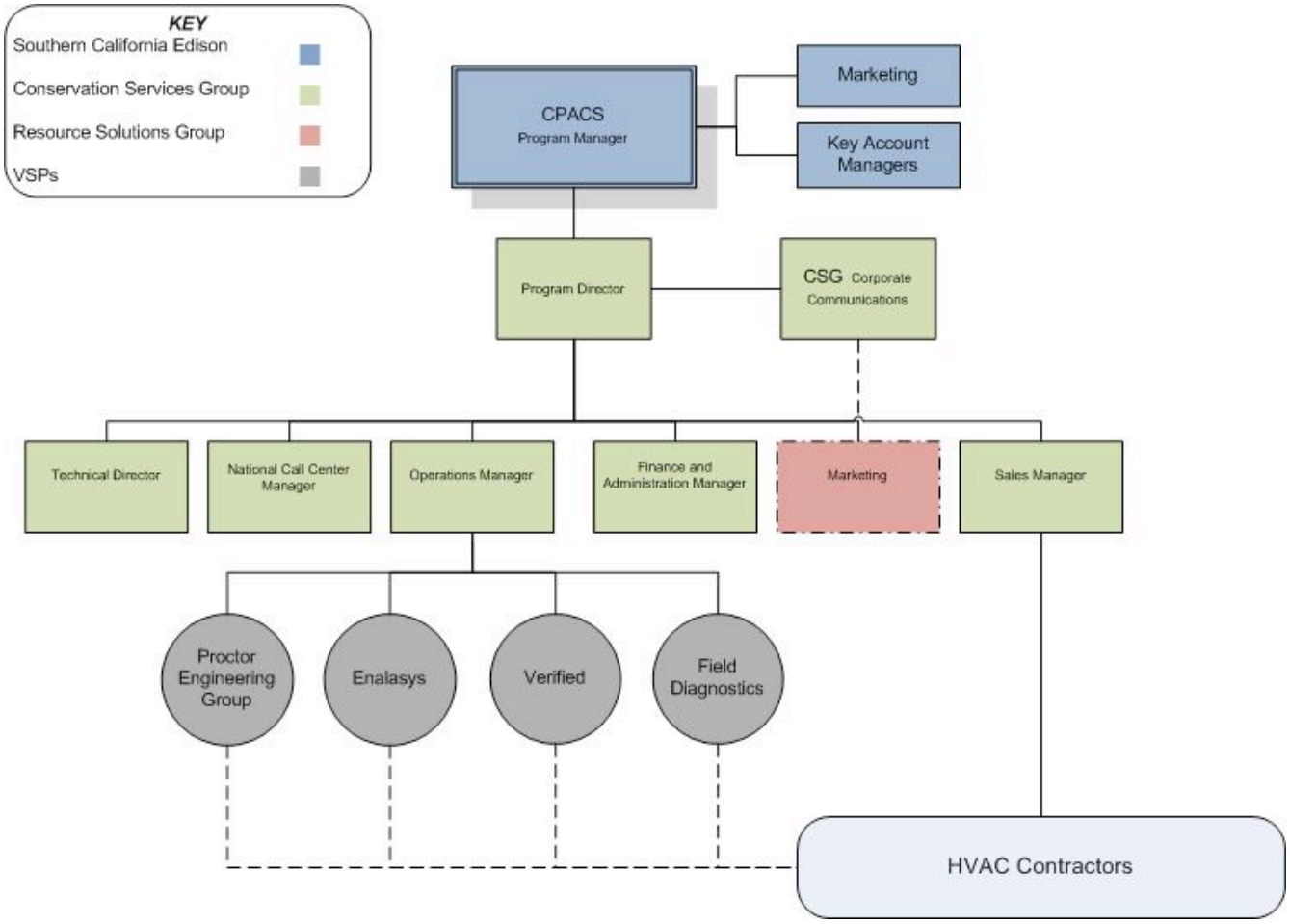
Figure 5: CPACS Program Logic Model as Amended in 2007



4.2.2 Program Organization

The most significant element of the 2006 – 2007 reorganization was the change in the Program's relationship with VSPs and participating HVAC contractors. VSPs provided an important role in measures installation verification but did not provide the level of contractor recruitment and management as originally envisioned. The role of contractor recruitment and support was changed to a CSG function (See Figure 6). Additional detail is provided in Section 4.2.4 below.

Figure 6: 2007-2008 CPACS Organization Structure



4.2.3 Program Results

The program results from 2006 – 2007 shown below reflects the challenges of ramping up a comprehensive program in a complex and fragmented market place without basic market intelligence, very ambitious goals, and an untested program design. As a result of the 2006 – 2007 Review and substantial management investment by both SCE and CSG, the program goals, structure, and organization were realigned. This is shown in the program results from 2007 – 2008. Additional detail is provided in Section 4.2.4 below.

Table 1 – Program Results

	2006			2007				2008				Total			
	Goal (units)	Actual (units)	%	Original Goal[1]	Revised Goal[2]	Actual (units)	%	Original Goal[1]	Revised Goal	Actual[3] (units)	%	Original Goal*	Revised Goal**	Actual[3] (units)	%
Commercial RCA	370		0	17,160	10,838	6,641	61	22,470	20,348	20,308	100	40,000	31,556	26,949	85
Commercial condenser coil cleaning				12,990	4,790	5,349	112	17,010	15,173	26,585	175	30,000	19,963	31,934	160
Evaporator coil cleaning				10,392	3,611	3,402	94	13,608	12,209	21,500	176	24,000	15,820	24,902	157
Commercial Economizer Retrofit				1,940	0	0	0	3,060	513	0	0	5,000	513	0	0
Commercial early retirement				5,432	1,482	275	19	8,568	6,777	930	14	14,000	8,259	1,205	15
Residential RCA	1,200	1,047	87	11,949	9,437	19,371	205	15,647	12,871	58,955	458	28,796	23,508	79,373	338
Residential condenser coil cleaning				6,234	5,123	13,090	256	8,164	6,950	58,529	842	14,398	12,073	71,619	593
Residential RCA New Construction				2,165	1,143	1,233	108	2,835	2,401	3,309	138	5,000	3,544	4,542	128
Residential duct sealing	500	636	127	1,516	4,154	6,646	160	1,985	3,644	4,831	133	4,001	8,298	12,113	146
Residential early Retirement w/QI				3,224	1,667	930	56	4,776	3,924	1,389	35	8,000	5,591	2,319	41

Note: 1 -2006-08 Production goals provided by CSG in November 2006
2 - 2008 totals contain data that has yet to be approved by SCE, final totals may differ after invoicing is complete
Production numbers above are "unit count" not tonnage
% = Percent of revised goals.

4.2.4 Response to the 2006 – 2007 Recommendations

The following section presents the program's response to the recommendations of the 2006 – 2007 review.

Near-term Strategic Recommendations

- ***Develop an issue management and resolution process*** – A handful of technical issues related to VSP protocols and savings estimates were holding back the program. EMI understood that CSG and SCE communicated regularly. Despite this regular and valuable dialogue, there lacked a formal program review process and had little documentation to support how they raised issues, prioritized solutions and documented decisions. Further, these important management discussions were marginalized by the lack of current and detailed program performance metrics. It is understood that CSG collected a variety of program metrics for their internal use; however, this information was not synthesized and reported to the SCE Program Manager to support tactical decision-making. EMI recommended in its 2006 - 2007 report that SCE/CSG develop a transparent process for understanding and prioritizing program issues and creating a strategy for quick implementation. EMI also called for SCE/CSG to develop program metrics for all program activities, include budget/forecast, actual performance and variances. The variance report would identify issues and offer or indicate appropriate resolutions.

  Implemented Solution: An ongoing issues list, monthly metrics, and reporting process were developed and implemented. CSG sends SCE monthly reports of program progress and issues.

- ***Develop a fall production strategy*** –Program results for 2006 – early 2007 were well below original forecast goals. According to CSG, these original projections were based on inaccurate assumptions about the productivity of the VSPs. EMI was not able to substantiate or document the assumptions for CSG's projections. As SCE needed confidence in CSG's immediate production forecasting and management. EMI recommended that CSG provide a well-documented and clear plan of how it would calculate and meet production goals.

  *Implemented Solution***:** New goals for the fall of 2007 and 2008 were developed, based on more realistic assumptions of VSP and contractor capacity, and more direct engagement of the VSPs and core contractors. In the first two quarters of 2008, these revised goals generally were met or exceeded.

- ***Focus on increasing participation of already-recruited contractors*** –The Program-reported data showed a near exclusive participation by a handful of contractors. There was no clear indication of why the remaining enrolled and trained contractors were not participating. CSG's work around production strategy focused on additional contractor recruitment. EMI recommended the Program investigate existing contractor barriers to participation and develop strategies to re-engage less active contractors.

  Implemented Solution: In concert with the Program's clarification and refinement of the VSPs' role (see below) and CSG's take over of direct management of select high production contractors, a strategy was developed to collect contractor intelligence for analysis and evaluation. This fresh contractor intelligence provided market insights that drove a variety program enhancements, primarily the tiered incentive structure and marketing collateral support.

- ***Clarify roles and responsibilities of VSPs*** – The measures installation verification function provided by the VSPs is integral to the success of the current CPACS Program model. The original program assumed that VSPs would operate semi-autonomously to ensure the measures were installed/provided correctly, program data were verified and reported to CSG/SCE accurately and in a timely fashion, and contractor incentives were paid on time. The program reported a variety of concerns, including poor data quality, untimely data reporting, long contractor payment cycle times and high technician failure rates. EMI recommended the immediate evaluation of the VSP function, focusing on clarifying the VSP role, responsibilities and performance expectations.

  Implemented Solution: The program's reliance on VSPs to communicate with recruited, but inactive, contractors was not achieving program goals. In the fall of 2007, the program made a strategic decision to focus on the top 20% of active contractors. This aggressive program shift involved CSG communicating with select contractors directly, instead of through the VSPs. CSG sales staff were assigned as key account managers, weekly issue management meetings were instituted, and specific production goals were established in concert with focused incentives.

Long-term Strategic Recommendations

EMI suggested that the CPACS Program was a good candidate for a more ***market-based implementation strategy.*** In simple terms, such a strategy would be:

- ***Highly informed*** – SCE would have a solid understanding of market players and their barriers to participation, in addition to understanding HVAC technology and other market factors.
- ***Entrepreneurial*** – The utility would engage the California Public Utility Commission (CPUC) and trade allies to make investments and take risks.
- ***Strategically nimble*** – The utility and its partners would make quick, informed decisions based on market information. Players would understand when market conditions require a change in strategy and /or tactics.

The ultimate goal of this strategy would be a utility program supporting a vibrant nexus of *smart* HVAC contractors and *smart* end-users pushing and pulling demand for quality installation of high-efficiency HVAC equipment and tune-up services. If implemented appropriately, EMI predicted the approach would generate long-term savings.

Implemented Solution: The implementation of the Near-term Strategic Recommendations above afforded purpose-driven communications with the VSPs and major contractors. These new and refined processes, especially the gathering and synthesis of market and contractor performance information (***Highly informed)***, allowed the PMC to clearly identify market barriers and work with the CPACS program manager to fine tune the program (***Strategically nimble)***. The focal point of this refinement was the tactical adjustments and repackaging of contractor incentive levels (***Entrepreneurial)*** in direct response to contractor intelligence and performance.

As program performance stabilized, the CPACS program manager engaged external consultant support to identify and scope strategic opportunities to improve program performance. Throughout the summer and fall of 2007, the CPACS program manager communicated with peers at PG&E and SDG&E on broader scale issues. The result of this communication was a consensus that there was potential for additional program improvements through coordination of a variety of program elements, including:

- Program offerings and incentive level alignment;
- Contractor training and support; and

- Stakeholder and trade ally engagement

This coordination effort was superseded in October of 2007 with the California Energy Commission's task, required by AB 2021, to develop a plan to improve the energy efficiency of air conditioners in California and report to the Legislature on any changes in law needed to implement the plan. The vision of this effort was as follows:

> *A revitalized HVAC Industry will contribute to increased energy efficiency, reduced peak electricity usage and the capability to control peak demand by providing high quality installation and maintenance services for all cooling system installations. This goal will be accomplished by developing a brand for customers to use to recognize and ensure quality installation and by giving suppliers a profit motive to deliver higher quality installation and maintenance practices, These practices are expected to result in lower peak energy use, better comfort, higher reliability and better indoor air quality. These changes will lead to sustained profitability for HVAC trade allies as the business model changes from a commodity to a value-added service business.*

The resulting broad HVAC stakeholder effort, including direct participation by the IOU HVAC program managers resulted in the drafting of the CEC report "Recommended Strategic Plan to Transform the Existing HVAC Industry and Achieve Additional Peak Savings, Sustainable Profitability and Increased Customer Comfort". This report was approved by the CEC June 18, 2008.

This industry-wide planning effort was further leveraged with the development of the CPUC's "California Long Term Energy Efficiency Strategic Plan" (CLTEESP) September 2008. The HVAC section of the CLTEESP refined the CEC's work into a concise set of actionable strategies. The HVAC vision:

The residential and small commercial heating, ventilation, and air conditioning (HVAC) industry will be transformed to ensure that technology, equipment, installation, and maintenance are of the highest quality to promote energy efficiency and peak load reduction in California's climate.

The CLTEESP and resultant program implementation plans for the 2009 – 2011 IOU planning period reflect an order of magnitude increase in HVAC program planning and coordination. While the details of the CLTEESP and PIPs are outside the scope of this assessment, they do reflect a maturing of HVAC program planning necessary to understand the complexity of the market, advance savings potential, and drive market transformation.

Based on this summary, EMI believes the major near-term/high-priority performance issues identified in the Rapid Feedback Evaluation have been resolved, and that SCE and CSG have implemented effective program planning and management processes that can sustain the program into the 2009-2011 planning period.

4.3 2007 – 2008 CPACS Program Evaluation Results

This section reports EMI's actions and findings per the goals and tasks described in section 4.1.

HVAC Contractor Surveys -- The original 2007 – 2008 evaluation scope included EMI's development of a robust survey to capture HVAC contractor market intelligence and process the resulting information. Fortunately, EMI identified a concurrent and similar San Diego Gas & Electric (SDG&E) phone survey. With the approval of the SCE EM&V project manager, SCE and SDG&E were able to merge the two

surveys and thereby cost-effectively collect the necessary contractor information while reducing contractor survey participation time. EMI conducted the following activities:

- Provide detailed input towards the development of a joint SDG&E/SCE telephone survey of participating and non-participating HVAC contractors to identify and understand barriers to program participation.
- If necessary, conduct a follow-up focus group of actively participating contractors, and contractors who were trained to provide program services but had not yet participated substantially in it.

HVAC Contractor Survey Results

Telephone surveys were completed with 140 HVAC contractors located within San Diego Gas & Electric and SCE service territories in the fall of 2007. The survey focused on contractor training and education with an emphasis on the services provided by VSPs, and captured basic firm information and practices.

Contractors were separated into the following four groups based on their firm's annual revenue:

- Very small (less than $250,000 annual revenue): 28 percent (37 contractors)
- Small ($250,000 - $1,000,000 annual revenue): 44 percent (59 contractors)
- Medium ($1,000,000 - $5,000,000 annual revenue): 22 percent (30 contractors)
- Large (more than $5,000,000 annual revenue): 6 percent (8 contractors)

Most responses were similar across all four groups of contractors. Though major differences between the four groups are noted throughout this report, the small sample size of large contractors (N=8) made it difficult to compare this group to others. Furthermore, this disproportionately large number of small and very small contractors skews this sample somewhat.

Verified Service Providers and HVAC Contractors

Sixty-five percent of all firms surveyed were aware of one of the four VSP platforms in use in SDG&E and SoCal Gas/SCE service territories (Check-Me, Enalasys, Field Diagnostics, and Verified-RCA). Roughly half of all firms who were aware of the VSPs did not have a single technician who had been trained through one of the platforms. This was most common among very small firms; the percentage decreased with increasing firm size. Firms that did not have any technicians trained using one of the four VSPs cited the following reasons for this decision:

- Doesn't add anything to our business: 22 percent
- Too costly: 16 percent
- Technicians too busy to perform the procedures: 16 percent
- Didn't know about the training: 16 percent

Seventy percent of contractors said they didn't participate in the training because they already did similar work using other procedures. Seventy percent also agreed that it would be difficult to participate in program training sessions during the summer due to their busy construction schedules.

Thirty-five percent of the firms had signed up with one of the four VSPs. Among this group, Check-Me was the most common platform (53%), followed by Enalasys (29%) and Verified-RCA (24%). None of the firms reported using Field Diagnostics.

Small and very small firms were less likely to practice VSP-specific advanced diagnostics and quality installation procedures when servicing refrigerant charges. These firms also were less likely to perform

duct test and seal projects, and did not find information gained from VSP-specific procedures as beneficial as larger firms.

Employment Market

Seventy-five percent of contractors surveyed believed there was a shortage of technicians. Contractors from very small firms were the least likely to believe this shortage existed, while those from larger firms were the most likely to think so. The following were the most common responses given concerning how this shortage affects business:

- Makes it difficult to expand business: 26 percent
- Continually have to train new technicians: 24 percent
- Continually have to hire new technicians: 19 percent

Contractors were also asked about the prevalence of NATE certified technicians at their firms. Fifty-seven percent reported zero NATE certified technicians at their firms, while 21 percent reported having only one.

Encouraging Training

Contractors were asked what the utility would need to do to get more HVAC technicians to use advanced diagnostics and quality inspection techniques in the field. Fifty-three percent believed that rebates or incentives would encourage the use of AD/QI techniques, while 44 percent thought the utility should subsidize the training. Sixty-four percent of firms of all sizes reported they would send technicians to a free half-day sales training for high efficiency HVAC equipment. Sixty-six percent of firms also reported they would be interested in a free full-day training on AD/QI techniques, though this number was much lower for large customers that did not want to have their technicians unavailable to do service work for an entire day.

Market Issues and Current State

A very small number of firms reported installing new equipment with a SEER rating of 15 or higher. Seventy percent of firms reported that less than 20 percent of their new equipment installations carried SEER ratings of 15 or higher; 23 percent reported that none of the equipment they installed had a SEER rating of at least 15. Firms of all sizes reported that when they replaced old equipment, they nearly always replaced it with a similar-sized or larger air conditioner.

Contractors of all sizes reported the following issues as being the largest barriers when trying to sell above code equipment or AD/QI services:

- Price/cost issues
- Lack of customer awareness or knowledge
- Customers state they don't need the product or service

Fifty-four percent of contractors indicated that utilities could help sell premium efficiency equipment and AD/QI services by increasing the size of rebates, while 21 percent suggested the utilities could advertise the vale of this type of equipment and these services.

Contractors reported that repeat customers tended to be their main source of business; referrals and advertising were third and fourth respectively. This was true for firms of all sizes.

Long-term Program Options Assessment -- The objective of this task was to review program designs that are currently being implemented to capture energy savings available through HVAC tune-ups (both

residential and commercial) and, from this review, identify potential best practices that may be utilized as an alternative program model for SCE. The following activities were undertaken:

- Literature review -- a literature review was undertaken of existing utility HVAC programs in the US. As a starting point, EMI used the Consortium for Energy Efficiency's residential HVAC program summary (2005)[3]. The CEE summarized the program elements in Table 2 for the following utilities:

  - Alliant Energy-Interstate Power & Light Co
  - Austin Energy
  - Cape Light Compact, National Grid, Northeast Utilities, NSTAR Electric, Unitil
  - Connecticut Light & Power and United Illuminating Company
  - Long Island Power Authority
  - Los Angeles Dept of Water & Power
  - MidAmerican Energy Company
  - National Grid (Narragansett Electric)
  - New Jersey Board of Public Utilities
  - New York State Energy Research and Development Authority
  - Pacific Gas and Electric
  - PacifiCorp (dba Utah Power)
  - Sacramento Municipal Utility District
  - San Diego Gas and Electric
  - Southern California Edison
  - Tacoma Power
  - TXU Electric Delivery
  - Wisconsin Department of Administration, Focus on Energy

Kansas City Power and Light was included to add representation from the mid west. To better understand HVAC programs offered in the hot/dry climate zones similar to SCE, we reviewed the programs from:
NVEnergy (Nevada)
APS (Arizona)

Table 2 – CEE HVAC Program Elements

PROGRAM BACKGROUND
Name
Coordination
Year Established
Target Audiences
Specification Reference
Budget Cycle
Budget
Goals and Objectives
Contact
PROGRAM COMPONENTS
Offerings (equipment rebates/installation incentives
Financing
Training (upstream/midstream)
Verification
PROGRAM MARKETING AND EVALUATION
Marketing and Outreach Strategy
Past Performance

[3] Taylor, John, Consortium for Energy Efficiency, Residential HVAC Programs: National Summary September 2005

- Utility Program Manager Interviews – From the appended CEE list of utility programs above, EMI conducted in-depth interviews with 6 HVAC program managers at the following utilities:
  PG&E
  NVEnergy
  NYSERDA
  Austin Energy
  Kansas City Power and Light
  SMUD

- Industry Expert Interviews – Over the course of this evaluation, formal and informal interviews were conducted with the following industry experts:
  Danny S. Parker - Florida Solar Energy Center, HVAC researcher
  Jim Braun –Purdue University, HVAC researcher
  John Proctor - Proctor Engineering, HVAC researcher and verification service provider
  Stan Price - Putman Price Group, Inc., HVAC program implementer
  Marshall Hunt - UC Davis Western Cooling Efficiency, HVAC researcher

- Stakeholder Interviews -- Interviews were conducted with the following California HVAC industry stakeholders:
  Bob Wiseman - President, Institute of Heating & Air Conditioning Industries (IHACI)
  Bob Guenther - International Code Council / Architectural and Engineering Services
  Charles Segerstrom - PG&E Stockton Training Center
  Erik S. Emblem - Sheet Metal & Air Conditioning Contractors National Association (SMACNA)
  Dale Gustavson - President, Better Buildings Inc
  Glen Hourahan - Air Conditioning Contractors of America

Long-term Program Options Assessment Results

Literature Review - While the referenced CEE report and EMI's follow up research should not be considered comprehensive; it does represent a very reasonable picture of the range of utility HVAC programs. The majority of the utilities on the amended utility HVAC program list have both commercial and residential HVAC high efficiency equipment replacement programs based on Energy Star or better criteria. Programs are generally split between utility- and program implementer-offered. The majority of equipment programs offer a similar tiered set of incentives for the range of above code SEER equipment. However, only a few utilities directly support HVAC technician training and/or offer incentives for quality installation or maintenance (See Table 3).

Table 3 – Utility HVAC Program Summary

COORDINATION	50% statewide, 50% individual utility
YEAR ESTABLISHED	1992-2006
TARGET CUSTOMER SECTORS	70% residential only 25% both residential and commercial 15% upstream only
BENEFITS TO TRADE ALLIES	20% offer various types of benefits to trade allies
SPECIFICATION REFERENCE	50% Energy Star Only 5% ARI specs only 10% CEE specs only 25% Energy Star & CEE/ARI specs 5% No specs
INCENTIVE AMOUNTS	Split System AC or HP 13 SEER (Tier 1) - $150-300 Split System AC or HP 15 SEER (Tier 2) - $300-500 Advanced AC (> 15 SEER) - $450-625
ADDITIONAL INCENTIVE OPTIONS	Pay contractors for diagnostics through other program Pay for installation services through other program Listing as QIV provider For each rebated system passing charge and air flow test Free classroom training Reimbursements for training Reimbursements for purchase of digital flow grid or hot wire anemometer Further incentives for NATE certified technicians Reimbursements for registration fee for NATE course Energy Star AC or HP Free CheckMe! Training/testing or access for rebated systems For AC dealers for applications with qualifying sizing calculation Installation Bonus for contractors Incentives paid to distributors
TRAINING	40% Contractor/technician training 20% Dealer/distributor training 10% Unspecified training 10% No training
VERIFICATION	75% Verification/inspection component exists 20% No existing verification/inspection component
MARKETING AND OUTREACH STRATEGY	*From most common to least common:* Trade allies (primarily contractors and/or distributors) Bill inserts Website Direct mail Brochures Trade shows, events Radio, TV, newspapers Yellow Pages
PAST PERFORMANCE	75% Not publicly available 25% Publicly available evaluations

Program Manager, HVAC Expert, and Stakeholder Interviews – Interviews were open-ended and focused on identifying the current issues affecting the HVAC industry. These interviews indicated three main areas of interest/concern:

- Industry stakeholder involvement in utility program design;
- Technology investments in high efficiency HVAC equipment; and
- Savings estimates from HVAC tune ups

Industry stakeholder involvement in utility program design

The majority (10 out of 11) of industry stakeholders identified the electric utilities as generally isolated from the HVAC industry. This was clarified to mean utilities, due to the variety of programmatic drivers they work within, do not communicate regularly or attempt to engage the HVAC industry in meaningful dialogue. The top programmatic drivers identified by the respondents were:

- Regulatory constraints – Cost effectiveness constraints limiting the utilities' support of adequate incentives to drive market changes,
- Market intelligence - the utilities' general limited understanding of the HVAC market place, and
- General risk aversion – the utilities' general conservative culture to try on different programmatic approaches.

Stakeholders suggested a useful dialogue would include:

- Broad discussions regarding market character and trends,
- Strategic approaches to market transformation, and
- Program approaches beneficial to the industry (this did not specifically refer to energy efficiency or demand response but generally meant contractor/manufacturer profitability).

Technology investments in high efficiency HVAC equipment

The majority (8 out of 11) of industry stakeholders identified a general need to invest broadly in high efficiency equipment research and development. This included high SEER units, load shifting strategies and technology, and regional solution (hot/dry and hot/humid). There was no consensus if the electric utilities had a major role in supporting that research.

Savings estimates from HVAC tune ups

Five out of the eight industry stakeholders that felt competent in addressing HVAC technology (tune up savings assumptions and methodology) offered a wide range of anecdotal viewpoints regarding these programs and is interpreted as a lack of consensus

Energy Efficiency Services Inspections Coordinator at a southeast utility, said:
Austin Energy does not have an Air Conditioner tune-up program and, therefore, no calculated energy savings or rebates. Our staff has reviewed and rejected a program centered on refrigerant charge due to areas of significant system degradation that involve items such as dirty filters and condensers. These items can reduce performance and erase savings held within a tune up program in a relatively short time.

Also, an HVAC Researcher states:
Correcting charge does not always yield savings! Particularly when a unit is undercharged and was not meeting load previously…The fact remains that correcting undercharged units will often lead to increased energy use in the real world since the systems were often not being used before. This seldom considered fact is important for utility programs…By the way, the impacts of charge correction are small in any case. (<5%). Overcharged units represented the biggest savings for utilities.

As an illustration of the confusion in this area among professionals, it is worth noting specifically that while Parker points to most savings being from overcharged units, others claimed that (for TXV units) undercharged units actually are at least as efficient under a broad range of circumstances for refrigerant charge up to 15 percent below specification. These are all important comments from key players that give

an idea of the different viewpoints and lack of consensus on savings estimation variables and techniques among leaders in the industry.

Interviewees generally believe the basic theory behind the savings calculations is reasonable. It appears though, that estimating electrical energy savings indirectly from an AC unit's pre- and post-tune up thermodynamic conditions with no direct power or energy measurements may involve too many factors of uncertainty to have confidence in the reliability of savings. There was a general consensus that significantly more research would be required to be able to determine uncertainty quantitatively.

Long-term Program Evaluation Strategy Design -- The objective of this task is to identify the evaluation needs associated with the selected program design, including specific data needs, performance metrics, and timing. Specific tasks included:

- Construct an M&V Dashboard -- a dashboard of key performance indicators will be drafted and specified for implementation by SCE or a selected contractor.
- Identify program performance metrics -- these metrics will be utilized to track on-going performance of key program drivers.

M&V Dashboard

The proposed task to develop a dashboard of key performance indicators for implementation by SCE or a selected contractor was considered redundant with the task of identifying program performance metrics. This task was dropped from the evaluation with the approval of the SCE EM&V project manager.

Program Performance Metrics

The following program performance metrics (Table 4) were developed collaboratively between SCE and CSG. This metrics reflect data and information critical to effective program management and evaluation but does not include the contractually required financial reporting data set.

Table 4 - Program Performance Metrics

Metric	Unit	Frequency	Comment
Production			
Measures installed	Tons	Weekly, monthly, year to date	Include year to date
Measure goals	Tons	Weekly, monthly, year to date	Include year to date
Production by contractor	Tons	Weekly, monthly, year to date	Include year to date
Production by VSP	Tons	Weekly, monthly, year to date	Include year to date
Variance	Tons	Weekly, monthly	
Narrative		Weekly, monthly	Variance description and corrective action if applicable
QA			
Inspections performed	Number/type	Monthly	Include year to date
Inspection Goals	Number/type	Monthly	Include year to date
Variance	Number/type	Monthly	
Inspection results by measure	Number/type/VSP/ contractor	Monthly	
Narrative			Variance description and corrective action if applicable
Data Management			
Measure installations reported by VSP	Measures	Weekly, monthly, year to date	Include year to date
Batch rejections			
Narrative			Rejection description and corrective action if applicable
Other			
Incentives processed and paid	Number, value and type	Monthly	Include year to date
VSP training sessions	Number, contractors	Monthly	Include year to date
Other training	Number, participant type	Monthly	Include year to date
Marketing materials	Number, target	Monthly	Include year to date
Issue tracking	Number, type	Weekly, monthly	Description and corrective action if applicable

5.0 PHASE II ISSUES AND RECOMMENDATIONS

The 2006-2008 CPACS Program was developed as a standard resource acquisition program based on past energy efficiency program models. It is EMI's opinion that the program was designed and originally implemented without an adequate understanding of the complexity of the HVAC marketplace, market players, savings potential or technical challenges. This is not unique to CPACS, SCE or CSG. This apparent inadequacy is evidenced, in part, by the challenges CPACS experienced in the 2006 program launch, the issues identified in the Phase I report, additional issues identified in this Phase II report, and the complex issues raised in the attached California Long-Term Energy Efficiency Strategic Plan, Section 6 - HVAC, CPUC September 2008.

The issues identified in this section and the related recommendations reflect the complexity of the HVAC arena and importance of approaching this complex business and technical environment in an equally sophisticated manner. EMI's Rapid Feedback Evaluation suggested that the CPACS Program develop a market-based approach based on a detailed understanding of the HVAC market and its key market players. This approach is highly informed, entrepreneurial and strategically nimble.

While the issues identified during the 2007-2008 evaluation and addressed in this report are truly multi-dimensional, they can be categorized as ***technical/economic***, ***market-based*** and ***organizational*** in nature. It is EMI's opinion that by addressing them, the CPACS Program will be better positioned to achieve greater short- and long-term savings.

5.1 Technical/Economic Issues

Savings Estimation Uncertainty - The complex HVAC mechanical and thermodynamic systems are well understood. Although the savings potential for equipment replacement is reasonably quantified (DEER 2005), the savings potential for commissioning and re-commissioning still is uncertain. While the California Energy Commission (CEC), CPUC, utilities and other HVAC industry stakeholders are addressing some of these uncertainties, their current understanding indicates a significant reduction in HVAC savings potential, in particular through RCA and duct sealing. This reduction in real savings potential, combined with increasing measures installation costs, significantly impact program cost-effectiveness. Some of the issues that feed into or result from savings estimation uncertainties include the following.

Incomplete or Inconclusive Work Papers –For the CPACS Program to be responsive to the complex HVAC market environment, support effective decision-making and be cost-effective, SCE needs work papers reflecting up-to-date savings assumptions. From a series of interviews with SCE project managers, EMI's understanding is that work papers are generally developed (often after the fact) for the top 80% of the portfolio's measures, based on expected savings activity. Program managers can request new work papers as new information and studies are identified. The process of prioritizing work paper development is not transparent. Work paper development often competes with other non-EE priorities. Work papers for the CPACS Program were developed late in 2007 due to low 2006 production, and several were revised to reflect new information provided by the program. However, at the time of this report, several program-critical work papers remain either incomplete or inconclusive. The work paper for residential RCA has been completed but appears inconclusive and of little value for planning purposes. In addition, the CPACS Program shifted to a more commercial focus during 2008 that will continue in the 2009-2011 cycle, when commercial activities will account for approximately 80% of the savings. However, there is no commercial RCA work paper at this time.

Recommendation: EMI recommends that this work paper be readdressed. EMI recommends SCE develop commercial and multi-family RCA work papers to support this significant program strategy.

At the time of this report, work paper development responsibility has been transferred from Engineering to the Energy Efficiency function. This is a positive step in creating transparency to a prioritization process and to using Work Papers as a strategic resource.

Unverified E3 Calculations — SCE's potential third-party program implementers are required to receive training in the use of the SCE-specific E3 methodology to calculate savings for third-party implementation programs. This approach places the accountability on the vendor but does not remove SCE's risk that the results may not be current or robust. Based on conversations with the CPACS Program Manager and others, it appears that SCE Engineering staff reviews the E3 spreadsheets for completeness, but may not check the savings assumptions thoroughly. The process for vendor E3 review is outside the scope of this report, however, the reported limited validation of savings assumptions is an area of potential concern.

Recommendation: With respect to the increasing complexity of and uncertainty associated with HVAC measures, SCE should consider the programmatic risk of not fully validating third-party E3 calculations, understanding the savings uncertainties, and incorporating those uncertainties into program goals. SCE should take appropriate actions to ensure the accuracy of program results prior to program filing with the CPUC and before setting program performance goals.

VSP Technology Uncertainties – One long-term goal of SCE's CPACS Program is to transform the contractor market to ensure highest-quality unit installation and maintenance in order to maximize persistent energy savings. At this time, and for the foreseeable future, it will be critical for verification providers to confirm installed savings measures. Installation data from the CPACS Program and similar utility HVAC programs point to some uncertainties regarding the replicability and stability of the VSP platforms. Uncertainties exist around the validity of savings assumptions as coded into the platforms, overall software stability, data transfer quality control and platform calibration. These concerns, coupled with the equally complex nature of the HVAC mechanical and thermodynamic system elements these systems measure (see next issue), point to the need for SCE to have more confidence in the VSPs' tracking and reporting technologies.

Recommendation: SCE should coordinate with the other IOUs, California Energy Commission (CEC), CPUC, and VSPs to quantify system and process uncertainties. This should lead to the development and implementation of a verification platform "certification" and/or calibration protocol and a process to review and approve new VSPs.

Measures Verification Uncertainty – Table 5 below shows a representative sample of CPACS measure installation QA/QC data from early 2008. The apparent high percent of measure installation failure is due to human error, such as inadequate training and oversight; process errors, including data management failures, and/or mechanical failure; and inappropriate or improperly calibrated test equipment. Additional documented and anecdotal information from SCE and other utility HVAC M&V studies also point to the uncertainties of the post-installation field verification of HVAC savings measures. These uncertainties underscore the importance of improving the reliability of VSP field verification (addressed above), and the nature and scope of HVAC M&V protocols, QA/QC and longer-term savings validation/evaluation.

Recommendations: SCE should work with the other IOUs, CPUC, M&V providers and others on a study or studies to quantify the inherent uncertainties of HVAC savings measure field

verification during and after installation. These studies should lead to the development of processes or protocols that support improving the reliability of VSP field verification and ensure that measures are installed appropriately via post-installation review/inspection.

Table 5: CPACS QA/QC Data Sample (Q1 and Q2 2008)

	Total #	Physical #	Fail %	Visual #	Fail %
Total Inspections	2439	1817	48.43%	613	34.75%
Com RCA	744	494	43.32%	245	31.43%
Res RCA	541	378	61.90%	161	38.51%
DTS	102	82	59.76%	20	55.00%
Com Coil Cleaning	809	646	39.63%	161	31.06%
Res Coil Cleaning	243	217	58.53%	26	50.00%

5.2 Market Issues

Inadequate Market Characterization and Saturation Information – The 2006-2008 CPACS Program was developed as a standard resource acquisition program. The program was designed and implemented without an adequate understanding of the complexity of the HVAC marketplace and its key players, or detailed savings potential. As stated elsewhere in this report, in the course of building the program, CPACS has gained a significant amount of market intelligence, has a good understanding of the market's complexity, and has the systems in place to use that information in program planning. However, it is EMI's opinion that the CPACS Program still does not have the market intelligence necessary to effectively address immediate and long-term savings goals, particularly in the commercial sector.

> *Recommendation*: To be effective in the residential and commercial HVAC market, CPACS needs access to current and detailed HVAC saturation data for its service area as well as general market characterization information[4]. This information would afford a better understanding of savings potential, as well as better deployment of marketing and production resources. Further, the Program should continue to regularly and routinely engage program contractors and stakeholders to both gather and interpret market intelligence and trends.

5.3 Organizational Issues

Many of the issues that affect the CPACS Program are organizational at their core. In other words, some SCE business processes, beyond technical/economic methods or marketing and market intelligence analysis, are inherently unsupportive of or are hindering the CPACS Program's progress toward meeting its savings goals cost-effectively. As stated above, EMI believes CPACS, as well as all SCE demand-side management (DSM) programs can best be positioned to meet savings goals and support other SCE business objectives by being highly informed, entrepreneurial and strategically nimble. The path to this program precision is complex, requires management attention, and is understandably constrained by current business practices, regulatory issues, divergent organizational missions and utility/SCE culture.

The issues below were identified during the 2007 – 2008 evaluation. These organizational issue areas can be characterized as "back office", that is, SCE functions that directly or indirectly support the DSM programs. While a detailed process review of these organizational concerns is clearly outside the scope of this report, EMI believes the issues are not only noteworthy but must be addressed to ensure CPACS meets its future savings goals.

Marketing – SCE Corporate Marketing is responsible for maintaining the integrity of the SCE brand. CSG is responsible for marketing the CPACS Program and is contractually obligated to consult with the SCE Corporate Marketing group. The two marketing organizations have different scopes, but have similar skills and apply similar tools. At this time, the CPACS Program Manager provides the coordination between these two organizations. This is ineffective and costly to the CPACS Program. Unfortunately, several important SCE Corporate Marketing initiatives have compromised the CPACS Program significantly. The timing, scope and unintended mixed messages confused end-users and program-recruited HVAC contractors, substantially affected program momentum and diluted program savings and

[4] EMI acknowledges the market data contained in new CEUS and 2003 RASS, 2005 CLASS saturation data; however we recommend an enhanced data set of much higher resolution (by zip codes within the SCE service areas) to support tactical marketing efforts.

cost-effectiveness. This probably is a systemic issue for SCE. It is EMI's observation that these organizations are trying to meet their objectives in a complex environment but are operating in a knowledge vacuum.

> *Recommendation*: EMI recommends that SCE Corporate Marketing and the CPACS Program share their goals, objectives and plans; identify organizational synergies and obstacles; and develop ways to collaborate and coordinate their efforts.

Business Services – SCE's Business Customer Division (BCD) manages and "sells" the "value proposition" of over 70 complex energy-efficiency programs and products plus Demand Response, billing and service issues. It is EMI's observation that the BCD organization is aggressively trying to meet their objectives, but is operating in an increasingly complex environment with less than adequate knowledge of the CPACS Program strategy. In addition, BCD and CSG have similar goals and support the same portfolio, but have different roles and responsibilities. During Phase II, several BCD initiatives directly compromised the CPACS Program. As in the marketing discussion above, the timing, scope and unintended mixed messages confused end-users and program-recruited HVAC contractors, thereby substantially negatively affecting program momentum and reducing program savings and cost-effectiveness.

> *Recommendation*: EMI recommends a management review of the BCD – Energy Efficiency Programs business relationship to clarify roles and responsibilities, improve BCD's Program Managers' awareness of the CPACS Program's value, and increase program utilization. One goal of that review would be to identify human, tool and process investments to address increasing the capacity of BCD

Procurement – SCE's CPACS program is contracted program. The procurement process is built on standard contracting methods and processes designed to protect SCE from contractual liability issues, expedite the transfer of payments and/or incentives to contractors, ensure that the program meets appropriate financial reporting standards, and to be responsive to CPUC third-party program contracting requirements. EMI's assessment of the CPACS program procurement approach, while contractually sound, may not fully support effective program management and the higher-level purpose of inviting new, innovative and cost-competitive program ideas.

The vendor procurement process provides a template to guide potential vendors as they prepare their proposals. SCE uses the template to review the proposals and develop the chosen vendors' scope of work. This is an efficient way to understand and process a wide range of complex information. However, the procurement template does not give the Program Manager information and resources to help them be more effective in managing these third-party contracts, particularly with regard to identifying and contractually requiring basic program management metrics, materials and processes. This lack of basic program management information compounded CPACS early implementation. Many of SCE's Program Managers are new to the industry and have not yet developed the management skills these increasingly complex savings programs require.

> *Recommendation***:** Although a detailed review of the third-party procurement process was outside the scope of this report, EMI recommends a review of the procurement template as part of a larger analysis of program management skills and needs assessments. In support of this, the CPACS Program Manager developed a program management tool that will be incorporated as a contractual requirement in the CPACS 2009-2011 purchase order. This tool organizes most of the existing management reports and plans scattered throughout the current procurement template into a single managed document. It also includes additional program management needs, such as detailed

program metrics and their specific reporting requirements, which were identified in the CPACS reviews.

The vendor program procurement process is intended to invite new, innovative and cost-competitive program ideas into the SCE portfolio. While review of the third-party procurement process was outside the scope of this report, EMI's experience with the CPACS Program and other third-party programs points to the need to reassess elements of this process. Program portfolio savings goals are generated in concert with CPUC guidance. Portfolio budgets flow from this guidance and a general understanding of cost-effectiveness constraints. However, it appears little to no strategic consideration is provided to focus proposals around specific program or technology needs. During this evaluation, EMI was asked to review the 2009-2011 HVAC third-party procurement request for proposals (RFP) and review the submitted proposals. In many cases, SCE's RFP identified both required savings and budget; that is, it said, as an example, SCE has "$100 to spend to acquire 100kWh of savings". Many of the vendors responded with program proposals offering "100kWh of savings for $100" reflecting little, if any competitive behavior. While this is a simplistic representation of a very complex procurement strategy, it highlights a potential process flaw that appears to constrain competitive proposals for savings acquisition.

> *Recommendation*: In light of SCE's higher savings goals, increasing program and measures complexity, and rising costs, EMI recommends a management review of the third-party procurement process in concert with emerging tech strategy development and other savings acquisition processes. One element of that review would be to identify process issues and barriers that constrain competitive proposals.

Market Research, Quality Assurance and Engineering Support –The CPACS Program has effectively made short-term decisions based on market information and production metrics. However, for the program to expand and meet future savings and market penetration goals, detailed market characterization research is essential. Unfortunately, EMI's interviews with CPACS Program staff, other DSM program staff and EM&V staff provide anecdotal but clear concerns that the SCE market research function is not equipped to provide detailed market characterization data or intelligence.

The discussion in the section on savings uncertainties above reflects the increasing complexity of savings measures and verification/M&V processes; the need to invest in advanced technology-based energy-efficiency solutions; and the need to support proper installation practices and assurances that the technology is installed correctly. Interviews with CPACS staff and other DSM program managers identified a general lack of awareness of how engineering priorities are set, and an apparent lack of process transparency and organizational responsiveness.

In addressing the complexity and uncertainties surrounding in-field verification methodology, CPACS developed an independent QA/QC plan to meet immediate training and production needs. EMI's review of this plan showed it met the general criteria of QA/QC planning. This places contractual responsibility on the third-party vendor. However, it is EMI's understanding that the SCE QA function is not equipped to provide detailed plan guidance or review. It is EMI's opinion that SCE's "check the checker" QA program is insufficient to address the complex issues with the CPACS Program. Further, this lack of review makes it harder for SCE to secure and validate program savings. These "back office" program support issues are interrelated, inherently complex and reflect more systemic challenges within SCE.

Recommendation: It is EMI's opinion that SCE must make significant management investments in these "back office" issues to fully characterize them and develop plans to resolve them. EMI supports the creation of the new strategic management organization as a nexus for addressing a variety of these issues.

6.0 APPENDIX – RAPID FEEDBACK EVALUATION SUMMARY: CPACS PROGRAM

PHASE I RAPID FEEDBACK EVALUATION SUMMARY:

CPACS PROGRAM

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June 28, 2007

CONTENTS

1. BACKGROUND

Energy Market Innovations, Inc. (EMI) has completed a Phase 1 *Rapid Feedback Evaluation* of Southern California Edison's (SCE) Comprehensive Packaged Air Conditioning System (CPACS) Program.

Using our Rapid Feedback Evaluation approach, the goals of this project phase were to:

- ***Assess Near-term Performance*** -- Conduct a rigorous, but expedited review of program performance; and
- ***Identify Program Issues and Offer Recommendations*** -- Identify near-term process or market issues that may hinder the ultimate success of SCE's efforts, and provide near-term recommendations to address these issues.

As part of this review, EMI completed the following three tasks[1]:

- ***Task 1: Program Documentation*** -- EMI documented the program as it exists in relationship to the conceptual program plan. Documentation included (1) a review all available program materials; (2) development of a visual representation of the program organization including identification of all relevant vendors and contractors; and (3) documentation of the program theory using logic models.
- ***Task 2: Review Program Performance*** -- EMI conducted in-person and phone interviews of key program players. Interviews were 45 to 60 minutes in length and focused on roles and responsibilities, planning, metrics, performance, reporting, and barriers to success. EMI also reviewed available program databases.
- ***Task 3: Summary Assessment and Briefings*** -- In this task, EMI prepared a series of briefings offering our findings and initial recommendations. The objectives of these briefings were to identify near-term priority issues necessary to support the continued evolution and ultimate success of the program.

Our findings relative to these above-identified goals are provided below.

[1] Note that EMI did not develop an M&V "Dashboard" as was identified in our initial scope of work. A major Phase 2 task will be the development of performance measures and their timely reporting.

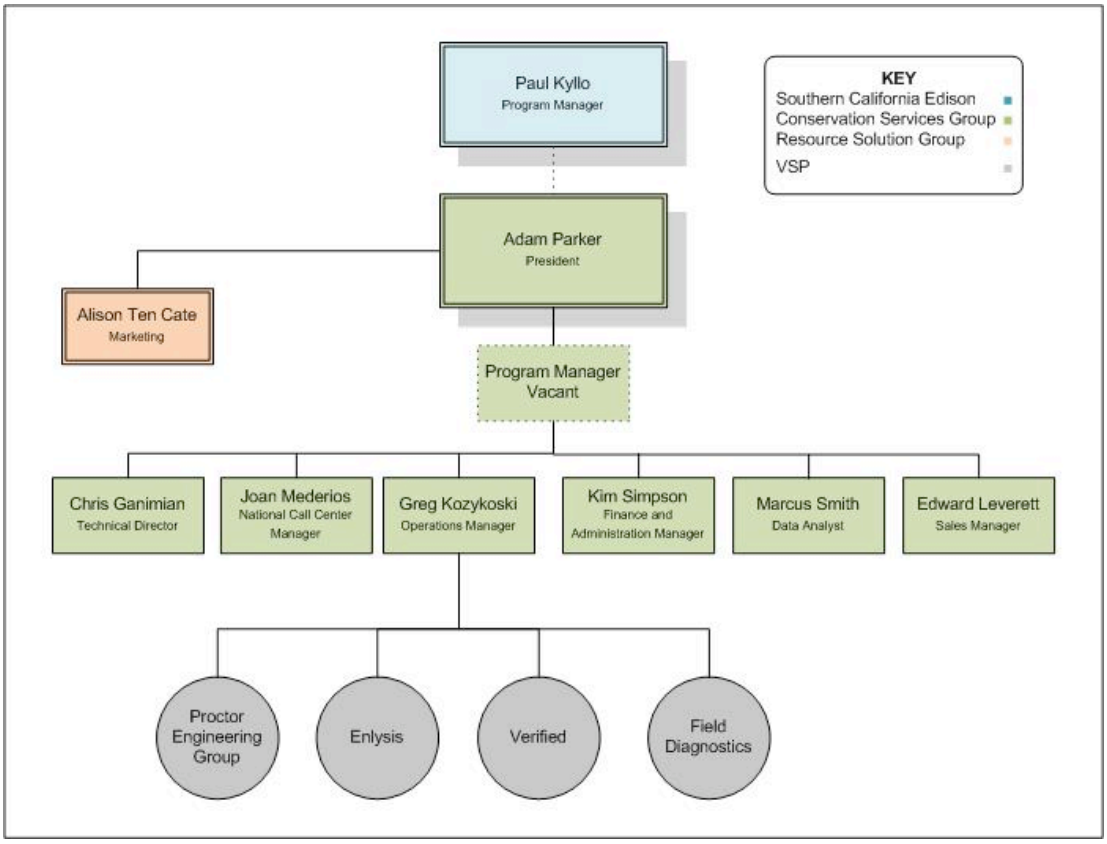
2. PROGRAM DOCUMENTATION

As a reference point, we provide below a summary of the CPACS program organization and the underlying program theory / logic.

2.1 CPACS Program Organization

Figure 1 provides an overview of the current program organization. Conservation Services Group (CSG) serves as the primary implementation contractor, with staffing responsibilities as shown, and relies upon four Verification Service Providers (VSPs) to serve as the interface between contractors participating in the program.

Figure 1: Current CPACS Program Organization

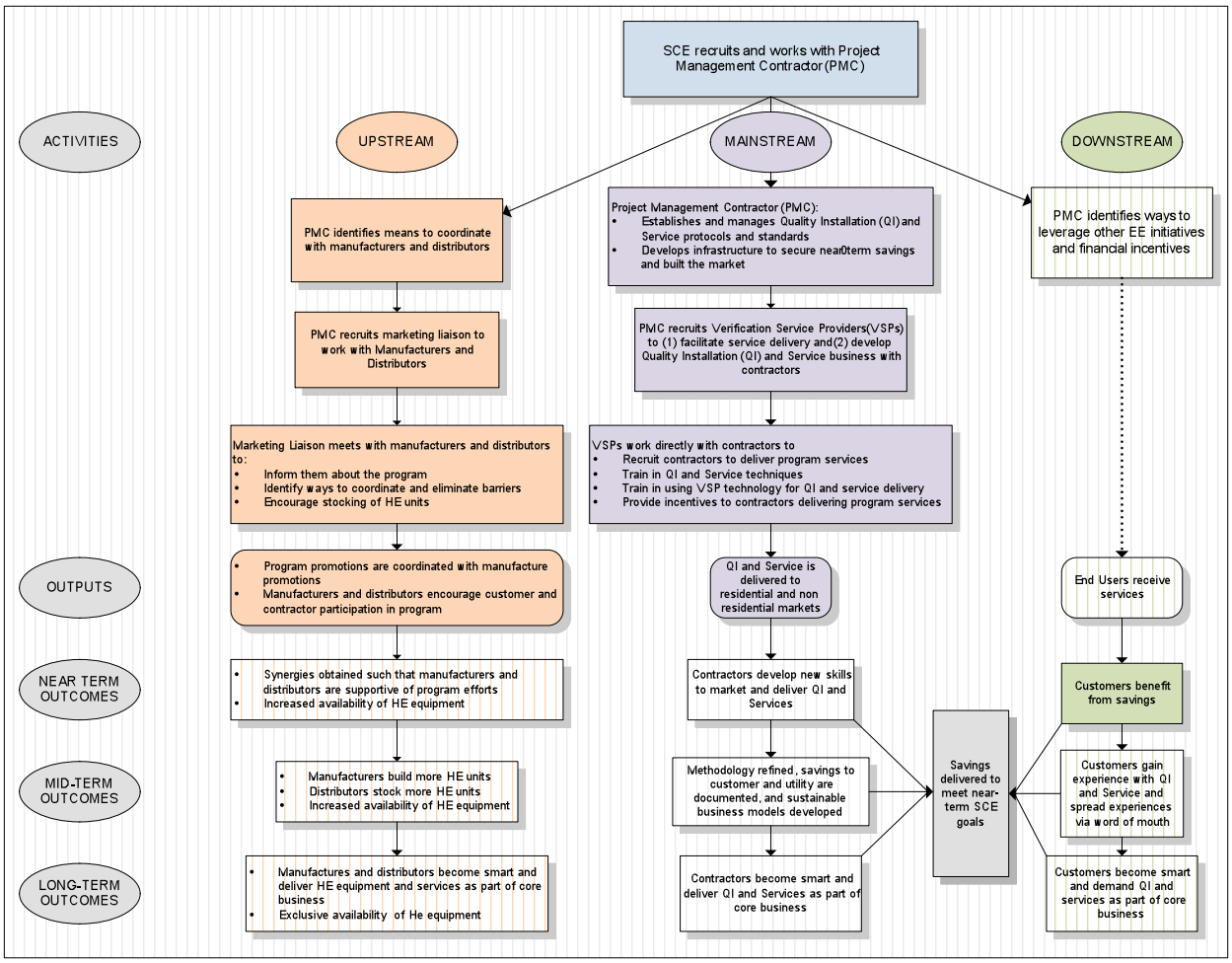


2.2 Program Logic Model

Figure 2, below, provides an overview of the underlying program logic. This logic model is based upon our understanding of the program design as it was intended to operate, as derived from the initial program filing and conversations with SCE staff. We have contrasted in this figure those elements of the original logic model that are operational at this point in time with those that have not yet been implemented.

Figure 2: CPACS Program Logic as Intended in CPUC Filing

(Note: solid fill indicates operational; partial fill indicates <u>not</u> operational)



3. NEAR-TERM PERFORMANCE ASSESSMENT

In order to assess near-term program performance, EMI reviewed goal attainment progress to date, conducted an analysis of services provided by each of the four VSPs, and examined sector-level participation.

3.1 Goal Attainment

Program goal attainment is identified in Figures 3 and 4 below. It should be noted that some lag time existed in January and February between field activities and reporting. This was due to data transfer issues that have since been resolved.

Figure 3

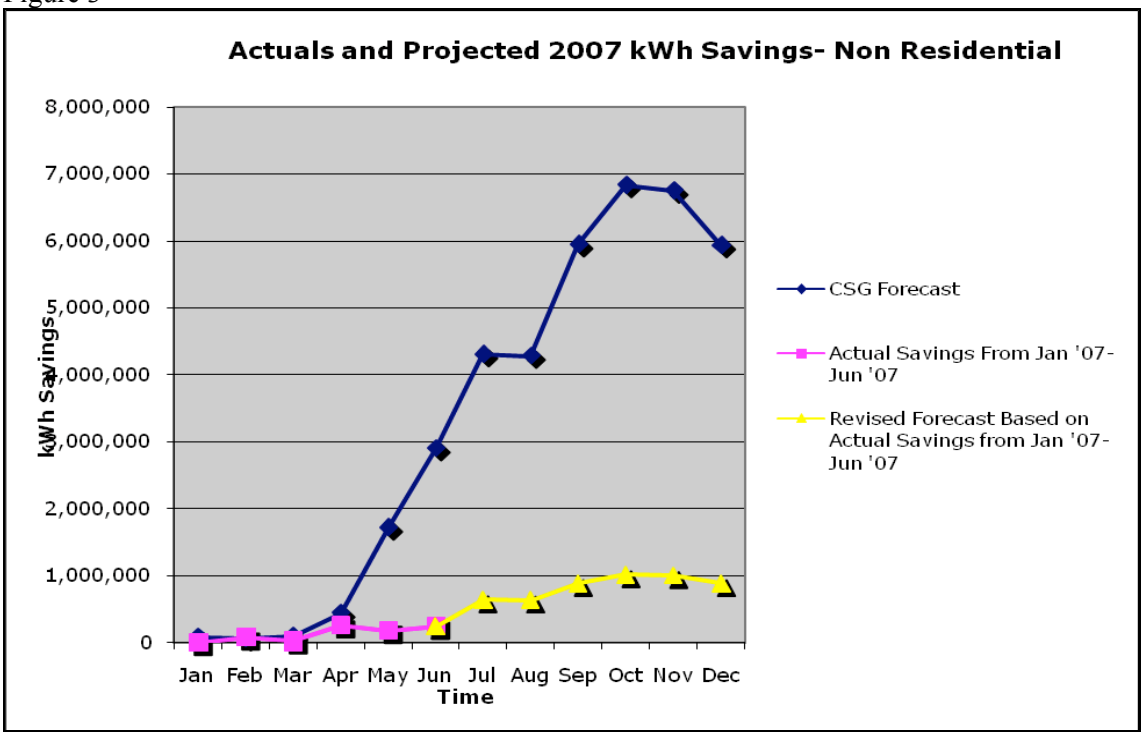
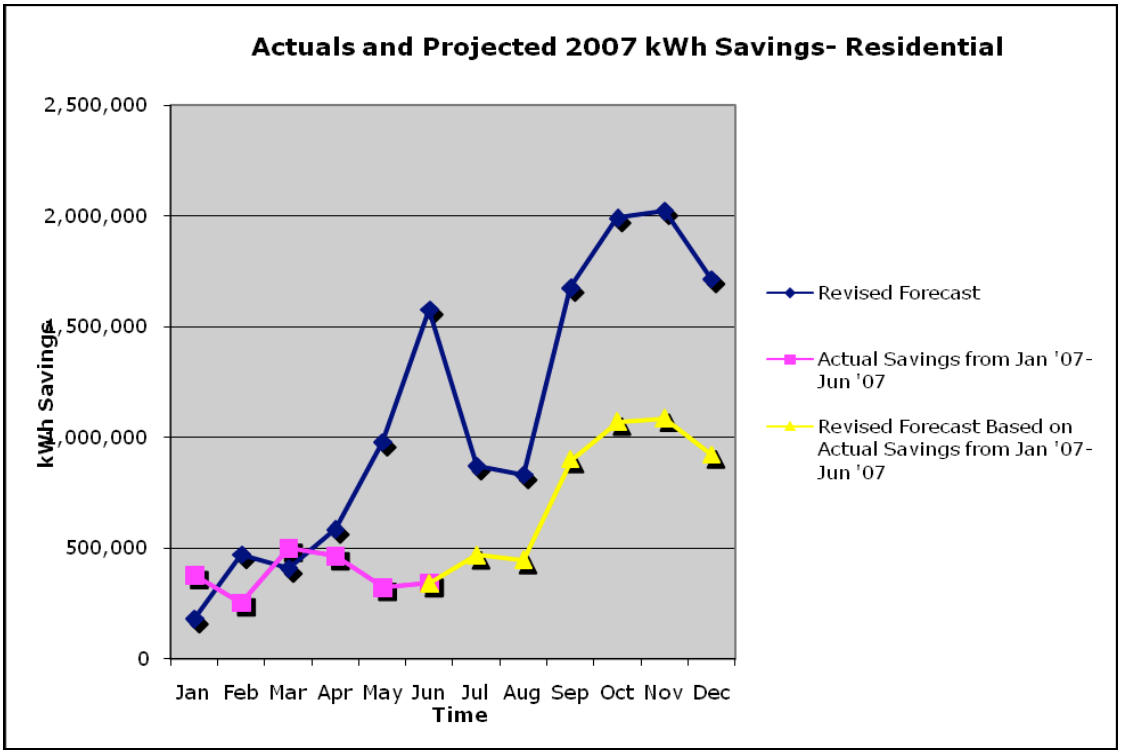


Figure 4



3.2 VSP Performance

As of May 17, 2007, 12,395 evaluations were performed on air conditioning units in the Southern California Edison service territory. As shown in Table 1, Enalasys performs the majority of these evaluations (82.5%).

Table 1: Total evaluations performed by each contractor as of 5/17/07

VSP	Customers Served	% of Total
Enalasys	10,226	82.50%
PEG	1,417	11.43%
Verified	547	4.41%
Field Diagnostics	205	1.65%
Total	12,395	100.00%

While there are over one hundred contractors participating in the program, a select few are performing the majority of the work. The 2007 Quarterly Goals Report stated that 20% of contractors are expected to perform 80% of the work. At the moment, 83% of the work is performed by the top five performers for each VSP, roughly 20% of the contractors. Enalyasys, Verified, and Field Diagnostics each have a few contractors that do the majority of the VSP's work, while PEG's contractors generally share an equal portion of the work.

Enalasys performs the majority of the work under the program and their main contractor -- American Synergy -- performs almost half of all the work performed through the entire program (46.74%). Table 2 represents the

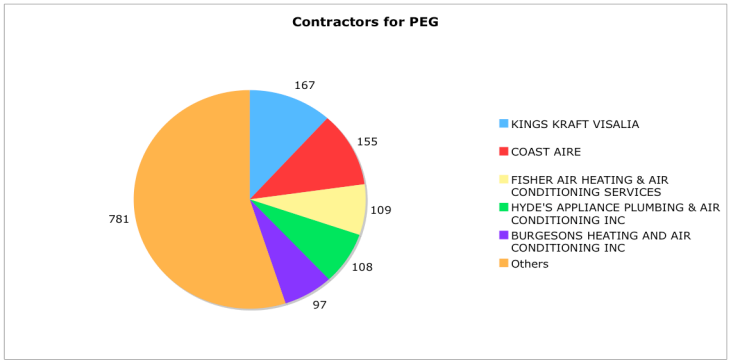
number of customers served by the contractor, the percentage of their work compared to others within their VSP, and the percentage of the contractor's work to the overall number of clients served by the program.

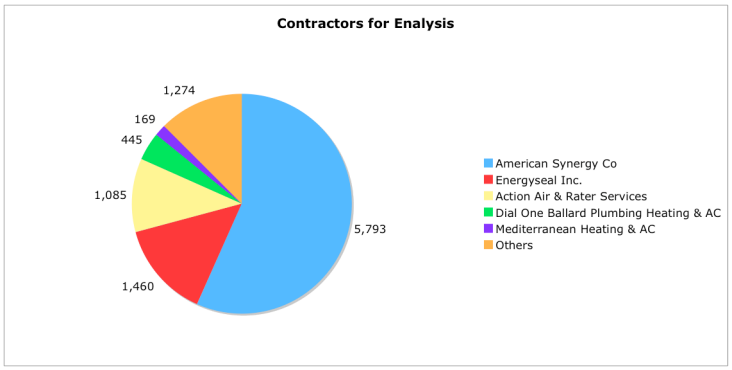
Table 2: Most active contractors within each VSP as of 5/17/07

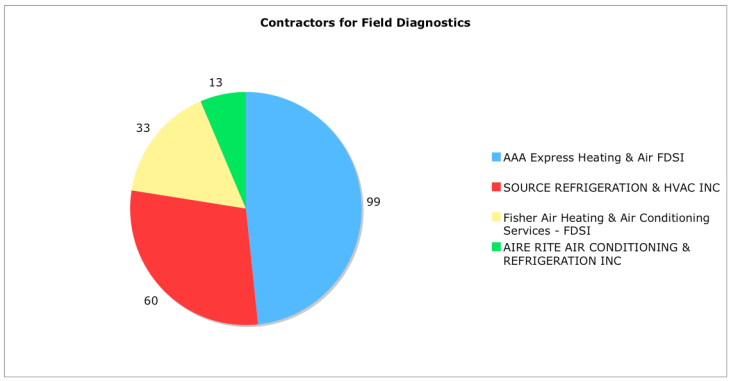
VSP	Most Active Contractor	# of Clients Served	% of VSP's Work	% of All Work
Enalysis	American Synergy Co.	5,793	56.65%	46.74%
Field Diagnostics	AAA Express Heating and Air FDSI	99	48.29%	0.80%
PEG	Kings Kraft Visilia	167	11.79%	1.35%
Verified	Sears- Montclair	232	42.41%	1.87%
Total		6,291		50.75%

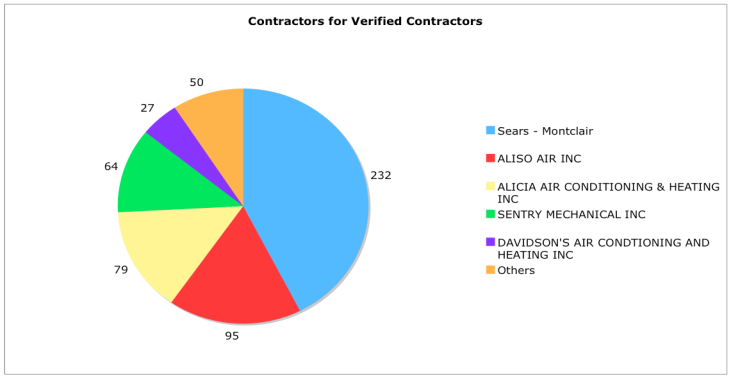
Chart Set 1, below, shows the number of customers serviced by each of the top five contractors as of May 17, 2007 (note that Field Diagnostics only uses 4 contractors).

Chart Set 1: Customers Serviced by Top 5 Contractors under Each VSP









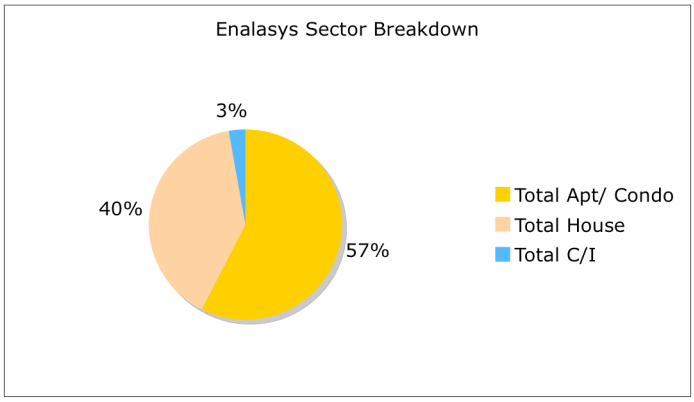
3.3 Sector-level Participation

The CPACS program is open to both residential and nonresidential clients; however, the primary customers to date are residential. This is because the majority of work conducted under Enalysis, the VSP with the most clients, is residential. Work undertaken by PEG and Verified is split more evenly between residential and commercial/industrial (C/I). Table 3, below provides a more detailed of overall participation by sector. Chart Set 2 provides sector-level activity information for each VSP.

Table 3. Sectors Serviced by the CPAC Program.

Sector	#	%
Residential	10,976	*88.55%*
Commercial/Industrial	1,393	*11.24%*
Unknown	26	*0.21%*
Total	12,395	*100.00%*

Chart Set 2: Sectors Serviced by Each VSP



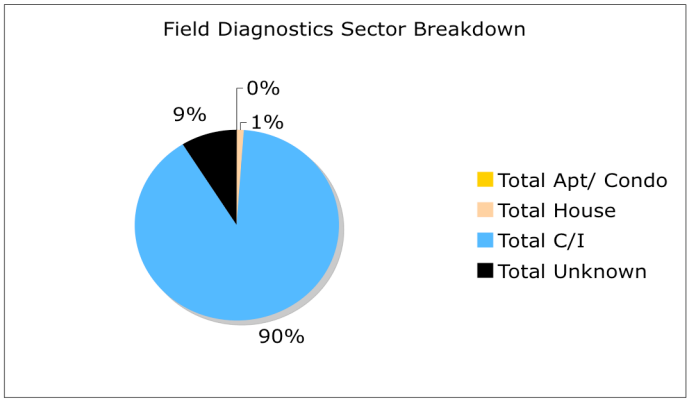
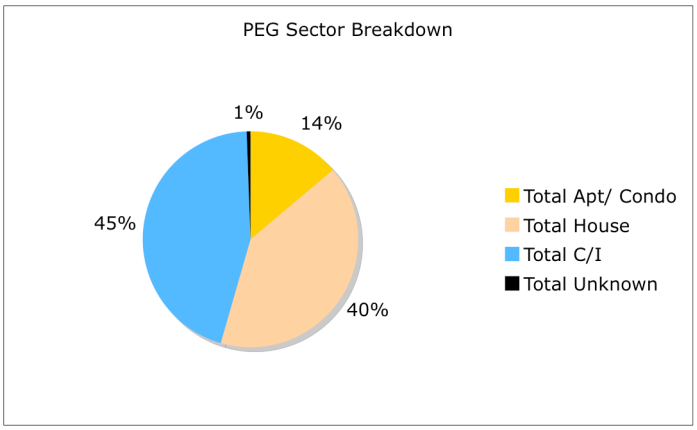
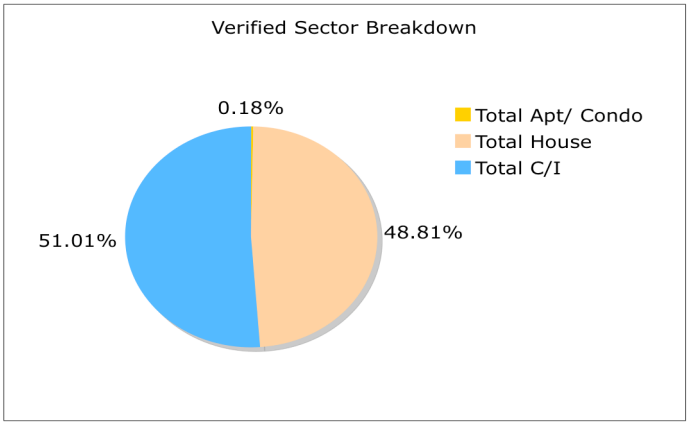


Chart Set 2 (continued): Sectors Serviced by Each VSP





EMI also examined the data to examine trends in sector-level focus among the participating contractors. The majority of contractors tend to focus in one particular sector:

- 88% of contractors focus over 75% of their work in one sector (either residential or C/I).
- 58% of contractors focus 100% of their work in one sector (either residential or C/I).

The sector specializations for the top five contractors working under each VSP are summarized in Table 4.

Table 4: Sector-level Focus for Participating Contractors

Contractor	Residential		C/I		Unknown		Total	
	Total	%	#	%	#	%	#	%
ENALYSIS:								
American Synergy Co	5,781	99.79%	12	0.21%	0	0.00%	5,793	100.00%
Energyseal Inc.	1,460	100.00%	0	0.00%	0	0.00%	1,460	100.00%
Action Air & Rater Services	1,085	100.00%	0	0.00%	0	0.00%	1,085	100.00%
Dial One Ballard Plumbing Heating & AC	445	100.00%	0	0.00%	0	0.00%	445	100.00%
Mediterranean Heating & AC	169	100.00%	0	0.00%	0	0.00%	169	100.00%
Others	995	78.10%	279	21.90%	0	0.00%	1,274	100.00%
FIELD DIAGNOSTICS:								
AAA Express Heating & Air FDSI	2	2.02%	97	97.98%	0	0.00%	99	100.00%
SOURCE REFRIGERATION & HVAC INC	0	0.00%	60	100.00%	0	0.00%	60	100.00%
Fisher Air Heating & Air Conditioning Services - FDSI	0	0.00%	15	45.45%	18	54.55%	33	100.00%
AIRE RITE AIR CONDITIONING & REFRIGERATION INC	0	0.00%	13	100.00%	0	0.00%	13	100.00%
PEG:								
KINGS KRAFT VISALIA	91	54.49%	70	41.92%	6	3.59%	167	100.00%
COAST AIRE	152	98.06%	1	0.65%	2	1.29%	155	100.00%
FISHER AIR HEATING & AIR CONDITIONING SERVICES	29	26.61%	80	73.39%	0	0.00%	109	100.00%
HYDE'S APPLIANCE PLUMBING & AIR CONDITIONING INC	108	100.00%	0	0.00%	0	0.00%	108	100.00%
BURGESONS HEATING AND AIR CONDITIONING INC	74	76.29%	23	23.71%	0	0.00%	97	100.00%
Others	317	40.59%	464	59.41%	0	0.00%	781	100.00%
VERIFIED:								
Sears - Montclair	39	16.81%	193	83.19%	0	0.00%	232	100.00%
ALISO AIR INC	95	100.00%	0	0.00%	0	0.00%	95	100.00%
ALICIA AIR CONDITIONING & HEATING INC	0	0.00%	79	100.00%	0	0.00%	79	100.00%
SENTRY MECHANICAL INC	64	100.00%	0	0.00%	0	0.00%	64	100.00%
DAVIDSON'S AIR CONDTIONING AND HEATING INC	26	96.30%	1	3.70%	0	0.00%	27	100.00%
Others	44	88.00%	6	12.00%	0	0.00%	50	100.00%

4. ISSUE IDENTIFICATION AND RECOMMENDATIONS

In order to identify issues related to program design, processes, and performance, EMI conducted in-depth interviews with the following:

- SCE program implementation staff;
- The third-party implementer (Conservation Services Group [CSG]);
- Program marketing subcontractor (Resource Solutions Group [RSG]);
- Verification Service Providers (VSP); and
- Participating HVAC contractor (American Synergy Company).

EMI also reviewed available program databases:

- CSG - CPACSDataRequest-Projects_V2 (installed measures inception to May 15, 2007)
- SCE - 2007-08 Production Q3 6_15_07 - pk estimate (program performance to date and forecasts)

During the course of this project, EMI prepared summaries of program activity and presented these to SCE staff:

- ***Initial findings and recommendations from document review and initial interviews*** -- a meeting was held on May 3, 2007, with Paul Kyllo, the SCE CPACS program manager, and Shahana Samiullah, the M&E sponsor of this effort. This meeting was documented in a memo dated May 7, 2007;

- ***Additional findings and recommendations from ongoing program review*** -- An additional meeting was held on May 14, 2007 with Paul Kyllo and Shahana Samiullah. This meeting was documented in a memo dated May 21, 2007; and

- ***CPACS program high-level briefing*** -- an informal presentation of findings and discussion of strategy options was presented to Dave Bruder on June 15, 2007.

A workshop with SCE implementation staff and CSG staff was conceptualized early in the project as a venue to identify and prioritize program performance issues. EMI and SCE agreed that such a workshop would be of little value during this phase as SCE needs to rethink its implementation strategy. One or more workshop(s) is expected to take place in Phase 2.

4.1 Current Performance Challenges

Based upon our initial review of this program, we are able to identify the following key issues:

- Production goals have not been met;

- The design of the program has shifted from a three channel approach -- upstream (manufacturers and distributors), midstream (HVAC contractors), and downstream (end users) -- to an approach based exclusively on the midstream channel;

- Program marketing and implementation in the HVAC contractor marketplace have failed to get any traction;

- The VSP subcontractors have not functioned as intended; specifically, these vendors have not served as an active conduit to contractors;

- The implementing contractor appears to have responded to program difficulties with contractor participation by simply recruiting more contractors rather than maximizing participation of already-recruited contractors; and

- There is no current plan to turn this performance around.

The current CPACS strategy follows a standard resource acquisition model addressing savings gains through a multi-channel approach. While this strategy has been successful with other energy efficiency programs, it has not produced desired results with SCE's CPACS or at the other two California IOUs with similar HVAC programs. Performance has been impacted for a variety of reasons.

- ***Barriers to Contractor Participation*** -- First and foremost, the program has focused almost solely on the midstream (contractor's) channel. While this is an appropriate avenue to generate savings, the program has not fully addressed the contractors' barriers to participation and the complex set of related issues. The financial incentives element of the program appears ineffective on its own in driving market penetration of quality installation and tune up services among HVAC contractors. Anecdotal evidence from contractors indicates both financial and non-financial barriers are problematic (inability to effectively market new and existing customers into the program).VSPs were to take a lead in contractor participation; however, CSG-reported data shows that only a handful of trained contractors are currently participating.

- ***Absence of Upstream Strategy*** -- The upstream channel strategy, focusing on HVAC equipment manufacturers and distributors, has involved limited information sharing and joint marketing campaigns with the implementing contractor. This has been done with little to no documented scoping or planning. CSG was repeatedly asked for its written upstream strategy and marketing plan. As of the date of this memo, EMI has yet to see this documentation.

- ***Absence of Downstream Strategy*** -- The downstream channel strategy, residential and non-residential end-users, has not been formally addressed. At a minimum, the task set out in CSG's statement of work to coordinate CPACS program delivery with other SCE EE end-users programs has not been acted on. Further, the strategy of creating potential market pull through some type of end-user enticement may not have been fully analyzed. Both could be opportunities for driving market penetration and additional savings.

4.2 Similarities with Other Program Experiences

Unfortunately, the experiences of this program generally mirror the experiences of similar initiatives elsewhere in the country. Table 5 below provides a summary of these program development obstacles.

Table 5: HVAC Tune-up Program Development Obstacles

Technical/Economic
• Inconsistent savings estimates
  o Unit to unit
  o Measurement and verification
• Regional/IOU inconsistency in the find-and-fix-it protocols
• Refrigerant charge inconsistencies (California verses other regions)
• Questionable manufacture's quality standards
• Significant technical training is required
• Burdensome verification documentation is required

Market
• Dislocations
• Not a compelling business case for HVAC Contractors
  o Loose interest too quickly
  o There is no stickiness, difficult to sell to end user
  o Work is time consuming
  o Too much paper work
  o Inconsistent profits
  o Seasonal issues
• Little (if any) end-user market demand
• Inadequate pay-back period (commercial)
• Small end user purchase window (residential)

Organizational • Utility is disconnected from contractors • Cumbersome/complex program design • Inadequate number /skill base of utility employees • Currently residential/small business oriented – big business potential • Lack of long term utility/PUC commitment

Our understanding is that SCE believes, as do other utilities across the nation, that significant energy savings may be achieved through quality installation and regular maintenance of HVAC systems. However, as evidenced by the experiences of this program, as well as similar programs elsewhere, there remain significant barriers that must be overcome.

Since SCE has made a substantial investment in this program, and since there is a significant savings potential, it is not recommended that SCE abandon the current program. Rather, it is recommended that SCE take a limited number of steps to shore up the current program operations while, at the same time, working in concert with the other IOUs in California to develop a long-term market development strategy. Based upon this assessment, we have outlined below our recommendations for near- and long-term program development strategies.

4.3 Near-term Strategic Recommendations

While a long-term strategy must be quickly developed and implemented to leverage the utilities investment to date, there are several specific steps that may be taken in the short-term to maximize the success of the on-going efforts. These all have equal priority and include:

- ***Development of Issue Management and Resolution Process*** -- There remain a handful of technical issues related to VSP protocols and savings estimates that are holding back the program. We understand that there is substantial dialogue between CSG and SCE, however, there is no formal process and little documentation to support how issues are raised and prioritized and what decisions are made. SCE/CSG should also develop a transparent process for understanding and prioritizing program issues. It is recommended that issues be fleshed out, reviewed, and a strategy developed for quick implementation. Moreover, it is recommended that SCE lead this process at this point in the program development

- ***Development of a Fall production strategy*** -- The Fall repair season arriving shortly and immediate plans need to be developed to keep market players interested in the program. Within this plan, CSG needs a clear strategy to maintain and enhance contractor interest during the 2007 summer months to sustain program *momentum* and expansion when the repair and maintenance season starts in the Fall.

- ***Focus on increasing participation of already-recruited contractors*** -- CSG reported data show a nearly exclusive participation by a handful of contractors. There is no indication of why the remaining enrolled and trained contractors are not participating. CSG's production strategy appears focused on contractor recruitment.

- ***Tracking of production activities forecast*** -- While CSG has been optimistic about the program being able to reach longer-term energy savings goals, program performance has failed to meet original or even revised goals. CSG reported April 2007 as a good month from a production perspective and expected to double this performance in May. Neither was the case. SCE needs confidence in CSG's immediate production forecasting and management; CSG must provide a well documented and clear plan of how production goals are calculated and how they will be met.

- ***Clarify role and expectations of VSPs*** -- VSP management issues are complex and interrelated and need to be addressed, but a number of management options are available to SCE/CSG. If the VSPs are to remain integral to the success of the CPACS program, we recommend that there be increased clarity of VSP roles, responsibilities, and performance expectations.

4.4 Long-term Strategic Recommendations

The HVAC market and market players in the SCE service area are very complex. Multiple climate zones, different local economies, different local jurisdictions, and a wide variability of HVAC contractor business models are just a few examples of the complexities the CPACS program must address. We provide below a brief overview of the potential program concept that we recommend SCE explore, followed by a brief discussion of key tactical considerations.

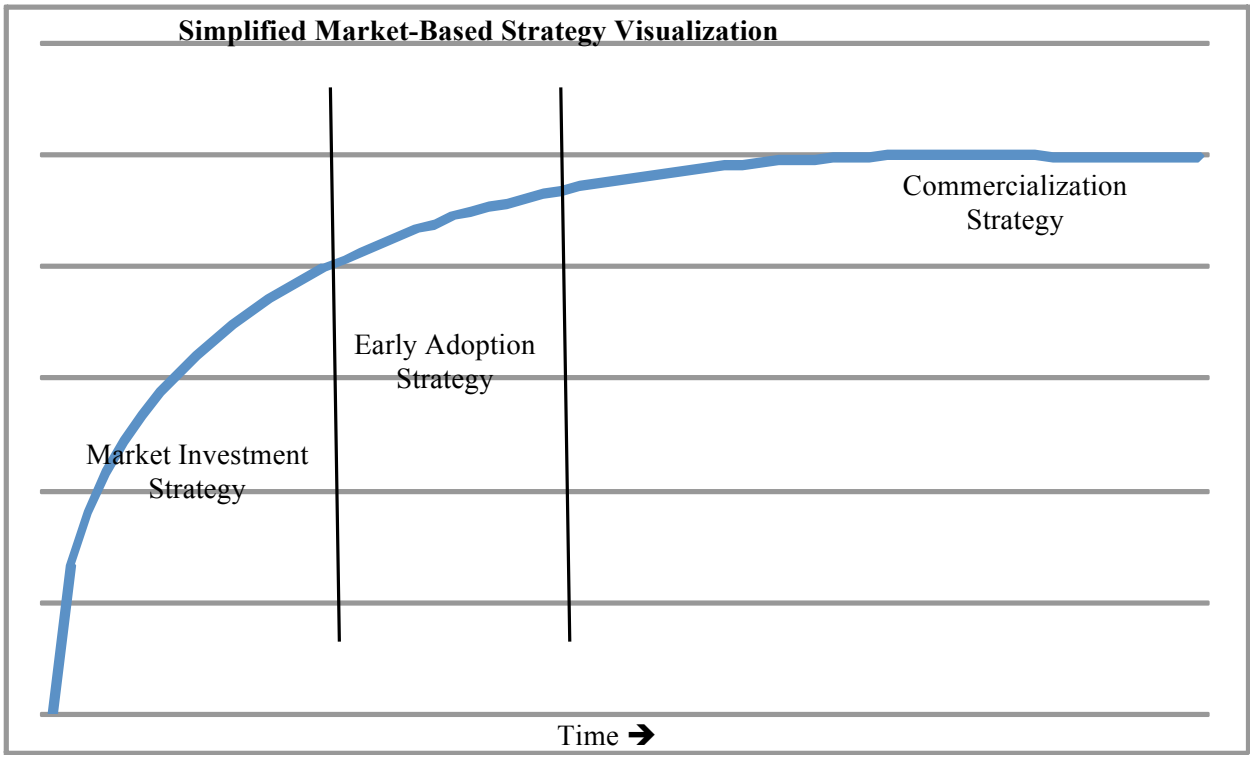
Program Concept

EMI believes the CPACS program is a good candidate for a more *entrepreneurial*, *market-based strategy* that reflects the diffusion cycle of a new product / service such as that offered by this program. Within this framework, the underlying logic of the program would be to develop a market-based strategy using the analogue of introducing a new product into the commercial market place. The ultimate goal of this strategy is to develop a vibrant nexus of *smart* HVAC contractors and *smart* end-users pushing and pulling demand for quality installation of high efficiency HVAC equipment and tune up services. If conceptualized and implemented appropriately, long-term savings would be generated as an outcome of this approach.

Figure 5 portrays a simplified market penetration (commercialization) model. In simple terms, a market based strategy must be:

- ***Highly informed*** –Have a robust understanding of market players and their barriers to participation, a solid understanding of the HVAC technology, as well as other market factors;
- ***Entrepreneurial*** – The utility must engage the CPUC and trade alleys and together be willing to make investments and take risk; and
- ***Strategically nimble*** – The utility and its partners must make quick, informed decisions based on market information. Players must understand when market conditions require a change in strategy and /or tactics.

Figure 5



Tactical Issues

Tactical planning is the process of actualizing strategic decisions into implementation plans. Tactical planning will result from a clearly defined high-level strategy, reasonable goals, and a transparent planning process. EMI recommends the development of this SCE led planning process as soon as strategic options are identified and agreed upon. It is recommended that SCE engage internally and with its key market players to lead an effort that will prioritize and address the issues identified in these recommendations. This SCE-led strategic development process should be guided by the CPUC's interest in regional collaborative planning over a 6 to 10 year time horizon, overall SCE portfolio goals, and SCE's broader energy efficiency strategy. The overall strategy process should be open-ended to be responsive to market changes. We highlight below, several tactical and programmatic issues that we recommend be addressed during this planning process.

- ***Midstream Component*** –The CPACS program has focused on the First almost solely on the midstream (HVAC contractor's) channel. While this is an appropriate avenue to generate savings, the program has not fully addressed the issues surrounding the contractor's success in this complex market. For many of the issues identified in Table 5, the mid stream program has failed. CSG reported data shows a nearly exclusive participation by a handful of contractors. There is no indication of why the remaining enrolled and trained contractors are not participating. CSG's production strategy appears focused on contractor recruitment and dependence on what our research shows as poorly developed incentives.

- ***Role of VSPs*** -- Program players (primarily VSPs) continue to disagree on program implementation, technical aspects of measurement and validation, and incentive levels. This behavior shows a lack of management acuity by CSG and the SCE program office. Reported HVAC contractor payment lag times have been as long as 8 weeks. There is also a significant variability between VSP contractor payout processes. This has the potential to swamp other more important issues if lag times are not decreased.

- ***Upstream Component*** – As noted above, the upstream channel strategy focuses on HVAC equipment manufacturers and distributors. To date, this program element has involved limited information sharing and joint marketing campaigns with the implementing contractor. This has been done with little to no documented scoping or planning. There is little evidence of any coordination with the central mid stream market focus. It is questionable if the program is creating value, market awareness, or potential savings, from the expended resources.

- ***Downstream Component*** – A downstream strategy, residential and non-residential end-users, has not been formally analyzed. The CPACS program SOW details a variety of simple coordinative roles that have not been addressed by CSG. Further, a strategy of creating market pull through some type of end-user enticement has shown potential in other utilities. This approach has not been fully analyzed. End user pull, program coordination, and other strategies are potential lost opportunities in need of further articulation.

- ***Performance Metrics*** - SCE is currently provided with a fair amount of "snap-shot" data, generally involving monthly production numbers and ad hoc reports. The complexities of the SCE CPACS program require a more detailed set of performance metrics and their timely reporting. These should go beyond production/savings numbers and include agreed upon activities that support program goals.