INDIRECT IMPACT EVALUATION OF THE STATEWIDE ENERGY EFFICIENCY EDUCATION AND TRAINING PROGRAM

VOLUME IV OF IV: EARLY FEEDBACK MEMOS

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Prepared for:

CALIFORNIA PUBLIC UTILITIES COMMISSION

ENERGY DIVISION

Prepared by:

OPINION DYNAMICS CORPORATION

Wirtshafter Associates, Inc.

Jai J. Mitchell Analytics

Summit Blue Consulting

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Memorandum

To: Pam Wellner, CPUC and Nick Hall, MECT
From: ODC Team (Contacts: Bill Norton or Jennifer Mitchell-Jackson)
Date: May 19, 2008
Re: Education and Training Program (Energy Center) Update Memo

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Introduction

This memo provides an overview of the efforts funded under the California IOU's Education, Training and Outreach programs. The memo is divided in two parts. Part 1 presents the budget breakdown for each of the Education and Training budgets, a description of each of the program efforts that are not directly associated with the Energy Centers, and the ODC team's recommendation regarding the inclusion of these efforts in the CG2 evaluation. Part 2 provides an overview of the characteristics and principal objectives of each of the Energy Centers funded through the programs. We also present a discussion how each Center differs and some of the issues that we have encountered in our early efforts, and an outline of the evaluation approach for each Center. The memo focuses on program efforts implemented in first 18 months of the 2006-2008 program cycle, from January 1, 2006 through June 30, 2007.

The findings in this early feedback memo are based on our research efforts to date, including:

- **Interviews with Energy Center Directors and key staff:** In-depth interviews with the directors and key staff for each of the California Energy Centers to understand the structure and primary mission of each Center, identify the types of course/activity tracking and participant data they maintain, and determine how those data are organized. We also asked about which of their courses or activities are most likely to lead to energy savings.
- **A review of background information on Center efforts:** Our review included collecting, reviewing and cataloging the available course and non-course activity materials, and as well as collecting, reviewing and synthesizing the course and activity data provided by each Energy Center under two data requests.
- **A review of Program budgets and discussions with Program Managers:** This effort included collecting and reviewing program budgets and holding discussions with Education, Training, and Outreach Program Managers and other IOU staff to develop a complete understanding of the specific activities funded through these programs.

Appendices A through I present an in-depth discussion of each Center including Center characteristics, logic models, and a revised detailed discussion of our evaluation approach. Each of the appendices also includes the courses and activities identified by the Center directors as having the highest likelihood to induce energy saving behavioral change.

Part 1: Overview of IOU Education, Training and Outreach Programs

In gathering information about the Energy Center budgets, it was clear to the evaluation team that the Energy Centers alone did not make up the full Education, Training and Outreach Program budget for PG&E and SCE. As part of our effort, therefore, we conducted follow-up interviews to gather information on each of the program efforts covered in the Education, Training and Outreach Program budgets.

The following table presents the budget allocated to each program effort, including the Energy Centers, and the ODC team's recommendation regarding the inclusion of the effort in the CG2 evaluation. A description of each program effort is presented below, along with the justification for our evaluation recommendation. We look forward to discussing our recommendations with the CPUC.

Table 1: 2006-2008 Total Program Budgets

IOU Program	Overall Budget	Program Effort	Allocated Budget	Evaluation Recommendation
PGE2010: PG&E Education and Training Program	$45.2 million	Pacific Energy Center (PEC)	$11.4 million	Covered in current approach
		Food Service Technology Center (FSTC)	$5.1 million	Covered in current approach
		Energy Training Center (ETC)	$3.3 million	Covered in current approach
		Third Party Training	$3.1 million	Covered under evaluation of Information Programs (CG3)
		Builder Operator Certification	$0.8 million	Include
		Integrated Audits	$13.4 million	Evaluability Assessment
		Smarter Energy Line	$3.7 million	Evaluability Assessment
		Business Customer Center	$2.2 million	Evaluability Assessment
		Local Government Initiative	$0.8 million	Exclude
		E-Source	$0.5 million	Exclude
		Home Energy Magazine	$0.1 million	Exclude
SCE2513: SCE Education, Training	$24.3 million	Customer Technology Application Center (CTAC)	$8.8 million	Covered in current approach

IOU Program	Overall Budget	Program Effort	Allocated Budget	Evaluation Recommendation
and Outreach Program		Agricultural Technology Application Center (AgTAC)	$4.2 million	Covered in current approach
		Technology and Test Centers (TTC)	$2.1 million	Covered in current approach
		Chinese Language Efficiency Outreach	$0.8 million	Covered under evaluation of Information Programs (CG3)
		Energy Design Resources	$2.5 million	Include
		Builder Operator Certification	$1.5 million	Include
		Education Training & Outreach	$1.3 million	Evaluability Assessment
		Mobile Education Unit	$1.4 million	Exclude
		Nonresidential Remote Energy Audits	$1.1 million	Exclude
		Outreach	$0.7 million	Exclude
SCG3503: SCG Education and Training Program	$6.5 million	SCG ERC	$6.5 million	Covered in current approach
SDGE3009: California Center for Sustainable Energy/Energy Resource Center Partnership	$4.1 million	SDG&E Energy Resource Center	$1.3 million	Covered in current approach
		California Center for Sustainable Energy	$2.8 million	Covered in current approach

In the table above, "Include" indicates a recommendation that the ODC Team include this effort in our current approach, while "Evaluability Assessment" indicates a recommendation that the ODC Team include an initial assessment to determine whether these efforts should be evaluated further. The ODC Team has not currently budgeted for efforts denoted by "Include" or "Evaluability Assessment" but we would propose using our contingency funds to complete these efforts under the current contract.

PGE2010: PG&E Education and Training Program Efforts

The PG&E programs included within the Education & Training budget include the three Energy Centers as well as non-residential audits, third party training programs, and administrative costs. Next is a short description of each effort included in the budget.

Energy Centers (Program budget: $19.8 million, 44% of overall budget)

The Pacific Energy Center, Food Service Technology Center, and Energy Training Center are included here. These three Centers are the focus of our current evaluation efforts.

Integrated Audits (Program budget $13.4 million, 30% of overall budget)

The Integrated Audit program provides energy audit options for all non-residential customers. The program offers small and medium business customers with less than 200 kW demand a variety of audit options including do-it-yourself audits, available in online (English and Spanish versions), CD-ROM, mail-in, and interactive telephone formats, and traditional integrated energy audits performed by trained auditors. These audits provide recommendations and tips for energy conservation, energy efficiency, rebate program and incentive information and links for qualifying measures.

The program offers Integrated Energy Audits to commercial, industrial, institutional and agricultural customers with 200 kW to less than 500 kW demand. PG&E account representatives conduct the audits at facilities with standard lighting and HVAC equipment and appliances.

Engineering consultants conduct audits in 500 kW and larger facilities, complex facilities and the facilities with special needs. These audits include: a survey of the processes, systems, equipment, buildings and support equipment; Analysis of no & low-cost and investment opportunities in energy conservation, energy efficiency, demand response and self-generation; and the development of an integrated audit report with an implementation plan for the recommended best practices and energy projects. For each recommended measure, the integrated audit report includes a detailed analysis of energy and demand savings, energy cost savings, installed project cost, and simple payback period or return on investment.

Earlier discussions with the CPUC indicated that this was not included in our original evaluation scope. While we anticipate that this program effort almost certainly generates significant energy savings, because the audits are used to channel participants to resource acquisition programs, we expect that the savings resulting from the audits will be accounted for under the evaluation of those programs either as directly channeled savings or participant spillover. However, the discovery that this is a large part of the overall Education and Training budget for PG&E lead us to feel that assessment of this program should be reconsidered. Because we do not currently know how the resource acquisition programs are using audits in their evaluations, we are recommending that ODC conduct an abbreviated evaluability assessment.[1] This effort would look only at two components: 1) how other evaluators are using audit information in their assessments across all IOUs, and 2) if these audits are not being assessed, a cost-effective way to determine indirect impacts from non-residential audits.

Smarter Energy Line and Business Customer Center (Program budgets $3.7and $2.2 million, 8% and 5% of overall budget.)

PG&E's Smarter Energy Line and Business Customer Center are on-line and telephone-based customer support resources that provide customers with direct access to energy efficiency advisors. The Smart Energy Line provides residential custom support while the Business Customer Center is a commercial customer resource. Energy advisors provide one-on-one consultation (over the phone) regarding energy efficiency projects, energy efficiency advice and referrals to PG&E resource

[1] A full evaluability assessment is not being recommended as it is broader in context and includes a look at program goals, performance criteria, and whether the goals are plausible as well as how data can be collected for a reasonable cost.

acquisition programs. Our discussions with the managers of these program efforts indicate that, while these programs are designed to provide energy efficiency support and consultations, they also handle a wide range of other inquiries related to billing and service issues.

Given that the energy efficiency consultations and resource acquisition program referrals provided by PG&E energy efficiency advisors have the potential to result in energy saving actions or behavior changes, the ODC team would like to discuss adding this effort to our evaluation. Because we do not know whether the information currently being collected by these efforts will support an evaluation, we suggest that the ODC team conduct an abbreviated evaluability assessment of this effort.

Third Party Training ($3.1 million, 7% of overall budget)

The third party training program effort includes two training programs: Builder Energy Code Training (PGE 2044), and the 2006–2008 Green Building Technical Support Services program (PGE 2057).

Builder Energy Code Training (BECT) provides training by the building industry for the building industry to improve compliance with Title 24 energy codes for residential new construction. It is an information-only program which provides training on the fundamentals of energy-efficiency standards required for new construction and an understanding of materials, assemblies, building systems and subsystems in the context of the California Energy Code.

The Green Building Technical Support Services program promotes Green Building through education and outreach as a core strategy to achieve greater energy efficiency in new and existing homes. The program is implemented by Frontier Associates and uses education and outreach to connect consumers and building professionals with the tools and technical expertise they need to build quality Green Buildings.

Both of these training efforts are conducted by third party implementers outside of the Energy Centers and funded under the PG&E Education and Training Program. Both of these programs (PGE2044 and PGE2057) are currently being evaluated as part of our Information Only Program evaluation (i.e., the CG3 evaluation effort).

Building Operator Certification ($0.8 million, 2% of overall budget)

The Building Operator Certification (BOC) program is a statewide effort implemented for the CA IOUs by the Northeast Energy Efficiency Council. The effort provides training that is not affiliated with the Energy Center efforts. The program provides competency-based training and certification for building operators offering improved job skills and professional knowledge and more comfortable, efficient facilities. Training topics include facility electrical, HVAC and lighting systems, indoor air quality, environmental health and safety, and energy conservation.

Given training topics a target audience of the BOC training effort, we expect that these courses have the potential to result in energy saving changes to the building operations and maintenance practice of training participants. As BOC training is not included in the catalogue of courses we are examining as part of the Energy Center effort, the ODC team would like to discuss adding this effort to our current CG2 evaluation.

Local Government Initiative ($0.8 million, 2% of overall budget)

Our research indicates that the Local Government Initiative component of the program budget includes the administrative budget allocated to the utility for their administration of the Local Government Partnership effort. As the activities funded by this budget are strictly administrative, we do not recommend inclusion this effort in the CG2 evaluation.

E-Source and Home Energy Magazine ($0.5 and $0.1 million, 1% and 0.2% of overall budget)

Our discussion with the PG&E program manager indicates that the E-Source and Home Energy Magazine components of the program budget represent expenditures required to access the E-Source database of DSM program information, and investment in the Home Energy Magazine, a periodical designed to disseminate practical systems engineering based information on residential energy efficiency, performance, comfort, and affordability.. While these efforts may yield energy savings among customers, the savings would most likely accrue quite distal to the program and be diffuse. It would also be impossible to attribute any effects to the PG&E funding since there are multiple funding sources for both E-Source and Home Energy Magazine. Because these efforts are a small component of the overall program and we believe that any evaluation effort would be not cost effective, we do not recommend their inclusion in the CG2 evaluation effort.

SCE2513: SCE Education, Training and Outreach Program Efforts

Energy Centers ($15.1 million, 62% of overall budget)

SCE's Energy Centers include the Customer Technology Application Center, Agricultural Technology Application Center, and Technology & Test Center. These three Centers are included in our current evaluation efforts.

Energy Design Resources (EDR) ($2.5 million, 10% of overall budget)

The Energy Design Resources (EDR) program includes the development and support of the Energy Design Resources website (www.energydesignresources.com). The EDR website is designed for building design professionals and offers users energy design tools and resources that help make it easier to design and build energy-efficient commercial and industrial buildings in California. The website also provides a free on-line design tool software library that provides design tools, such as eQuest and others, which are used to evaluate the energy use impact of design decisions. The goal of this effort is to educate architects, engineers, lighting designers, and developers about techniques and technologies that contribute to energy efficient non-residential new construction.

The program also develops and distributes The Newsletter and eNews. The Newsletter is a periodical presenting articles on topics relevant to specific building types while eNews is a series of newsletters each focusing on specific end-use technologies or design topics and highlighting related training opportunities.

Use of the website is tracked by number of hits, but currently no specific user information is recorded that would allow the evaluation team to indentify users of the website. The program manager did indicate that beginning June 2008 the program expects to roll out a new version of the website which will have enhanced marketing capabilities including some ability to track users. Further, it may be possible to develop a list of users of the "my EDR" function on the website which allows users to sign

in and keep track of their favorite or oft-used resources. The program does maintain a distribution list for the Newsletter and eNews.

Given the objective of this effort and the focus on market actor training and education, the ODC evaluation team believes that there exists a potential for this effort to produce energy savings or increases in awareness or knowledge among users. As such, we would like to like to discuss adding this effort to our CG2 evaluation and believe that the best way to reach decisions on this program would be to perform an evaluability assessment similar to what we recommended for PG&E.

Building Operator Certification ($1.5 million, 6% of overall budget)

As noted above, the Building Operator Certification (BOC) program is a statewide effort implemented for the CA IOUs by the Northeast Energy Efficiency Council. The effort provides training that is not affiliated with the Energy Center efforts. Given the reasons outlined in the discussion of the PG&E program effort above, the ODC team would like to discuss adding this effort to our current CG2 evaluation.

Mobile Education Unit (MEU) ($1.4 million, 6% of overall budget)

The Mobile Education Unit (MEU) is a modified recreational vehicle that is outfitted with a number of energy efficiency displays. The displays are designed to promote energy efficiency solutions and energy management for residential and commercial customers and present information regarding the utility's energy efficiency and demand response programs. The displays are funded, in part, through the Outreach component of the budget (see below). The MEU travels to community events, including those targeting hard-to-reach and non-English speaking populations, and reaches customers in remote and diverse locations.

The program maintains a record of the events at which the MEU was used, however we do not believe that there are any lists of customers exposed to the MEU displays. While we could assess the use of the MEU through ride-alongs and intercept surveys during an event, this would only be for events occurring in the remainder of 2008 and would be able to obtain changes in awareness and perhaps knowledge and intent to take action. As such, we do not recommend including this effort in the CG2 evaluation unless the CPUC specifically desires information on this program.

Education, Training, and Outreach ($1.3 million, 5% of overall budget)

The SCE program manager indicated that this component of the program budget represents the administrative budget allocated to the utility for the administration and management of the Education, Training and Outreach Program. As the activities funded by this budget are strictly administrative, we do not recommend inclusion this effort in the CG2 evaluation.

Nonresidential Remote Energy Audits ($1.1 million, 5% of overall budget)

The Non-residential Remote Energy Audits program effort provides a self-audit service to nonresidential customers. The program provides different audit options available in online, CD-ROM, and mail-in formats. These audits can be used to assess energy use and provide recommendations and tips for improved energy efficiency and rebate program and incentive information.

In previous programs, these self-directed audits were identical to those mentioned in the PG&E program. We recommend including this program in the evaluability assessment that we would conduct regarding non-residential audits (described above).

Custom Language Efficiency Outreach ($0.8 million, 3% of overall budget)

The Custom Language Energy Efficiency Outreach (CLEO) program effort is a local, highly targeted residential and small commercial, energy efficiency marketing, outreach, education and training Program that targets hard-to-reach, Vietnamese, Indian, Chinese and Korean speaking residential and small business commercial customers. The program encourages implementation of energy efficiency measures through utility resource acquisition programs.

This program overlaps with the SCG program and is covered under our Information Only Program evaluation (i.e., the CG3 evaluation effort).

Outreach ($0.7 million, 3% of overall budget)

Our research indicates that the outreach component of the program budget provides funding for the development of displays that are used at events and trade shows. A small portion of this finding is also used to support general customer outreach efforts as well. None of this budget goes to support the displays at the SCE Energy Centers (CTAC, AgTAC, or TTC) though the budget does fund the development of displays for the Mobile Education Unit.

While it is possible that individuals exposed to the displays may take energy saving action, modify behavior, or increase their knowledge or awareness of an energy efficiency issue or topic as a result of their exposure, there is no record or list of such individuals. Similar to the MEU, we could attempt to assess this program through content analysis and intercept surveys, but believe that this would not be cost effective. As such, we do not recommend the inclusion this effort in the CG2 evaluation.

Part 2: Overview of Energy Center Efforts

The ODC team conducted in-depth interviews with the directors and key staff for each of the California Energy Centers to understand the structure and primary mission of each Center, identify the types of course/activity tracking and participant data they maintain, and determine how those data are organized. We also asked about which of their courses or activities are most likely to lead to energy saving. A summary of our findings is presented below.

Defining the "Energy Centers"

In our initial interviews, we worked to both understand and define the energy Centers. While most of the Centers are easily defined, two high level issues arose:

- Is the SDG&E program composed of one or two Centers (that is, are SDG&E's efforts separate from CCSE's efforts)?; and
- Is the Technology Test Center primarily part of Education and Training, or Emerging Technologies?

We explore these two issues below in an effort to better define the Energy Centers for our evaluation efforts.

The SDG&E Program

In the evaluation plan for the Education, Training and Outreach programs we discussed the eight physical Energy Centers. The locations of these Centers are shown in the last column of Table 2. Through our initial interviews, however, we have explored these Centers and determined that the SDG&E Program consists of two distinct units: SDG&E and CCSE occupying a single physical space.

Table 2 presents general information regarding each of the Energy Centers including its location, corresponding utility and utility program number, while the following map provides a graphic depiction of the locations of each of the eight Energy Centers.

Table 2: Energy Center Location and Utility Program Information

Energy Center	Utility	Utility Program	Location of Physical Center
Pacific Energy Center (PEC)	Pacific Gas and Electric	PGE2010 – Education and Training	San Francisco
Education and Training Center (ETC)			Stockton
Food Service Technology Center (FSTC)			San Ramon
Agricultural Technology Application Center (AgTAC)	Southern California Edison	SCE2513 – Education, Training and Outreach	Tulare
Customer Technology Application Center (CTAC)			Irwindale
Technology and Test Centers (TTC)			Irwindale
Energy Resource Center (SCG ERC)	Southern California Gas	SCG3503 – Education and Training	Downey
Energy Resource Center (SDERC)	San Diego Gas and Electric	SDGE3009 – CCSE Energy Resource Center Partnership	San Diego
California Center for Sustainable Energy (CCSE)			

Figure 1 Map of California Energy Center Locations

Based on our interviews with directors for each Center it is clear that while the CCSE and SDG&E offer their courses in the same physical space, they seem to have differing mission and key objective strategies. The SDERC targets the non-residential sector and mostly uses the Center for training courses and as a channeling mechanism for resource acquisition programs. The CCSE seems to have a much broader mission, "to create a sustainable energy future", placing an emphasis on three areas: (1) clean and renewable distributed generation; (2) green construction; and (3) energy efficiency. The CCSE targets a larger audience of both residential and non-residential sectors through multiple activities including: workshops; outreach at community events; technical consultations; a demonstration area exhibiting multiple energy efficient technology, green construction materials and distributed generation; and an energy efficiency tool lending library.

Through the ODC evaluation teams' initial exploration into the SDERC, we discovered that the SDG&E and the CCSE schedule, market, plan and execute different activities funded by the SDGE3009 Program and often operate independently of one another including having separate administrative support staff, tracking databases and budgets. As such, we are recommending to the CPUC that SDG&E and CCSE be treated as two independent Centers for evaluation. The table below summarizes how the SDG&E and the CCSE compare and contrast in relation to their program efforts. We provide a more detailed description of each Center in Appendices H and I.

Table 3: Comparing and Contrasting SDG&E and CCSE Efforts Funded by the SDGE3009 Program

SDERC	SDG&E	CCSE
Physical Space	SDG&E staff only uses the SDERC for classroom space.	CCSE staff offices and activities are located at the SDERC. The SDERC is maintained by CCSE.
Courses	System specific courses for contractors (LEED, HVAC, NATE Cert., Electrical Installation & Training, Title 24 Compliance, Preventing Compressor Failures, eQuest software), customized trainings for businesses (HVAC systems and central plant operations in hospitals or healthcare facilities, lighting and equipment in food service).	Specific Energy Efficient measures or technology for architects, designers & builders (lighting, exit signs, pathway systems, windows and compressors), Green building or green design workshops for architects and designers (selling green, green buildings and climate change, EE design training, EE operations, specifying green, energy economics and environment), Commissioning (building and retro) and renewables (Solar Water Heating).
Online Courses	Offered by SDG&E	Not offered by CCSE
Target Market	Non-residential focus primarily on contractors and commercial & industrial building operators/facilities.	Both a non-residential and residential focus for all activities at the Center, however the workshops focus primarily on non-residential: architects, designers, builders and some commercial and industrial building operators/facilities.
Technical Assistance	Informally through SDG&E account managers, encourages participation in tech assistance provided by CCSE	Formal technical assistance for energy efficiency options and financing through engineers on CCSE staff.
Energy Resource Library and Tool Lending Program	Encourages participation in the Library and Tool Lending	Manages the library and tool lending program.

SDERC	SDG&E	CCSE
Exhibit Area	Encourages participation in the Exhibit Area. Fills and maintains the marketing collateral for SDG&E programs.	Develops and maintains the demonstrations/exhibits and the marketing collateral for CCSE and 3rd Party programs.
Marketing and Outreach	Email blasts are edited and executed through SCG ERC, markets workshops through SDG&E's website. Attends a minimal number of events on an informal basis.	Manages own website for CCSE, website markets CCSE courses, manages newsletter and email blasts for CCSE courses and activities. Attends many events in the community on a formal basis.
Courses/Activities that will induce energy savings	Courses for market actors such as HVAC code compliance and customized trainings for commercial businesses such as food service and hospitals.	Courses for specific technology, post-retrofit and Technical Assistance.

The Technology Test Center (TTC)

TTC was created in the 2006-2008 program cycle. Previously, many of the activities included in TTC were part of the Emerging Technology Program (ETP), thus their function were probably driven by ETP priorities. TTC personnel continue to be funded by more than one program and continue to work in both programs. However, TTC has a somewhat broader mandate than ETP and performs work within Codes & Standards and Demand Response as well as ETP. TTC consists of the lighting test Center (run by Doug Avery) and the refrigeration test center (run by Ramin Farmazi). Similar to ETP, TTC performs testing on equipment. However, there is no overlap between the testing that occurs under TTC and testing by ETP. The TTC testing activity is considered more of a research and development effort than what occurs in ETP. Given these differences in the efforts, the question arose about how to best assess TTC - as an Energy Center, under ETP, or through a combination of these approaches?

Based on our initial interviews, we have determined that TTC has a parallel path for seminars, performs some high level networking for ETP projects, but it does little to no outreach specific to ETP. As such, we recommend keeping virtually all of TTC activity assessment under the auspices of the CG2 evaluation effort. The evaluation team will coordinate to include in our efforts the ETP interviews with Doug Avery and Ramin Farmazi to explicate vendor interactions that influence ETP (as part of the implementation assessment and perhaps the portfolio assessment that will occur in the ETP evaluation). We will also work to categorize the seminars performed by the same people as either TTC or ETP, and we will exclude seminars that solely related to the ETP effort in our evaluation. TTC seminars would be included under our evaluation effort. (Note that these recommendations have been discussed with ETP and the evaluation contractors are aware of this division.)

An Overview of the Energy Centers and Their Activities

From January 1, 2006 through June 30, 2007, each of the nine Centers focused on delivering energy efficiency information and training; however, the target audience and the method(s) through which each Center sought to accomplish this objective vary somewhat, as shown in Table 4.

The target audience for the trainings and other activities implemented by the Centers differs. With the exception of ETC and CCSE, all of the Centers focus primarily on the commercial market segment, often through the provision of training to market actors. The CCSE disseminates information on a

wide range of energy efficient topics to both residential and commercial customers through courses and other efforts targeting both market actors and end-use customers. The ETC's efforts focus almost exclusively on residential market actors, such as residential builders, contractors and design professionals, with some courses targeting small commercial contractors.

AgTAC and FSTC further distinguish themselves from the other Centers by the target audience they serve and the technologies they address. AgTAC's efforts include seminars, workshops, displays, demonstrations, technical consultations, and on-site seminars and presentations to provide market actors and end-use customers with in-depth and objective energy efficiency information targeting agricultural end-uses. FSTC's efforts target the food service industry exclusively. While AgTAC offered fewer classes than most other Centers, and FSTC touched the fewest number of participants, their efforts are by far the most targeted.

The Centers also differ in terms of their methods of disseminating information to the target audience. The predominant method of conveying energy efficiency information to end-use customers and market actors has been training courses or seminars. While FSTC and TTC both offer classes, they are primarily research laboratories and/or technology testing facilities. The primary thrust of these efforts is to replicate end-use customer environments and demonstrate the performance and energy efficiency of technologies specific to the markets they target. Additionally, the FSTC is instrumental in creating and maintaining testing methods for commercial foodservice equipment. These methods (that undergo the ASTM International process) are instrumental in providing way to determine the energy efficiency of specific products and allow for an Energy Star standard to be created.

Table 4: Overview of Energy Center Efforts

Energy Center	Methods of Information Dissemination						Unique Characteristics
	Classes, Seminars and Workshops	Customer-specific Trainings, Demonstrations and Consultations	Lending Libraries	Outreach Activities (facility tours, trade shows, industry events)	Information Dissemination (Displays, Exhibits, Brochures, website)	EE Technology Testing	
Agricultural Technology Application Center (AgTAC)	√	√	√	√	√		Targets Agricultural End-Users and Technologies
Customer Technology Application Center (CTAC)	√	√		√	√		Emphasis on improving training effectiveness through Train the Trainer program
Technology and Test Centers (TTC)	√	√		√	√	√	Technology test laboratory
Pacific Energy Center (PEC)	√	√	√	√	√		Tool lending library and use of the physical center
Stockton Energy Training Center (ETC)	√	√	√	√	√		Targets residential market actors; Emphasis on energy savings potential of courses
Food Service Training Center (FSTC)	√	√			√	√	Food service technology test laboratory and industry focus. Creation of test methods.
SCG Energy Resource Center (ERC)	√	√		√	√		
SDG&E Energy Resource Center (ERC)	√	√		√	√		
CA Center for Sustainable Energy (CCSE)	√	√	√	√	√		

All of the Centers offer some sort of classes, seminars or workshops. In all, the Energy Centers implemented a total of 1,390 classes and touched 54,102 participants through trainings between

January 1, 2006 and June 30, 2007[2]. Notably, however, the total number of courses implemented by each of the Centers in the first 18 months varies considerably suggesting that the Centers do not all place the same emphasis on courses as a means of disseminating information (See Table 5). The ETC, PEC, CTAC and ERC focus heavily on trainings. The number of courses offered by each Center during the first 18 months of the 06-08 program cycle is shown in Table 5 below.

Table 5: Energy Centers Class and Participant Information
(January 1, 2006 to June 30, 2007**)**

	Total Number of classes	Unique Number of classes[3]	Number of participants
ETC	419	116	8,049
PEC	229	106	9,556
CTAC	185	56	8,002
SCG ERC	183	90	17,980
FSTC	136	80	282
AgTAC	95	58	2,310
SDG&E ERC	61	51	6,315
TTC	46	34	675
CCSE	36	33	933
TOTAL	1,390	624	54,102[4]

For more detailed information on a specific Center, please refer to Appendices A – I of this memo.

Accomplishments of Each Center (January 2006-June 2007)

Table 6 presents summary information on each Center's goals documented in IOU quarterly report filings. Based on the activity reports included in the filings, the majority of these efforts appear to be on track in meeting their goals. It should be noted that goals outlined in the PIPs are explicitly goals about the number of classes, trainings, tool loans, outreach activities, etc. completed. For the 2006-2008 program cycle, the Centers did not have energy savings goals. As part of our evaluation efforts, however, we will be examining how these numerical goals translate into actions taken, and ultimately energy savings for the portfolio.

[2] This is not the unique number of course participants as the available participant data does not permit the determination of the unique number of course participants across the nine Centers.
[3] Many Centers offer the same course multiple times during the evaluation period. This number reflects the number of unique classes offered by each Energy Center.
[4] Ibid.

Table 6: 2006-2008 Energy Center Goals

		Classes, Seminars and Workshops		Customer-specific Trainings, Demonstrations and Consultations		Tool Loans		Outreach Activities	
	Budget	06 – 08 Goals	On-target?	06 – 08 Goals	On-target?	06 – 08 Goals	On-target?	06 – 08 Goals	On-target?
PEC		375	Y	375	Y	2500	Y	225	Y
ETC		360	Y	120	Y	90	Y	50	Y
FSTC		150	Y	30	Y	*NR*	*NR*	30	Y
AgTAC		534	Y	*NR*	*NR*	*NR*	*NR*	300	*NR*
CTAC				*NR*	*NR*	*NR*	*NR*		
TTC		*NR*	*NR*	*NR*	*NR*	*NR*	*NR*	*NR*	*NR*
SCG ERC		307	Y	895*	Y**	*NR*	*NR*	*NR*	*NR*
SDG&E ERC/CCSE* **		50	Y	45	Y	*NR*	*NR*	50	Y

NR = Not Reported

* 700 Equipment Demonstrations, 150 Manufacturer-Assisted Equipment Trainings, 45 FESC CAD Kitchen Designs

** On- or over-target numbers for equipment demonstrations and mfg assisted trainings, under-target for CAD kitchen designs.

*** SDREO Numbers reported; early quarterly reports also mention SDG&E seminars goal of 26 (w/ 11 completed through 2Q 2006).

Update on our Energy Center Evaluation Effort

A major component of our evaluation effort focuses on the effects of the trainings, seminars and workshops. ODC has spent a significant amount of time gathering information and developing a database of these efforts. Table 7 presents the number of courses offered at each Center and the number of classes for which course participant data are available. As shown in Table 4, participant data are available for the majority of courses implemented between January 1, 2006 and June 30, 2007 though data are not available for a significant proportion of courses offered by FSTC and TTC. Given the approach outlined in our evaluation plan, courses for which no participant data are available will be excluded from the assessment of indirect impacts. As such, the ODC team continues to work with the Centers and IOUs to gather these data where available.

Table 7: Energy Centers Class and Participant Information

	Total Number of classes	Number of classes with participant data	% of total with data	Number of participants	Number of classes without participant data
FSTC	136	12[5]	8.8%	282	124
TTC	46	18	39.1%	675	28
PEC	229	216	94.3%	9,556	13
AgTAC	95	91	95.8%	2,310	4
CTAC	185	183	98.9%	8,002	2
ETC	419	417	99.5%	8,049	2
SCG ERC	183	182	99.5%	17,980	1
SDG&E ERC	61	61	100%	6,315	0
CCSE	36	36	100%	933	0

As noted above, these Centers also have several other activities outside of their courses. In Table 8, we present which Energy Center activities we are planning to examine. A "Y" indicates that we will fully evaluate the activity based on the approach outlined in the evaluation plan. A "P" indicates that we will evaluate the activity to the extent possible but that some component of the activity may not be included in the evaluation due to a lack of participant or other data required to evaluate the effort. For example, participant data may only be available for a specific type of demonstration effort; our evaluation will only cover the demonstrations for which the required data are available[6]. An "N" indicates that we are not be able to evaluate the activity in terms of quantifying indirect impacts however we will include the activity in our evaluation efforts in a descriptive manner. We are not planning to conduct any primary research for these efforts.

[5] The Center has indicated that participant information is available for many of the additional classes, we have agreed to request this information following our random selection of courses for the Wave 1 evaluation effort.

[6] In these cases the evaluation team will seek opportunities to extrapolate results where appropriate and possible.

Table 8: Overview of Energy Center Evaluation Effort

	Classes, Seminars and Workshops	Customer-specific Trainings, Demonstrations and Consultations	Lending Libraries	Outreach Activities (facility tours, trade shows, industry events)	Information Dissemination (Displays, Exhibits, Brochures, website)	EE Technology Testing
Agricultural Technology Application Center (AgTAC)	**Y**	P	**Y**	N	P	
Customer Technology Application Center (CTAC)	**Y**	P		N	P	
Technology and Test Centers (TTC)	**Y**	P		N	N	N
Pacific Energy Center (PEC)	**Y**	P	**Y**		N	
Stockton Energy Training Center (ETC)	**Y**	**Y**	**Y**	N	N	
Food Service Training Center (FSTC)	**Y**	P			N	**Y**
SCG Energy Resource Center (ERC)	**Y**	P[7]		N	P	
SDG&E Energy Resource Center (ERC)	**Y**	N		N	N	
CA Center for Sustainable Energy (CCSE)	**Y**	**Y**	**Y**	N	N	

Gray Shade = Activity not undertaken at the specific Energy Center

Ongoing Evaluation Efforts

The evaluation team continues to work with the Energy Centers to fulfill the data request and gather the information required to build a comprehensive database of Center activities implemented between January 1, 2006 and June 30, 2007. We are in the process of fielding the course instructor data collection form. The form was initially fielded electronically via email however we are currently following up with unresponsive course instructors to complete the survey and to gather any additional training materials for courses which were not provided by the Centers. Additionally, we will soon begin fielding a similar on-line data collection form for activity coordinators. The data gathered via these forms are being used to populate our evaluation database of Energy Center activities.

The evaluation team has begun to develop the Wave 1 participant survey analysis plan and associated survey instrument. In addition, we have begun to develop course specific research and case study plans for the subset of Tier 1 courses (listed by Center in the appendices) that have been identified by the Energy Center Directors and for which we have complete instructor data and course materials. The

[7] We are awaiting available participant information for all SCG ERC activities, once this information is provided (expected mid-June) we will be able to assess which activities we are able to evaluate.

evaluation team will prioritize these efforts in parallel with the completion of the instructor data collection effort.

Appendices A through I present detailed information on each of the nine Energy Centers as well as our specific evaluation plans for each Center.

Appendix A: Pacific Gas and Electric – Pacific Energy Center (PEC)

PEC: The PEC utilizes seminars, consultations, tool lending and information to target the commercial building operation and new construction design markets including building owners/operators, architects, engineers, and contractors. The seminars offered by the PEC focus on new and existing energy efficiency technologies in lighting, HVAC, building envelope and controls. PEC's stated goal is to address deficiencies in the market place that result in energy-wasting commercial buildings.

Program Description

- **Energy Center Name:** Pacific Energy Center (PEC)
- **Program Cycle Budget:** Part of the Education, Training and Outreach program, PEC's 2006-2008 program cycle budget is $11.4 million.
- **Geographic Area:** PEC is located in San Francisco, CA; however it serves all of PG&E's territory.
- **Target Market Sector:** Commercial Building Operation and Commercial New Construction Design
- **Target Participants:** Commercial Building Owners and Operators; Architects, Engineers and Contractors involved in New Construction
- **Program Description:** PEC serves the commercial building operation and new construction design markets with seminars, consultations, tool lending and information. Seminars focus on new technologies in lighting, HVAC, building envelope and controls. PEC's market segmentation allows PG&E to create topics to address the application needs in each en-use area of the target markets.
- **Desired Market Effect:** To address deficiencies in the marketplace that result in energy-wasting commercial buildings by educating building owners/operators, architects, engineers, and contractors in new energy efficiency technologies and techniques, as well as traditional efficient building practices such as shading, daylight and natural ventilation.
- **Program Goal:** The objective of PEC programs is to break down market barriers that keep customers from taking advantage of energy efficient opportunities in their buildings. PG&E sees educational classes as one of the most important first steps in introducing customers and market actors to the benefits of energy efficiency.
- **Educational Tactics:** Seminars and Workshops (both in-classroom and online); Energy Efficiency Showcases; Customer Consultations; Resources (Tool Lending Library, Energy Library, etc.)
- **Length of Participant Interaction with Program:** Trainings range from 1 hour evening lectures or seminars to extensive workshops (12 full day classes); but are usually a half-day (three to four hours) to a full day (seven to eight hours) in length. During in-depth consultations with PEC staff, participants might interact with the PEC for anywhere from 15 minutes to several days.
- **Format of Program Activities:** Seminars, Workshops, Displays, Exhibits, Showcases, Consultations, Tool Lending Library, Fact Sheets and Brochures and Off-site seminars and presentations.
- **Degree of Emphasis on Channeling to Utility Energy Efficiency Rebate Programs:** The evaluation team will explore the degree of emphasis on channeling. However, based on our initial interviews with the Center, they appear to provide basic information at the beginning of the classes and materials on other programs are available (on display) for those who take classes in the Center. We also expect that there are a few courses with a stronger emphasis on utility programs, but we

will determine this through our instructor and participant surveys.

- **Numbers of Courses:** From January 1, 2006 – June 30, 2007, PEC held 229 classes, seminars and workshops.
- **Numbers of Course Participants:** During the same time period, there were 9,556 participants in these events.
- **Activities:** Consultations, Tool Lending Library, Energy Resource Library, Ad Hoc Meetings, Events, Exhibits/Tours
- **Number of Activity Participants:** Reports by the PEC are shown in the table below. Estimates are 155 outreach events, 224 technical consultations, 1,314 tool loans, and several thousand interactions through the library. (Note that lists are not available for all activities. As such, we can not confirm these numbers.)

Summary of Activities Reporting By PG&E in Quarterly Reports
January 2006-June 2007

	Training Sessions	Outreach Events (Hosted By PEC)	Technical Consultations	Tool Loans	Library Info Requests	Ad Hoc PEC Events
Goal	*125*	*75*	*125*	*830*	*NA*	*NA*
1Q06	19	44	29	171	1,232	73
2Q06	46	18	30	201	1183	81
3Q06	13	--	30	--	1183	81
4Q06	52	20	35	405	1,165	65
Goal	*125*	*75*	*125*	*830*	*NA*	*NA*
1Q07	34	54	53	227	1101	
2Q07	52	19	47	310	--	

*We report the information provided each quarter; however, we note that the reported cumulative totals do not match the sum of these quarterly reports. It appears that the cumulative totals were trued-up, but it is unclear where there was miscounting.

Detailed Description

The core effort of the PEC is focused on educating through seminars and workshops. Over the three year period, this Center has a goal of offering 375 training sessions (PIP), which is among the largest number of courses offered by any of the Energy Centers. The end-use targeted most often by PEC courses is lighting.

PEC Courses and Participants by End-Use

End-Use	Courses	Participants
Lighting	50	2,411
Commissioning/Retrocommissioning	25	499
Renewable Energy	25	1,262
HVAC	23	634
Controls/Energy Management Systems	22	727
Other	20	1,484
Green Building	16	1,061
Building Envelope	15	388
Water Heating	13	438
Codes & Standards	8	225
Distributed Generation	7	317
Demand/Response	2	62
Motors/Pumps	2	48
Commercial Cooking/Foodservice	1	NA

While not described in the PIP, one objective of this Center is increasing the overall reach (i.e., attendance) of their seminars and workshops. According to PEC staff, at the direction of the CPUC, they have been asked to increase attendance to bring down the cost per student by 5 percent. Thus, offering lecture style courses that appeal to large numbers of people is a goal of this Center. The majority of the seminars and courses are primarily offered at the PEC facility in San Francisco (and thus appeal to people willing to come to the physical Center); however, through partnerships, PEC has also started to offer courses in remote locations.[8] Moreover, in January 2006, the PEC began simulcasting courses to extend the reach of the Center. For the January 2006 through June 2007 period, 69 courses were simulcast by the PEC.

Moreover, according to our in depth interview with this Center, in some cases, there is the possibility of the courses to go beyond what is evident from our examination of the number of participants in the courses. For example, some instructors develop courses for the PEC, but then take that material and deliver it elsewhere.

Although the reach of the Center is clearly an important objective, in recent years, the PEC has also taken steps to increase the effectiveness of their courses. Many of the PEC courses qualify for AIA accreditation and as part of this process, the course must state the learning objectives of the course. In 2006-2008, the courses are also to be designed not only around end-uses, but more specifically, around end-uses specific to a targeted segment because it is believed that this is a more targeted approach. In addition, according to PEC staff, the PEC has asked instructors to incorporate more case studies and hands on exercises to increase the energy savings potential of their interactions. (Note that we will be exploring both the length of interactions, and the types of materials used, through our Instructor Survey effort.) An increasing priority on energy savings is also demonstrated by the fact that the PEC has started to offer a Retrocommissioning Workshop Series that is designed specifically to lead to energy savings. Participants in this workshop are pre-screened to ensure that they have a building that will serve as a case study, and that they are able to commit to a series of 12 full day workshops on how to increase energy efficiency in their building.

[8] In the third quarter of 2006, Silicon Valley Energy Watch (SVEW) held a workshop, "Title 24 Non-residential/Building Envelop Requirements," which was the first in a series hosted through Partnership. In the forth quarter of 2006, SVEW held five additional trainings in Santa Clara County.

It should be noted that while the PEC is responsible for the course content for most of the courses offered at this Center, however there are a couple of occasions where PEC is not responsible for the course content of the courses offered at the Center. Notably, these courses are generally listed under the Center that is responsible for the course content. For example, a course for the food service industry offered by FSTC at the PEC facility would be listed under FSTC.

According to the PIP "moving training participants into other programs" is a key objective of all of the PG&E Energy Centers. According to the 2006-2008 Program Implementation Plan (PIP), the PEC supports PG&E's portfolio of integrated demand side management programs, including four PCG-funded programs: Mass Markets (residential architects), Residential Contractor Training (facility use), Commercial New Construction, and Target Market Business Segments. The evaluation team will explore the degree of emphasis on channeling. However, based on our initial interviews with the Center, they appear to provide basic information at the beginning of the classes and materials on other programs are available (on display) for those who take classes in the Center. We also expect that there are a few courses with a stronger emphasis on utility programs, but we will determine this through our instructor and participant surveys. In addition, there are a few unique courses that the PEC offers to train third party contractors responsible for demand-size management programs. For example, in the third quarter of 2006, PEC staff provided training to Santa Clara County employees on Commissioning Lighting Controls.

Other key efforts by this Center include the Tool Lending Library (goal of 2,500) and the Consultations (goal of 375). These are viewed as efforts that will lead to energy saving behavioral change due to their interactive nature.

The PEC also emphasizes the value of the physical building as a "community energy center" to bring people together to exchange ideas. Although not immediately quantifiable, a lot of people come to the Center to meet people and work together on projects. The PEC staff gave an example of an electrician who saw displays and made the decision to learn about lighting, became a lighting designer to the point that much of his business now revolves around efficient lighting. As part of the building and physical meeting space, the PEC maintains displays and exhibits to educate those who come to their Center.

The PEC also spends a lot of time doing outreach. Their outreach efforts include two types of activities: Outreach Events, which are hosted at the Center; and Ad Hoc Events where the PEC controls the content of the meeting.

PEC hosts a large number of Outreach Event (they have a goal of 225 events). While these outreach events are an opportunity for people to come to the Center and see the exhibits, the Center does not control the content of the events. Events range from community events to for-profit events. The total number of events, and the use of this Center by both community and for-profit entities, demonstrates the Center's reputation and impact on the community.

For Outreach Events, PEC maintains lists of the events, and generally a contact for each event, but not the number of attendees. While Outreach Events will not be part of our evaluation effort because participant lists are not being collected; for 2008, the PEC will classify these events into the sponsor of the event, and how prevalent energy efficiency was in the event, (as follows) to give a better sense of the use of the facility.

Sponsoring Organization or Company:

- PG&E CEE
- PG&E Other
- Statewide IOU
- Business/For-Profit
- Non-Profit
- Government
- Educational Institution
- Other

Energy Efficiency Category:

- Energy efficiency is main topic
- Energy efficiency is one of many topics (sustainable/environment)
- Energy efficiency is one of many topics (non-sustainable/environment)
- Energy efficiency is not a topic covered at event

According to the PEC, Ad Hoc Events "Definitely impart energy efficiency information." These meeting can be either onsite or off-site. They are generally given by PEC instructors; however, they are different from seminars because there are no materials. An example of an Ad Hoc Events would be going to an architectural office to talk to them about new Title 24 requirements or glass selection. (Note that for Ad Hoc Events, PEC inconsistently maintains one contact name, not the names of all those touched.).

The Center also put on at least two showcases annually (lighting and water). According to staff, these showcases are "pretty inexpensive because you get a few hundred people through the door." The value is in putting vendors in contact with people.

Finally, this Center has a library that serves the public as well as PEC staff. When asked about the benefit the library provides, the librarian replied that based on the feedback she gets she is often able to provide both internal and external customers with information about energy efficiency and emerging technology that they were not able to find otherwise.

The library gets information requests through phone and email, as well as through actual visits to the library. Requests/questions range from very general information to very specific requests and the librarian provides minor consultations to those that she assists. (Note that these are not tracked.) If the request is very technical or if someone is looking for an actual consultation, the librarian will refer people to the technical staff. Moreover, if a participant or visitor is unfamiliar with programs, the librarian will refer them to a program manager who can steer them to the appropriate program. The librarian also does a lot of background research for the PEC staff that sometimes results in new courses and/or curriculum changes to existing courses.

Tier 1 Courses and Activities

PEC staff identified 10 activities or courses at the Center that are most likely to lead to behavioral changes. These included two activities and eight courses.

Among the activities are the Tool Lending Library and the One-on-One consultations. The Tool Lending Library is believed to result in energy savings because it is the direct use and application of

energy saving tools. The consultations are among the top 10 due to the one-on-one nature of their interaction.

Among the eight courses, PEC staff identified the Retrocommissioning Workshop Series because it is specifically designed to lead to energy savings. As described above, the participants in this course are screened to ensure that they have a building that could serve as a case study, and that they can could commit to attending all 12 meetings (i.e., a 84 hour commitment).

The PEC identified the other seven classes listed below because they are classes with innovative teaching methods, employed more hands on and case studies, and had longer interactions with students.

Event Name	Length of Time (hours)	Number of Participants
TOOL LENDING LIBRARY ACTIVITIES--will need information on users, etc.	NA	NA
Consultations--will need information on people touched	NA	NA
Retrocommissioning Workshop Series 1 and II (12 classes each)	7*12 classes	286
Optimizing Air-Side System Design	7	30
HVAC Retrofits 101 for Commercial Buildings	7	95
Tools for Evaluating Existing Indoor Lighting	3	85
Tools for Evaluating Existing Outdoor Lighting	3	61
Using Non-dimming Strategies to Save Energy and Money	3	46
Lighting for Profit: Finding Hidden Energy Savings	3	58
Using DDC Control Systems to Commission VAV Boxes	7	81

Program Logic Model

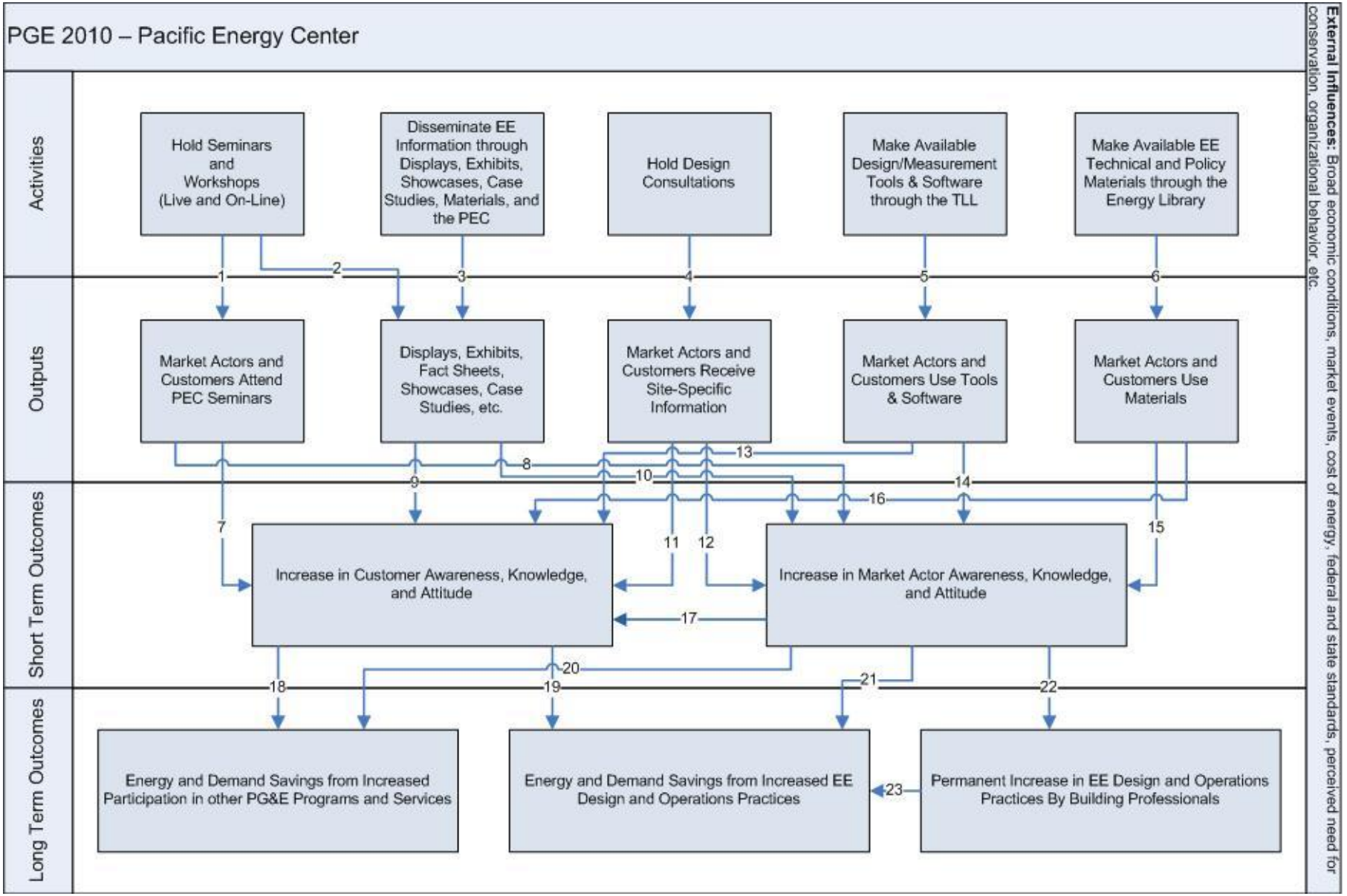
The PEC seeks to increase access to technical and applications information and move clients into other, more site-specific PG&E services. Various Center activities – including live and on-line seminars and workshops; design consultations; displays, exhibits, case studies, and other materials, and the PEC itself as an example of energy efficient building design and operation – are designed to increase customer and market actor awareness and knowledge of energy efficient commercial building design practices and operations. In addition, the PEC seeks to overcome market barriers concerning cost, performance uncertainty, and asymmetric product information by making available design and measurement tools and software through the Tool Lending Library as well as energy efficiency technical and policy materials through the Energy Library. The educational information provided by the PEC encourages the adoption of energy efficient practices and operations and participation in other PG&E programs, leading to energy and demand savings.

Note that the model below lists five activities that are conducted by the PEC. Our evaluation efforts will focus on the following three activities:

1. Seminars and Workshops
2. Design Consultations
3. Design Measurement Tools and Software (i.e., Tool Lending Library)

There are two other activities shown below that will not be covered in our evaluation efforts. These include disseminating information through the exhibits and demonstrations and providing information

through the Energy Library. While we will attempt to provide any information available on these two activities to demonstrate the extent of the Center's effort, the PEC does not maintain lists of customers touched by these efforts, so there is no way to collect primary data on these efforts.


PGE 2010 – Pacific Energy Center
Activities
Outputs
Short Term Outcomes
Long Term Outcomes
Hold Seminars and Workshops (Live and On-Line)
Disseminate EE Information through Displays, Exhibits, Showcases, Case Studies, Materials, and the PEC
Hold Design Consultations
Make Available Design/Measurement Tools & Software through the TLL
Make Available EE Technical and Policy Materials through the Energy Library
Market Actors and Customers Attend PEC Seminars
Displays, Exhibits, Fact Sheets, Showcases, Case Studies, etc.
Market Actors and Customers Receive Site-Specific Information
Market Actors and Customers Use Tools & Software
Market Actors and Customers Use Materials
Increase in Customer Awareness, Knowledge, and Attitude
Increase in Market Actor Awareness, Knowledge, and Attitude
Energy and Demand Savings from Increased Participation in other PG&E Programs and Services
Energy and Demand Savings from Increased EE Design and Operations Practices
Permanent Increase in EE Design and Operations Practices By Building Professionals
1
2
3
4
5
6
7
8
9
10
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23
External Influences: Broad economic conditions, market events, cost of energy, federal and state standards, perceived need for conservation, organizational behavior, etc.

Appendix B: Pacific Gas and Electric – Stockton Energy Training Center (ETC)

ETC: The focus at the ETC is on providing technical training to residential and small commercial contractors. By providing this type of training, ETC works to eliminate any gaps in skills and improved the quality of the installation of energy efficiency technologies.

Program Description

- **Energy Center Name:** Stockton Energy Training Center (ETC)
- **Program Cycle Budget:** Part of the Education, Training and Outreach program, PEC's 2006-2008 program cycle budget is approximately $3.3 million.
- **Geographic Area:** ETC is located in Stockton, CA; however it serves all of PG&E's territory.
- **Target Market Sector:** Mass market residential upstream market actors, midstream residential market actors, and small commercial market actors
- **Target Participants:** Residential and small commercial contractors
- **Program Description:** ETC focuses on training residential and small commercial contractors by conducting workshops and seminars that that compliment the education and training needs of each of the market segments. ETC addresses the mass market sector by providing upstream and midstream education, training, services and technical support in the field of energy efficiency.
- **Desired Market Effect:** ETC aims to increase energy efficiency awareness and activities in the mass market through education, training, and technical support of upstream and midstream market actors – primarily residential contractors.
- **Program Goal:** ETC identifies critical skills with low availability, and works with distributors, contractors, builders, designers, and city/county building departments to eliminate any skill gaps in contractors to improve the quality of installation of energy efficiency measures; to influence the mass market through upstream and midstream market actors; and to improve compliance with Title 24 code updates.
- **Educational Tactics:** Provides education, training, consultations, services and technical support to upstream and midstream market actors. Includes mobile units to get market outside of Stockton.
- **Length of Participant Interaction with Program:** Trainings are usually a half-day (three to four hours) to a full day (seven to eight hours) in length.
- **Format of Program Activities:** Seminars, Workshops, Consultations, Tool Lending and Technical Support
- **Degree of Emphasis on Channeling to Utility Energy Efficiency Rebate Programs:** This Center emphasizes channeling to other utility energy efficiency rebate programs. This is clear from the titles of several of their courses: "Multi-Family Energy Efficiency Program: New Construction 2005 Title 24 Update," "Multi-Family Energy Efficiency Program: Basics," or "PG&E's Residential New Construction Program." Instructors are also encouraged by the Center to emphasize rebates, where they exist.
- **Numbers of Courses:** From January 1, 2006 – June 30, 2007, ETC held 419 classes, seminars and workshops.
- **Numbers of Course Participants:** During the same time period, there were 8,049 participants in these events.
- **Activities:** customized training and technical consultations, tool loans and outreach events.
- **Number of Activity Participants:** Reports by the ETC are shown in the table below. Estimates are 303 training sessions, 35 outreach events, 107 technical consultations, and 48 tool

loans. (Note that lists are not available for all activities. As such, we can not confirm these numbers.)

Summary of Activities Reporting By PG&E in Quarterly Reports
January 2006-June 2007

	Training Sessions	Outreach Events	Technical Consultations	Tool Loans
Goal	*120*	*17*	*40*	*30*
1Q06	36	3	1	8
2Q06	43	3	14	4
3Q06	31	3	14	2
4Q06	104	9	45	20
Goal				
1Q07	44	10	17	3
2Q07	45	7	16	11

*We report the information provided each quarter; however, we note that the reported cumulative totals do not match the sum of these quarterly reports. It appears that the cumulative totals were trued-up, but it is unclear where there was miscounting.

Detailed Description

This Center, located in Stockton, describes itself as a proactive leader in the industry—Utility-wide, Statewide and Nationwide. They emphasize changes in the marketplace, serve as an important channel for providing information on utility courses, and play a National Leadership role through their involvement with organizations such as Affordable Comfort.

This Center is unique in that it offers contractors an opportunity for hands-on training through its Contractor Training House, which is located on the Energy Center property. The contractor training house is a full-scale home with multiple systems and an open design to allow contractors to see different types of lighting, windows, and insulation. In addition to the House, this Energy Center also has multiple rooms to demonstrate lighting in a kitchen or living room.

Because the Center feels as though they have saturated the market within 40 miles of Stockton, the Center also has portable models (for whole house and insulation) and systems (primarily HVAC) to allow for demonstrations at off-site locations. ETC partners with distributors and distributor training facilities to expand the reach of this Center since this is where contractors go to procure equipment. They also partner with organizations such as the Builder Exchange, and with Local Government Partnerships. For example, in the second quarter of 2007, the ETC conducted seven training sessions in support of the Fresno, Stockton and Redwood Coast Energy Watch programs. For all of these partnership courses, the ETC controls the course content, but the distributor markets the courses and ensures that the class is subscribed.[9]

Notably, this Center also planned to start web-simulcast courses in the fourth quarter of 2006 to expand their reach. Based on a review of the information provided by this Center, they offered seven web-simulcast courses during the Wave 1 period.

[9] Note that the ETC does maintain lists of participants for these courses. They may be difficult to identify in the list of courses (ask Karen for help, if necessary).

While not as structured as the courses, the Center also includes "Public Events" or off-calendar classes, such as courses for Laney College etc., which tend to be two to three hour events with an evening lecture or presentation. For these outreach events, the Center collects the ETC presenter name only. There are no names or participant lists. There are also no materials for these events.

In addition, the Center provides consultations and tool lending through their tool lending library. The activity level for both consultations and tool lending is somewhat small relative to the numbers served through the courses. These are not seen as having a large potential to induce energy savings since there are only a few types of tools, and the consultations are primarily to assist the contractor with understanding how to use the tools.

While all of these activities are portrayed in the logic model below, the key emphasis is on courses. Since the past evaluation (2004-2005), this Energy Center has been committed to offering classes that lead to energy savings. They (1) emphasize courses that target market actors (to increase the "influencer effect"), (2) they track key characteristics and course objectives to ensure that their courses lead to savings, and (3) they have completed self-evaluations to better understand the effects of their efforts. Information provided by the Center on a self-evaluation of several courses offered through the Bakersfield/Kern Energy Watch Partnership shows that "the sessions resulted in a potential energy savings of 7,230,960 kWh of electricity and 1,047,168 therms of natural gas annually." In addition the Center has created a "course cruncher" which determines a score (up to 100) for each class based on a number of characteristics including attendance, cost/student, savings potential, channeling and support of overall PG&E sustainability efforts.

The primary targets for this Center are HVAC Contractors, Residential Builders and General Contractors, Mechanical Engineers, Energy Consultants, and Designers/Architects. This Center also targets HERS Raters, Building Department Inspectors and Plan Checkers because these market actors have the potential to touch many homes.[10] In the marketing materials (i.e., the course calendar) the Center clearly lays out the target audience for each upcoming course. They also offer North American Technician Excellence (NATE) courses. The end-use most represented in ETC courses is HVAC with 196 courses and 3,031 participants.

[10] Notably, they do not emphasize building inspectors, etc. as much as contractors due to the fact that it could be hit or miss as far as the effect. However, some of the largest effects do come from the ripple effect of emphasizing building inspectors. Center staff provided one example of educating the Brentwood building inspector, who then required all of the building department to attend the course.

ETC Courses and Participants by End-Use

End-Use	Courses	Participants
HVAC	196	3,031
Other	64	1,094
Codes & Standards	46	866
Renewable Energy	23	754
Water Heating	21	619
Lighting	11	247
Controls/Energy Management Systems	10	203
Rebates/Tax Credits	10	164
Building Envelope	9	178
Commercial Cooking/Foodservice	7	138
Green Building	7	334
Motors/Pumps	6	137
Refrigeration	5	179
Process Heating	2	38
Steam Systems	1	42
Compressed Air	1	25

While the Center includes a computer lab, and classrooms, this Center emphasizes hands-on learning in order to increase potential savings. Most ETC classes are about 15 to 30 participants to allow for hands-on learning (45 percent of all courses in Jan 2006-June 2007) but course can range in size from 2 to 79.

Notably, as mentioned above, this Center builds many of their courses in coordination with PG&E's Mass Market and other energy saving programs. They describe their efforts as "…partnering with the rebate program managers and particularly for products or concepts that just come off the list of emerging technologies into the market, we know we need to help them so we do." They work directly with the rebate program managers to ask them if there is something they want the ETC to support. One example of this is the pool pump program, in which PG&E offered a rebate for multi-speed pool pumps and the ETC offered classes on this subject. These efforts ultimately rippled through the market and lead to support from the California Energy Commission, and a change in the market so that it's difficult to get a single-speed pump.

Tier 1 Courses and Activities

The evaluation plan calls for each Center director to identify the courses and activities most likely to induce energy saving behavioral change. This section presents the courses and activities selected by the Center director as well as a brief discussion of why the course or activity was chosen and the most likely evaluation approach.

ETC has identified the following courses and activities:

Event Name	Length of Time (hours)	Number of Participants
Title 24 HVAC System Change-Outs: Duct Testing Requirements for Residential and Small Business	4	238
Title 24 Duct Installation Standards and Diagnostic Testing	8	160
Equipment Sizing and Selection Using ACCA Manual J	8	26
HVAC System Air Flow and Static Pressure Diagnostics	8	161
Proper Procedures for Changing Air Conditioners and Heat Pumps	8	410
Quality Insulation Installation Series	8	210
California Building Performance Contractors Association (CBPCA) Diagnostic and Remediation Training: Utilizing the Systems Approach—six day all systems	48	115
Consultations	NA	108 consultations
Tool Loans	NA	48 loans

The ETC's criteria for selecting courses were that they had to target the right audience at the right time with the right topic to take advantage of missed opportunities in the market.

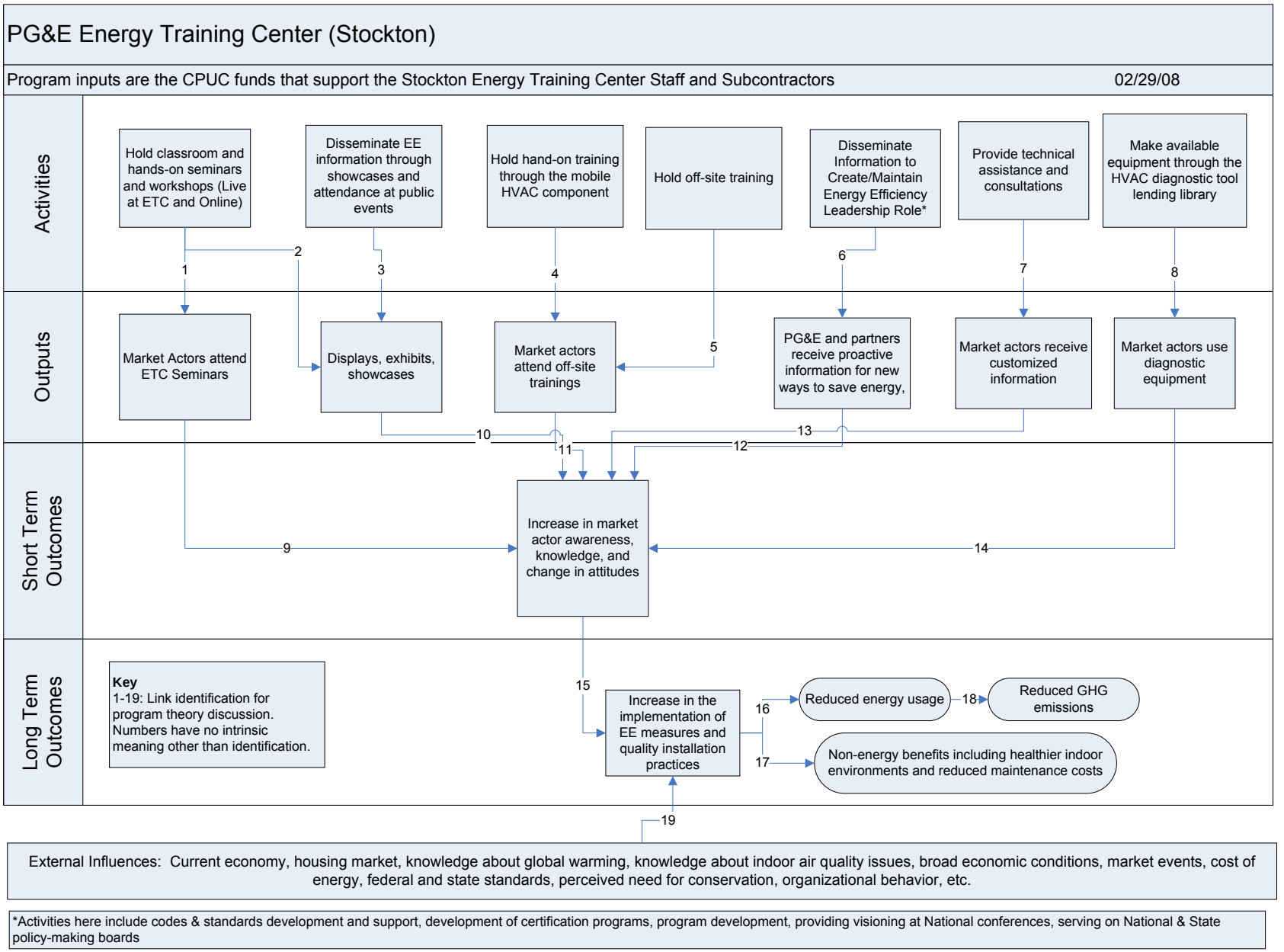
Many of the courses selected by the ETC were selected specifically because they target contractors, and have the ability to touch multiple homes or sites. In addition, the majority of the courses selected deal with HVAC systems, which, as one instructor put it, has a "massive electrical load," with very large gas or electrical demand.

The Quality Insulation Installation course was selected because the performance of insulation can drop by 30 to 50 percent if it is not properly installed.

Program Logic Model

The ETC's education and training activities are designed to overcome energy efficiency awareness and ability barriers among residential contractors. ETC activities include classroom and hands-on seminars and workshops (live and online); off-site training, including the mobile HVAC component; customized technical assistance and consultations; displays, exhibits, and showcases; attendance at public events; and dissemination of information to create/maintain an energy efficiency leadership role. In addition, the ETC seeks to overcome market barriers concerning cost, performance uncertainty, and asymmetric product information by making available HVAC diagnostic tools through its Tool Lending Library. As a result of these activities, contractors will be more aware or and knowledgeable about energy efficient equipment and practices. They will implement energy efficient measures and use quality installation practices more often, leading to reduced energy usage and greenhouse gas emissions as well as non-energy benefits such as healthier indoor environments and reduced maintenance costs.

Note that the model below lists seven activities that are conducted by the ETC. Our evaluation efforts will include all of the efforts (with the exception of Dissemination of Information and Public Events), although the emphasis of our effort will be on the seminars and courses. While the Center conducts "Public Events," the Center maintains a list of the ETC presenter name only. There are no names or participant lists.


PG&E Energy Training Center (Stockton)
Program inputs are the CPUC funds that support the Stockton Energy Training Center Staff and Subcontractors
02/29/08
Activities
Outputs
Short Term Outcomes
Long Term Outcomes
Hold classroom and hands-on seminars and workshops (Live at ETC and Online)
Disseminate EE information through showcases and attendance at public events
Hold hand-on training through the mobile HVAC component
Hold off-site training
Disseminate Information to Create/Maintain Energy Efficiency Leadership Role*
Provide technical assistance and consultations
Make available equipment through the HVAC diagnostic tool lending library
Market Actors attend ETC Seminars
Displays, exhibits, showcases
Market actors attend off-site trainings
PG&E and partners receive proactive information for new ways to save energy,
Market actors receive customized information
Market actors use diagnostic equipment
Increase in market actor awareness, knowledge, and change in attitudes
Increase in the implementation of EE measures and quality installation practices
Reduced energy usage
Reduced GHG emissions
Non-energy benefits including healthier indoor environments and reduced maintenance costs
Key
1-19: Link identification for program theory discussion. Numbers have no intrinsic meaning other than identification.
1
2
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External Influences: Current economy, housing market, knowledge about global warming, knowledge about indoor air quality issues, broad economic conditions, market events, cost of energy, federal and state standards, perceived need for conservation, organizational behavior, etc.
*Activities here include codes & standards development and support, development of certification programs, program development, providing visioning at National conferences, serving on National & State policy-making boards

Appendix C: Pacific Gas and Electric – Food Service Technology Center (FSTC)

FSTC: The FSTC aims to increase energy efficiency in food service throughout the state of California. The foundations of this effort are FSTC's equipment testing and equipment testing protocol development which serve to close the gaps in product knowledge and allow customers to make informed purchase decisions. The Center also offers seminars and consultations to customers, with a specific focus in food service technologies.

Program Description

- **Energy Center Name:** Food Service Technology Center (FSTC)
- **Program Cycle Budget:** Part of the Education, Training and Outreach program, FSTC's 2006-2008 program cycle budget is $5.1 million.
- **Geographic Area:** PEC is located in San Ramon, CA; however it serves all of PG&E's territory.
- **Target Market Sector:** Food service industry.
- **Target Participants:** Food service equipment manufacturers and their customers including hospitals, educational facilities, restaurants and commercial cooking design consultants.
- **Program Description:** FSTC serves the food service industry with seminars, consultations, and energy efficiency site audits. PG&E's market segmentation allows FSTC to create topics to address the application needs in each end-use area of the target markets. In addition, FSTC performs equipment testing that allows for unbiased measurement of production capacity and energy efficiency and provides technical and market data in support of developing codes and standards.
- **Desired Market Effect:** FSTC aims to increase efficiency in food service throughout the state of California. The foundation for energy efficiency is formed by the Center's application research, equipment testing and seminars.
- **Program Goal:** The objective of FSTC programs is to break down market barriers that keep customers from taking advantage of energy efficient opportunities in their food service operations. PG&E sees educational classes as one of the most important first steps in introducing customers and market actors to the benefits of energy efficiency.
- **Educational Tactics:** Seminars and Workshops (both on and off-site); Customer Consultations and Audits; and Information distribution (website, brochures, etc.).
- **Length of Participant Interaction with Program:** Trainings range from 0.5 hour lectures to full day classes; but are usually less than a half-day (three to four hours) in length. In fact, the average length of a seminar offered by FSTC is 2.2 hours.
- **Format of Program Activities:** Research and Testing, Seminars, Workshops, Consultations, Fact Sheets, Brochures and On-line content.
- **Degree of Emphasis on Channeling to Utility Energy Efficiency Rebate Programs:** The evaluation team will explore the degree of emphasis on channeling. However, based on our initial interviews with the Center and review of the Center's course offerings, it is clear that they place an emphasis on supporting both the audit and foodservice rebate programs.
- **Numbers of Courses:** From January 1, 2006 – June 30, 2007, FSTC held 136 classes, seminars and workshops.
- **Numbers of Course Participants:** Participation records for FSTC classes are missing in many cases, however for those classes with participant data reported, the average class size is 26.
- **Activities:** Equipment testing and Application research; Consultations.

- **Number of Activity Participants:** While numbers are not available for FSTC activities in 2006, activity numbers for the first half of 2007 are 53 training sessions, 10 outreach events, 2 technical consultations and 43 tool loans. (Note that lists are not available for all activities. As such, we can not confirm these numbers.)

Summary of Activities Reporting By PG&E in Quarterly Reports
January 2006-June 2007

	Training Sessions	Outreach Events	Technical Consultations	Tool Loans
Goal	*NA*	*NA*	*NA*	*NA*
1Q06	*NA*	*NA*	*NA*	*NA*
2Q06	*NA*	*NA*	*NA*	*NA*
3Q06	*NA*	*NA*	*NA*	*NA*
4Q06	*NA*	*NA*	*NA*	*NA*
Goal	*48*	*5*	*10*	*60*
1Q07	26	4	1	19
2Q07	27	6	1	24

*We report the information provided each quarter; however, we note that the reported cumulative totals do not match the sum of these quarterly reports. It appears that the cumulative totals were trued-up, but it is unclear where there was miscounting.

Detailed Description

FSTC is a research lab that offers some training, provides support to other program efforts, and conducts industry-based outreach efforts for the food service sector.

As a research lab, the FSTC is a national leader in pushing for energy efficiency in the food-service industry. The FSTC facility houses a test center that allows them to test food-service equipment (e.g., fryers, pizza ovens, open refrigeration units for convenience stores) for specific applications. For example, a large chain store or restaurant will approach the FSTC with several options for refrigeration or cooking equipment. The FSTC tests the equipment being considered specifically for the application needed, and makes a recommendation about which equipment is the most efficient equipment for the application. In general, that equipment (and the customer that requested the test) is then eligible for a custom rebate through the utility DSM programs.

As such, this program feeds directly into utility DSM programs. These efforts also lead to energy savings—however these savings are generally covered under the Food Service Equipment Rebate program. The rebate, however, is only for the customer's California-based facilities. For many chains, the proven energy efficiency equipment is also utilized in other states, and so the savings reach beyond California. According to the FSTC, they are the only food-service test center in the nation, and their efforts to increase energy efficiency have nationwide implications. In many cases, the effects are not just customer-specific, but lead to energy efficiency codes and standards both in and out of California. (National codes and standards work includes efforts with Energy Star and the Consortium for an Energy Efficiency.) While ODC will not be able to evaluate these activities according to our methodology for evaluating courses and activities due to the lack of participant data, we will likely evaluate the equipment testing and testing protocol development as one of the in-depth case studies outlined in our evaluation plan.

In addition to equipment testing, the FSTC also offers a variety of courses—although not as many as some of the other energy Centers. The FSTC offered 136 courses during the Wave 1 evaluation period of January 1, 2006 through June 30, 2007.

FSTC categorizes their courses into the following eight groups:

FSTC Course Categorization

	Number of Courses	Participants Available?
Food Service Seminar	39	Partially
Industry Seminar	35	Partially
Statewide IOU Food Service Seminar	26	Yes
Food Service Training	14	No
Food Service Event	13	No
Industry Event	4	This is a presentation at a trade show and won't necessarily have a list of participants
PG&E Training	3	Internal trainings
Energy Audit Training	2	Internal trainings

Some of the Food Service Seminars are designed for the general commercial food service audience, such as "Ten Energy Saving Tips," while others are targeted at specific customers, e.g, "Starwood Hotel Saving Energy in the Commercial Kitchen." Many of the food service seminars are focused on universities, such as "University of California, Davis Commercial Food Service Appliance Basics" or the "National Association of College & University Food Service Conference Purchasing Energy Efficient Equipment for Your Sustainable Kitchen." A few of these university based courses are for students, and so the effects are expected to be delayed.

In addition, several of FSTC's courses in the first 18 months were aimed at internal training of sales and service people. For example, FSTC lists a few "Energy Audit Training" courses, "FS/CEE Training" courses, "PG&E Rep Training Energy Efficiency Opportunities for Food Services," and "PG&E Trainings." Generally, FSTC offers training to PG&E staff, but FSTC also provides support to energy audits and design consultations for PG&E customers. The energy audits are typically performed by a member of the FSTC staff and the customer account representative, who go on-site to a commercial facility to assess their energy efficiency practices and make recommendations on potential improvements. FSTC has shifted emphasis to this aspect of their program beginning in 2007; therefore the ODC team hopes to pick up this shift during our evaluation when we compare the Wave 1 and Wave 2 time periods. Similar to the energy audits, the design consultations are a one-on-one interaction between the FSTC and a customer—however, according to FSTC staff, consultations are not believed to lead to large energy savings. In both instances we intend to evaluate the activity by the same methodology used for course evaluations provided that participant data is available. It should be noted that through our conversations with the FSTC we believe that participant data is at least partially available for both the energy audits and the design consultations. The FSTC budget is expected to increase in 09-11 because they will provide additional technical support and training for the Food Service Rebate Program.

It should be noted that FSTC is also responsible for the course content of a number of courses offered at other Energy Centers (both within PG&E and across the state). As such, FSTC courses include several Joint Energy Center (JEC) courses, or Statewide IOU Food Service Seminars, which are courses that are developed by FSTC but conducted at other Centers. This allows the FSTC to broaden their reach and touch customers throughout the state. In these cases, FSTC provides the instructor and the course content while the other Center provides the facility and marketing support. However, FSTC does not maintain the participant lists. For example, CTAC would have the lists an FSTC seminar held for SCE.

Finally, the Center conducts outreach activities including attendance at "Industry Events" and conferences, publication of technical report and providing educational content on the Center's website. For purposes of this evaluation, these activities will be considered marketing activities which drive customers to participate in the classes, seminars, audits and consultations; and any savings will be captured during the evaluation of the Center's classes, seminars, audits and consultations.

FSTC emphasizes commercial cooking and foodservice courses; however, FSTC courses appear to cover eight different end-uses, shown below.

FSTC Courses by End-Use

End-Use	Courses
Commercial Cooking/Foodservice	93
HVAC	19
Rebates/Tax Credits	6
Green Building	6
Water Heating	5
Lighting	4
Refrigeration	2
Codes & Standards	1

The FSTC is run by an external contractor, Fisher-Nickel. Interestingly, the FSTC was not a part of the 2004-2005 Statewide Education, Training and Services Program Evaluation.

Tier 1 Courses and Activities

FSTC staff identified seven activities or courses at the Center that are most likely to lead to behavioral changes. These included four activities and three courses.

Among the activities are the Test methods and equipment testing as well as the energy audit support. The test methods and equipment testing are believed to result in energy savings because, as stated above, the tests determine energy efficient equipment that is then installed by the customer (generally through a rebate program).

The energy audits are among the top efforts due to the one-on-one nature of the audits. However, ODC will have to investigate whether these are already being examined under another program effort. Again, this may be a good case study for this Center.

Among the three courses, FSTC staff identified the following:

Top FSTC Courses

Course Name	Occurrences
Food Service TC 28	10
Top Ten Tips	19
Fundamentals of Kitchen Ventilation (Advanced)	1

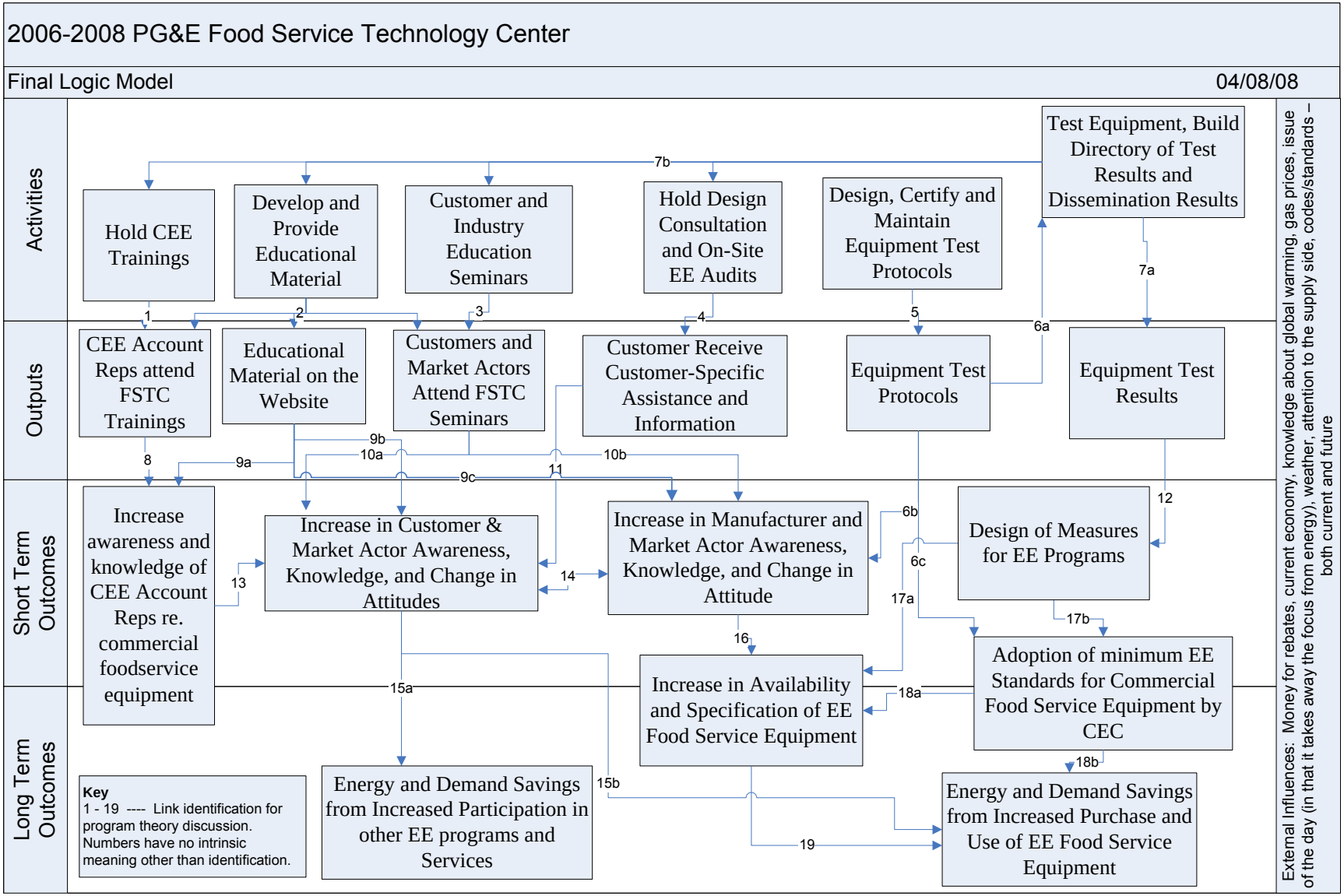
Finally, the Center suggested examining some of the national impacts. For example, with some chain customers that are market actors (such as In-N-Out Burger), FSTC interacts with the market actors through industry meetings and is able to influence energy use decisions. FSTC suggests reviewing the process evaluation, and examining the testimonials in prior reports.

Our evaluation methodology calls for us to identify other courses and activities offered by the Center which also have a high likelihood of inducing energy saving behavioral change. The Center has already identified the attributes of courses and activities which have a high likelihood of inducing energy saving behavioral change. Therefore, as we assess FSTC's courses and activities to determine other Tier 1 courses and activities, we will focus specifically on courses which have similar characteristics as those identified by the Center itself.

Program Logic Model

The FSTC seeks to fill technical gaps in the marketplace and serve as a conduit for new technologies through various activities: (1) CEE trainings provide account representatives with the information they need to inform their customers of PG&E programs and services; (2) customer and industry education seminars, design consultations and on-site audits, and educational materials increase customer, market actor, and manufacturer awareness and knowledge of potential energy saving actions they can take or offer to their clients and the portfolio of relevant resource acquisition programs offered by PG&E; and (3) equipment test protocols and equipment test results support the design of measures for PG&E resource acquisition programs and the adoption of minimum standards for commercial food service equipment by the CEC. The information made available through these activities breaks down barriers of awareness and knowledge. As a result, customers and market actors will be more likely to take energy efficient actions promoted by the FSTC and/or participate in other PG&E programs, leading to energy and demand savings. More stringent energy efficiency standards will contribute to savings by increasing the availability of and demand for energy efficient food service equipment.

Note that the model below lists six activities that are conducted by the FSTC. Our evaluation efforts will include all of these activities; however we may determine that certain activities are already included under another program effort, specifically the energy audits.


2006-2008 PG&E Food Service Technology Center
Final Logic Model
04/08/08
Activities
Outputs
Short Term Outcomes
Long Term Outcomes
Hold CEE Trainings
Develop and Provide Educational Material
Customer and Industry Education Seminars
Hold Design Consultation and On-Site EE Audits
Design, Certify and Maintain Equipment Test Protocols
Test Equipment, Build Directory of Test Results and Dissemination Results
CEE Account Reps attend FSTC Trainings
Educational Material on the Website
Customers and Market Actors Attend FSTC Seminars
Customer Receive Customer-Specific Assistance and Information
Equipment Test Protocols
Equipment Test Results
Increase awareness and knowledge of CEE Account Reps re. commercial foodservice equipment
Increase in Customer & Market Actor Awareness, Knowledge, and Change in Attitudes
Increase in Manufacturer and Market Actor Awareness, Knowledge, and Change in Attitude
Design of Measures for EE Programs
Increase in Availability and Specification of EE Food Service Equipment
Adoption of minimum EE Standards for Commercial Food Service Equipment by CEC
Energy and Demand Savings from Increased Participation in other EE programs and Services
Energy and Demand Savings from Increased Purchase and Use of EE Food Service Equipment
Key
1 - 19 ---- Link identification for program theory discussion. Numbers have no intrinsic meaning other than identification.
External Influences: Money for rebates, current economy, knowledge about global warming, gas prices, issue of the day (in that it takes away the focus from energy), weather, attention to the supply side, codes/standards – both current and future

Appendix D: Southern California Edison – Agricultural Technology Application Center (AgTAC)

AgTAC: Similar to CTAC, AgTAC has a strong emphasis on providing course content to SCE customer market segments and end-users. However, because of its location, many of the courses and much of the Center's displays and exhibits focus on agricultural end-uses. We also observed SCE's commitment to improving its training opportunities at AgTAC, as many of the courses there are undergoing revision to incorporate best practices in adult education.

Program Description

- **Energy Center Name:** Southern California Edison's Agricultural Technology Application Center (AgTAC)
- **Program Cycle Budget:** Part of the Education, Training and Outreach program, the AgTAC 2006-2008 program cycle budget is $4.2 million.
- **Geographic Area:** AgTAC is located in Tulare, CA, however it serves all of SCE's territory.
- **Target Market Sector:** Agricultural
- **Target Participants:** Market Actors and End-Users
- **Program Description:** AgTAC offers a place where customers can see, hear, touch and learn about the latest energy-efficient technologies for their businesses and home. The Centers are relied upon by, and are trusted resources for, utility customers seeking unbiased and accurate information regarding existing and emerging energy efficiency technologies and their application.
- **Desired Market Effect:** The AgTAC Energy Center uses hands-on energy efficiency displays and exhibits in conjunction with seminars to help breakdown customer market barriers concerning first cost, performance uncertainty, and asymmetric product information. The Center aims to influence customers to implement energy efficient measures which result in energy savings and bill reductions.
- **Program Goal:** The primary objective is defined as "the reduction of barriers to customer participation in the energy efficiency marketplace by providing accurate and unbiased energy efficiency information to SCE customers."
- **Educational Tactics:** Offer Classes/Seminars, conduct hands-on demonstrations and consultations, provide facility tours, and produce current exhibits, displays and brochures.
- **Length of Participant Interaction with Program:** Trainings are typically a half-day (three to four hours) to a full day (seven to eight hours) in length.
- **Format of Program Activities:** Seminars, Workshops, Displays, Demonstrations, Technical Consultations, Facility Presentations, Fact Sheets and Brochures and Off-site seminars and presentations.
- **Degree of Emphasis on Channeling to Utility Energy Efficiency Rebate Programs:** The evaluation team will explore the degree of emphasis on channeling. We expect that there are a few courses with a stronger emphasis on utility programs, but we will determine this through our instructor and participant surveys.
- **Numbers of Courses:** From January 1, 2006 – June 30, 2007, AgTAC held 95 classes, seminars and workshops.
- **Numbers of Course Participants:** During the same time period, there were 2,310 participants in these events.
- **Activities:** Tool lending library, customized consultations, Center tours, and information dissemination including exhibits and displays.

Detailed Description

On January 31, 2008 members of the ODC Team met with the Manager of Projects and Product, C. Marrs Gist and other members of the AgTAC staff. The main purpose of this meeting was to gain an understanding of all of the Center's activities and the likelihood of each activity to induce energy saving behavioral change. Additionally, we needed to assess our ability to evaluate each of the Center's activities.

AgTAC is very well-organized, offering all of the standard activities that are expected of an Energy Center. AgTAC's cornerstone activity is offering classes, seminars and workshops which focus on energy management and energy efficiency solutions. In addition, AgTAC conducts a number of other activities which support the Center's goal of promoting energy efficiency to business customers. Primary of these events is the tool lending library, and the Center also offers technical consultations, demonstrations and tours at the Center. Finally, the Center produces current exhibits, displays and brochures which are used both as marketing tools and as teaching tools.

AgTAC shows a strong commitment to adult education best practices, and has begun to update class, seminar and workshop content to reflect these practices. As the Center continues with its program planning for the 2009 – 2011 program period, it will continue to update course content. Wave 1 of our evaluation focuses on the period January 1, 2006 to June 30, 2007 and Wave 2 of our evaluation will focus on the period July 1, 2007 to December 31, 2008, therefore we hope to pick up these improvements during our evaluation when we compare courses from the Wave 1 time period to the Wave 2 time period.

The classes, seminars and workshops offered by AgTAC are typically a half-day to a full day in length. These classes include basic and advanced lighting, HVAC, motors and refrigeration. Through the first evaluation period AgTAC has held 95 classes with 2,393 participants; an average of 25 students per class. Table 2 presents the classes offered during the Wave 1 evaluation period grouped by the end-use targeted by the course. The end-use targeted most often by AgTAC course offerings is HVAC which also has the highest number of participants.

AgTAC Courses and Participants by End-Use

End-Use	Courses	Participants
HVAC	23	576
Other	22	429
Lighting	17	325
Motors/Pumps	10	240
Refrigeration	5	124
Rebates/Tax Credits	4	214
Controls/Energy Management Systems	4	106
Building Envelope	3	77
Compressed Air	3	61
Codes & Standards	2	52
Water Heating	2	106

AgTAC keeps all of its course registration and planning data in a general database, making access to participant data, instructor information and other course demographics easily accessible. Therefore we anticipate that evaluation of AgTAC's courses in all three strata to be straightforward and according to

the methodology outlined in the evaluation plan.

There are a number of other activities which AgTAC undertakes, some of which we will be evaluating, some of which we will not. The primary activity outside of classes, seminars and workshops is the Tool Lending Library. Customers who are interesting in exploring an energy efficiency software tool can come to the Center and "check-out" any number of tools. During the first evaluation time period, AgTAC lent tools out to 41 customers.

Evaluation of the Tool Lending Library will be completed according to the methodology outlined for the evaluation of courses. We will conduct a survey of the activities coordinators in order to determine the attributes of the activity. As discussed below, this is an activity which has been identified by the Center director as having a high likelihood of inducing energy efficient behavior changes and therefore will be included in Tier 1 of our Wave 1 participant survey effort.

AgTAC also offers technical consultations, demonstrations and tours to customers who have questions about specific technologies or end-uses and would like to see these technologies in action. These can be scheduled in advance or done on a walk-in basis and make use of the displays available at the Center as well as the expertise of Center staff. At AgTAC the consultations focus on one technology while the tours and demonstrations give an overview of all of the technologies available at the Center. During the first evaluation time period, AgTAC completed 9 consultations and 926 demonstrations and tours.

Evaluation of the consultations will be similar to the evaluation of courses. Through our conversations with Center staff it appears that participant data is available for the consultations, while the demonstrations and tours are more informal in nature and therefore the Center currently does not track participants. Therefore we will be able to evaluate the consultations according to the methodology presented in the evaluation plan, while we will not be able to quantitatively evaluate the demonstrations and tours. Instead, AgTAC's tours and consultations are being viewed largely as marketing tools that help drive participants into one (or more) of the Center's course offerings. In doing so, we will capture any energy saving behavioral changes in the evaluation of the course itself. Furthermore, without a participant list we are unable to evaluate this activity under the methodology outlined in the evaluation plan. It should be noted that if the Center begins to track participants and occurrences for activities like the tours and demonstrations during the Wave 2 evaluation period (July 1, 2007 through December 31, 2008), the ODC team may be able to include these activities in the Wave 2 evaluation effort.

The exhibits, displays and brochures that are generated by AgTAC are used primarily as marketing tools to draw customers into the Center and then into available classes, seminars and workshops. The exhibits and displays are also used during the classes, seminars and workshops as teaching aides and during technical consultations as demonstration aides. A limited number of the exhibits and displays are actually mobile and can be brought directly into the classroom as well as on the road to off-site events. For purposes of this evaluation we will consider the exhibits, displays and brochures to be course materials where relevant; however we will not consider the production of the exhibits, displays and brochures as a unique center activity itself.

In addition to these activities, the Center includes a follow-up request in all of its course evaluations. When a course participant asks for further follow-up the contact information is referred to either the customer's account executive or the business solutions group. Additionally, AgTAC notifies a

customer's account executive whenever the customer participates in a class, seminar or workshop. We intend to explore the effects of actions like these through a module of questions in each of the participant surveys.

Finally, as part of our evaluation effort, we asked the Center directors to identify the courses and/or activities which they feel are most likely to induce energy saving behavioral change. Five to eight of these courses will be included in Tier 1 of our Wave 1 evaluation. The following section presents information on the courses and activities selected by AgTAC.

Tier 1 Courses and Activities

The evaluation plan calls for each Center director to identify the courses and activities most likely to induce energy saving behavioral change. This section presents the courses and activities selected by the Center director as well as a brief discussion of why the course or activity was chosen and the most likely evaluation approach. The end-uses targeted by the courses and activities identified by AgTAC include HVAC, lighting, refrigeration, compressed air, building envelope and irrigation.

The courses and activities selected by AgTAC were chosen because they have the potential to create energy savings by one or more of a number of factors. The factors present in the courses identified by AgTAC include participants are market-actors and therefore have the potential to see hundreds of projects each year; the industry targeted has a high potential for energy savings (eg. HVAC, irrigation); the end-use targeted is one where a small behavioral change can create a large energy savings; and participants are learning specific behaviors or are identifying specific equipment changes that can be made to improve energy efficiency.

Our evaluation methodology calls for us to identify other courses and activities offered by the Center which also have a high likelihood of inducing energy saving behavioral change. The Center has already identified the attributes of courses and activities which have a high likelihood of inducing energy saving behavioral change. Therefore, as we assess AgTAC's courses and activities to determine other Tier 1 courses and activities, we will focus specifically on courses which have similar characteristics as those identified by the Center itself.

AgTAC has identified the following courses and activities:

- Tool Lending Library
- Energy Pro 4.0
- Title 24 Classes
- Package Unit HVAC
- Industrial Refrigeration
- Compressed Air
- Drip Irrigation
- HVAC System Testing

Program Logic Model

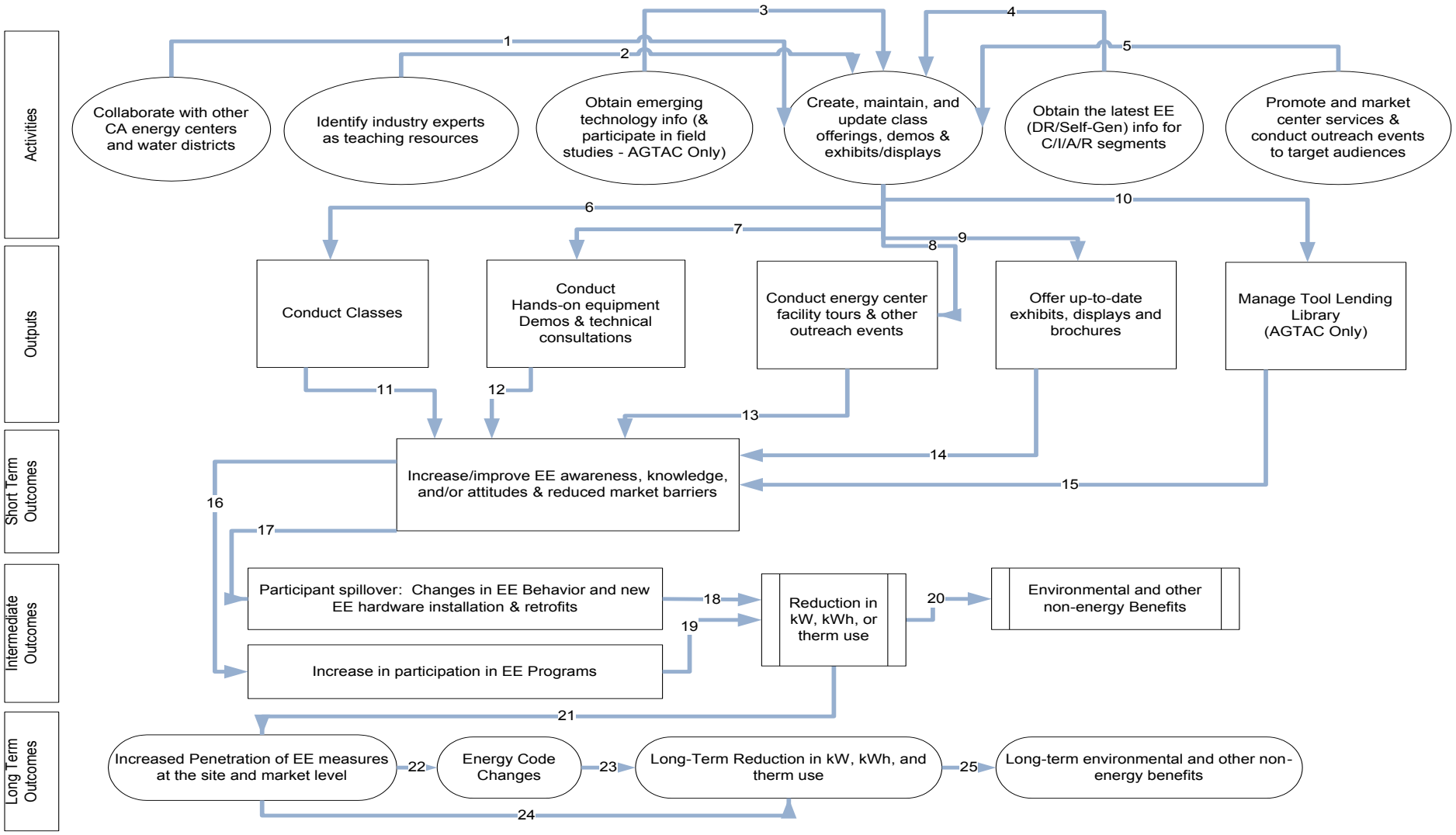
CTAC and AgTAC are designed to overcome customer market barriers of cost, performance

uncertainty, and asymmetric product information regarding energy efficient products and technologies. The Centers use a variety of channels to this end: seminars and workshops; hands-on equipment demos and technical consultations (AgTAC only); Energy Center facility tours and other outreach events; exhibits, displays, and brochures; and the Tool Lending library (AgTAC only). CTAG and AgTAC activities increase and improve energy efficiency awareness, knowledge, and attitudes and reduces market barriers. In the medium-term, this leads to a reduction in kW, kWh, or therm use and other non-energy benefits though (1) increased installation of energy efficiency hardware and (2) participation in SCE energy efficiency, demand reduction, and self-generation programs. In the long-term, the Center activities lead to energy and non-energy benefits through increased penetration of energy efficiency measures at the site and market level and changes in the energy code.

Our evaluation will not address all of these activities and outputs. Specifically, we will not be able to address activities or outputs for which participant information is not available. In the case of AgTAC, this applies to the facility tours, a portion of the hands-on demonstrations and technical consultations, as well as the offering of up-to-date exhibits, displays and brochures.[11]

[11] Please note that exhibits, displays and brochures are, for the most part, considered to be marketing tools for the center. However, wherever a link can be established the exhibits and displays will be considered part of the evaluation of a class, seminar or workshop or other center activity.

CTAC/AGTAC Energy Center Program Logic Diagram, Version 16



Appendix E: Southern California Edison -- Customer Technology Application Center (CTAC)

CTAC: Edison's CTAC promotes energy efficiency to virtually all of SCE's customer market segments and a number of market actors. The education and training components of the Center focus on providing classes, seminars and workshops; however the Center also offers customized trainings, demonstrations and consultations; interactive displays and exhibits; print information; and facility tours. Each of these activities is aimed at breaking down customer market barriers concerning first cost, performance uncertainty, and asymmetric product information in order to influence customers to implement energy efficient measures which result in energy savings and bill reductions. While the Center serves all of Edison's customers, there is a strong focus on business customers, with CTAC focusing specifically on Commercial and Industrial customers. SCE is currently involved in an effort to improve the quality of the training it provides, and therefore is placing a great deal of emphasis on updating course content and delivery as well as providing "train the trainer" opportunities for their instructors.

Program Description

- **Energy Center Name:** Southern California Edison's Customer Technology Application Center (CTAC)
- **Program Cycle Budget:** Part of the Education, Training and Outreach program, the CTAC 2006-2008 program cycle budget is $8.8 million.
- **Geographic Area:** CTAC is located in Irwindale, CA, however it serves all of SCE's territory.
- **Target Market Sector:** CTAC reaches out to all customer market sectors.
- **Target Participants:** Market Actors and End-Users including architects, engineers, distributors and contractors.
- **Program Description:** CTAC aims to be a place where customers can "see, hear, touch and learn about the latest energy-efficient technologies." Customers trust the information presented by the Center regarding existing and emerging energy efficiency technologies and their application.
- **Desired Market Effect:** The CTAC Energy Center uses hands-on energy efficiency displays and exhibits in conjunction with seminars to help breakdown customer market barriers concerning first cost, performance uncertainty, and asymmetric product information. The Center aims to influence customers to implement energy efficient measures which result in energy savings and bill reductions.
- **Program Goal:** CTAC's primary focus is on the dissemination of energy efficiency information to SCE customers. This supports the primary objective of the Center, defined as "the reduction of barriers to customer participation in the energy efficiency marketplace by providing accurate and unbiased energy efficiency information to SCE customers."
- **Educational Tactics:** Offer Classes/Seminars, conduct hands-on demonstrations and consultations, provide facility tours, and produce current exhibits, displays and brochures.
- **Length of Participant Interaction with Program:** Trainings are usually a half-day (three to four hours) to a full day (seven to eight hours) in length.
- **Format of Program Activities:** CTAC offers a full compliment of education activities including seminars, workshops, displays, demonstrations, technical consultations, facility presentations, fact sheets and brochures and off-site seminars and presentations. The major focus of the Center, however, appears to be the seminars and workshops.
- **Degree of Emphasis on Channeling to Utility Energy Efficiency Rebate Programs:** The

evaluation team will explore the degree of emphasis on channeling. We expect that there are a few courses with a stronger emphasis on utility programs, but we will determine this through our instructor and participant surveys.

- **Numbers of Courses:** From January 1, 2006 – June 30, 2007, CTAC held 185 classes, seminars and workshops.
- **Numbers of Course Participants:** During the same time period, there were 8,002 participants in these events.
- **Activities:** Technical consultations, tours and demonstrations, information dissemination include displays, exhibits and brochures.

Detailed Description

On January 30, 2008 members of the ODC Team met with Center Director Cecelia Mushinskie and other members of the CTAC staff. The main purpose of this meeting was to gain an understanding of all of the Center's activities and the likelihood of each activity to induce energy saving behavioral change. Additionally, we needed to assess our ability to evaluate each of the Center's activities.

CTAC is very well-organized, offering all of the standard activities that are expected of an Energy Center. CTAC's cornerstone activity is offering classes, seminars and workshops which focus on educating customers about energy management and energy efficiency solutions. In addition, CTAC conducts a number of other activities which support the Center's goal of promoting energy efficiency to business customers. Primary of these events are the technical consultations, and the Center also offers tours and demonstrations at the Center. Finally, the Center produces current exhibits, displays and brochures which are used both as marketing tools and as teaching tools. In many cases, the technical consultations and classes, seminars and workshops take advantage of the Center's various exhibits and displays in order to provide the customer with a hands-on display of the energy efficient technology.

CTAC shows a strong commitment to adult education best practices, and has begun to update class, seminar and workshop content to reflect these practices; as well as offering teachers the opportunity to receive training in order to improve the quality of instruction at the Center. As the Center continues with its program planning for the 2009 – 2011 program period, it will continue to update course content. Wave 1 of our evaluation focuses on the period January 1, 2006 to June 30, 2007 and Wave 2 of our evaluation will focus on the period July 1, 2007 to December 31, 2008, therefore we hope to pick up these improvements during our evaluation when we compare courses from the Wave 1 time period to the Wave 2 time period.

The classes, seminars and workshops offered by CTAC are typically a half-day to a full day in length. These classes include basic and advanced lighting, HVAC, motors and refrigeration. Through the first evaluation period CTAC has held 204 classes with 8,789 participants; an average of 43 students per class. The following table presents the classes offered during the Wave 1 evaluation period grouped by the end-use targeted by the course. The end-use targeted most often by CTAC course offering is lighting which also has the highest number of participants.

CTAC Courses and Participants by End-Use

End-Use	Courses	Participants
Lighting	43	1,903
HVAC	42	2,070
Controls/Energy Management Systems	23	839
Other	20	927
Motors/Pumps	17	968
Rebates/Tax Credits	13	153
Compressed Air	8	225
Refrigeration	6	292
Commercial Cooking/Foodservice	5	114
Green Building	4	288
Building Envelope	2	100
Codes & Standards	1	96
Steam Systems	1	27

CTAC keeps all of its course registration and planning data in a general database, making access to participant data, instructor information and other course demographics easily accessible. Therefore we anticipate that evaluation of CTAC's courses in all three strata to be straightforward and according to the methodology outlined in the evaluation plan.

There are a number of other activities which CTAC undertakes, some of which we will be evaluating, some of which we will not. The primary activity outside of classes, seminars and workshops are the technical consultations. Customers who have questions about specific technologies or end-uses or would like to see these technologies in action may contact the Center for a technical consultation. These consultations make use of the demonstrations and displays available at the Center as well as the expertise of Center staff.

Evaluation of the technical consultations will be similar to the evaluation of courses. These consultations may take place over the phone or in-person and therefore may not always have available participant data. However, through our conversations with Center staff it appears that participant data is available for the in-person, scheduled consultations. Therefore we will be able to evaluate this subset of technical consultations according to the methodology presented in the evaluation plan.

Similar to the technical consultations, CTAC also offers Center tours and demonstrations. These run from self-guided tours to guided, customized tours led by Center staff. These can be scheduled in advance or done on a walk-in basis. They may be a large group or they may be one individual. The tours and demonstrations are informal in nature and therefore the Center currently does not track occurrences or participants.

For purposes of this evaluation, CTAC's tours and demonstrations are being viewed largely as marketing tools that help drive participants into one (or more) of the Center's course or workshop offerings. In doing so, we will capture any energy saving behavioral changes in the evaluation of the course or workshop itself. Furthermore, without a participant list we are unable to evaluate this activity under the methodology outlined in the evaluation plan. It should be noted that if the Center begins to track participants and occurrences for activities like the tours and demonstrations during the Wave 2 evaluation period (July 1, 2007 through December 31, 2008), the ODC team may be able to include these activities in the Wave 2 evaluation effort.

Like the tours and demonstrations at CTAC, the exhibits, displays and brochures that are generated by the Center are used primarily as marketing tools to draw customers into the Center and then into available classes, seminars and workshops. The exhibits and displays are also used during the classes, seminars and workshops as teaching aides and during technical consultations as demonstration aides. A limited number of the exhibits and displays are actually mobile and can be brought directly into the classroom as well as on the road to off-site events. For purposes of this evaluation we will consider the exhibits, displays and brochures to be course materials where relevant; however we will not consider the production of the exhibits, displays and brochures as a unique Center activity itself.

In addition to these activities, the Center includes a follow-up request in all of its course evaluations. When a course participant asks for further follow-up the contact information is referred to either the customer's account executive for large customers or the business solutions group for smaller customers. We intend to explore the effects of actions like these through a module of questions in each of the participant surveys.

Finally, as part of our evaluation effort, we asked the Center directors to identify the courses and/or activities which they feel are most likely to induce energy saving behavioral change. Five to eight of these courses will be included in Tier 1 of our Wave 1 evaluation. The following section presents information on the courses and activities selected by CTAC.

Tier 1 Courses and Activities

The evaluation plan calls for each Center director to identify the courses and activities most likely to induce energy saving behavioral change. This section presents the courses and activities selected by the Center director as well as a brief discussion of why the course or activity was chosen and the most likely evaluation approach. The end-uses targeted by the courses and activities identified by CTAC include HVAC, food service, motors/pumps, dry cleaning and lighting.

The courses and activities selected by CTAC were chosen because they have the potential to create energy savings by one or more of a number of factors. The factors present in the courses identified by CTAC include participants being new to the industry and technologies addressed; activity addresses specific customer needs; activity provides hands-on experience with new technologies; class addresses specific regulations or specific financial incentives that affect customers; and participants are learning specific behaviors or are identifying specific equipment changes that can be made to improve energy efficiency.

Our evaluation methodology calls for us to identify other courses and activities offered by the Center which also have a high likelihood of inducing energy saving behavioral change. The Center has already identified the attributes of courses and activities which have a high likelihood of inducing energy saving behavioral change. Therefore, as we assess CTAC's courses and activities to determine other Tier 1 courses and activities, we will focus specifically on courses which have similar characteristics as those identified by the Center itself.

CTAC has identified the following courses and activities:

- Package Unit HVAC
- Technical Consultations

- Food service Demonstrations
- DOE Classes (Motor Management, Fan System Assessment, Pumping System Assessment)
- Save Energy, Save Money
- Wet Cleaning Workshop
- Basic HVAC
- Introduction to Lighting
- Title 24 Classes (Duct Leakage, Acceptance Testing)

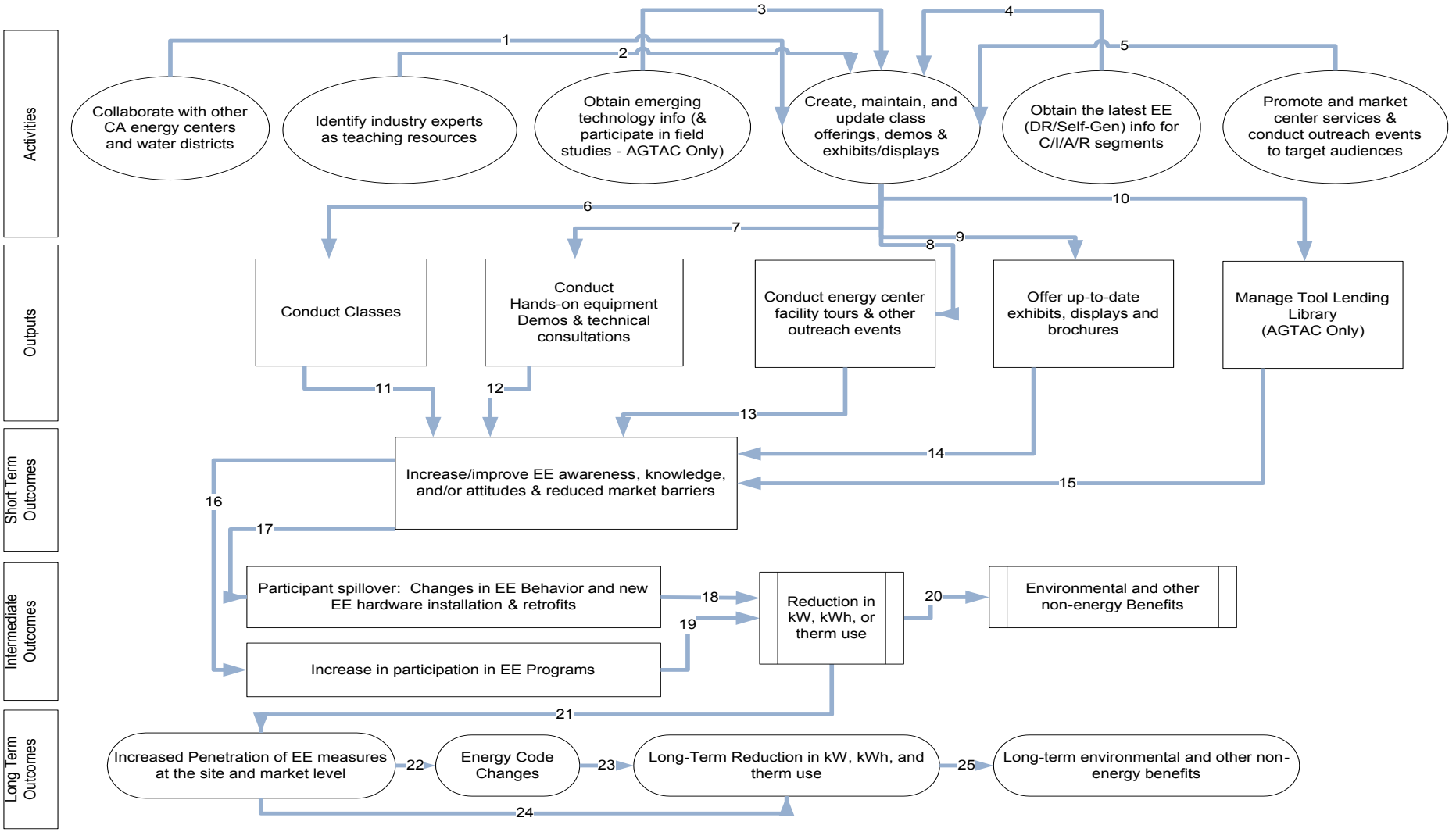
Program Logic Model

CTAC and AgTAC are designed to overcome customer market barriers of cost, performance uncertainty, and asymmetric product information regarding energy efficient products and technologies. The Centers use a variety of channels to this end: seminars and workshops; hands-on equipment demos and technical consultations (AgTAC only); Energy Center facility tours and other outreach events; exhibits, displays, and brochures; and the Tool Lending library (AgTAC only). CTAG and AgTAC activities increase and improve energy efficiency awareness, knowledge, and attitudes and reduces market barriers. In the medium-term, this leads to a reduction in kW, kWh, or therm use and other non-energy benefits though (1) increased installation of energy efficiency hardware and (2) participation in SCE energy efficiency, demand reduction, and self-generation programs. In the long-term, the Center activities lead to energy and non-energy benefits through increased penetration of energy efficiency measures at the site and market level and changes in the energy code.

Our evaluation will not address all of these activities and outputs. Specifically, we will not be able to address activities or outputs for which participant information is not available. In the case of CTAC, this applies to the facility tours, a portion of the hands-on demonstrations and technical consultations, as well as the offering of up-to-date exhibits, displays and brochures.[12]

[12] Please note that exhibits, displays and brochures are, for the most part, considered to be marketing tools for the center. However, wherever a link can be established the exhibits and displays will be considered part of the evaluation of a class, seminar or workshop or other center activity.

CTAC/AGTAC Energy Center Program Logic Diagram, Version 16



Appendix F: Southern California Edison –Technology and Test Centers (TTC)

TTC: The focus at the TTC is specifically on end-uses with a large opportunity for energy savings, specifically process refrigeration, lighting and HVAC. As it is also a laboratory for technology testing, a large portion of the Center's information and training activity is providing customer specific training and workshops. The Center is also responsible for a handful of courses that are offered at both CTAC and AgTAC.

Program Description

- **Energy Center Name:** Southern California Edison's Technology and Test Centers (TTC)
- **Program Cycle Budget:** Part of the Education, Training and Outreach program, TTC's 2006-2008 program cycle budget is $2.1 million.
- **Geographic Area:** The TTC is located in Irwindale, CA, however it serves all of SCE's territory.
- **Target Market Sector:** Commercial and Industrial
- **Target Participants:** Market Actors and End-Users
- **Program Description:** TTC focuses on end use technologies where there is a significant opportunity for energy efficiency improvements, including process refrigeration, lighting, and HVAC. The Center is relied upon by, and is trusted resource for, utility customers seeking unbiased and accurate information regarding existing and emerging energy efficiency technologies and their application. The TTC supports SCE through involvement in the Codes and Standards and Resource Acquisition Programs, providing expertise and knowledge regarding the three end uses indicated above.
- **Desired Market Effect:** The TTC Energy Center uses technology testing and training to help breakdown customer market barriers concerning performance uncertainties and lack of reliable product information. Additionally, they use internal training to help assure a high level of expertise by those at SCE who interact directly with the customer.
- **Program Goal:** The primary objective is defined as "the reduction of barriers to customer participation in the energy efficiency marketplace by providing accurate and unbiased energy efficiency information to SCE customers."
- **Educational Tactics:** Develop and conduct seminars and workshops at Energy Centers, conduct customized training events and tours at the TTC, and contribute to industry publications.
- **Length of Participant Interaction with Program:** Trainings are typically a half-day (three to four hours) to a full day (seven to eight hours) in length, however some trainings are as short as 1 to 1.5 hours.
- **Format of Program Activities:** Seminars, Workshops, Demonstrations, Technical Consultations.
- **Degree of Emphasis on Channeling to Utility Energy Efficiency Rebate Programs:** The evaluation team will explore the degree of emphasis on channeling. We expect that there are a few courses with a stronger emphasis on utility programs, but we will determine this through our instructor and participant surveys.
- **Numbers of Courses:** From January 1, 2006 – June 30, 2007, TTC held 46 classes, seminars and workshops.
- **Numbers of Course Participants:** Participant data for TTC classes, seminars and workshops is not always available. There are 18 classes, seminars and workshops for which participant data is available and 675 participants in these events.

- **Activities:** Customized trainings, workshops, consultations and tours.

Detailed Description

On February 13, 2008 members of the ODC Team met with the Doug Avery, Ramin Farmazi, Henry Lau and Caroline Chen of SEC. The main purpose of this meeting was to gain an understanding of all of the Center's activities and the likelihood of each activity to induce energy saving behavioral change. Additionally, we needed to assess our ability to evaluate each of the Center's activities.

TTC was created in the 2006-2008 program cycle. Previously, much of the activities included in TTC were part of the Emerging Technologies Program (ETP). TTC personnel continue to be funded by more than one program and continue to work in both programs. However, TTC has a broader mandate than ETP and performs work within Codes and Standards and Demand Response as well. TTC funding is approximately $725,000 per year for this funding cycle. TTC consists of two components: the lighting test center (run by Doug Avery) and the refrigeration test center (run by Ramin Farmazi). Both Doug and Ramin have a role within the current ETP, but the actual activities they perform for TTC are separate. Similar to ETP, TTC performs testing on equipment. However, there is no overlap between the testing that occurs under TTC and testing by ETP. The TTC testing activity is considered more of a research and development effort than what occurs in ETP. Technologies tested by the TTC may be considered under the ETP at the end of the TTC activity, but not always. So, if technologies move from one program to the other, it is a one-way move – from TTC to ETP. There is the possibility that actions by Doug and Ramin have influence on the technologies that are assessed for ETP as well as the TTC. This will be explored further in our assessment. We have an ODC team member on the ETP evaluation team as well who is making sure that we understand this intersection and treat it appropriately in our evaluation.

The Education and Training component of the TTC includes seminars and workshops which focus on lighting, refrigeration and HVAC, as well as customized consultations or tours of the Center. In addition, TTC performs outreach functions such as contributing to industry publications or presenting at industry conferences. Finally, the Center holds quarterly meetings with SCE employees (generally account representatives) to discuss energy efficiency measures.

The seminars and workshops offered by TTC are typically a half-day to a full day in length. These classes focus on lighting, refrigeration and HVAC. Through the first evaluation period TTC has held 45 classes. Table 2 presents the classes offered during the Wave 1 evaluation period grouped by the end-use targeted by the course. The end-use targeted most often by TTC course offerings is lighting.

TTC Courses by End-Use

End-Use	Courses
Lighting	24
Refrigeration	11
HVAC	6
Other	5

18 of TTC's seminars are run through the other SCE Energy Centers, CTAC and AgTAC. Both CTAC and AgTAC keep all of their course registration and planning data in a general database, making access to participant data, instructor information and other course demographics easily

accessible. Therefore we anticipate that evaluation of this portion of TTC's courses in all three strata to be straightforward and according to the methodology outlined in the evaluation plan. The courses which are not run through CTAC or AgTAC do not have accessible participant data and therefore we will not be able to evaluate these courses according to the methodology outlined in the evaluation plan within the first wave of evaluation. However, the TTC is working closely with Caroline Chen to create performance metrics for their program and have indicated that they will begin to keep contact lists for seminars which they run outside of CTAC or AgTAC. Because lists have begun to be kept in February 2008, it is assumed that partial lists of outside seminars will be available for the second wave of evaluation.

The TTC also undertakes several other education and training activities which we will evaluate as we are able based on available information. The primary activity at the TTC is the technical consultations. These can take the form of either a customized seminar or tour of the Center. Evaluation of the technical consultations will be similar to the evaluation of courses. Through our conversations with Center staff it appears that participant data is available for the technical consultations. Therefore we will be able to evaluate the consultations according to the methodology for course evaluation presented in the evaluation plan.

The TTC offers internal trainings which provide energy efficiency information to utility staff. These trainings target both account executives through periodic "updates" and new hires through customized training sessions. Again, through our conversations with center staff it appears that participant data is available for these activities, therefore we will be able to evaluate the internal training sessions according to the methodology for course evaluation presented in the evaluation plan.

Finally, as part of our evaluation effort, we asked the Center directors to identify the courses and/or activities which they feel are most likely to induce energy saving behavioral change. Five to eight of these courses will be included in Tier 1 of our Wave 1 evaluation. The following section presents information on the courses and activities selected by TTC.

Tier 1 Courses and Activities

The evaluation plan calls for each Center director to identify the courses and activities most likely to induce energy saving behavioral change. This section presents the courses and activities selected by the Center director as well as a brief discussion of why the course or activity was chosen and the most likely evaluation approach. The end-uses targeted by the courses and activities identified by TTC include lighting, refrigeration, and HVAC.

Our evaluation methodology calls for us to identify other courses and activities offered by the Center which also have a high likelihood of inducing energy saving behavioral change. As we assess TTC's courses and activities to determine other Tier 1 courses and activities, we will focus specifically on courses which have similar characteristics as those identified by the Center itself.

TTC has identified the following courses and activities:

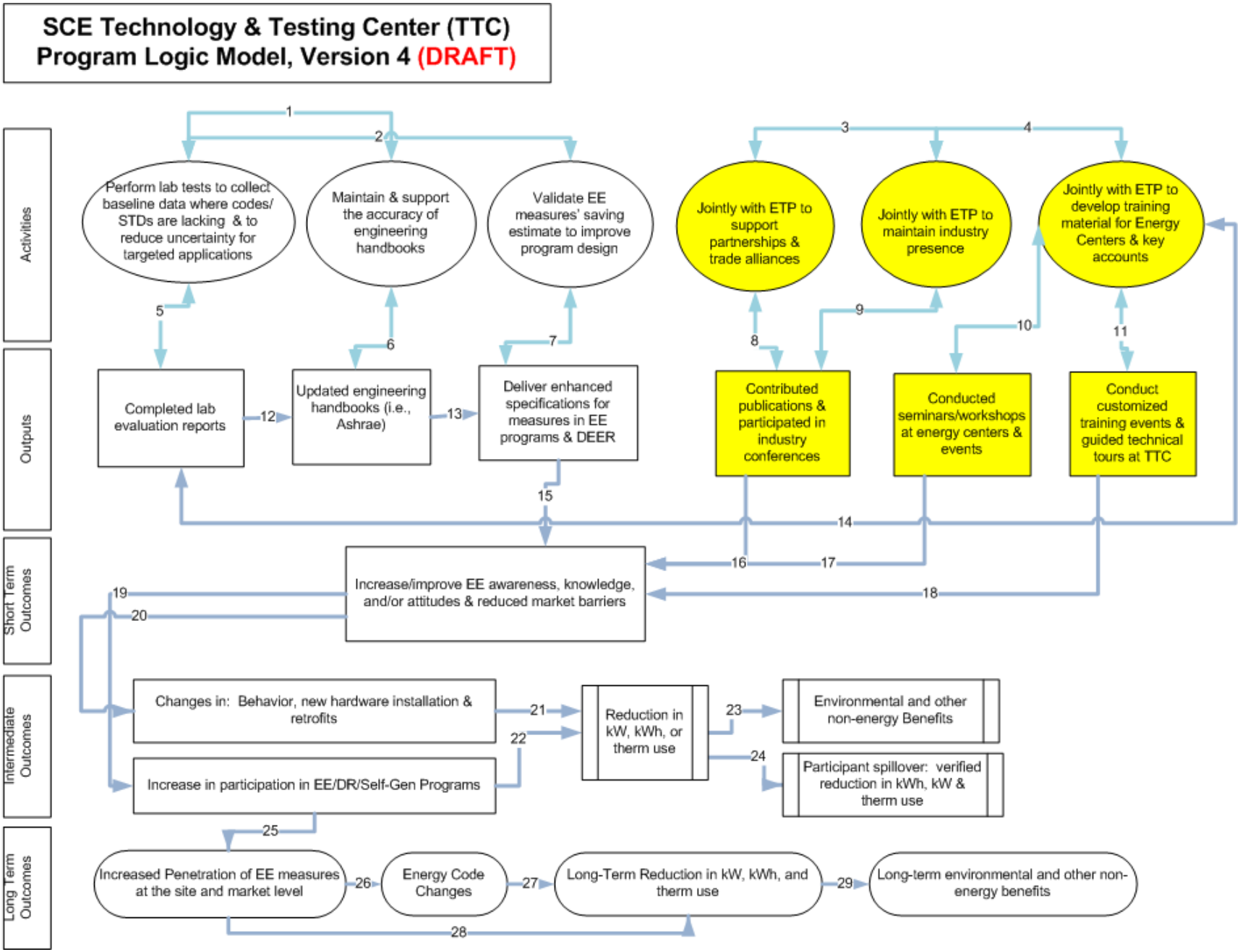
- Lighting fixture maintenance
- Lighting retrofit strategies and project management techniques
- Customized training of Vons maintenance management
- Revision/enhancement of Jack-in-the-Box refrigeration equipment specifications

- Fireside chat with SCE account executives
- Customized training of staff of Business Solution division and SCE new hires

Program Logic Model

The TTCs seek to overcome market barriers of performance uncertainty and unreliable product information by conducting end use technology performance tests, maintaining and supporting the accuracy of engineering handbooks, and validating energy efficiency measures' savings estimates. These activities result in enhanced measure specifications and serve to support and improve the design of SCE energy efficiency programs. Jointly with ETP, the TTCs support partnerships and trade alliances, maintain an industry presence, and develop training materials for Energy Centers and key accounts. The suite of TTC activities increases and improves energy efficiency awareness, knowledge, and attitudes and reduces market barriers. In the medium-term, this leads to a reduction in kW, kWh, or therm use and other non-energy benefits though (1) increased installation of energy efficiency hardware and (2) participation in SCE energy efficiency, demand reduction, and self-generation programs. In the long-term, the Center activities lead to energy and non-energy benefits through increased penetration of energy efficiency measures at the site and market level and changes in the energy code.

Our evaluation will not address all of these activities and outputs. Specifically, we will not be able to address activities or outputs for which participant information is not available. In the case of TTC, this applies to certain technical consultations, the facility tours, and information dissemination activities.


SCE Technology & Testing Center (TTC)
Program Logic Model, Version 4 (DRAFT)
Activities
Outputs
Short Term Outcomes
Intermediate Outcomes
Long Term Outcomes
Perform lab tests to collect baseline data where codes/ STDs are lacking & to reduce uncertainty for targeted applications
Maintain & support the accuracy of engineering handbooks
Validate EE measures' saving estimate to improve program design
Jointly with ETP to support partnerships & trade alliances
Jointly with ETP to maintain industry presence
Jointly with ETP to develop training material for Energy Centers & key accounts
Completed lab evaluation reports
Updated engineering handbooks (i.e., Ashrae)
Deliver enhanced specifications for measures in EE programs & DEER
Contributed publications & participated in industry conferences
Conducted seminars/workshops at energy centers & events
Conduct customized training events & guided technical tours at TTC
Increase/improve EE awareness, knowledge, and/or attitudes & reduced market barriers
Changes in: Behavior, new hardware installation & retrofits
Increase in participation in EE/DR/Self-Gen Programs
Reduction in kW, kWh, or therm use
Environmental and other non-energy Benefits
Participant spillover: verified reduction in kWh, kW & therm use
Increased Penetration of EE measures at the site and market level
Energy Code Changes
Long-Term Reduction in kW, kWh, and therm use
Long-term environmental and other non-energy benefits
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Appendix G: Southern California Gas -- Energy Resource Center (SCG ERC)

SCG ERC: SCG's ERC disseminates information about energy-efficient technology and practices to utility customers for the purpose of assisting them in reducing energy usage, lowering their utility bills, reducing operation and maintenance costs, and improving productivity. The SCG ERC disseminates this information through training courses to a variety of market actors, architects, designers, engineers, distributors, and contractors to help increase energy savings system wide. The SCG ERC also houses the Food Service Equipment Center (FSEC) which offers seminars focused on the food service industry as well as food service equipment demonstrations.

Program Description

- **Energy Center Name:** Southern California Gas Company Energy Resource Center (SCG ERC)
- **Program Cycle Budget:** The 2006-2008 program cycle budget for the SCG ERC is $6.5 million.
- **Geographic Area:** SCG ERC is located Downey, CA but covers all of SCG's service territory.
- **Target Market Sector:** Residential and Non-Residential (Food Service Industry)
- **Target Participants:** Market Actors and End-Users
- **Program Description:** The SCG ERC promotes energy efficiency to a variety of customer segments through Energy Centers (physical and virtual) and other informational programs.
- **Desired Market Effect:** Break down customer market barriers concerning cost, performance uncertainty, and asymmetric product information. Influence customers to implement energy-efficient measures, which can result in energy savings and conservation, as well as, effectively move them to participate in other public goods funded programs.
- **Program Goal:** The primary objective is to "(1) disseminate information about energy-efficient technology and practices to utility customers for the purpose of assisting them in reducing energy usage, lowering their utility bills, reducing operation and maintenance costs, and improving their productivity; and (2) provide services to a variety of midstream and upstream market actors who use information and tools to design more efficient buildings or processes, and to conduct energy-efficient retrofits and renovations".
- **Educational Tactics:** Seminars, workshops, displays, demonstrations, technical consultations, facility presentations, fact sheets and brochures. Off-site seminars and presentations using community organizations, local government and trade associations.
- **Length of Participant Interaction with Program:** Trainings are usually a half-day (three to four hours) to a full day (seven to eight hours) in length.
- **Format of Program Activities:** SCG-ERC offers classes, seminars, workshops, demonstrations and technical consultations.
- **Degree of Emphasis on Channeling to Utility Energy Efficiency Rebate Programs:** The evaluation team will explore the degree of emphasis on channeling. We expect that there are a few courses with a stronger emphasis on utility programs, but we will determine this through our instructor and participant surveys.
- **Channeling to Utility Energy Efficiency Rebate Programs:** Yes
- **Numbers of Courses:** From January 1, 2006 – June 30, 2007, SCG ERC held 192 classes, seminars and workshops.
- **Numbers of Course Participants:** During the same time period, there were 18,459

participants in these events.

- **Activities:** Industrial End User Program, technical consultations and demonstrations; manufacturer's training sessions, and facility tours.
- **Number of Activities:** Activity numbers for the SCG ERC are 386 equipment demonstrations, seven IEU workshops, 77 manufacturers assisted training workshops, three CAD kitchen designs and 6 NATE certification trainings. (Note that lists are not available for all activities. As such, we can not confirm these numbers.)

Summary of Activities Reporting By SCG in Quarterly Reports
January 2006-June 2007

	Equipment Demonstrations	Industrial End User Workshops	MFG Assisted Training Workshops	CAD Kitchen Designs	NATE Certification Training
Goal	*200*	*6*	*50*	*12*	*3*
1Q06	72	3	10	0	1
2Q06	96	1	16	0	1
3Q06	38	0	13	0	1
4Q06	44	3	18	0	1
Goal	*300*	*9*	*50*	*12*	*3*
1Q07	71	0	8	1	1
2Q07	65	0	12	2	1

*We report the information provided each quarter; however, we note that the reported cumulative totals do not match the sum of these quarterly reports. It appears that the cumulative totals were trued-up, but it is unclear where there was miscounting.

Detailed Description

On February 1, 2008 members of the ODC Team met with Rodney Davis and other key staff members at the Energy Center. The main purpose of this meeting was to gain an understanding of all of the Center's activities and the likelihood of each activity to induce energy saving behavioral change. Additionally, we needed to assess our ability to evaluate each of the Center's activities.

Central to the SCG ERCs implementation strategy are the seminars offered by the Center through both the SCG ERC and the FESC. During the initial evaluation period, the SCG ERC has held 192 seminars with 6,431 participants; an average of 34 attendees per seminar. Table 2 presents the seminars offered during the Wave 1 evaluation period grouped by the end-use targeted by the seminars. The end-use targeted most often by SCG ERC is HVAC which also has the highest number of participants.

SCG ERC Courses and Participants by End-Use

End-Use	Courses	Participants
HVAC	81	9,036
Other	15	1,354
Controls/Energy Management Systems	15	546
Commercial Cooking/Foodservice	14	1,321
Steam Systems	11	802
Motors/Pumps	9	597
Green Building	9	2,136
Building Envelope	7	372
Codes & Standards	6	522
Lighting	6	221
Water Heating	4	563
Compressed Air	2	86
Renewable Energy	2	370
Process Heating	1	30
Rebates/Tax Credits	1	24

SCG ERC keeps its seminar registration and planning data in a general database, making participant data, instructor information and other course demographics easily accessible. While the tracking information did not correspond directly with the format of our evaluation database, we were able to manipulate the data provided by SCG with assistance from the SCG ERC staff. Therefore we anticipate that the evaluation of the seminars at the SCG ERC to be straightforward and according to the methodology outlined in the evaluation plan.

Among the seminars offered by the SCG ERC are the NATE (North American Training Excellence) training courses. The SCG ERC offers a series of eight courses which prepare HVAC professionals to take the NATE certification exam. As discussed below, the SCG ERC has identified this series of courses as one of the courses or activities most likely to induce energy savings behavioral change.

In addition to the seminars offered by the SCG ERC, the Center undertakes a number of activities some of which we will evaluate, some of which we will not. These activities include the Industrial End User Program, technical consultations and demonstrations; manufacturer's training sessions, and facility tours.

The Industrial End User Program is designed to offer on-site energy efficiency workshops or seminars at selected industrial customer sites. The program includes a pre-audit consultation, on-site workshop and post-audit consultation. We anticipate the evaluation of this activity to follow the evaluation methodology for the SCG ERC seminars. We will conduct a survey of the activities coordinators in order to determine the attributes of the activity. As discussed below, this is an activity which has been identified by the Center director as having a high likelihood of inducing energy efficient behavior changes and therefore will be included in Tier 1 of our Wave 1 participant survey effort.

The SCG ERC also offers technical consultations and demonstrations which are designed to assist customers with testing out different types of energy efficient equipment as well as learning how to properly use and maintain energy efficient equipment. As we are able, based on the availability of participant data, we will evaluate the consultations and demonstrations according to the methodology presented in the evaluation plan. In cases where participant data is not available we will not be able to

quantitatively evaluate the activity.

The tours at the SCG ERC are designed to showcase the Center itself, a LEED certified building. As a LEED certified building, the SCG ERC is unique when compared to the other Centers because the building itself can be used as a tool for demonstrating energy efficient technology. Therefore as part of our evaluation effort, we will ask the course participants about their whole experience at the SCG ERC and how just being in a LEED certified building may have affected their experience.

Finally, as part of our evaluation effort, we asked the Center directors to identify the courses and/or activities which they feel are most likely to induce energy saving behavioral change. Five to eight of these courses will be included in Tier 1 of our Wave 1 evaluation. The following section presents information on the courses and activities selected by the SCG ERC.

Tier 1 Courses and Activities

The evaluation plan calls for each Center director to identify the courses and activities most likely to induce energy saving behavioral change. This section presents the courses and activities selected by the Center director as well as a brief discussion of why the course or activity was chosen and the most likely evaluation approach.

SCG ERC has identified the following courses and activities:

- Industrial End User Program
- NATE Certification Program
- Food service seminars

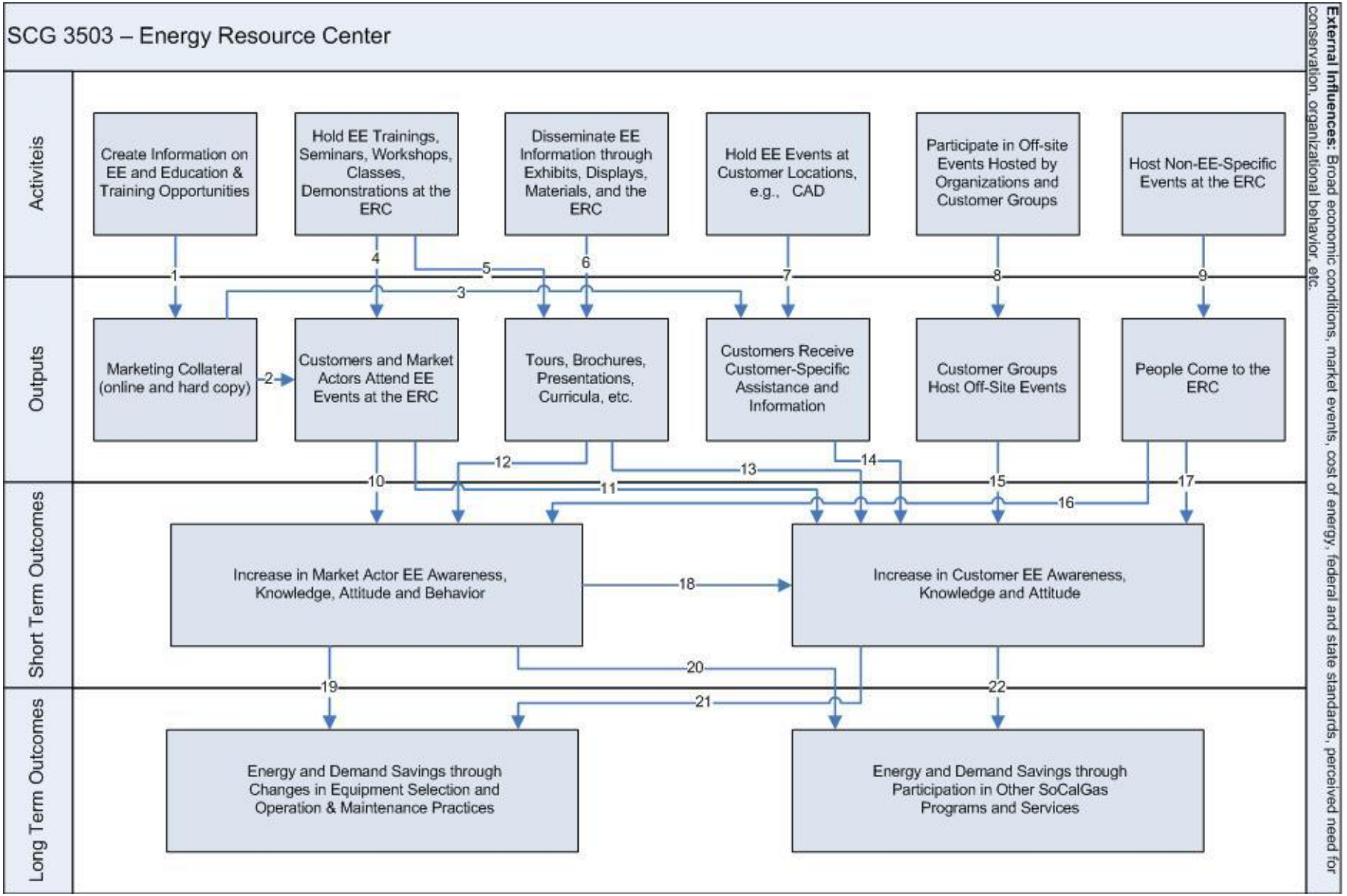
Our evaluation methodology calls for us to identify other courses and activities offered by the Center which also have a high likelihood of inducing energy saving behavioral change. The Center has already identified the attributes of courses and activities which have a high likelihood of inducing energy saving behavioral change. Therefore, as we assess SCG ERC's courses and activities to determine other Tier 1 courses and activities, we will focus specifically on courses which have similar characteristics as those identified by the Center itself.

Program Logic Model

The ERC seeks to overcome awareness and knowledge barriers by disseminating energy efficiency information through trainings, seminars, workshops, demonstrations, exhibits, displays, and materials at the ERC; events at customer locations or other off-site venues; and the ERC itself, as an example of energy efficient building design and operation. Participation in ERC education and training opportunities helps to break down market barriers concerning cost, performance uncertainty, and asymmetric product information. After attending program events, customers and market actors will be more aware and knowledgeable of potential energy savings, the energy saving actions they can take or offer to their clients, and the portfolio of relevant resource acquisition programs offered by SCG. As a result, customers and market actors will be more likely to take energy efficient actions promoted by the ERC and/or participate in other SCG programs, leading to energy and demand savings.

Our evaluation will not address all of these activities and outputs. Specifically, we will not be able to

address activities or outputs for which participant information is not available. We have requested that SCG provide participant information for all activities and expect to receive this information by mid-June. At that time we will be able to assess which activities will be evaluated and which will not because of lack of participant information.


SCG 3503 – Energy Resource Center
Activiteis
Outputs
Short Term Outcomes
Long Term Outcomes
Create Information on EE and Education & Training Opportunities
Hold EE Trainings, Seminars, Workshops, Classes, Demonstrations at the ERC
Disseminate EE Information through Exhibits, Displays, Materials, and the ERC
Hold EE Events at Customer Locations, e.g., CAD
Participate in Off-site Events Hosted by Organizations and Customer Groups
Host Non-EE-Specific Events at the ERC
Marketing Collateral (online and hard copy)
Customers and Market Actors Attend EE Events at the ERC
Tours, Brochures, Presentations, Curricula, etc.
Customers Receive Customer-Specific Assistance and Information
Customer Groups Host Off-Site Events
People Come to the ERC
Increase in Market Actor EE Awareness, Knowledge, Attitude and Behavior
Increase in Customer EE Awareness, Knowledge and Attitude
Energy and Demand Savings through Changes in Equipment Selection and Operation & Maintenance Practices
Energy and Demand Savings through Participation in Other SoCalGas Programs and Services
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External Influences: Broad economic conditions, market events, cost of energy, federal and state standards, perceived need for conservation, organizational behavior, etc.

Appendix H: San Diego Gas and Electric – San Diego Energy Resource Center (SDERC) – SDG&E Efforts

SDERC: The SDERC provides energy efficiency education, information and outreach to achieve substantial energy savings for the region. The physical location of the SDERC currently houses training programs from two collaborative efforts – The CCSE, a local government partnership, and SDG&E's Statewide Education and Training Program (SETP) efforts.

The CCSE and SDG&E efforts seem to have differing mission and key objective strategies. SDG&E targets the non-residential sector and mostly uses the Center for training courses and as a channeling mechanism for resource acquisition programs. The CCSE seems to have a much broader mission, "to create a sustainable energy future," placing an emphasis on three areas: (1) Clean and renewable distributed generation; (2) Green construction; and (3) Energy efficiency. The CCSE targets a larger audience of both residential and non-residential sectors through multiple activities including: workshops; outreach at community events; technical consultations; a demonstration area exhibiting multiple energy efficient technology, green construction materials and distributed generation; and an energy efficiency tool lending library. Because of these differing missions and key objective strategies, we will consider each effort (CCSE and SDG&E) separately in our evaluation.

Through the ODC evaluation teams' initial exploration into the SDERC, we discovered that the SDG&E and the CCSE schedule, market, plan and execute different activities funded by the education and training program and often operate independently of one another. The ODC evaluation team uncovered many differences in the use of education and training program funds by the SDG&E and the CCSE. The table below summarizes how the SDG&E and the CCSE compare and contrast in relation to their program efforts. The findings below the table present the unique characteristics of the SDG&E efforts and the activities that will likely be evaluated through our evaluation.

Comparing and Contrasting SDG&E and CCSE Efforts
Funded by the SDGE3009 Program

SDERC	SDG&E	CCSE
Physical Space	SDG&E staff only uses the SDERC for classroom space.	CCSE staff offices and activities are located at the SDERC. The SDERC is maintained by CCSE.
Courses	System specific courses for contractors (LEED, HVAC, NATE Cert., Electrical Installation & Training, Title 24 Compliance, Preventing Compressor Failures, eQuest software), customized trainings for businesses (HVAC systems and central plant operations in hospitals or healthcare facilities, lighting and equipment in food service).	Specific Energy Efficient measures or technology for architects, designers & builders (lighting, exit signs, pathway systems, windows and compressors), Green building or green design workshops for architects and designers (selling green, green buildings and climate change, EE design training, EE operations, specifying green, energy economics and environment), Commissioning (building and retro) and renewables (Solar Water Heating).
Online Courses	Offered by SDG&E	Not offered by CCSE
Target Market	Non-residential focus primarily on contractors and commercial & industrial building operators/facilities.	Both a non-residential and residential focus for all activities at the Center, however the workshops focus primarily on non-residential: architects, designers, builders and some commercial and industrial building operators/facilities.
Technical Assistance	Informally through SDG&E account managers, encourages participation in tech assistance provided by CCSE	Formal technical assistance for energy efficiency options and financing through engineers on CCSE staff.

Energy Resource Library and Tool Lending Program	Encourages participation in the Library and Tool Lending	Manages the library and tool lending program.
Exhibit Area	Encourages participation in the Exhibit Area. Fills and maintains the marketing collateral for SDG&E programs.	Develops and maintains the demonstrations/exhibits and the marketing collateral for CCSE and 3rd Party programs.
Marketing and Outreach	Email blasts are edited and executed through SCG ERC, markets workshops through SDG&E's website. Attend a minimal number of events on an informal basis.	Manages own website for CCSE, website markets CCSE courses, manages newsletter and email blasts for CCSE courses and activities. Attend many events in the community on a formal basis.
Courses/Activities that will induce energy savings	Courses for market actors such as HVAC code compliance and customized trainings for commercial businesses such as food service and hospitals.	Courses for specific technology, post-retrofit and Technical Assistance.

Program Description

- **Energy Center Name:** San Diego Energy Resource Center (SDERC)
- **Program Cycle Budget:** The budget for the entire San Diego Energy Resource Center Program is $4.1 million. The budget for SDG&E's efforts over the 2006-2008 program period is $1.3 million.
- **Geographic Area:** The Center covers all of SDG&E's service territory.
- **Target Market Sector:** Non-Residential
- **Target Participants:** Market Actors and End-Users
- **Program Description:** The SDERC is a local program that provides energy efficiency information, education and outreach.
- **Desired Market Effect:** The SDERC provides education, technical assistance and outreach that are necessary to bring about substantial energy savings for the entire region.
- **Program Goal:** The primary objective is to "educate customers and increase their awareness and knowledge of the significance of energy efficiency and the regional and individual economic benefits of energy efficiency".
- **Educational Tactics:** Offer courses/workshops, customized trainings, technical assistance through SDG&E account managers and outreach.
- **Length of Participant Interaction with Program:** Trainings are usually a half-day (three to four hours) to a full day (seven to eight hours) in length.
- **Format of Program Activities:** Training classes, Seminars, Workshops
- **Channeling to Utility Energy Efficiency Rebate Programs:** Yes
- **Numbers of Courses:** From January 1, 2006 – June 30, 2007, SDERC held 68 classes, seminars and workshops.
- **Numbers of Course Participants:** During the same time period, there were 6,315 participants in these events.
- **Numbers of Activities:** None
- **Number of Activity Participants:** None recorded

Detailed Description

Physical Space
SDG&E uses classroom space in the Center to conduct the courses that they plan. The SDG&E staff that plans and executes on courses works out of offices at SDG&E.

Courses
SDG&E offers courses in the form of workshops and customized trainings which are scheduled, planned, marketed and executed separately and independently from the CCSE's efforts by the SDG&E. The courses cover an array of topics including energy efficiency measures, green building practices and building commissioning. The following table present SDG&E courses by end-use.

SDGE Courses and Participants by End-Use

End-Use	Courses	Participants
Other	20	2,267
HVAC	18	2,073
Controls/Energy Management Systems	5	290
Motors/Pumps	4	214
Rebates/Tax Credits	3	68
Water Heating	2	236
Process Heating	2	129
Lighting	2	167
Compressed Air	2	232
Commercial Cooking/Foodservice	1	56
Codes & Standards	1	152
Green Building	1	76

The SDG&E courses are almost entirely system-specific, focusing heavily on HVAC systems. Additionally, SDG&E offers customized trainings to business segments such as Hospitals, Healthcare Facilities and the Food Services Industry. A number of the SDG&E workshops are offered both onsite at the SDERC and via web conference.

There is some degree of overlap between the course topics that the SDG&E and the CCSE offer but the content of the course differs. Both offer courses on the LEED Process, the CCSE offers a two-part course tied into a Green Building workshop while the SDG&E offers one-time course on LEED Process, Sustainability and Roofs.

Target Market
SDG&E directly target non-residential sectors through its courses. In particular, the SDG&E seems to target HVAC contractors and commercial and industrial building operators.

Technical Assistance
The SDG&E offers technical assistance informally via the SDG&E account managers and workshop coordinators by speaking with participants about further resources provided by CCSE and SDG&E. SDG&E's account representatives often attend the workshops with their customers and shepherd them through the process of learning about resources and methods and ultimately implementing energy efficient practices in their business. SDG&E also encourages their course participants to take advantage of the Technical Assistance offered by the CCSE.

Notably, SDG&E's account representatives take on both a technical assistance and marketing role for the SDERC. The account representatives engage their customers in conversations about what types of information they would like to learn about, make recommendations for workshop topics, and recruit customers for the workshops. After SDG&E courses, account representatives follow-up with participants to encourage participation in other services provided by SDG&E and/or the CCSE.

Exhibit Area
The SDERC has a demonstration area featuring energy efficiency related equipment, displays and exhibits. The area also has a wall of brochures and marketing collateral divided into three sections: SDG&E Programs, CCSE Programs and Other Programs. SDG&E's only involvement in the exhibit areas is to maintain the marketing collateral designated for SDG&E programs.

Marketing and Outreach
SDG&E representatives do attend a minimal number of events on an informal basis, SDG&E will hear about an event that might be a good opportunity to meet potential workshop participants and someone from SDG&E will attend and speak people at the event about the Center and the types of course and activities it offers. The SDG&E does their own marketing for their courses and email blasts (primarily through SCG ERC, SCG reviews all email blasts created by SDG&E and executes the email blast) to non-residential customers. SDG&E also creates and disseminates information on energy efficiency and education training opportunities through marketing collateral, both through the SDG&E website, the CCSE website and hard copy.

Tier 1 Courses and Activities

Based on the input provided by the Center Director, the SDG&E courses for the evaluation will likely highlight the customized trainings specific to a particular business segment (Hospitals, Healthcare Facilities and the Food Services Industry), and contractor trainings such as the NATE Certification and HVAC courses.

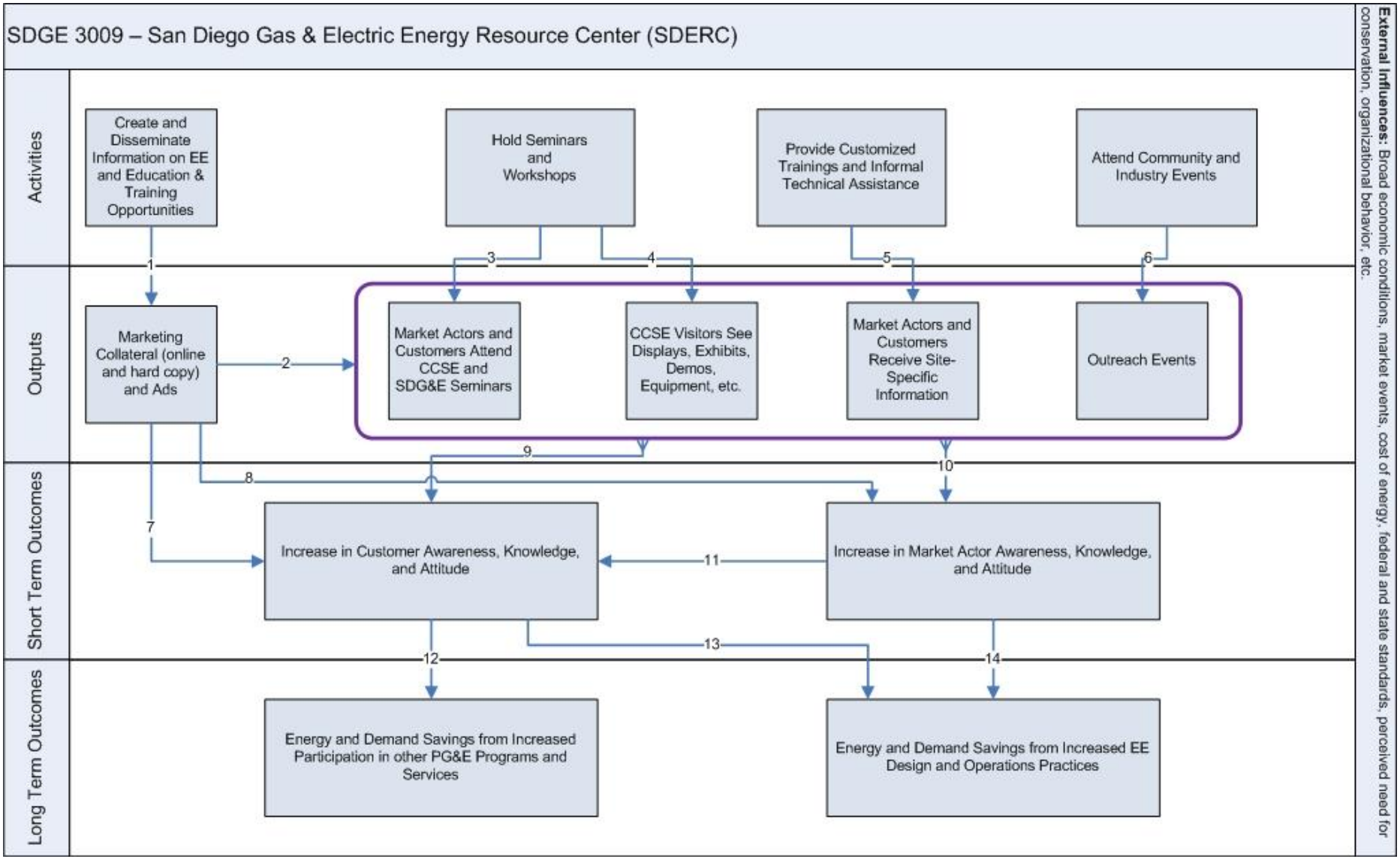
Our evaluation methodology calls for us to identify other courses and activities offered by the Center which also have a high likelihood of inducing energy saving behavioral change. The Center has already identified the attributes of courses and activities which have a high likelihood of inducing energy saving behavioral change. Therefore, as we assess SDG&E's courses and activities to determine the Tier 1 courses and activities, we will focus specifically on courses which have similar characteristics as those identified by the Center itself.

Program Logic Model

The SDERC is a collaboration between the CCSE and SDG&E. The SDERC is designed to be a single source point for energy information, resources, and programs in the greater San Diego region. The SDERC seeks to overcome awareness and knowledge barriers by disseminating energy efficiency information through a variety of channels. Through its efforts SDG&E offers seminars and workshops; provides customized trainings and technical assistance via its account managers; and attends community and industry events (albeit infrequently and on an ad hoc basis). These activities are designed to increase customer and market actor energy efficiency awareness and knowledge. As a

result, customers and market actors will be more likely to take energy efficient actions promoted by the SDERC and/or participate in other SDG&E programs, leading to energy and demand savings.

We do not plan to include the SDG&E activities of technical assistance, marketing and outreach and encouragement in participation of CCSE activities in our evaluation of SDG&E efforts for the SDERC. For purposes of this evaluation, these activities are being viewed largely as marketing tools that help drive participants into one (or more) of the Center's course of workshop offerings. Therefore we will capture any energy saving behavioral changes in the evaluation of the course or workshop itself. Furthermore, without a participant lists we are unable to evaluate these activities under the methodology outlined in the evaluation plan.


SDGE 3009 – San Diego Gas & Electric Energy Resource Center (SDERC)
Activities
Outputs
Short Term Outcomes
Long Term Outcomes
Create and Disseminate Information on EE and Education & Training Opportunities
Hold Seminars and Workshops
Provide Customized Trainings and Informal Technical Assistance
Attend Community and Industry Events
Marketing Collateral (online and hard copy) and Ads
Market Actors and Customers Attend CCSE and SDG&E Seminars
CCSE Visitors See Displays, Exhibits, Demos, Equipment, etc.
Market Actors and Customers Receive Site-Specific Information
Outreach Events
Increase in Customer Awareness, Knowledge, and Attitude
Increase in Market Actor Awareness, Knowledge, and Attitude
Energy and Demand Savings from Increased Participation in other PG&E Programs and Services
Energy and Demand Savings from Increased EE Design and Operations Practices
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External Influences: Broad economic conditions, market events, cost of energy, federal and state standards, perceived need for conservation, organizational behavior, etc.

Appendix I: San Diego Gas and Electric – San Diego Energy Resource Center (SDERC) – CCSE Efforts

SDERC: As discussed in Appendix H, the SDERC provides energy efficiency education, information and outreach to achieve substantial energy savings for the region. The physical location of the SDERC currently houses training programs from two collaborative efforts – The CCSE, a local government partnership, and SDG&E's Statewide Education and Training Program (SETP) efforts. The CCSE and SDG&E efforts seem to have differing mission and key objective strategies, therefore, we will consider each effort (CCSE and SDG&E) separately in our evaluation. The findings below present the unique characteristics of the CCSE efforts and the activities that will likely be evaluated through our evaluation.

Program Description

- **Energy Center Name:** San Diego Energy Resource Center (SDERC)
- **Program Cycle Budget:** The budget for the entire San Diego Energy Resource Center Program is $4.1 million. The budget for CCSE's efforts over the 2006-2008 program period is $2.8 million.
- **Geographic Area:** The center covers all of SDG&E's service territory.
- **Target Market Sector:** Residential and Non-Residential
- **Target Participants:** Market Actors and End-Users
- **Program Description:** The SDERC is a local program that provides energy efficiency information, education and outreach.
- **Desired Market Effect:** The SDERC provides education, technical assistance and outreach that are necessary to bring about substantial energy savings for the entire region.
- **Program Goals:** The primary objective is to "educate customers and increase their awareness and knowledge of the significance of energy efficiency and the regional and individual economic benefits of energy efficiency".
- **Educational Tactics:** Offer workshops, technical assistance, participate in local energy fairs/trade shows, collaborate with professional/trade associations, San Diego Excellence in Energy Awards, partnership with chambers of commerce, website and newsletter, energy resource library, tool lending program, and a technology center featuring displays and exhibits.
- **Length of Participant Interaction with Program:** Workshops time ranges between 1.5 and 7 hours, but typically last 3 hours.
- **Format of Program Activities:** Seminars, Workshops, Displays, Demonstrations, Exhibits, Technical Consultations, Tool Lending, Resource Lending
- **Channeling to Utility Energy Efficiency Rebate Programs:** Yes
- **Numbers of Courses:** 36 courses
- **Numbers of Course Participants:** 1,288 participants
- **Numbers of Activities:** 2 activities: technical assistance and tool lending library
- **Number of Activity Participants:** 367 participants

Summary of Activities Reporting By SDG&E in Quarterly Reports
January 2006-June 2007

	Onsite Workshops	Outreach Events	Technical Assistance Sessions	Seminars	Tool Loans	Resource Library Loans
Goal	*50*	*50*	*45*	*26*	*NA*	*NA*
1Q06	*6*	*6*	*36*	*11*	*24*	*NA*
2Q06	*5*	*8*	*36*	*11*	*24*	*20*
3Q06	*NA*	*NA*	*NA*	*26*	*NA*	*NA*
4Q06	*2*	*3*	*38*	*NA*	*44*	*15*
Goal	*50*	*50*	*45*	*NA*	*NA*	*NA*
1Q07	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
2Q07	*9*	*14*	*30*	*NA*	*48*	*35*

*We report the information provided each quarter; however, we note that the reported cumulative totals do not match the sum of these quarterly reports. It appears that the cumulative totals were trued-up, but it is unclear where there was miscounting.

Detailed Description

Physical Space
The physical space of the Center houses the CCSE staff and offices. In addition, the Center provides the physical space for other CCSE program efforts including the Technical Center, classrooms, technical assistance and the Resource and Tool Lending Libraries. The entire physical space of the Center is maintained and staffed by CCSE.

Courses
The CCSE offers courses in the form of workshops and customized trainings. The courses are scheduled, planned, marketed and executed separately and independently by the CCSE. The CCSE covers multiple topics including energy efficiency measures, green building practices, building commissioning and renewable energy courses. The following tables present CCSE courses by end-use.

CCSE Courses and Participants by End-Use

End-Use	Courses	Participants
Other	11	443
Lighting	7	239
Green Building	5	269
Controls/Energy Management Systems	3	129
Water Heating	2	92
Building Envelope	1	18
Rebates/Tax Credits	1	43
Renewable Energy	1	37
Compressed Air	1	18

The CCSE courses place an emphasis on green building or green design specific topics, along with several lighting and daylighting courses. The CCSE also offers renewable courses on Solar Water Heating.

The CCSE offers customized trainings to building operators that have recently retrofitted a building and need training on how to operate the new equipment and to market actors interested in a certain type of energy efficient technology. Equipment and technology includes lighting, compressors, windows, energy controls for water heating, exit signs, and pathway systems.

There is some degree of overlap between the course topics that the SDG&E and the CCSE offer but the content of the course differs. Both offer courses on compressors, however the CCSE offers a course on energy efficient compressors while the SDG&E offers a course on preventing compressor failures.

Target Market
The CCSE targets architects, designers and whole building contractors more often than the SDG&E. The CCSE also targets the residential sector through its Technology Center, Resource and Tool Lending Libraries, Technical Assistance, and marketing and outreach events in the community.

Technical Assistance
The CCSE provides Technical Assistance Sessions that coach customers through project design, equipment purchase and installation, commissioning, and ongoing operation and maintenance. The consultations primarily help with energy efficient measures such as questions related to lighting options or equipment/technology; however, the consultations also provide information about resource acquisition programs, help with a home energy audit, inquiries into CCSE tool resources, and general consultation into energy efficiency options while building a new home. Two engineers on the CCSE staff offer technical assistance. The technical assistance involves educating customers about their energy efficient options but also financing assistance by channeling customers to incentive programs offered by the SDG&E and other third parties.

Energy Resource Library and Tool Lending Program
The CCSE manages and maintains The Energy Resource Library and Tool Lending Program. The library offers space where customers can browse and borrow resources on energy efficiency. SDERC participants can also take advantage of energy efficient resources through the Tool Lending Program whereby customers can borrow energy efficiency tools for a specific amount of time. The Tool Lending Program is a hands-on activity and provides customers with tools and instructions on how to use the tools to estimate energy savings potential.

Exhibit Area
The CCSE creates, manages and maintains the center's exhibit area. The area is divided into four exhibit spaces: Mechanical (compressors), Lighting (many types of track lighting, indoor and outdoor, street lamps and exit signs), Renewable Energy (distributed generation and solar water heating) and Building Materials (example of an energy efficient residence using many types of building materials). The area also has a wall of brochures and marketing collateral divided into three sections: SDG&E Programs, CCSE Programs and Other Programs.

Marketing and Outreach
Outreach events are one of the main activities run by the CCSE. The CCSE attends community and industry events such as local "energy fairs," trade shows and other public forums. At the events, CCSE distributes CCSE course information, demonstrates energy efficiency tools from the Tool Lending Library and provides general education and awareness for energy efficiency. The CCSE creates and disseminates marketing collateral, online and hard copy, including a website dedicated to

the CCSE (only SDG&E courses are listed on the website) and an online newsletter. The CCSE collaborates with professional /trade associations and local, regional, state and federal agencies that promote energy efficiency. It also partners with regional and local Chambers of Commerce.

In addition, the CCSE conducts the San Diego Excellence in Energy Awards (SANDEE). The awards "recognize outstanding projects and activities that have achieved significant energy savings and/or contributions toward the goals of the San Diego Regional Energy Strategy 2030 through the implementation of energy efficiency, energy conservation, renewable energy measures and CO_2 reduction in San Diego County". The awards are a promotional marketing tool to drive customers to the CCSE, build awareness for energy efficiency in the business community, and encourage other businesses to adopt energy efficiency measures.

Tier 1 Courses and Activities

Based on the input provided by the Center Director, the CCSE courses for the evaluation will likely highlight targeted workshops classified as:

- Post-Installation Education: Workshops that teach businesses how to operate equipment after they install an energy efficient measure.
- Technology Focused Education: Workshops focused on specific technology such as compressors, lighting or windows.

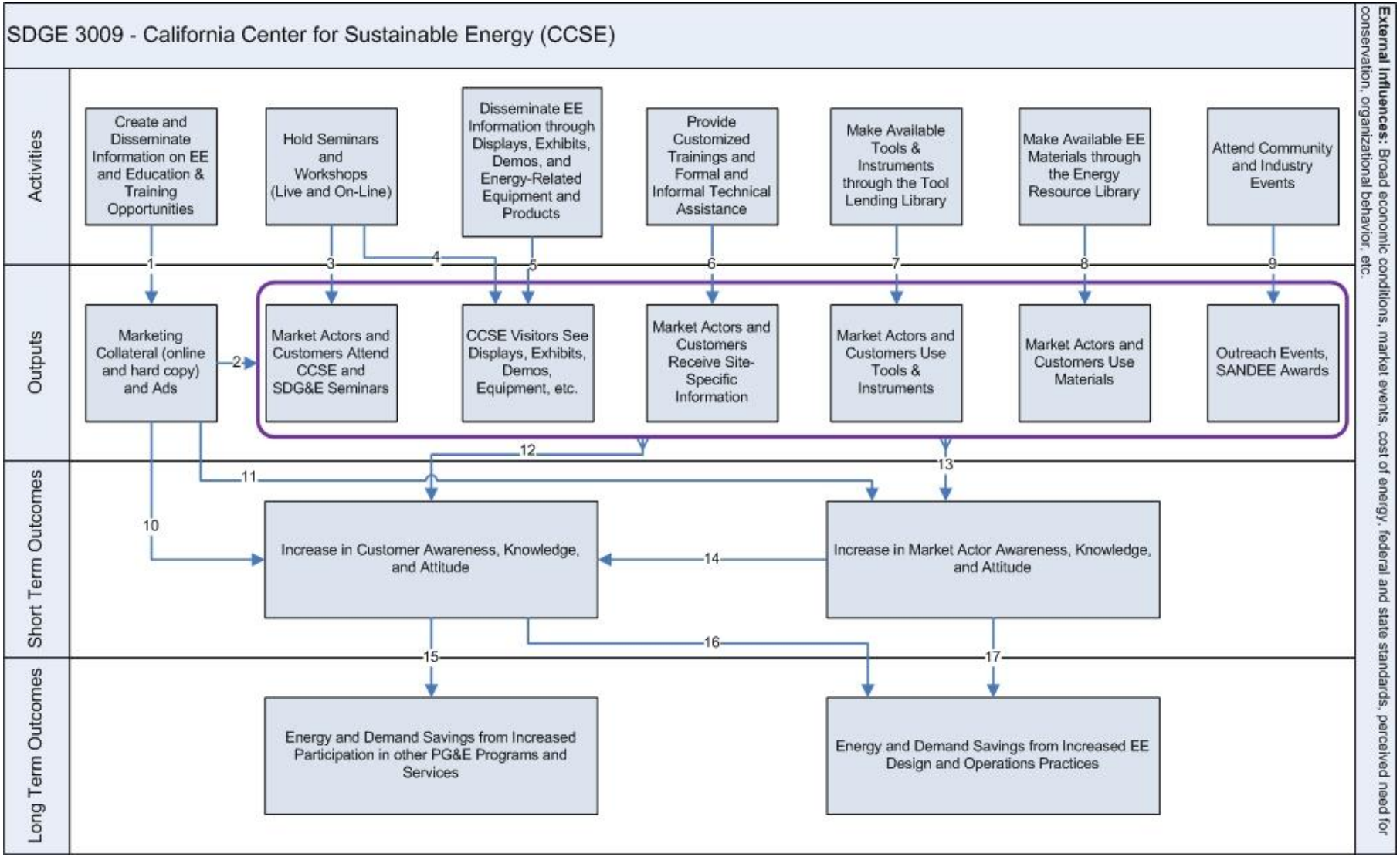
Our evaluation methodology calls for us to identify other courses and activities offered by the center which also have a high likelihood of inducing energy saving behavioral change. The center has already identified the attributes of courses and activities which have a high likelihood of inducing energy saving behavioral change. Therefore, as we assess CCSE's courses and activities to determine the Tier 1 courses and activities, we will focus specifically on courses which have similar characteristics as those identified by the center itself.

Program Logic Model

The SDERC is a collaboration between the CCSE and SDG&E. The SDERC is designed to be a single source point for energy information, resources, and programs in the greater San Diego region. The SDERC seeks to overcome awareness and knowledge barriers by disseminating energy efficiency information through a variety of channels. The CCSE offers seminars and workshops; provides customized trainings and technical assistance, attends community and industry events, disseminates energy efficiency information through displays, exhibits, demos, and energy-related equipment and products; and seeks to overcome market barriers concerning cost, performance uncertainty, and asymmetric product information by making available tools and instruments through its Tool Lending Library and other energy efficiency materials through the Energy Resource Library. All these activities will increase customer and market actor energy efficiency awareness and knowledge. As a result, customers and market actors will be more likely to take energy efficient actions promoted by the SDERC and/or participate in other SDG&E programs, leading to energy and demand savings.

Our evaluation will not cover CCSE's marketing and outreach activates or the center's Exhibit Area. The Center does not keep track of participant data for their marketing and outreach, Resource Library or Exhibit Area. The CCSE indicated that these activities are not necessarily designed to save energy

as stand alone efforts and instead have some indirect effects on the community such as increased awareness and knowledge of energy efficiency. For purposes of this evaluation, these activities are being viewed largely as marketing tools that help drive participants into one (or more) of the center's course of workshop offerings. In doing so, we will capture any energy saving behavioral changes in the evaluation of the course or workshop itself.


SDGE 3009 - California Center for Sustainable Energy (CCSE)
Activities
Outputs
Short Term Outcomes
Long Term Outcomes
Create and Disseminate Information on EE and Education & Training Opportunities
Hold Seminars and Workshops (Live and On-Line)
Disseminate EE Information through Displays, Exhibits, Demos, and Energy-Related Equipment and Products
Provide Customized Trainings and Formal and Informal Technical Assistance
Make Available Tools & Instruments through the Tool Lending Library
Make Available EE Materials through the Energy Resource Library
Attend Community and Industry Events
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Marketing Collateral (online and hard copy) and Ads
2
Market Actors and Customers Attend CCSE and SDG&E Seminars
CCSE Visitors See Displays, Exhibits, Demos, Equipment, etc.
Market Actors and Customers Receive Site-Specific Information
Market Actors and Customers Use Tools & Instruments
Market Actors and Customers Use Materials
Outreach Events, SANDEE Awards
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Increase in Customer Awareness, Knowledge, and Attitude
Increase in Market Actor Awareness, Knowledge, and Attitude
15
16
17
Energy and Demand Savings from Increased Participation in other PG&E Programs and Services
Energy and Demand Savings from Increased EE Design and Operations Practices
External Influences: Broad economic conditions, market events, cost of energy, federal and state standards, perceived need for conservation, organizational behavior, etc.

Memorandum

To: Pam Wellner, CPUC and Nick Hall, MECT
From: ODC Team (Contacts: Tami Buhr or Bill Norton)
Date: September 22, 2008
Re: Education and Training Program (Energy Center) Update Memo

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Introduction

This memo provides an overview of the methodology for our evaluation of the efforts funded under the California IOU's Education, Training and Outreach programs as well as an update of our efforts to date. Part 1 of the memo presents the detailed methodology for the following:

- **Instructor Survey Effort:** In March and April, 2008 we fielded an online survey that reached out to 204 instructors across all nine Centers. Between May and July, we completed an intensive callback effort in an attempt to reach a 100% completion rate among the instructors. The callback effort included several updates to Center directors regarding the status of the survey effort.
- **Course Material Review:** Our review of course materials included developing a comprehensive database of the energy savings actions detailed in the available course materials. These data will be used to inform the end-use specific modules for the participant survey.
- **Wave 1 Sampling Strategy:** The sample for the participant survey effort was developed using the information gathered by the Instructor Survey and our previous data collection efforts. The sample was drawn from the unique courses for which we had a completed Instructor Survey and useable participant data.
- **Census Stratum Analysis Plans:** We developed a specific analysis plan for each of the courses and activities in the census or "Tier 1" stratum. The plan is based on the availability of participant data and the nature of the specific course or activity. These plans include case studies, modified participant surveys, etc.

Part 2 of the memo provides an overview of the detailed findings from the Instructor Survey and the comprehensive database and catalog of all Center courses and activities (i.e., the Course Materials Review). Based on the findings from the Instructor Survey and our Course Material Review, the ODC Team created End-Use Specific Modules for our participant survey. The participant survey instrument (approved on September 4, 2008) was designed to assess changes in knowledge and to identify behavioral changes (actions taken) that are attributable to

participation in an Energy Center course or activity. The end-use specific modules are intended to gather the information necessary to estimate the energy impacts of these actions.

At the time that this memo was submitted the survey had been fielded to the participants in the courses associated with the lighting end-use module. The full results of the participant survey will be detailed in a future memo.

Note that ODC has also been working on an evaluability assessment of non-Energy Center program efforts, but this information will be provided in a separate memo.

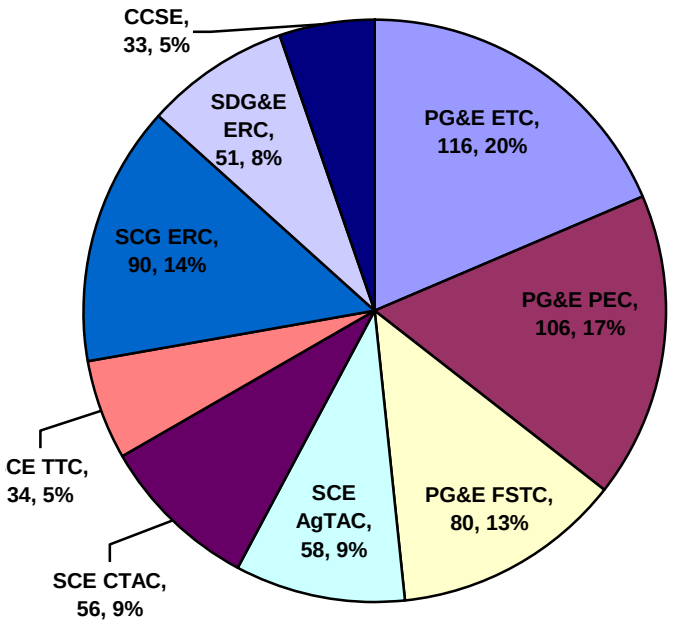
Part 1: Discussion of Evaluation Methodology

1.1 Instructor Survey Effort

The Instructor Survey is an important part of our evaluation effort. The information gathered by this survey includes the key course characteristics and factors that will be used in our Wave 1 analysis. Therefore, without a completed survey we are unable to evaluate the course. Between March and April 2008, we fielded the online version of the Instructor Survey. Additionally we completed a comprehensive callback effort in order to attempt to reach a 100% completion rate.

Prior to fielding the survey we determined the number of unique courses within each Center. Based on information provided to us by the IOUs we determined that there were 624 unique courses among the Energy Centers. Each of the nine Centers represented between five and 20% of unique courses.

Figure 1: Unique Courses by Center (n=624)



Our survey efforts resulted in completed questionnaires for 83% of unique courses. The specific rates for each Center are presented in Table 1.

Table 1:
Percent of Courses with a Completed Instructor Survey

Energy Center	Instructor Survey Response Rate
PG&E Energy Training Center	94% of courses
PG&E Pacific Energy Center	68% of courses
PG&E Food Service Training Center	98% of courses
SCE Agricultural Technology Application Center	95% of courses
SCE Customer Technology Application Center	84% of courses
SCE Technology and Test Centers[1]	26% of courses
SCG Energy Resource Center	81%of courses
SDG&E Energy Resource Center	86% of courses
California Center for Sustainable Energy	94% of courses
Overall	*83% of courses*

Of the 204 individual instructors, 163 completed all or some of the questionnaires for the courses that they taught, and 41 (or 20%) did not respond. We found that it was difficult to get the instructor population to "buy-in" to our evaluation efforts, particularly those instructors who were industry professionals hired by the Centers to teach one or two classes as opposed to those instructors who were employees of the IOUs or taught courses for a living. Table 2 presents Center specific information about the profile of instructors surveyed at that specific Center as well as information on the questionnaire response rates for that specific Center.

[1] The majority of TTC courses are taught by one of two SCE employees. We worked closely with each of these instructors to determine the best possible way to get the Instructor Survey completed for each of the Center's courses. However, the time commitment on the part of the instructors was still significant. Therefore, we prioritized the courses which were selected for the "Tier 1" evaluation.

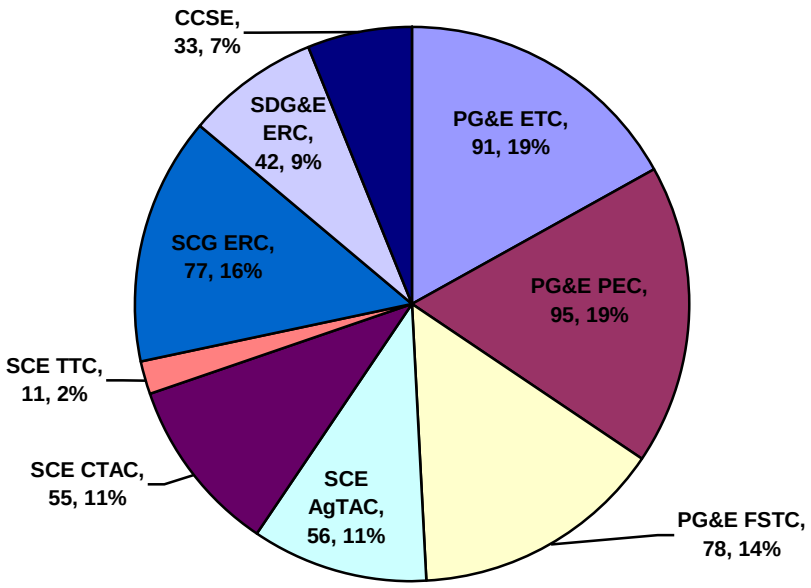
Table 2:
Center Specific Instructor Profile
(Prior to Instructor Survey Effort)

Energy Center	Unique Courses	Unique Instructors by Center	Average Courses per Instructor	Notes	Percent of Instructors with Incomplete Surveys
PG&E ETC	116	50	2.3	Five instructors are responsible for 39 courses, teaching 6 or more courses apiece.	5 (10%)
PG&E PEC	106	67	1.6		20 (30%)
PG&E FSTC	80	8	10		2 (25%)
SCE AgTAC	58	20	2.9	Three instructors are responsible for 31 of the courses, teaching 6 or more courses apiece.	2 (10%)
SCE CTAC	56	23	2.4	Two instructors are responsible for 24 courses, teaching 6 or more courses apiece.	5 (22%)
SCE TTC	34	4	8.5	Two instructors are responsible for 32 courses.	2 (50%)
SCG ERC	90	47	1.9		12 (26%)
SDG&E ERC	51	21	2.4		2 (10%)
CCSE	33	24	1.4		2 (8%)
TOTAL	*624*	*204 unique**	-		*52*

* Note that some of the instructors teach at multiple Centers.

Based on the information provided by the instructors during the fielding of the Instructor Survey we determined that a portion of the courses that were originally identified as unique, were actually the same as another unique course. Therefore at the conclusion of the Instructor Survey effort we revised the population of unique courses to reflect this new information. Going forward our evaluation efforts will be based on this revised set of 539 unique courses.

Figure 2:
Revised Unique Courses by Center Based on Instructor Survey
(n=539)



1.2 Course Material Review

During the period covered by this interim memo, we have continued to build our catalog of Center courses and activities. Specifically, this includes our review of the course content to identify energy efficiency measures and development of the three main objectives of each course based on information provided by the Instructor Survey and our Content Review.

Each Center was asked to provide the materials that accompany each of their courses, including any handouts, power point or other slide presentations, workbooks, etc. In most cases the Center provided us with the power point or other slide presentation that was also distributed to the participants of the course.

Before we could review the course content provided by the Centers, we needed to create a catalog of the content that mapped each piece of information from the specific class to the unique course (the unit of measurement for our evaluation). By creating the link between specific class and unique course, we are able to review all materials for a given course, even across Centers when appropriate (i.e. the same course may be offered at CTAC and AgTAC, but we may have only received content for the course from one of the two Centers). In all we cataloged close to 2,000 pieces of information.

Once the catalog was created we were able to attempt to complete a content review for each of the 539 unique courses in our evaluation. Of these 539, however, the instructors did not complete surveys for 90 courses. ODC contacted the Centers multiple times to inform them that the course could not be included in our evaluation effort without a completed Instructor Survey.

Because the Instructor Survey was not completed, the courses were not included and we did not review the materials, however the materials associated with these courses have been cataloged and therefore a content review could easily be completed by the ODC team if we were to receive a completed Instructor Survey under the second wave of the evaluation. We were able to complete content reviews for 344 of the 449 courses with completed Instructor Surveys while the remaining 105 courses did not have any course materials provided by any of the nine Energy Centers.

The content review had two main objectives, first to identify the energy efficiency measures or behavioral changes discussed in the course materials and second to develop a list of the main objectives of the course based on information provided by the course instructor and in the course materials.

For each course we identified up to 15 measures (e.g. HVAC), submeasures (e.g. economizers - use cool outdoor air for cooling), and type of action (e.g. system design/redesign). This information is the basis on which we will create the end-use specific modules to be used in our participant survey effort.

Additionally, for each course we identified the main objectives of the course (e.g. understanding different types of HVAC systems) which will also be used to inform the participant survey effort as well as serve as a trigger for the participants when asked to recall the information they learned in the course. This is especially important for those courses that were offered at the beginning of our Wave 1 evaluation period.

Table 3 below summarizes the number of courses that had completed Instructor Surveys and Course Material Reviews.

Table 3:
Summary of Courses

Number of Courses	Disposition
344	Completed Instructor Survey and Content Review
105	No materials, but Instructor Survey was completed so course was included in effort
90	No Instructor Survey (removed from evaluation effort)
539	**Unique Courses**

1.3 Wave 1 Sampling Strategy

In Wave 1, ODC will be evaluating 190 of the 539 unique courses (across all Centers), which represents over one third of the courses in the first half of our evaluation process. In addition we will be evaluating 10 Center activities. The following section presents a discussion of the process used to determine our Wave 1 sample.

The sampling plan that was initially proposed in the Evaluation Plan is presented in Table 4.

Table 4:
Overall Sampling Plan

Activity Strata	Sampling Approach	Sample Size* Wave 1	Sample Size* Wave 2
Census Stratum	Census of activities, census of participants in the activity	5 – 8 Activities X 8 Centers = 40 – 64	5 – 8 Activities X 8 Centers = 40 – 64
Random Draw Stratum	Random sample of activities, census of participants in the activity	80 – 96	12 – 15 Activities X 8 Centers = 96 – 120
Low Impact Stratum	Census of categories of activities, random samples of participants across all activities within each category	All Categories of Activities will be represented by Center (exact numbers TBD)**	0
		Total Number of Activities and Courses To Be Evaluated ~ 400	

* These are samples of the activities. The total customer samples will be in the hundreds. These can be viewed as the sample of clusters in a cluster sampling approach.
** Because individual activities included in the Low Impact Stratum are aggregated into categories, the rigor and efforts for this stratum will be lower (and less costly). This lower level of effort for the "Low Impact Stratum" will allow the ODC team to place more emphasis on the Census and Random Draw stratums.

We have since determined that many of the courses and activities that we expected to fall into the Low Impact Stratum did not have associated participant lists. Combined with the fact that the overall number of unique courses is far lower than originally anticipated, we have dropped the Low Impact Stratum from our evaluation and instead will draw a random sample from all unique courses with a valid Instructor Survey and participant data list. The total number of courses and activities to be evaluated in Wave 1 will remain at 200, therefore our Random Draw Stratum of courses will equal 200 minus the total number of courses and activities placed into the Census Stratum by either the Center or the ODC evaluation team.

1.3.1 Census Stratum

The Census Stratum is designed to include five to eight courses and activities per Center for a total of 40 to 64 courses and activities. Each of these courses or activities has a specific analysis plan that is designed based on our knowledge and understanding of the course or activities characteristics.

We envisioned these courses and activities would represent those courses and activities with the highest potential for energy savings. Therefore, during our interviews with Energy Center directors in early 2008 and again in a data request in May 2008, we asked each Center to provide us with a list of at least five courses or activities which they felt had the best potential for creating energy saving behavioral change among participants. These courses and activities make up the bulk of the Census Stratum, however since a few of the Centers did not provide this list of

activities the evaluation team rounded out the list of courses and activities by selecting courses and activities with similar characteristics as those already selected by the Centers.

We present complete lists of courses and activities selected by each Center as well as those courses and activities added by the evaluation team in Tables 6A through 6I below. These tables also indicate whether we are proposing a participant survey or a case study for each Tier 1 course (i.e., the Analysis Plan for each course or activity). In all we will evaluate 63 course and activities in the Census Stratum.

Table 5:
Census Stratum Courses and Activities by Center

Center	Tier 1 Courses	Tier 1 Activities	Totals
ETC	9	1	10
PEC	7	2	9
FSTC	4	2	6
AgTAC	8	1	9
CTAC	4	1	5
TTC	5	-	5
SCG ERC	6	2	8
SDG&E ERC	5	-	5
CCSE	5	1	6
TOTAL	*53*	*10*	*63*

Table 6A:
Energy Training Center
Census Stratum Course and Activities

Course ID	Course Description	Action Taken	Individual Analysis Plan	
			Participant Survey	Case Study
ETC0371	Title 24 HVAC System Change-Outs: Duct Testing Requirements for Residential and Small Business		√	
ETC0351	Title 24 Duct Installation Standards and Diagnostic Testing		√	
ETC0187	Equipment Sizing and Selection Using ACCA Manual J		√	
ETC0212	HVAC System Air Flow and Static Pressure Diagnostics		√	
ETC0287	Proper Procedures for Changing Air Conditioners and Heat Pumps		√	
ETC0303	Quality Insulation Installation Series: QII & Thermal By-Pass Checklist – Full		√	
ETC0304	Quality Insulation Installation Series: QII & Thermal By-Pass Checklist – Half		√	
ETC0310	Quality Insulation Installation Series: QII Hands On		√	
ETC0130	California Building Performance Contractors Association (CBPCA) Diagnostic and Remediation Training: Utilizing the Systems Approach—six day all systems		√	
ACTIVITY	Tool Loans			√
ACTIVITY	Consultations	DROPPED*		

* This activity was dropped because participant data was incomplete or missing.

Table 6B:
Pacific Energy Center
Census Stratum Course and Activities

Course ID	Course Description	Action Taken	Individual Analysis Plan	
			Participant Survey	Case Study
PEC0001	Retro-commissioning Workshop Series			√
PEC1916	Optimizing Air-Side System Design		√	
PEC2308	HVAC Retrofits 101 for Commercial Buildings		√	
PEC2417	Tools for Evaluating Existing Indoor Lighting		√	
PEC2419	Tools for Evaluating Existing Outdoor Lighting		√	
PEC2421	Using Non-dimming Strategies to Save Energy and Money		√	
PEC2424	Lighting for Profit: Finding Hidden Energy Savings		√	
ACTIVITY	Tool Lending Library			√
ACTIVITY	Consultations			√
PEC2438	Using DDC Control Systems to Commission VAV Boxes	DROPPED*		

* These courses and activities were dropped because there was insufficient data to complete the evaluation – either we did not receive a completed Instructor Survey or participant data was incomplete or missing.

Table 6C:
Food Service Training Center
Census Stratum Course and Activities

Course ID	Course Description	Action Taken	Individual Analysis Plan	
			Participant Survey	Case Study
FSTC0009	Top Ten Tips		√	
FSTC0133	Fundamentals of Kitchen Ventilation -- Advanced		√	
FSTC0046	Purchasing Efficient Equipment	ADDED*	√	
FSTC0140	Fundamentals of Commercial Kitchen Ventilation	ADDED*	√	
ACTIVITY	Audit Support		√	
ACTIVITY	Testing			√

* These courses were added because the Center did not provide us with at least five courses or activities for the Census Stratum. The evaluation team selected courses based on the characteristics of other Census Stratum courses including hands-on approach, emphasis on energy savings actions and examples, etc.

Table 6D:
Agricultural Technology Application Center
Census Stratum Course and Activities

Course ID	Course Description	Action Taken	Individual Analysis Plan	
			Participant Survey	Case Study
AGT701241	Energy Pro 4.0 – Envelope		√	
AGT604181	T24 Class		√	
AGT610262	T24 Class		√	
AGT703221	Package Unit HVAC		√	
AGT706031	Industrial Refrigeration		√	
AGT703211	Compressed Air		√	
AGT704122	Drip Irrigation		√	
AGT612141	HVAC System Testing		√	
Activity	Tool Lending Library			√
AGT611162	T24 Class	DROPPED*		
AGT610261	T24 Class	DROPPED*		
AGT701242	Energy Pro 4.0 – Lighting	DROPPED*		
AGT701251	Energy Pro 4.0 – Mechanical	DROPPED*		

* These courses were dropped because there were too many courses selected for the Census Stratum by this Center. The Center had identified several groupings of courses for evaluation in the Census Stratum, and we dropped four classes from these groupings, making sure that at least one of the courses in the grouping was still evaluated in the Census Stratum. The courses that were dropped fell to the Random Draw Stratum and had the chance of being selected in the random sample.

Table 6E:
Customer Technology Application Center
Census Stratum Course and Activities

Course ID	Course Description	Action Taken	Individual Analysis Plan	
			Participant Survey	Case Study
CTAC17147	Package Unit HVAC		√	
CTAC16341	DOE: Motor Management		√	
CTAC17086	Basic HVAC		√	
CTAC17088	Introduction to Lighting		√	
CTAC17471	Wet Cleaning Workshop (ACTIVITY)		√	
	Title 24 Classes: Duct Leakage, Acceptance Testing	DROPPED*		
	Save Energy, Save Money	DROPPED*		
CTAC14515	DOE: Fan System Assessment	DROPPED**		
CTAC14613	DOE: Pumping System Assessment	DROPPED**		
ACTIVITY	Technical Consultations	DROPPED**		
ACTIVITY	Food service Demonstrations	DROPPED**		

* These courses were dropped because the Center did not provide enough information to identify this course among the unique courses in our evaluation.
** These courses and activities were dropped because there was insufficient data to complete the evaluation – either we did not receive a completed Instructor Survey or participant data was incomplete or missing.

Table 6F:
Technology and Testing Centers
Census Stratum Course and Activities

Course ID	Course Description	Individual Analysis Plan	
		Participant Survey	Case Study
TTC0118	Lighting fixture maintenance	√	
TTC0117	Lighting retrofit strategies and project management techniques	√	
ACTIVITY: ALSO INCLUDES TTC0002 TTC0009 TTC0034	Customer Specific Consultations including: Revision/enhancement of Jack-in-the-Box refrigeration equipment specifications; Customized training of Vons maintenance management; Customized training of staff of Business Solution division and SCE new hires; and Fireside chat with SCE account executives		√

Table 6G:
SCG's Energy Resource Center
Census Stratum Course and Activities

Course ID	Course Description	Action Taken	Individual Analysis Plan	
			Participant Survey	Case Study
SCG14922	Retro-Commissioning	ADDED*	√	
SCG15524	Insulated Concrete Walls: Energy Efficiency Meets Sustainability	ADDED*	√	
SCG16358	Combustion Seminar	ADDED*	√	
SCG16446	On the Menu Series: Appetizers, Starters & Small Plates	ADDED*	√	
SCG16572	Retro-Commissioning (RCx) Fundamentals	ADDED*	√	
SCG17130	Industrial Energy Efficiency – Boost your Bottom line	ADDED*	√	
ACTIVITY	Food Service Demonstrations (Activity)			√
ACTIVITY	Industrial End User Program (Activity)			√
SCG16394	NATE Certification Program	DROPPED**		

* These courses were added because the Center did not provide us with at least five courses or activities for the Census Stratum. The evaluation team selected courses based on the characteristics of other Census Stratum courses including hands-on approach, emphasis on energy savings actions and examples, etc.
** These courses were dropped because there was insufficient data to complete the evaluation – either we did not receive a completed Instructor Survey or participant data was incomplete or missing.

Table 6H:
SDG&E's Energy Resource Center
Census Stratum Course and Activities

Course ID	Course Description	Action Taken	Individual Analysis Plan	
			Participant Survey	Case Study
SDG&E5311	Combustion Seminar	ADDED*	√	
SDG&E5397	Central Plant Operations in Hospitals	ADDED*	√	
SDG&E5453	HVAC, Direct Digital Control (DDC) Open Systems	ADDED*	√	
SDG&E5459	Introductory eQUEST	ADDED*	√	
SDG&E5465	Intermediate eQUEST	ADDED*	√	
* These courses were added because the Center did not provide us with at least five courses or activities for the Census Stratum. The evaluation team selected courses based on the characteristics of other Census Stratum courses including hands-on approach, emphasis on energy savings actions and examples, etc.				

Table 6I:
California Center for Sustainable Energy
Census Stratum Course and Activities

Course ID	Course Description	Action Taken	Individual Analysis Plan	
			Participant Survey	Case Study
CCSE028	Energy Management & Auditing 101		√	
CCSE017	Building Commissioning		√	
CCSE011	Specifying Green		√	
CCSE030	High Performance Window Products		√	
CCSE004	Pass the Test on EE and Effective Lighting		√	
ACTIVITY	Tool Lending Library	ADDED*		√
* The evaluation team chose to add this activity because all the other Centers with a Tool Lending Library had selected that activity for the Census Stratum.				

1.3.2 Random Draw Stratum

The total number of courses and activities to be evaluated in Wave 1 is 200, therefore our Random Draw Stratum of courses equals 200 minus the total number of courses and activities placed into the Census Stratum (63), for a total of 137 courses in the Random Draw Stratum.

The remaining 137 courses to be evaluated in Wave 1 are drawn from a randomly generated list of unique courses at the Center level. Each Center has a varied number of unique courses and in an effort to avoid "over" sampling courses from a Center with a small number of courses, such as TTC, we determined each Centers' percentage of the total number of valid courses (unique courses minus Census Stratum courses minus courses with known missing participant data). Then we applied that percentage to 137 (200 total sampled courses minus 63 Census Stratum courses) to arrive at the number of courses to sample in the Random Draw Stratum for each Center. The results of this exercise are presented in Table 7.

Table 7:
Random Draw Sampling Exercise

Center	Valid Courses	Percent of TOTAL Valid Courses	Sample Size
PGE ETC	87	19%	26
PGE PEC	91	20%	28
PGE FSTC	24	5%	7
SCE AgTAC	47	10%	14
SCE CTAC	51	11%	15
SCE TTC	6	1%	2
SCG ERC	77	17%	22
SDG&E ERC	46	10%	14
CCSE	28	6%	9
TOTAL	*457**	*100%*	*137*

*Note that in order to keep the evaluation process moving forward it was necessary to generate the random lists prior to the conclusion of the Instructor Survey effort. Therefore we had identified some, but not all, of the duplicate courses. This number is based on the unique courses with valid participant data that were identified at the time we generated the sample (520).

The 137 sample courses were then drawn from randomly generated lists of the unique courses. We pulled the number of courses identified by the sample size exercise detailed above from each Center's list – for example we pulled the first 26 courses from PEC's random list to be evaluated under the Random Draw Stratum.

As we continued with our evaluation efforts, including the conclusion of the Instructor Survey, we determined that some of the courses in the initial draw needed to be dropped for one of the following reasons:

- Insufficient or missing participant data
- Incomplete Instructor Survey
- Duplicate course

In these cases we replaced the course that needed to be dropped with the next course on the randomized list for that Center. For example if the 20th course on PEC's list needed to be dropped due to insufficient participant data we picked the 27th course to take its place in the Random Draw Stratum. By doing this instead of generating a new random list of courses each

time a course fell out of our evaluation population we ensure the integrity of the sample and reduce the potential for sample bias.

We are confident that this sampling process will provide an accurate picture of the savings that can be attributed to the Energy Center courses and activities. In the end we will be sampling 190 of the 539 unique courses (across all Centers) or over one third of the courses in the first half of our evaluation process. The complete list of sampled courses (both Census and Random Draw strata) is presented in Appendix A.

Part 2: Discussion of Findings from Ongoing Evaluation Efforts

This section presents provides detailed findings from our Course Instructor Survey (Section 2.1), and our Course Material Review (Section 2.2). These findings help the ODC Team to understand what is being taught in each course so that we can develop specific energy-saving survey modules for each course. The detailed findings in the next two sections also allow us to verify that we are accurately capturing the Center's efforts, and will ultimately be synthesized to provide context to in our final report.

In Section 2.1, we present the results of the Instructor Survey effort including course characteristics such as content delivery methods, target audience and focus on inducing energy efficiency behavioral changes. Section 2.2, we then present the results of our course content review including the energy savings measures and end-uses discussed in these materials.

2.1 Instructor Survey Effort

Based on the revised estimate of unique courses, we did not receive completed Instructor Survey questionnaires for 90 of the 539 unique courses. Of the remaining 449 unique courses, 425 or 95% are classified as group classes. The remaining five percent of courses are classified as conferences/meetings (17), one-on-one consultations (6), and an on-line class/seminar (1).

Instructors were asked about how the course content was delivered. Specifically they were asked to estimate the percentage of time that was spent using a specific method of content delivery including lecture/presentation, video/movie, group discussion, instructor demonstration, attendee presentations, hands-on exercises, and workplace consultations. A summary of the range, average and median percentage of time spent using each of the content delivery methods as well as the total number of courses employing the method are presented in Tables 8A through 8G.

Table 8A:
Course Content Delivery Method:
Lecture/Presentation

Center	Range	Average	Median	Number
PGE ETC	10 – 100%	62%	60%	78
PGE PEC	5 – 100%	78%	80%	65
PGE FSTC	70 – 75%	75%	75%	70
SCE AgTAC	15 - 100%	64%	60%	47
SCE CTAC	10 - 100%	64%	60%	44
SCE TTC	40 – 95%	69%	70%	5
SCG ERC	25 – 100%	70%	75%	51
SDG&E ERC	10 – 100%	67%	70%	33
CCSE	50 – 95%	74%	75%	27
TOTAL	*5 – 100%*	*69%*	*75%*	*420*

This data shows us that a lecture or presentation format is used frequently as a means for conveying the content of a course. In fact, 420 of the courses for which we have completed Instructor Surveys use lecture or presentation as a means of content delivery at least some of the time. On average, when used as a method for content delivery, lecture/presentation makes between 62% and 78% of the allotted course time.

Table 8B:
Course Content Delivery Method:
Group Discussion

Center	Range	Average	Median	Number
PGE ETC	5 – 50%	19%	20%	65
PGE PEC	5 – 40%	15%	15%	53
PGE FSTC	20 – 25%	25%	25%	70
SCE AgTAC	5 – 30%	17%	20%	36
SCE CTAC	10 – 30%	19%	20%	34
SCE TTC	5 – 100%	37%	15%	7
SCG ERC	5 – 30%	17%	15%	39
SDG&E ERC	5 – 30%	20%	20%	25
CCSE	5 – 50%	16%	10%	28
TOTAL	*5 – 100%*	*19%*	*20%*	*357*

Group discussion is the content delivery method used second most often, with 357 of all Energy Center courses using group discussion for at least part of the allotted class time. On average,

most Centers employ group discussion between 15% and 20% of allotted class time, however both the FSTC and TTC use group discussion more often. Both of these Centers are focused on customized trainings for specific end-users, so this is not a surprising use of class-time.

Table 8C:
Course Content Delivery Method:
Instructor Demonstration

Center	Range	Average	Median	Number
PGE ETC	5 – 100%	18%	10%	52
PGE PEC	5 – 100%	25%	15%	21
PGE FSTC	-	-	-	-
SCE AgTAC	10 – 100%	21%	10%	39
SCE CTAC	5 – 100%	16%	10%	33
SCE TTC	15 – 20%	18%	17.5%	2
SCG ERC	5 – 100%	29%	17.5%	28
SDG&E ERC	5 – 25%	13%	10%	16
CCSE	5 – 90%	24%	15%	14
TOTAL	*5 – 100%*	*20%*	*10%*	*205*

Close to half of all unique courses made use of instructor demonstration as a means of content delivery for at least some portion of the allotted class time. A majority of Centers use instructor demonstration an average of 15% to 25% of the allotted class time. However, the SDG&E ERC only makes use of instructor demonstration an average of 13% of class time, while the SCG ERC makes use of instructor demonstration an average of 29% of class time.

Table 8D:
Course Content Delivery Method:
Hands-On Exercises

Center	Range	Average	Median	Number
PGE ETC	2 – 90%	24%	20%	47
PGE PEC	5 – 90%	27%	25%	11
PGE FSTC	-	-	-	-
SCE AgTAC	10 – 90%	19%	10%	31
SCE CTAC	5 – 60%	16%	10%	28
SCE TTC	30%	30%	30%	2
SCG ERC	5 – 50%	16%	13%	17
SDG&E ERC	5 – 60%	16%	10%	15
CCSE	5 – 50%	21%	20%	8
TOTAL	*2 – 90%*	*20%*	*10%*	*159*

Use of hands-on exercises is more varied across the Centers with two Centers (SCG ERC and SDG&E ERC) using hand-on exercises an average of 16% of allotted class time while TTC uses hands-on exercises an average of 30% of allotted class time. The Centers do make good use of hand-on exercises as a method of content delivery with 159 courses employing hands-on exercises for at least some portion of the allotted class time.

Table 8E:
Course Content Delivery Method:
Video/Movie

Center	Range	Average	Median	Number
PGE ETC	1 – 30%	7%	5%	11
PGE PEC	5 – 10%	7%	5%	3
PGE FSTC	5 – 10%	8%	10%	3
SCE AgTAC	5 – 30%	12%	7.5%	6
SCE CTAC	5 – 10%	8%	10%	3
SCE TTC	-	-	-	-
SCG ERC	2 – 20%	9%	10%	14
SDG&E ERC	10 – 50%	24%	10%	5
CCSE	5 – 20%	10%	7.5%	4
TOTAL	*1 – 50%*	*10%*	*10%*	*49*

In nearly all cases a video or movie is used as a method of content delivery for an average of 10% or less of class-time. Exceptions include AgTAC and SDG&E's ERC, however the number

of courses which report using a video or movie as a method of content delivery at these two Centers is very low.

Very few instructors make use of attendee presentations and workplace consultations as a method of content delivery. In nearly all cases, when used, these methods make up 10% or less of allotted class time. The exception is the use of Attendee Presentations at ETC which when used, make up an average of 30% of class time.

Table 8F:
Course Content Delivery Method:
Attendee Presentation

Center	Range	Average	Median	Number
PGE ETC	5 – 70%	30%	15%	3
PGE PEC	10%	10%	10%	1
PGE FSTC	-	-	-	-
SCE AgTAC	-	-	-	-
SCE CTAC	5%	5%	5%	1
SCE TTC	-	-	-	-
SCG ERC	5 – 10%	8%	7.5%	2
SDG&E ERC	-	-	-	-
CCSE	5%	5%	5%	1
TOTAL	*5 – 70%*	*16%*	*7.5%*	*8*

Table 8G:
Course Content Delivery Method:
Workplace Consultation

Center	Range	Average	Median	Number
PGE ETC	5%	5%	5%	2
PGE PEC	-	-	-	-
PGE FSTC	-	-	-	-
SCE AgTAC	-	-	-	-
SCE CTAC	5%	5%	5%	1
SCE TTC	-	-	-	-
SCG ERC	5 – 10%	8%	7.5%	4
SDG&E ERC	-	-	-	-
CCSE	10%	10%	10%	1
TOTAL	*5 – 10%*	*7%*	*5%*	*8*

Instructors were also asked to rate their class on several characteristics that might lead directly to participants adopting energy efficient behaviors. The first self-assessment asked instructors to rate the degree to which their classes included implementation of energy efficiency practices or behaviors. Respondents rated each class on a scale where one equals "implementing energy saving actions is the only theme of the course;" two equals "implementing energy saving actions is one of several themes addressed by the course and it is a central component of the course;" three equals "implementing energy saving actions is one of several themes addressed by the course and it is no more important than the other themes;" and four equals "implementing energy saving actions is a minor theme of the course." Center by Center results of this rating are presented in Table 9.

Table 9:
Degree of Emphasis on Energy Efficiency
as a Theme of the Course
(includes percent of Center course total)

Course Rating*	ETC	PEC	FSTC	AgTAC	CTAC	TTC	SCG ERC	SDGE ERC	CCSE	Rating Total
1	20 (24%)	10 (15%)	72 (96%)	8 (16%)	11 (24%)	2 (29%)	8 (15%)	4 (12%)	8 (26%)	143 (32%)
2	53 (63%)	39 (57%)	3 (4%)	41 (80%)	30 (67%)	4 (57%)	30 (55%)	26 (79%)	17 (55%)	243 (54%)
3	5 (6%)	15 (22%)	-	1 (2%)	4 (9%)	1 (14%)	11 (20%)	1 (3%)	6 (19%)	44 (10%)
4	6 (7%)	4 (6%)	-	1 (2%)	-	-	6 (11%)	2 (6%)	-	19 (4%)
Center Course Total	*84*	*68*	*75*	*51*	*45*	*7*	*55*	*33*	*31*	*449*

*1 – Implementing energy saving actions is the only theme
*2 – Implementing energy saving actions is a central theme
*3 – Implementing energy saving actions is one of several themes
*4 – Implementing energy saving actions is a minor theme

Almost a third of the courses were rated by the instructors as including implementation as the only theme of the course. An additional 54% of classes were rated as including implementation as one of several themes of the course. The majority of courses in each Center were rated a "2," with the exception of the FSTC which rated a majority of its classes a "1."

The second self-assessment asked instructors to rate the degree to which the course provides specific and actionable examples of how to implement energy saving practices or behaviors. Instructors rated each of their classes on a scale where one equals "course provides detailed examples of how to implement energy savings practices or behaviors;" two equals "course provides more general examples of how to implement energy savings practices or behaviors;" and three equals "course does not give examples of how to implement energy savings practices or behaviors." Center by Center results of this rating are presented in Table 10.

Table 10:
Specificity of Examples of Energy Efficiency
(includes percent of Center course total)

Course Rating*	ETC	PEC	FSTC	AgTAC	CTAC	TTC	SCG ERC	SDGE ERC	CCSE	Rating Total
1	53 (63%)	31 (46%)	3 (4%)	20 (39%)	11 (24%)	6 (86%)	29 (53%)	15 (45%)	18 (58%)	186 (41%)
2	28 (33%)	34 (50%)	72 (96%)	31 (61%)	34 (76%)	1 (14%)	22 (40%)	17 (52%)	12 (39%)	251 (56%)
3	3 (4%)	3 (4%)	-	-	-	-	4 (7%)	1 (3%)	1 (3%)	12 (3%)
Center Course Total	*84*	*68*	*75*	*51*	*45*	*7*	*55*	*33*	*31*	*449*

*1 – Course provides detailed examples
*2 – Course provides more general examples
*3 – Course does not give examples

Ninety-seven percent of courses were rated by instructors as giving at least general examples of how to implement energy savings practices or behaviors.

While there appears to be a large number of courses that have been given high ratings in each of these two rating exercises, it is worth noting that only 38 or eight percent of courses were given a rating of "1" in both instances. Table 11 presents a break down of the courses when the two indexes are cross-referenced against each other.

Table 11:
Cross-Tabulation of Course Rating Exercise

	1 – Course provides detailed examples	2 – Course provides more general examples	3 – Course does not give examples
1 – Implementing energy saving actions is the only theme	38 (8%)	104 (23%)	1 (0.2%)
2 – Implementing energy saving actions is a central theme	135 (30%)	108 (24%)	-
3 – Implementing energy saving actions is one of several themes	12 (3%)	31 (7%)	1 (0.2%)
4 – Implementing energy saving actions is a minor theme	1 (0.2%)	8 (2%)	10 (2%)

Instructors were asked to identify the end-use(s) that were the primary focus of the class. Table 12 presents the results of this question. HVAC, Controls/EMS, Green Building and Lighting are the most frequently mentioned end-uses. Additionally certain Centers have a specific emphasis on one or more end-uses. For example, FSTC identified Commercial Cooking/Foodservice as the main end-use targeted by its course offerings, while both the ETC and the PEC place an emphasis on Building Envelope.

Table 12:
Number of Courses that Target Each End-Use
(includes percent of Center course total)

End Use	ETC	PEC	FSTC	AgTAC	CTAC	TTC	SCG ERC	SDGE ERC	CCSE	Total
HVAC	60 (71%)	33 (49%)	67 (89%)	26 (51%)	27 (60%)	-	31 (56%)	24 (73%)	16 (52%)	284 (63%)
Controls/ EMS	18 (21%)	35 (51%)	74 (99%)	11 (22%)	14 (31%)	-	36 (65%)	20 (61%)	16 (52%)	224 (50%)
Green (LEED) Building	24 (29%)	39 (57%)	75 (100%)	7 (14%)	13 (29%)	-	24 (44%)	11 (33%)	24 (77%)	217 (48%)
Lighting	28 (33%)	34 (50%)	54 (72%)	21 (41%)	26 (58%)	4 (57%)	14 (25%)	10 (30%)	20 (65%)	211 (47%)
Water Heating	30 (36%)	10 (15%)	57 (76%)	6 (12%)	6 (13%)	-	28 (51%)	12 (36%)	15 (48%)	164 (37%)
Refrigeration	19 (23%)	5 (7%)	53 (71%)	6 (12%)	12 (27%)	3 (43%)	15 (27%)	12 (36%)	10 (32%)	135 (30%)
Building Envelope	35 (42%)	34 (42%)	3 (4%)	10 (20%)	14 (31%)	-	16 (29%)	7 (21%)	14 (45%)	133 (30%)
Commercial Cooking/ Foodservice	7 (8%)	1 (1%)	75 (100%)	-	2 (4%)	-	21 (38%)	6 (18%)	4 (13%)	116 (26%)
Motors/ Pumps	16 (19%)	13 (19%)	3 (4%)	11 (22%)	16 (36%)	-	19 (35%)	14 (42%)	10 (32%)	102 (23%)
Renewable Energy	21 (25%)	16 (24%)	-	5 (10%)	9 (20%)	-	16 (29%)	3 (9%)	15 (48%)	85 (19%)
Demand/ Response	14 (17%)	14 (21%)	2 (3%)	8 (16%)	8 (18%)	-	10 (18%)	5 (15%)	7 (23%)	68 (15%)
Distributed Generation	8 (10%)	13 (19%)	1 (1%)	3 (6%)	8 (18%)	-	12 (22%)	5 (15%)	8 (26%)	58 (13%)
Steam Systems	4 (5%)	3 (4%)	-	2 (4%)	5 (11%)	-	24 (44%)	8 (24%)	7 (23%)	53 (12%)
Process Heating	4 (5%)	3 (4%)	-	1 (2%)	3 (7%)	-	18 (33%)	10 (30%)	7 (23%)	46 (10%)
Compressed Air	3 (4%)	2 (3%)	-	3 (6%)	8 (18%)	-	10 (18%)	5 (15%)	6 (19%)	37 (8%)
Center Course Total	*84*	*68*	*75*	*51*	*45*	*7*	*55*	*33*	*31*	*449*

NOTE that this question allowed for multiple responses, therefore a single course may have targeted more than one end-use.

In addition to being asked about the end-uses that were targeted by each course, instructors were also asked to identify the market sector and type of market actor that were targeted by each course. Tables 13 and 14 present the results of these questions.

Table 13:
Number of Courses in Each Market Sector
(includes percentage of Center course total)

Market Sector	ETC	PEC	FSTC	AgTAC	CTAC	TTC	SCG ERC	SDGE ERC	CCSE	Total
Commercial	34 (40%)	63 (93%)	75 (100%)	38 (75%)	41 (91%)	5 (71%)	49 (89%)	32 (97%)	29 (94%)	366 (82%)
Residential	70 (83%)	27 (40%)	-	25 (49%)	15 (33%)	-	15 (27%)	15 (45%)	14 (45%)	181 (40%)
Industrial	16 (19%)	23 (34%)	-	26 (51%)	37 (82%)	2 (29%)	30 (55%)	23 (70%)	21 (68%)	178 (40%)
Agricultural	11 (13%)	9 (13%)	-	21 (41%)	15 (33%)	-	12 (22%)	9 (27%)	6 (19%)	83 (18%)
Other	4 (5%)	7 (10%)	-	2 (4%)	-	2 (29%)	6 (11%)	4 (12%)	3 (10%)	28 (6%)
Center Course Total	*84*	*68*	*75*	*51*	*45*	*7*	*55*	*33*	*31*	*449*

NOTE that this question allowed for multiple responses, therefore a single course may have targeted more than one market sector.

The market sector targeted most often by Energy Center courses is the Commercial sector. This holds true for nearly every Center, with the exception of the ETC which targets the Residential sector more often than the Commercial sector. This is consistent with that Center's emphasis on Residential market actors.

Instructors were then asked to identify if their courses targeted End-Users, Trade Professionals or both. A majority of courses (297 of 449 unique courses) target both trade professionals and end-users. Additionally there are quite a few courses targeted directly at trade professionals while only a handful of courses are intended solely for end-users. In all, 419 courses (93%) targeted Trade Professionals.

Table 14:
Number of Courses Targeting End-Users, Trade-Professionals or Both
(includes percentage of Center course total)

Market Actor	ETC	PEC	FSTC	AgTAC	CTAC	TTC	SCG ERC	SDGE ERC	CCSE	Total
Both Trade Professional and End-User	38 (45%)	36 (53%)	75 (100%)	32 (63%)	34 (76%)	3 (43%)	34 (62%)	23 (70%)	22 (71%)	297 (66%)
Trade Professional	39 (46%)	30 (44%)	-	14 (27%)	8 (18%)	-	14 (25%)	10 (30%)	7 (23%)	122 (27%)
End-User	3 (4%)	2 (3%)	-	2 (4%)	2 (4%)	-	5 (9%)	-	2 (6%)	16 (4%)
Other	4 (5%)	-	-	3 (6%)	1 (2%)	4 (57%)	2 (4%)	1 (3%)	-	15 (3%)
Center Course Total	*84*	*68*	*75*	*51*	*45*	*7*	*55*	*33*	*31*	*449*

When we asked instructors to identify which trade professional(s) a course was designed for, unfortunately, it appears that in many cases instructors gave us a list of all of the different types of trade professionals who attend the course instead of a smaller, targeted list. However, this information is still valuable as it paints of picture of who is attending the courses and makes up the participant population. The following table presents the responses to this question.

Table 15:
Targeted Trade Professionals
(includes percent of Center course total)

Trade Professional	ETC	PEC	FSTC	AgTAC	CTAC	TTC	SCG ERC	SDGE ERC	CCSE	Total
Energy Efficiency Consultant	64 (76%)	57 (84%)	75 (100%)	40 (78%)	39 (87%)	2 (29%)	39 (71%)	25 (76%)	24 (77%)	365 (81%)
Architect/ Design Engineer	59 (70%)	65 (96%)	75 (100%)	39 (76%)	35 (78%)	1 (14%)	31 (56%)	19 (58%)	25 (81%)	349 (78%)
Facility Engineer/ O&M Professional	26 (31%)	45 (70%)	75 (100%)	29 (57%)	34 (76%)	2 (29%)	34 (62%)	23 (70%)	28 (90%)	296 (66%)
Equipment Sales Representative	31 (37%)	29 (43%)	75 (100%)	30 (59%)	25 (56%)	2 (29%)	18 (33%)	14 (42%)	5 (16%)	229 (51%)
General Contractor	48 (57%)	39 (57%)	1 (1%)	31 (61%)	26 (58%)	1 (14%)	23 (42%)	22 (67%)	21 (68%)	212 (47%)
HVAC Contractor	55 (65%)	29 (43%)	3 (4%)	30 (59%)	29 (64%)	-	26 (47%)	26 (79%)	14 (45%)	212 (47%)
Equipment Manufacturer	22 (26%)	25 (37%)	70 (93%)	23 (45%)	20 (44%)	-	22 (40%)	12 (36%)	6 (19%)	200 (45%)
Plant Manager	14 (17%)	28 (41%)	-	25 (49%)	31 (69%)	1 (14%)	27 (49%)	18 (55%)	15 (48%)	159 (35%)
Other Contractor	33 (39%)	24 (39%)	2 (3%)	26 (51%)	22 (49%)	2 (29%)	16 (29%)	11 (33%)	6 (19%)	142 (32%)
Residential Builder	51 (61%)	21 (31%)	-	15 (29%)	6 (13%)	-	14 (25%)	13 (39%)	9 (29%)	129 (29%)
Commercial Property Developer	10 (12%)	34 (50%)	1 (1%)	19 (37%)	20 (44%)	1 (14%)	13 (24%)	8 (24%)	19 (61%)	125 (28%)
Building Inspector	34 (40%)	18 (26%)	2 (3%)	16 (31%)	9 (20%)	-	18 (33%)	14 (42%)	7 (23%)	118 (26%)
Other	14 (17%)	6 (9%)	3 (4%)	6 (12%)	5 (11%)	1 (14%)	3 (5%)	4 (12%)	1 (3%)	43 (10%)
Center Course Total	*84*	*68*	*75*	*51*	*45*	*7*	*55*	*33*	*31*	*449*

NOTE that this question allowed for multiple responses, therefore a single course may have targeted more than one trade professional.

2.2 Course Material Review

Our review of course content focused on identifying the energy efficiency measures and actions that are covered by the course materials. Once these measures and actions were identified, they were used to inform the development of our participant survey modules. Tables 16A through 16I present counts of the measure and type of action for both sampled (courses either in the Census or Random Draw sample for Wave 1) and non-sampled courses. The measures and actions are further grouped by end-use classification. Note that we were only able to complete the content review on those courses which had course materials provided, however we still plan to evaluate courses without course materials as long as we received a completed Instructor Survey. Therefore the following tables do not contain information for every unique course in our evaluation.

These tables illustrate both the types of courses that are being taught at each Energy Center (End-Use Classification) as well as the types of measures and actions that are targeted by these classes. For example, the HVAC courses offered by the ETC that were reviewed targeted HVAC analysis seven times and HVAC equipment installation 19 times.

Table 16A:
Course Measures and Actions:
Energy Training Center

End-Use Classification	Measure	Action	Total
HVAC	Building Envelope	Equipment Installation	3
		System Design/Redesign	4
	HVAC	Analysis	7
		Equipment Installation	19
		Equipment Removal	1
		Operations Changes	4
		Repair/Maintenance	15
		System Design/Redesign	4
	Other	Analysis	1
		Equipment Installation	2
General	Boilers	System Design/Redesign	1
	Building Envelope	Analysis	1
		Equipment Installation	2
	HVAC	Analysis	1
		Equipment Installation	5
		Operations Changes	2
	Lighting	Equipment Installation	3
	Other	Analysis	1
		Equipment Installation	2
		System Design/Redesign	2
	Water Heating	Equipment Installation	1

End-Use Classification	Measure	Action	Total
Building Envelope	Building Envelope	Equipment Installation	6
		Operations Changes	1
		System Design/Redesign	9
	HVAC	Equipment Installation	1
	Lighting	Equipment Installation	3
	Motors/Pumps	Equipment Installation	1
Other	Other		1
		Equipment Installation	2
		Operations Changes	10
		System Design/Redesign	4
Codes & Standards	Building Envelope	Analysis	1
		Equipment Installation	1
		System Design/Redesign	2
	HVAC	Equipment Installation	2
		System Design/Redesign	3
	Lighting	Equipment Installation	3
	Other	Analysis	1
	Water Heating	System Design/Redesign	1
Lighting	Lighting	Equipment Installation	4
		System Design/Redesign	9
Rebates/Tax Credits	Building Envelope	Analysis	2
		Equipment Installation	2
		System Design/Redesign	2
	HVAC	Equipment Installation	3
	Motors/Pumps	Equipment Installation	1
	Other	Equipment Installation	1
	Water Heating	Equipment Installation	1
Water Heating	Water Heating	Equipment Installation	3
		Repair/Maintenance	5
Pool	Motors/Pumps	Operations Changes	2
	Other	Equipment Installation	2
		Operations Changes	4
Controls/ Energy Management Systems	Controls/ Energy Management Systems	Equipment Installation	2
		Operations Changes	2
		System Design/Redesign	2
Boilers/Furnaces	Motors/Pumps	Equipment Installation	2
		System Design/Redesign	2
Renewable Energy	Renewable Energy	Equipment Installation	3
Green Building	Green Building (LEED)	System Design/Redesign	1

Table 16B:
Course Measures and Actions:
Pacific Energy Center

End Use Classification	Measure	Action	Total
Lighting	Lighting	Equipment Installation	24
		Operations Changes	27
		Repair/Maintenance	2
		System Design/Redesign	18
HVAC	Building Envelope	Analysis	1
		Operations Changes	2
		System Design/Redesign	1
	HVAC	Analysis	3
		Equipment Installation	13
		Operations Changes	16
		System Design/Redesign	21
	Other	Equipment Installation	2
Green Building	Green Building (LEED)	Equipment Installation	1
		System Design/Redesign	40
Controls/ Energy Management Systems	Controls/ Energy Management Systems	Repair/Maintenance	7
		System Design/Redesign	1
	Demand/Response	Operations Changes	11
Other	Green Building (LEED)	Equipment Installation	1
		System Design/Redesign	13
	Other	Equipment Installation	2
		Operations Changes	1
		System Design/Redesign	1
Renewable Energy	Renewable Energy	Equipment Installation	3
		Operations Changes	2
		Repair/Maintenance	1
		System Design/Redesign	7
Commissioning/ Retrocommissioning	HVAC	Equipment Installation	1
		Operations Changes	5
		System Design/Redesign	1
	Refrigeration	Operations Changes	4
		System Design/Redesign	1
PV	Renewable Energy	Operations Changes	3
		System Design/Redesign	6
Boilers/Furnaces	Controls/ Energy Management Systems	Analysis	1
		Operations Changes	4
		Repair/Maintenance	1

End Use Classification	Measure	Action	Total
		System Design/Redesign	2
Building Envelope	Building Envelope	Equipment Installation	4
		System Design/Redesign	1
Solar Water Heating	Water Heating	Equipment Installation	2
		Operations Changes	1
General	Building Envelope	System Design/Redesign	1
	HVAC	System Design/Redesign	1

Table 16C:
Course Measures and Actions:
Food Service Training Center

End Use Classification	Measure	Action	Total
Commercial Cooking/ Foodservice/Refrigeration	Commercial Cooking/ Foodservice	Equipment Installation	15
		Operations Changes	10
		Repair/Maintenance	8
		System Design/Redesign	33

Table 16D:
Course Measures and Actions:
Agricultural Technology Application Center

End Use Classification	Measure	Action	Total
Lighting	Controls/ Energy Management Systems	Equipment Installation	1
	Lighting	Equipment Installation	44
		Equipment Removal	1
		Operations Changes	8
		System Design/Redesign	18
HVAC	Building Envelope	Equipment Installation	3
		System Design/Redesign	1
	Controls/ Energy Management Systems	Operations Changes	1
	HVAC	Analysis	14
		Equipment Installation	13
		Operations Changes	6
		Repair/Maintenance	6
		System Design/Redesign	14
	Lighting	Equipment Installation	1
		System Design/Redesign	1
	Other	Equipment Installation	3
		Operations Changes	1
		System Design/Redesign	1
	Renewable Energy	System Design/Redesign	1
General	HVAC	Equipment Installation	5
		Operations Changes	3
	Lighting	Equipment Installation	8
		Equipment Removal	1
		Operations Changes	2
		Repair/Maintenance	1
	Motors/Pumps	System Design/Redesign	1
	Other	Analysis	9
		Operations Changes	2
Motors/Pumps	Motors/Pumps	Equipment Installation	2
		Operations Changes	7
		Repair/Maintenance	1
		System Design/Redesign	8
	Other	Analysis	1
		Equipment Installation	1

End Use Classification	Measure	Action	Total
Controls/ Energy Management Systems	Controls/ Energy Management Systems	Equipment Installation	2
		Equipment Removal	1
		Operations Changes	4
		System Design/Redesign	6
	Lighting	Operations Changes	5
	Motors/Pumps	Operations Changes	1
Water Heating	Water Heating	Equipment Installation	8
		Operations Changes	2
		System Design/Redesign	5
Other	Building Envelope	System Design/Redesign	1
	HVAC	Equipment Installation	1
	Lighting	Equipment Installation	1
	Motors/Pumps	Equipment Installation	1
	Other	Analysis	1
		Equipment Installation	2
		Operations Changes	3
	Refrigeration	Analysis	1
	Water Heating	Equipment Installation	1
Building Envelope	Building Envelope	System Design/Redesign	4
	Lighting	System Design/Redesign	2

Table 16E:
Course Measures and Actions:
Customer Technology Application Center

End Use Classification	Measure	Action	Total
Motors/Pumps	Motors/Pumps	Analysis	1
		Equipment Installation	5
		Operations Changes	8
		Repair/Maintenance	1
		System Design/Redesign	28
HVAC	HVAC	Equipment Installation	9
		Operations Changes	18
		Repair/Maintenance	3
		System Design/Redesign	4
Lighting	Lighting	Equipment Installation	8
		Equipment Removal	1
		Operations Changes	2
		System Design/Redesign	9
Controls/ Energy Management Systems	Building Envelope	Analysis	2
	Controls/ Energy Management Systems	Operations Changes	9
		System Design/Redesign	3
	Other	Analysis	1
		System Design/Redesign	1
Commissioning/ Retrocommissioning	HVAC	Equipment Installation	1
		Operations Changes	3
		Repair/Maintenance	2
	Lighting	Equipment Installation	1
		Equipment Removal	1
		Operations Changes	1
	Motors/Pumps	System Design/Redesign	1
	Other	Analysis	1
	Refrigeration	Equipment Installation	4
Rebates/Tax Credits	HVAC	Equipment Installation	7
	Lighting	Equipment Installation	6
		Operations Changes	1
	Renewable Energy	Equipment Installation	1
Compressed Air	Compressed Air	Analysis	5
		Equipment Installation	1
		Operations Changes	7
Refrigeration	Motors/Pumps	Equipment Installation	1

End Use Classification	Measure	Action	Total
	Refrigeration	Analysis	1
		Equipment Installation	2
		Operations Changes	5
		System Design/Redesign	2
Commercial Cooking/ Foodservice/Refrigeration	Refrigeration	Equipment Installation	4
		System Design/Redesign	6
Green Building	Green Building (LEED)	Operations Changes	3
		System Design/Redesign	6
Codes & Standards	Building Envelope	System Design/Redesign	3
	Lighting	System Design/Redesign	1
Building Envelope	Building Envelope	Equipment Installation	1

Table 16F:
Course Measures and Actions:
Technology and Testing Centers

End Use Classification	Measure	Action	Total
Commercial Cooking/ Foodservice/Refrigeration	Refrigeration	Analysis	2
		Operations Changes	4
		Repair/Maintenance	2
		System Design/Redesign	6
	Commercial Cooking/ Foodservice	Equipment Installation	7
		Operations Changes	1
		Repair/Maintenance	2
		System Design/Redesign	13

Table 16G:
Course Measures and Actions:
SCG Energy Resource Center

End Use Classification	Measure	Action	Total
General	Boilers	Equipment Installation	1
		Repair/Maintenance	1
		System Design/Redesign	1
	Compressed Air	System Design/Redesign	1
	HVAC	Analysis	2
		Operations Changes	7
		Repair/Maintenance	1
		System Design/Redesign	2
	Lighting	Analysis	1
		Equipment Installation	1
		Operations Changes	1
		Repair/Maintenance	1
	Motors/Pumps	Operations Changes	1
	Other	System Design/Redesign	1
	Refrigeration	System Design/Redesign	4
	Commercial Cooking/ Foodservice	Repair/Maintenance	1
Green Building	Green Building (LEED)	Equipment Installation	5
		Operations Changes	1
		Repair/Maintenance	1
		System Design/Redesign	8
Commissioning/ Retrocommissioning	HVAC	Operations Changes	3
		Repair/Maintenance	1
	Lighting	Operations Changes	1
	Motors/Pumps	Operations Changes	1
	Other	Equipment Installation	1
		System Design/Redesign	5
	Water Heating	Repair/Maintenance	1
HVAC	HVAC	Analysis	4
		System Design/Redesign	3
Other	Other	System Design/Redesign	1
	Renewable Energy	System Design/Redesign	2
Motors/Pumps	Motors/Pumps	Equipment Installation	1
		System Design/Redesign	2
Building Envelope	Building Envelope	System Design/Redesign	2
CHP	Motors/Pumps	System Design/Redesign	1

Table 16H:
Course Measures and Actions:
SDG&E Energy Resource Center

End Use Classification	Measure	Action	Total
HVAC	Controls/ Energy Management Systems	System Design/Redesign	7
	HVAC	Equipment Installation	3
		Operations Changes	4
		Repair/Maintenance	8
		System Design/Redesign	18
Lighting	Lighting	Equipment Installation	10
		Equipment Removal	1
		Operations Changes	7
		System Design/Redesign	3
General	Demand/Response	Operations Changes	4
	HVAC	Equipment Installation	5
	Other	Analysis	2
		Equipment Installation	3
Water Heating	Water Heating	Equipment Installation	4
		Repair/Maintenance	2
		System Design/Redesign	6
Other	HVAC	System Design/Redesign	1
	Other	Equipment Installation	1
		Operations Changes	2
		Repair/Maintenance	2
		System Design/Redesign	5
Boilers/Furnaces	HVAC	Equipment Installation	1
		Operations Changes	1
	Motors/Pumps	Equipment Installation	1
		Repair/Maintenance	1
		System Design/Redesign	3
Motors/Pumps	Motors/Pumps	Equipment Installation	1
		Repair/Maintenance	1
		System Design/Redesign	3
Compressed Air	HVAC	Repair/Maintenance	3
Process Heating	Boilers	Operations Changes	3
Pool	Motors/Pumps	Equipment Installation	1
	Other	Equipment Installation	1

Table 16I:
Course Measures and Actions:
California Center for Sustainable Energy

End Use Classification	Measure	Action	Total
Other	Boilers	Equipment Installation	1
	Building Envelope	Equipment Installation	2
		System Design/Redesign	1
	Lighting	Equipment Installation	1
	Other	Analysis	4
		Equipment Installation	2
		Operations Changes	4
		System Design/Redesign	15
	Water Heating	Equipment Installation	1
General	HVAC	Operations Changes	1
		Repair/Maintenance	1
		System Design/Redesign	1
	Lighting	Equipment Installation	6
		Operations Changes	1
		System Design/Redesign	2
	Other	Analysis	5
		Equipment Installation	2
		Operations Changes	2
		System Design/Redesign	2
Commissioning/ Retrocommissioning	Boilers	Repair/Maintenance	1
	HVAC	Analysis	2
		Operations Changes	7
		Repair/Maintenance	1
	Lighting	Analysis	1
		Operations Changes	1
		Repair/Maintenance	1
	Motors/Pumps	Operations Changes	1
	Other	System Design/Redesign	4
Green Building	Green Building (LEED)	Equipment Installation	1
		System Design/Redesign	18
Lighting	Building Envelope	System Design/Redesign	1
	Lighting		1
		Equipment Installation	7
		Operations Changes	1
		Repair/Maintenance	1
		System Design/Redesign	3

End Use Classification	Measure	Action	Total
Rebates/Tax Credits	Building Envelope	Equipment Installation	1
		System Design/Redesign	1
	Green Building (LEED)	System Design/Redesign	1
	HVAC	Equipment Installation	4
	Lighting	Equipment Installation	1
	Other	Equipment Installation	2
	Renewable Energy	Equipment Installation	1
	Distributed Generation	Equipment Installation	2
HVAC	Other	Equipment Installation	2
		System Design/Redesign	5
Compressed Air	Compressed Air	Analysis	2
		System Design/Redesign	3
Building Envelope	Building Envelope	Analysis	1
		Equipment Installation	1
Solar Water Heating	Solar Water heating		1

Appendix A:
Sampled Courses and Census Courses/Activities

EventID	Sample Stratum	Course Name
AGT602151	Random Draw Stratum	On-Farm SCADA Electronic Monitoring and Control
AGT604181	Census Stratum	Title 24 In-Depth Review of the Energy Standards Compliance Documentation
AGT607191	Random Draw Stratum	Technology Update
AGT608241	Random Draw Stratum	Lighting Controls for Energy Management
AGT610261	Random Draw Stratum	Title 24 Envelope & Mechanical Standards
AGT610262	Census Stratum	Title 24 Nonresidential Energy Efficiency Standards-Lighting
AGT611012	Random Draw Stratum	Heating, Ventilation and Air Conditioning (HVAC) Quality Installation
AGT611021	Random Draw Stratum	Tankless Water Heaters
AGT612141	Census Stratum	Heating, Ventilation and Air Conditioning (HVAC) System Testing
AGT701241	Census Stratum	Energy Pro 4.0- Envelope
AGT702211	Random Draw Stratum	Implementing Energy Efficiency Projects
AGT703141	Random Draw Stratum	Industrial Maintenance
AGT703211	Census Stratum	Compressed Air System Efficiency
AGT703221	Census Stratum	Package Unit Heating, Ventilation & Air Conditioning (HVAC)
AGT704122	Census Stratum	Improving Energy Efficiency in Drip Irrigation
AGT704241	Random Draw Stratum	Evaporative Cooling for Commercial and Industrial Facilities
AGT705171	Random Draw Stratum	Air Handling Systems
AGT705241	Random Draw Stratum	FSU-CIT Variable Frequency Drives (VFD) For AG and Turf Irrigation Pumps
AGT706031	Census Stratum	Industrial Refrigeration
AGT706051	Random Draw Stratum	Advanced Lighting Technologies
AGT706061	Random Draw Stratum	Cool Roofs: Code Requirements and Program Opportunities
AGT706141	Random Draw Stratum	Energy Management Systems
CCSE001	Random Draw Stratum	A Practical Guide to Solar Water Heating
CCSE002	Random Draw Stratum	Hartman LOOP
CCSE004	Census Stratum	Pass the Test on Energy Efficient & Effective

EventID	Sample Stratum	Course Name
		Lighting
CCSE005	Random Draw Stratum	Life Cycle Cost Analysis
CCSE011	Census Stratum	Specifying Green
CCSE012	Random Draw Stratum	Lunch & Learn: Energy Economics & Environment
CCSE015	Random Draw Stratum	Green Building/LEED 201
CCSE017	Census Stratum	Building Commissioning
CCSE022	Random Draw Stratum	Measurement & Evaluation Workshop
CCSE028	Census Stratum	Energy Management and Auditing 101
CCSE030	Census Stratum	High Performance Window Products
CCSE034	Random Draw Stratum	Selling Green Building
CCSE036	Random Draw Stratum	Green Building and Climate Change
CTAC14215	Random Draw Stratum	Commercial Energy Efficiency Surveys
CTAC14399	Random Draw Stratum	Design Strategies for High Performance Glass
CTAC14572	Random Draw Stratum	Evaporative Cooling for Commercial and Industrial Facilities
CTAC14952	Random Draw Stratum	Displacement Ventilation
CTAC15823	Random Draw Stratum	Adjustable Speed Drives
CTAC15908	Random Draw Stratum	Air Handling Systems
CTAC15909	Random Draw Stratum	Chilled Water Systems
CTAC15910	Random Draw Stratum	Cooling Tower Efficiency
CTAC15911	Random Draw Stratum	Efficient Technologies for Commercial Refrigeration
CTAC15914	Random Draw Stratum	Comparing Motors and Engines as Prime Movers
CTAC16061	Random Draw Stratum	Energy Management Systems
CTAC16065	Random Draw Stratum	Compressed Air System Efficiency
CTAC16341	Census Stratum	Motor Systems Management
CTAC16554	Random Draw Stratum	Advanced Lighting Technologies
CTAC17055	Random Draw Stratum	Daylighting for Buildings
CTAC17086	Census Stratum	Basic Heating, Ventilation and Air Conditioning
CTAC17088	Census Stratum	Introduction to Lighting
CTAC17118	Random Draw Stratum	EnergyPro Nonresidential Software for Beginners
CTAC17147	Census Stratum	Package Unit Heating, Ventilation and Air Conditioning
CTAC17471	Census Stratum	Professional Wet Cleaning Workshop

EventID	Sample Stratum	Course Name
ETC0006	Random Draw Stratum	Compressed Air Systems Level 1
ETC0010	Random Draw Stratum	LGI: Title 24 HVAC Change Outs
ETC0030	Random Draw Stratum	LGI: Proper Procedures for Charging ACs
ETC0042	Random Draw Stratum	Small Business Energy Edge Sales
ETC0084	Random Draw Stratum	Pool Filtration at Half the Cost
ETC0100	Random Draw Stratum	RNC Builder Breakfast/Luncheon
ETC0113	Random Draw Stratum	Advanced MICROPAS Calculations for EnergyStar, Tax Credits, and California Solar Initiative
ETC0119	Random Draw Stratum	Basics of Photovoltaic Systems for Grid-Tied Applications
ETC0123	Random Draw Stratum	Build Tight - Ventilate Right
ETC0130	Census Stratum	Diagnosis and Remediation Training - Utilizing the Systems Approach
ETC0143	Random Draw Stratum	Cool Roofs: Code Requirements and Program Opportunities
ETC0177	Random Draw Stratum	Efficiency of Natural Gas Boilers
ETC0187	Census Stratum	Equipment Sizing & Selection Using ACCA Manual J
ETC0195	Random Draw Stratum	Gas Appliance Safety & Energy Efficiency for CREIA
ETC0202	Random Draw Stratum	Home Energy Efficiency Design
ETC0212	Census Stratum	HVAC System Air Flow and Static Pressure Diagnostics
ETC0221	Random Draw Stratum	Insulate Right
ETC0234	Random Draw Stratum	Multi Family Energy Efficiency Basics
ETC0254	Random Draw Stratum	NATE Test Prep/Review
ETC0258	Random Draw Stratum	Overview of ACCA Quality Installation Standards
ETC0287	Census Stratum	Proper Procedures for Charging Air Conditioners & Heat Pumps
ETC0291	Random Draw Stratum	Putting the V in Residential HVAC
ETC0297	Random Draw Stratum	PV Site Analysis & System Sizing
ETC0303	Census Stratum	Quality Insulation Installation & Thermal By-Pass Checklist
ETC0304	Census Stratum	Quality Insulation Installation (QII) & Thermal By-Pass Checklist
ETC0310	Census Stratum	Hands On Insulation Installation

EventID	Sample Stratum	Course Name
ETC0329	Random Draw Stratum	Small Business Motors & Comp. Air
ETC0337	Random Draw Stratum	Solar Water Heating Systems
ETC0342	Random Draw Stratum	Title 24 Advanced ACCA Manual D
ETC0351	Census Stratum	Title 24 Duct Installation Standards & Diagnostic Testing
ETC0371	Census Stratum	Title 24 HVAC System Change-Outs - Duct Testing Requirements for Residential & Small Business
ETC0397	Random Draw Stratum	Title 24 Overview of the 2005 Residential Standards
ETC0407	Random Draw Stratum	Tankless Water Heaters
ETC0409	Random Draw Stratum	Truth About Residential Fans and Motors
ETC0416	Random Draw Stratum	Water, Some Like It Hot - Some Want It Now!
FSTC0009	Census Stratum	Ten Energy Saving Tips for Food Service Easy Money
FSTC0029	Random Draw Stratum	Commercial Ventilation: A Plan Check Perspective … and Beyond
FSTC0046	Census Stratum	Purchasing Efficient Equipment
FSTC0099	Random Draw Stratum	Cashing In on Appliance Performance
FSTC0133	Census Stratum	Commercial Kitchen Ventilation: Advanced Level
FSTC0134	Random Draw Stratum	Energy Efficiency in Cook, Chill and Retherm Technologies
FSTC0135	Random Draw Stratum	Energy Efficiency in Food Service: Advanced Level
FSTC0140	Census Stratum	Fundamentals of Commercial Kitchen Ventilation
FSTC0147	Random Draw Stratum	Fundamentals of Energy Efficiency in Foodservice
FSTC0151	Random Draw Stratum	Green Building Practices for Commercial Foodservice
FSTC0153	Random Draw Stratum	Specifying Cooking Equipment for Energy Efficiency
PEC0001	Census Stratum	Retrocommissioning Workshop Series (Classes 1 - 12)
PEC1883	Random Draw Stratum	Digital Projection - Illuminating and Defining Architecture in the New Century
PEC1897	Random Draw Stratum	Assessing the Future of Green Building
PEC1899	Random Draw Stratum	EnergyPro Nonresidential Software for Experienced Users - Envelope and Lighting
PEC1901	Random Draw Stratum	The State of Plug-In Hybrid Electric Vehicles (PHEVs)

EventID	Sample Stratum	Course Name
PEC1903	Random Draw Stratum	Manual and Automated Demand Response and Critical Peak Pricing Strategies
PEC1915	Random Draw Stratum	Brown Bag HVAC Seminar - How to Measure Airflow
PEC1916	Census Stratum	Optimizing Air-Side System Design
PEC1917	Random Draw Stratum	Innovations in Evaporative Cooling and Water Treatment
PEC1922	Random Draw Stratum	Combined Heat and Power Applications for Commercial Buildings
PEC2078	Random Draw Stratum	Solar Hot Water Systems
PEC2184	Random Draw Stratum	New Technologies for Retail Lighting
PEC2187	Random Draw Stratum	A Case Study in High Color Temperature Lighting
PEC2226	Random Draw Stratum	Case Studies of HVAC Retrofits for High Tech Facilities
PEC2294	Random Draw Stratum	2005 Title 24 Glass and Fenestration Requirements
PEC2295	Random Draw Stratum	Getting Ready to Use LEED for Homes
PEC2300	Random Draw Stratum	Getting Started with Skylighting
PEC2301	Random Draw Stratum	Building Science for Building Professionals
PEC2308	Census Stratum	HVAC Retrofits 101 for Commercial Buildings
PEC2401	Random Draw Stratum	Technologies and Practices for Efficient and Reliable Data Centers
PEC2417	Census Stratum	Tools for Evaluating Existing Indoor Lighting
PEC2419	Census Stratum	Tools for Evaluating Existing Outdoor Lighting
PEC2421	Census Stratum	Using Non-dimming Strategies to Save Energy and Money
PEC2424	Census Stratum	Lighting for Profit: Finding Hidden Energy Savings
PEC2426	Random Draw Stratum	Retail Lighting Case Studies & Tour
PEC2430	Random Draw Stratum	Daylighting Academy Series-Fenestration Systems & Integration with Electric Lighting
PEC2448	Random Draw Stratum	Energy Efficient Data Centers
PEC2452	Random Draw Stratum	What's New in Green Building Products
PEC2456	Random Draw Stratum	Acoustical Benefits of Reducing Heat Transfer Through the Building Envelope
PEC2457	Random Draw Stratum	EnergyPro Nonresidential Software for Beginners
PEC2459	Random Draw Stratum	Alex Wilson: Passive Survivability
PEC2461	Random Draw Stratum	Making the Most with the Least: Designing Toward a

EventID	Sample Stratum	Course Name
		Post-carbon World
PEC2463	Random Draw Stratum	Basics of Photovoltaic (PV) Systems for Grid-Tied Applications
PEC2464	Random Draw Stratum	Photovoltaic (PV) Site Analysis and System Sizing
PEC2472	Random Draw Stratum	Advanced Framing
SCG14687	Random Draw Stratum	Chain Account Expo: Energy Performance Enhancements
SCG14691	Random Draw Stratum	Barbeque Bonanza
SCG14916	Random Draw Stratum	Solar Water Heating
SCG14917	Random Draw Stratum	Tankless Water Heating
SCG14921	Random Draw Stratum	Building Commissioning
SCG14922	Census Stratum	Retro-Commissioning
SCG15103	Random Draw Stratum	The Gas Company's Energy Efficiency Expo 2006
SCG15357	Random Draw Stratum	Municipal Water Pumping
SCG15524	Census Stratum	Insulated Concrete Walls: Energy Efficiency Meets Sustainability
SCG15727	Random Draw Stratum	DOE Advanced Refinery Controls
SCG15936	Random Draw Stratum	New Source Review
SCG16093	Random Draw Stratum	Build it Green: Certified Green Building Professional Training
SCG16334	Random Draw Stratum	Title V Compliance
SCG16350	Random Draw Stratum	Understanding Boiler Basics
SCG16352	Random Draw Stratum	Boiler Water Treatment for Energy Efficiency
SCG16356	Random Draw Stratum	LA Steam Operator's License Training
SCG16358	Census Stratum	Combustion Seminar
SCG16361	Random Draw Stratum	Desalination: Latest Technologies & Hybrid Power Solutions
SCG16392	Random Draw Stratum	IHACI - HVAC System Design
SCG16405	Random Draw Stratum	IHACI - Understanding & Diagnosing HVAC Electrical Systems
SCG16408	Random Draw Stratum	IHACI - Preventing Compressor Failures
SCG16443	Random Draw Stratum	Combi Ovens: The Future is here.
SCG16446	Census Stratum	On the Menu Series: Appetizers, Starters & Small Plates
SCG16571	Random Draw Stratum	New Building Commissioning Fundamentals

EventID	Sample Stratum	Course Name
SCG16572	Census Stratum	Retro-Commissioning (RCx) Fundamentals
SCG17023	Random Draw Stratum	The Gas Company's Energy Efficiency Expo 2007
SCG17130	Census Stratum	Industrial Energy Efficiency – Boost your Bottom line
SCG17176	Random Draw Stratum	EnergyPro Training: Envelope and Windows
SCG17539	Random Draw Stratum	Bakersfield Combustion Seminar for Residential Appliances
SDG&E5311	Census Stratum	Combustion Seminar
SDG&E5316	Random Draw Stratum	Contractors Kick-off Luncheon
SDG&E5320	Random Draw Stratum	System Design - Duct Design
SDG&E5321	Random Draw Stratum	System Design - Components
SDG&E5383	Random Draw Stratum	Adjustable Speed Drives
SDG&E5384	Random Draw Stratum	HVAC Maintenance/Selling Efficiency
SDG&E5385	Random Draw Stratum	Food Safety Symposium: Learn How to Make the Grade!
SDG&E5393	Random Draw Stratum	Lightfair Review 2006
SDG&E5394	Random Draw Stratum	Gas Heating
SDG&E5397	Census Stratum	Central Plant Operations in Hospitals
SDG&E5415	Random Draw Stratum	Implementing Energy Efficiency Projects
SDG&E5418	Random Draw Stratum	On Demand Water Heating
SDG&E5453	Census Stratum	HVAC, Direct Digital Control (DDC) Open Systems
SDG&E5454	Random Draw Stratum	Cooling Tower Design and Operation
SDG&E5458	Random Draw Stratum	Preventing Compressor Failures
SDG&E5459	Census Stratum	Introductory eQUEST
SDG&E5462	Random Draw Stratum	Let the Savings Flow
SDG&E5463	Random Draw Stratum	SDG&E Rebates, Programs and Incentives for the Retail Industry
SDG&E5465	Census Stratum	Intermediate eQUEST: Detailed Design using eQUEST
TTC0002	Census Stratum	Customized refrigeration training for Business Solutions Group
TTC0009	Census Stratum	CSBU training – Basic refrigeration for new SCE hires
TTC0034	Census Stratum	Fireside Chat (A/Es) - Internal to Edison
TTC0105	Random Draw Stratum	Specifying Refrigeration Equipment & Ice Machines

EventID	Sample Stratum	Course Name
		for Energy Efficiency
TTC0117	Census Stratum	Lighting Retrofit Strategies and Project Management Techniques
TTC0118	Census Stratum	Lighting Fixture Maintenance

MEMORANDUM

TO: Pam Wellner (CPUC) and Nick Hall (MECT)

FROM: Opinion Dynamics

DATE: July 22, 2009

RE: CG2 Wave 1 Survey Results: Behavior Change

Our Wave 1 research determined that the Energy Centers are having a large impact on the market by changing the practices of market actors, and assisting end-users in their efforts to take actions that lead to energy savings. Because each Center targets a different audience and offers different courses and opportunities, the results of our research varied by Center; however, overarching findings include the following:

- Just over half of the individuals who attended Wave 1 courses were market actors. Across all Centers: 54% of the course participants were market actors, 29% were commercial end-users and 17% were residential end-users. Because market actors have the ability to affect change in a larger number of buildings than a single commercial or residential end-user, the Center's efforts have the potential to extend into a larger segment of the market through the market actors who attend the courses.[1]

- As a result of the courses, a large majority of the market actors who took courses (77%) stated that they changed or enhanced the services they provide to clients.

    - In all, 66% of market actors said these changes had become standard practices, and 52% feel that the changes that they have made resulted in significant energy savings.

    - The evaluation team will be exploring the extent of these changes and enhanced offerings in much more depth in Wave 2.

- Among end-users, commercial respondents were more likely than residential respondents to have applied what they learned: four out of five commercial respondents (83%) took energy saving actions, while three out of five residential respondents (61%) did so.

    - Approximately one in ten end-users (11%) who took action did so in a building or facility outside IOU territory. One in four (26%) received assistance from another utility-sponsored program

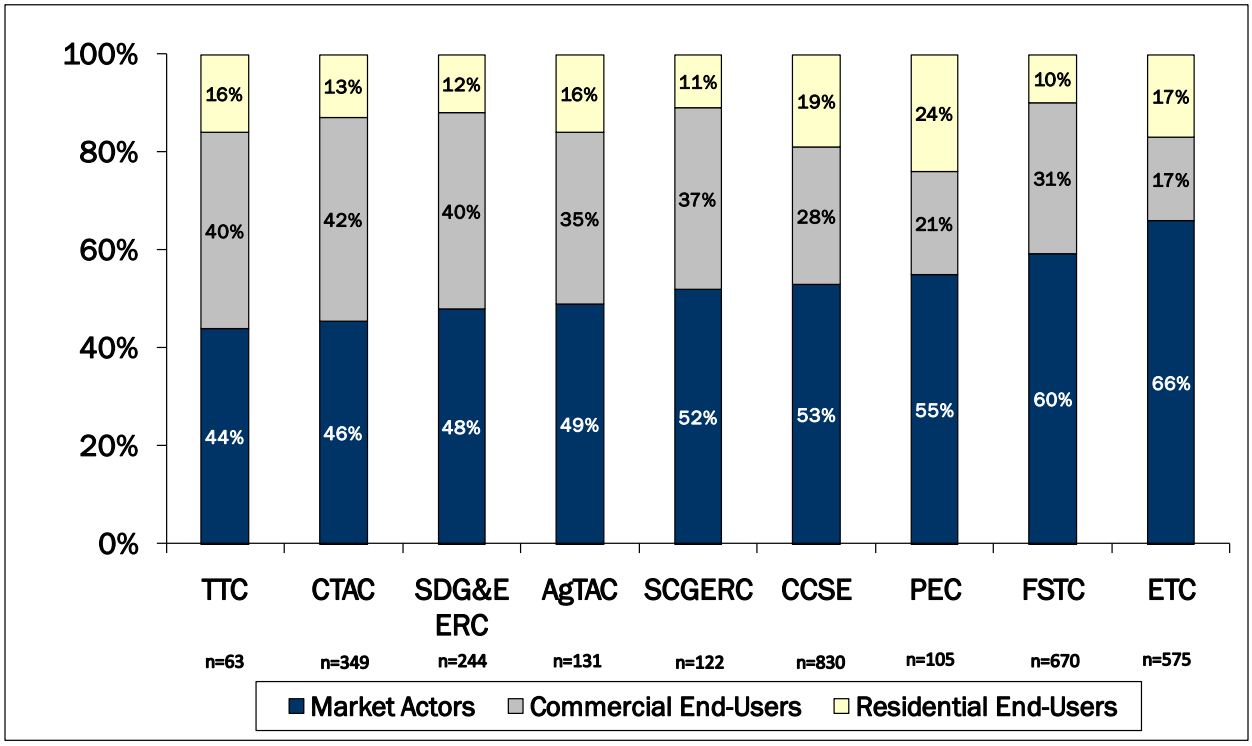
[1] We acknowledge, however, that some commercial end-users may operate multiple buildings.

Below, we present additional details with some breakdowns by Center. The information in this memo is based on a mixed method survey (telephone/internet) of Wave 1 (that is January 2007 through June 2008) participants in Energy Center courses. In all, we completed 2,864 surveys with 2,657 unique individuals.[2] These interviews were spread across the nine Energy Centers as shown in Figure 1 below.[3] Note, that the number of interviews completed per center ranged from 63 for the Technology and Test Centers (TTC), to 830 for the larger Pacific Energy Center (PEC).

Market Actors Represent a Slight Majority of Course Participants

Based on our surveys, a slight majority of the individuals reached by the Center's efforts are market actors. Across all Centers, 54% of the individuals in the courses are market actors, 29% are commercial end-users and 17% are residential end-users. Figure 1 presents the survey responses for all nine Energy Centers.

Figure 1: Type of Course Participant by Energy Center



[2] Many participants took multiple courses. Participants who took courses across multiple end-uses were asked to complete up to three surveys. The difference between completed surveys and unique individuals is because 157 people completed two surveys and 25 completed three.

[3] We asked participants who took more than one course in a single end-use to complete a single survey evaluating all of those courses. If they took multiple courses in a single end-use at more than one Energy Center, their survey response is assigned to each Center. This is why we have 2,864 completed surveys but the number of responses across the Centers sum to 3,089 in Figure 1.

Most Market Actors and End-Users are Applying Concepts

Based on our Wave 1 research, a large majority of both market actors and end-users are applying the concepts taught in the courses. Each respondent type was asked a number of questions designed to assess changes in behavior as a result of taking the course(s). Just over three out of four market actors (77%) changed or enhanced the services they provide to clients using the course concepts. Among residential respondents, three out of five (61%) took actions to save energy in their homes, whereas four out of five commercial respondents (83%) took energy saving actions at their facility.

The results varied by center. Across the Centers, we found that between 69% and 93% of market actors applied the course material. while between 57% and 92% of end-users did so (see Table 1).

Table 1: Percentage of Attendees that Applied Course Concepts by Center

	Market Actors (n=1,549)	Commercial End-Users (n=843)	Residential End-Users (n=472)
Pacific Gas and Electric			
ETC	80%	80%	61%
PEC	75%	81%	57%
FSTC	87%	84%	90%
Southern California Edison			
AgTAC	77%	85%	62%
CTAC	78%	90%	75%
TTC	93%	92%	80%
Southern California Gas			
SCG ERC	71%	71%	64%
San Diego Gas and Electric			
SDG&E ERC	73%	85%	59%
CCSE	69%	82%	57%
Total	**77%**	**83%**	**61%**

Market Actor Behavior Change

We have seen that a large majority of market actors (77%) said they had changed or enhanced the services they provide to clients based on what they learned in the course. The survey asked additional questions about the frequency and impact of changes. Among

market actors surveyed, two-thirds (66%) have made changes that have become standard practice. Just over half (52%) said they had made changes that resulted in measurable energy savings. Twenty percent of market actors had made changes that they would characterize as achieving "significant" savings.

Table 2: Market Actor Behavior

	Market Actors (n=1479)*
Changed services as a result of course	77%
Made changes that became standard practice	66%
Made changes resulting in measurable energy savings for clients	52%
Made changes resulting in significant savings	20%

*A total of 1549 market actors were surveyed. However, the 70 who took the courses on financial incentives were not asked about a change in their practices due to course content. Instead, they were asked if they took part in an incentive program, of which 39% (27) did participate.

Market actors were asked about specific types of changes to their services. Table 3 below indicates the types of changes made by market actors.

Table 3: Types of Changes Made by Market Actors

	Market Actors (n=1,479)
Specify EE measures more frequently	60%
Specify EE measures of which previously unaware	58%
Apply building or system design principals or elements of which previously unfamiliar	53%
Change methods used to size and specify new equipment	49%
Utilize building or system design tools or practices of which previously unfamiliar	44%
Utilize diagnostic tools or practices of which previously unfamiliar	43%
Change manner in which install or maintain EE equipment	41%

Given the variety of potential types of actions and situations in which market actors could have applied the course information;for Wave 1, we determined it would not be possible to gather data that would allow us to calculate energy savings using our quantitative survey

instrument. Our research goal for Wave 1 was to determine the degree to which participation in Energy Center courses yield changes in market actor knowledge and practices and understand the nature of these changes. The second wave of our analysis will explore in greater depth the impact the courses are having on the business practices of market actors. Using the Wave 2 survey results, we will more thoroughly characterize the changes market actors have made to their practices as a result of taking the courses. We will characterize the magnitude of energy savings that are likely to result from their actions and the frequency with which they are being taken. The assessment will be based on a general engineering review of survey,secondary data sources and detailed follow-up interviews with a sample of market actors that have changed their practices. We will also determine how frequently market actors channel their clients into IOU resource acquisition programs.

The Reach of Market Actor Impacts

The types of actions and reach of these actions are different for market actors than end-users. When end-users take action, only their facilities are impacted. The actions taken by market actors can impact all of the customers they serve. Across all Centers, 54% of the individuals in the courses are market actors, so the application of course concepts by this population has the ability to impact multiple buildings across the state.

Specifically, market actors who made changes to their services were asked to estimate the number of times they implemented the changes in 2008. While the number was highly variable ranging from zero to 500 (which reflects the varied nature of their work), in general, it is apparent that the market actors have the ability to extend their reach much further than a single end user. (See Table 4).

Table 4: Number of Times Implemented Changes in Past Year
(Among market actors that made a change)

Number of times	Number of Market Actors	Percentage (n=1,120)
0	56	5%
1-3	215	19%
4-6	239	21%
7-19	208	19%
20+	278	25%
Don't Know/Refused	124	11%

The frequency with which market actors implemented the changes varied by market sector.. Those working in the HVAC sector implemented changes more times on average than nearly every other sector. While architects implemented the changes the least. We will explore this

variation in more depth in a future deliverable.

End-User Behavior Change

As noted above, the majority of end-users are also applying course concepts: three out of five residential end-users (61%) reported taking actions to save energy in their homes, whereas just over four out of five commercial end-users (83%) reported taking energy saving actions at their facility. All residential and commercial end-users were asked also whether they had taken several actions that could lead to energy saving behavior in the future either by themselves or by others (see Table 5). The courses made an impression. A substantial majority of both types of end-users shared course information with someone else and a sizable number were motivated to search for additional information related to the course concepts. An equally large number of commercial end-users took an advocacy role after taking the course and helped convince others in their organization that energy saving actions were beneficial.

Table 5: Behavior Change among Residential and Commercial End-Users

	Residential (n=472)	Commercial (n=843)
Made energy saving efforts using course concepts*	61%	83%
Shared course information with friend/family/colleague	82%	93%
Searched for additional information related to course concepts	69%	71%
Helped convince others in organization that energy saving actions are needed	--	84%
Helped convince others outside organization that certain types of actions help save energy	--	72%

*These percentages do not include the 15 residential and 58 commercial end-users who took courses on financial incentives. They were not asked about making efforts to save energy using course content. Instead, they were asked if they took part in an incentive program, of which 36% (5) of residential and 40% (23) of commercial end-users did participate.

End-users who took energy saving action were directed to an additional survey module that collected information on the details of the actions that could be used to calculate energy savings. Energy savings can only be attributed to an Energy Center if the action took place within IOU territory and if the project did not receive funding from another IOU program. Eleven percent of those taking energy saving action did so at a building outside of IOU territory (9% of residential and 12% commercial end-users).

An even larger percentage of end-users who took action received support from another utility-sponsored program. Approximately one in five residential end-users (21%) and just

over one in four commercial end-users (28%) participated in another program. The course provided information about the program to two-thirds (65%) of these residential participants and slightly over half (57%) of the commercial participants. (See Table 6).

Table 6: Participation in Other Utility-Sponsored Programs among End-Users

	Residential (n=174)	Commercial (n=522)
Participated in another program	21%	28%
Course provided information on program (among those receiving assistance)	65%	57%

Next Steps for Wave 1 Analysis

The next step for the evaluation team is to calculate energy savings for end-users based on the information they provided in the Wave 1 survey impact modules. Currently, we have calculated energy savings for nine of the ten impact modules for which savings could be calculated. Once completed, these estimates will be presented in a future deliverable.

MEMORANDUM

TO: Pam Wellner and Nick Hall

FROM: The Opinion Dynamics Evaluation Team (primary contacts: Tami Buhr and Bill Norton)

DATE: July 22, 2009

RE: CART Analysis Results

The purpose of this memo is to provide information about the CART results and an opportunity to discuss them. This information will be integrated into our draft and final reports.

Summary of Results

As part of the evaluation of the Energy Centers, the Opinion Dynamics team sought to understand whether class attributes (e.g., length of course, subject of course, course method) and/or participant attributes (e.g., residential end user, market actor, etc.) helped predict whether participants would change their behaviors. The Opinion Dynamics team explored this through the use of a CART analysis.[1]

The goal of the CART analysis was two-fold:

1. To determine the best way to sample classes for future evaluation efforts. Given the sheer number of courses taught at the nine Energy Centers, there is a need to understand how to prioritize evaluation efforts. If there are particular class attributes that predict behavior change, we would be able to focus on those efforts for the indirect impact evaluation.
2. To provide insights about what metrics might be valuable for future evaluation efforts.

One major finding from this effort is that there are no strong relationships between class attributes and behavior change. When we used CART to determine whether class attributes could predict behaviors, the model split the respondents five times using attributes such as the type of course, whether the course focused on feeding into financial incentive programs, the presence or absence of reference materials, and course length (> or < 8.5 hours)—see Figure 2. Ultimately, however, even the best fit model was not able to predict behavior change well.

[1] It is important to note that one advantage of CART over parametric methods is that there are interaction effects in the models that could be missed in parametric models unless the analyst knew in advance what interactions to test.

We then ran a second model with both class *and* participant attributes—see Figure 3. In this second model, we found that taking action is driven less by the type of course and/or course attributes than other factors. In Figure 3 there are 10 "terminal nodes" that best separate those who took action from those who did not take action. The strongest predictors in this model included the type of respondent, business type, knowledge gain, and type of class.

Based on these two models, CART demonstrated that participant characteristics predict actions far more than class characteristics. Unfortunately, however, the fact that participant characteristics are more likely to predict action than class characteristics is not helpful for sampling since participant characteristics are not known in advance.

- Implications for Sampling - The results of the analysis indicate that a simple random sample of Wave 2 participants would be an efficient sample design. (Note that these results are being implemented for Wave 2, as explained in the April 29, 2009 memo to the CPUC.)

The CART model also provided other insights—specifically insights on a potential metric for the future. Evidence in this analysis, and elsewhere, demonstrates that when the appropriate information is provided to participants, and they feel they have gained knowledge, they are often taking action. This indicates that people attending classes are actively seeking information they can apply.

- A self-reported knowledge gain can predict energy saving actions (that is, those who indicate that they learned a lot from the course are more likely to take some action to reduce energy use.)

    - Notably, market actors appear to need a substantial level of knowledge gain to increase the actions they take. Market actors who reported a high degree of knowledge gain (a 7 on a 7 point scale), were the only market actors who were more likely to take action.

    - Commercial end users in the office, college/university, community service, and personal service all need a slightly lower change in knowledge to move them to action than other commercial end users (those reporting over 4 on a 7 point scale are more likely to take action). It is possible that this group is attending courses with a specific need and plan in mind and that the classes are providing them with the details needed to move those plans forward.

    - Residential customers also do not need as high a change in knowledge to take actions as market actors (those reporting over a 4 on a 7 point scale are more likely to take action). Other influences could be bringing about actions in the residential section that are unrelated to a large change in knowledge.

A potential future performance metric for education and training programs, therefore, could be knowledge increase, with the acknowledgement that judging success for classes for specific segments of the population (residential, some commercial end users) should be different.

Overall, the CART analysis proved useful for understanding the best way to sample for future evaluation efforts, and for supporting the need to ask about self-reported knowledge gain in

future evaluation efforts.

The remainder of the memo discusses the method and the results in more detail.

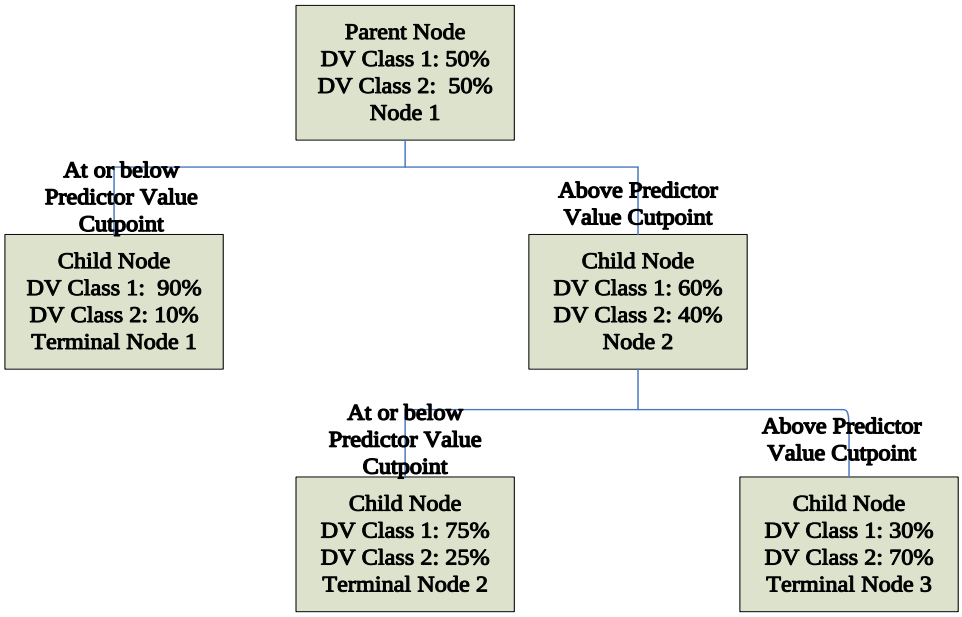
Method

CART (Breiman, et al., 1984) is a specific algorithm and software, belonging to a class of decision tree methodologies sometimes referred to as recursive partitioning methods. It is a non-parametric technique that can select from among a large set of categorical and continuous variables, regardless of their distributional characteristics, those that individually, or in combination, best predict the outcome variable of interest by splitting the sample into progressively more parsimonious subgroups using multiple predictors (or *splitters*, as they are called in CART). In this study we utilized this approach to identify the characteristics of the adult classes where participants were more likely to undertake action after the class. Five characteristics of the CART approach make it ideally suited to the type of data likely to be encountered in this type of study:

1. No variable used in a CART analysis, independent or dependent, is assumed to follow any specific type of statistical distribution, nor is independence of observations assumed.
2. CART has a built-in algorithm for dealing with missing values in a manner that doesn't eliminate observations (method is discussed below).
3. Outliers, multi-collinearity, heteroscedasticity or distributional error structures that so commonly plague parametric models do not affect CART.
4. CART detects and assesses interactions in the data.
5. CART effectively examines a large number of variables as potential predictors and can produce a parsimonious solution using only a few of these.

CART analyses produce results that are typically displayed in an inverted tree shaped diagram referred to as a "classification tree." A unique language is used to describe classification trees. Figure 1 presents a hypothetical analysis and introduces this language.

Figure 1. CART Output Example



The tree begins with a *parent node* (note that this term does not appear in trees based on actual data, but is understood to represent any node that results in further splits) that reports frequencies for each class of the dependent variable for the entire sample. In Figure 1, the dependent variable is represented as a binary outcome, with each class or category containing 50% of the observations. We utilize this example because it is relatively easy to follow. Note however that the dependent variable may represent a categorical (classification tree) or continuous (regression tree) outcome. The independent variables can be any combination of categorical or continuous variables; however, splitting will always result in two groups. In the case of categorical predictors, the categories will be divided into two groups, not necessarily consisting of contiguous categories. A continuous predictor, such as age, will be divided at the point along the continuum that best discriminates the two groups on the dependent variable using the specified splitting criteria. In **Error! Reference source not found.** the parent node is split into two *child nodes* (note that this phrase also doesn't appear in trees that show actual data, but it is understood to represent the two nodes that result from the splitting of a parent node). Each node produces a better classification outcome than is represented by its parent. In the case of the first child node in Figure 1, the 90% - 10% split cannot be improved and stopping criteria set within the software result in the termination of further splitting. In the case of the second child node, all variables are reassessed and a second split of the cases occurs. (Child) Node 2 becomes the parent node for the second split and the splitting criteria are again applied using all predictor variables. This means that the same predictor variable may enter the decision tree at more than one level, corresponding to its interaction with different variables. This represents a significant advantage of the CART approach and can illustrate the unique predictive power of the same variable at different levels of the tree. In this hypothetical example, the second split results in two terminal nodes and as all nodes are now terminal nodes the analysis is complete. Nodes are numbered systematically. Terminal nodes are numbered by one system and non-terminal nodes by another. Terminal nodes are numbered from 1 to the highest number starting at the left of the tree and moving counter clockwise. Non-terminal nodes are

numbered starting at the top level of the tree moving down by level. Within a level, the numbering moves from left to right.

In addition to splitters, CART analyses identify two other types of potentially useful predictor variables known as *surrogates* and *competitors*. Surrogates are variables that act in a similar manner to the splitter (i.e., tending to place the same cases in the same nodes as the primary splitter), and are used to make the splitting decision in observations containing missing values for the splitter. Where there is no surrogate, all observations with a missing value on the splitter will be placed in the node with the majority of observations, and therefore available for the next split from that node. Competitors are variables that might purify nodes at almost the level of the selected primary splitters, but are not entered into the model because the selected variables were at least slightly stronger. They differ from surrogates in that they do not act similarly to the primary splitter. Thus a CART approach has the advantage of not only identifying the most efficient splitters, but also other potentially important predictors (i.e., surrogates and competitors).

In addition to producing classification and regression trees, CART analyses provide a list of predictor variables and their importance weights. The highest importance weight of 100 is assigned to the variable that, over the whole tree, best distinguishes groups and subgroups on the dependent variable. All other variables are assigned scores relative to 100 that represent their purification power relative to the most important variable. These weights can be described further in terms of whether the predictor variable was an efficient splitter, and can be reported considering or not considering surrogates.

The CART software allows several methods of cross-validation to provide a realistic estimate of the sample-specific effects in the tree. The method used in the present study is one that derives the main model from the whole sample (the *learning sample*), but generates predictive stability rates on test samples of successive withholdings of one-tenth segments of the sample. Ultimately 10 trees are generated on different sets of 9/10 of the sample, and are the basis of reported error rates for the test sample that can be compared to those from the learning sample.

Application of CART to Wave 1 Outputs

The data output for Wave 1 consisted of information from two sources: a survey of all class instructors and the class participant surveys. Instructor surveys contained information regarding class structure such as length of class, percentage of time in each teaching format (i.e., lecture, hands-on exercises, etc.), and focus on energy efficiency (low, medium, high). Participant surveys contained demographic information and multiple questions regarding knowledge changes and actions taken. Six knowledge questions, each asking for response on a seven point scale, were averaged to create a knowledge index. Actions undertaken questions were summed (across multiple questions that were a Yes/No question, with Yes=1 and a No=0) and then converted to a percentage to create an action index for CART analysis. The number of questions regarding actions undertaken varied depending on whether the participant was an end user or market actor as the opportunities for actions to be taken vary. As such, the percentage was used to create a common metric across all participants. Additionally, the participant survey addressed the designated impact module by end use (i.e., lighting, HVAC, refrigeration, etc.). This variable served as a proxy for

the focus of the class within the CART analysis.

Prior to analysis, the dependent variable or target variable of actions taken was collapsed into three levels: no actions, those who had action percentages from 1% to 74% of the total possible actions, and those who had 74% or higher.

Results

Results of CART Analysis for Sampling

The second stage sample for this study is meant to serve several study goals, but the primary goal is to gather information from the sample participants in order to estimate the kWh savings achieved from the actions. While random sampling was still a consideration, CART was also considered as a means of identifying sample strata. The point of the CART analysis in this case was to identify variables that efficiently categorize participants into homogeneous groups on quantity of post-participation actions taken, using only variables that would be available before the next participant survey was fielded (i.e., instructor survey questions). Clearly, we could not sample based on variables we had not yet collected. Since the only variables that would be available at that time would be class descriptors, the initial trees used only those variables as potential splitters.

The resulting tree is shown in Figure 2 CART creates many trees but selects the one that is most efficient in node purity versus tree complexity, i.e., one with too many nodes. The most efficient tree by CART's standards had 6 terminal nodes and is presented in Figure 2.

The first level of analysis is to observe the rate of correct classification of cases. In this case, the no-action participants were the easiest to predict, and in the learning (full) sample, 48% were correctly classified by the six terminal nodes, and 42% of the time in the test sample[2]. The low-action participants (1-74%) were correctly classified 45% of the time in the learning sample, and 62% of the time in the test sample. Finally, those who took 75% or more actions were correctly classified 31% of the time in the learning sample and 24% in the test sample. The results are relatively stable because the cross-validation procedure (test sample) resulted in very small changes in correct classification rates for the high and low categories. However, only two of the three groups were well predicted.

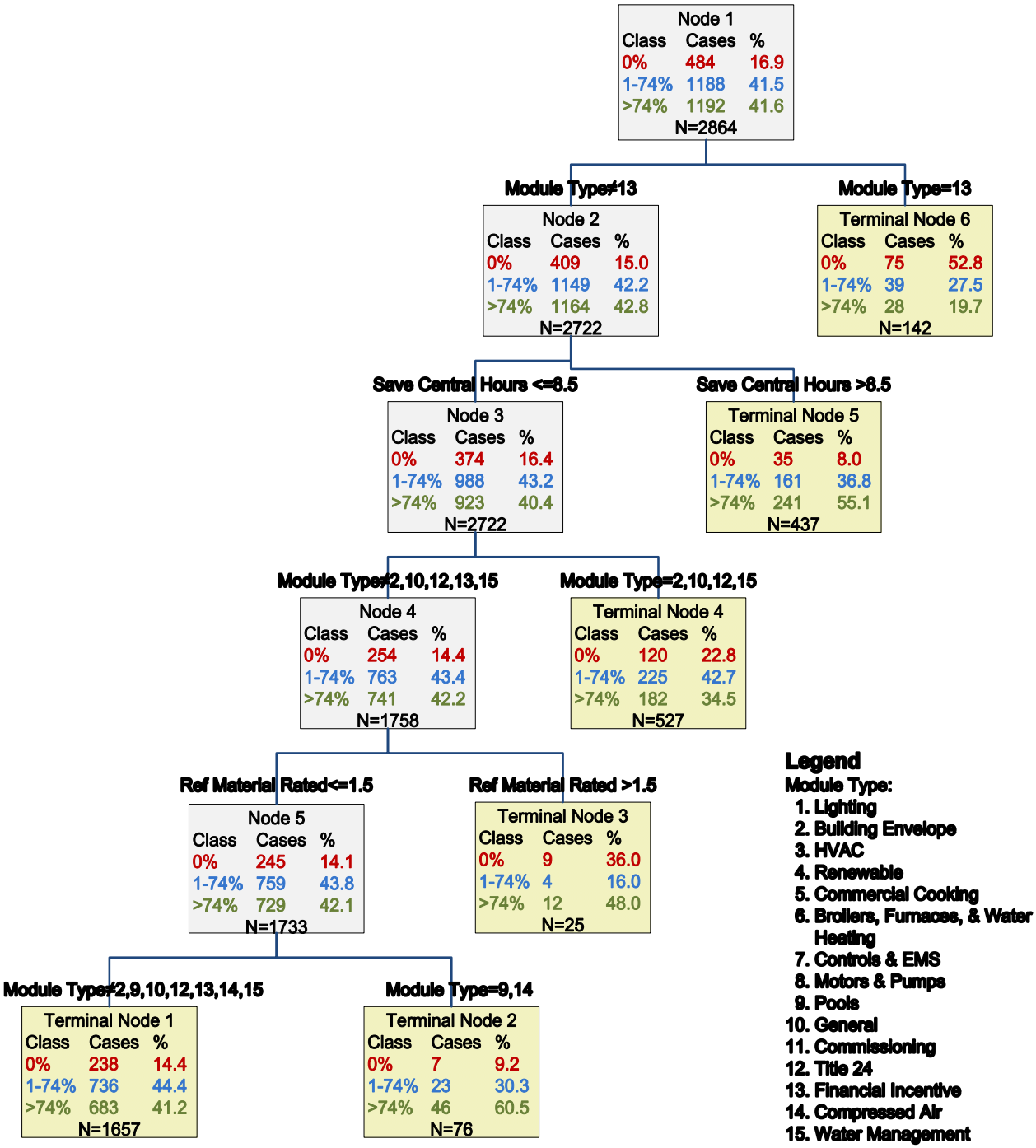
Another method of assessing the overall performance of the model is to evaluate the reduction in error from the initial node to the final (selected) tree. CART produces such an index which, in this case, was 0.886. This is the predictive accuracy compared to the initial node and is subtracted from 1 to yield the level of improvement due to the final tree splitters. Subtracting 0.886 from 1 produces 0.114 which translates to an 11.4% improvement. This is interpreted as an R^2 is interpreted, i.e., as explained variance. The formal effect size is the explained variance divided by the unexplained variance, and the result is called f^2. In those terms, this tree's Figure 2 effect size is 0.13, which compares to the medium effect size, as defined by Cohen (1986), of 0.17. We can consider this tree

[2] Remember that the learning sample prediction is information from the entire sample while the test sample prediction is from multiple runs of 90 percent of the sample. When these values are similar, the predictions are considered to be stable.

useful in terms of content, but this is too inefficient to be used for sampling to estimate a population parameter.

The conclusion from this analysis was that simple random sampling would be the more efficient approach for the central research question of this study. However, the content of the trees are still of interest in thinking about what it is about classes and participants that impacts participant behaviors after taking the class. This will be addressed in the next section.

Figure 2. CART Results for Sampling – Class Descriptions Only



Results of CART Analysis for Predicting Outcomes

Class Variables. The CART analysis proved useful for identifying the most efficient sampling method, simple random sampling. Additionally, it helps analyze the drivers of participant

actions considering only class-related variables. Analyzing Figure 2 in more detail shows a beginning or base node that contains all 2864 participants. Of those, 16.9% took no actions, 41.5% took some but less than three quarters of all possible actions noted in the survey, and 41.6% took three-quarters or more of the possible actions. Among these participants, those taking classes focusing on channeling participants into a resource acquisition program (based on the splitter Module Type called "financial incentives" Module Type=13 for the analysis) showed themselves less likely to undertake action than those of any other class type. As seen in Terminal Node 6 (TN6), the percentage of participants who took no action increased from 16.9% (in the parent node) to 52.8%. There are 142 participants in this node, and 75 of them took no action.

The larger group that took classes of any other type (the vast majority) looks very much like Node 1. They were, however, subject to a further split based on a splitter variable where energy savings is one of several themes addressed in the class and is a central component of the class, which further separated out the group (in TN5) who took more than 8.5 hours of classes. When people spent a large amount of time in classes where energy savings were a central component, they were more likely to undertake many actions (241 or 55.1%). For those who were in class less often, there was a small increase in those taking no action, or taking some actions, and a small decrease in those taking many actions. This group, however, was further split into two child nodes based on the type of class. Specifically, those who took classes that focused on the building envelope, Title 24, water management, or general topics (TN4) were slightly less likely to undertake 75% or more actions and more likely to undertake no actions.

The next split occurred based on a class designator. Ranging from 0 to 4, this variable stands for the number classes in which there were reference material handouts. Where reference materials were present 1.5 or more times, there was a high percent of actions taken (TN3). However, this split resulted in identifying only a small number of participants overall.

The final split was again based on the type of class (Module Type). Those taking Pool or Compressed Air classes (TN2) were substantially more likely to undertake 75% or more actions (60.5% did so). As with the previous split, though, this pulled out only a small number of participants (n=76). The last terminal split (TN1) is actually very similar to the original node (node 1) in terms of actions taken.

CART makes the splits noted above by selecting the variable that most efficiently splits the parent node into two child nodes. However, many times other variables would do almost as good a job as the one selected. Since they do not appear in the tree itself, they could be overlooked or assumed to be of no predictive value. Variables of this type are either surrogates or competitors. Surrogate variables act in a similar way to the primary splitter, i.e., it would assign the same cases to the same nodes, but less efficiently (which is why it is a surrogate and not a primary splitter). A competitor is a variable that may be almost as efficient as the primary splitter, but acts differently from the primary splitter (i.e., it will split the cases differently). Table 1 lists the tree splitters for each node, along with their surrogates and competitors. This information allows the reader (and analysts) to take note of other variables that also predict actions.

Table 1. Splitters and Their Surrogates & Competitors: Class Variables

Parent Node	Primary Splitter	Surrogates (used to split when there is a missing value)	Competitors (almost as strong an indicator of a split as the primary splitter)
Node 1	Module type	Class provides examples	Energy savings is a central theme
		Energy savings is only theme	Uses hands-on exercises
Node 2	Energy savings is a central theme	Class aimed at residential sector	Module type
		Class delivery—lecture	Number of classes taken
		Class format—group class	
		Class aimed at trade professionals	
Node 3	Module type (end use)	No surrogate – any missing values follow the largest group	Instructor provides demonstrations
			Rebates given brief discussion
			Class delivery—Other
			Expect expertise of participant—basic
			Class provides examples
Node 4	Reference material provided		Module type
			Rebates given brief discussion
			Expect expertise of participant—basic
			Energy savings one of many themes
			Number of classes taken
Node 5	Module type		Rebates given brief discussion
			Instructor provides demonstrations
			Class delivery—video
			Class delivery—group discussion

In this tree, class characteristics that were also predictive, but operated only as surrogates (i.e., they were used where there were missing values on the primary splitter) included: class

provides examples, energy savings is the only theme, class is aimed at residential sector, class delivery is lecture, class format is group class, and class aimed at trade professionals. There are more competitors than surrogates, and they are listed in Table 3. Clearly, the methods of delivery play a part as well as the general content and sector orientation of the classes.

All Variables. Since we have gone beyond using CART for identifying sample strata, we need not limit the analyses to class-level variables. We can take our understanding of what promotes post-class action to a deeper level by including information about the participants and what they experienced. Classification trees were developed using the action variable in its collapsed (trichotomy) form Figure 3 as was done in the first tree.

Figure 3. CART Results – All Variables

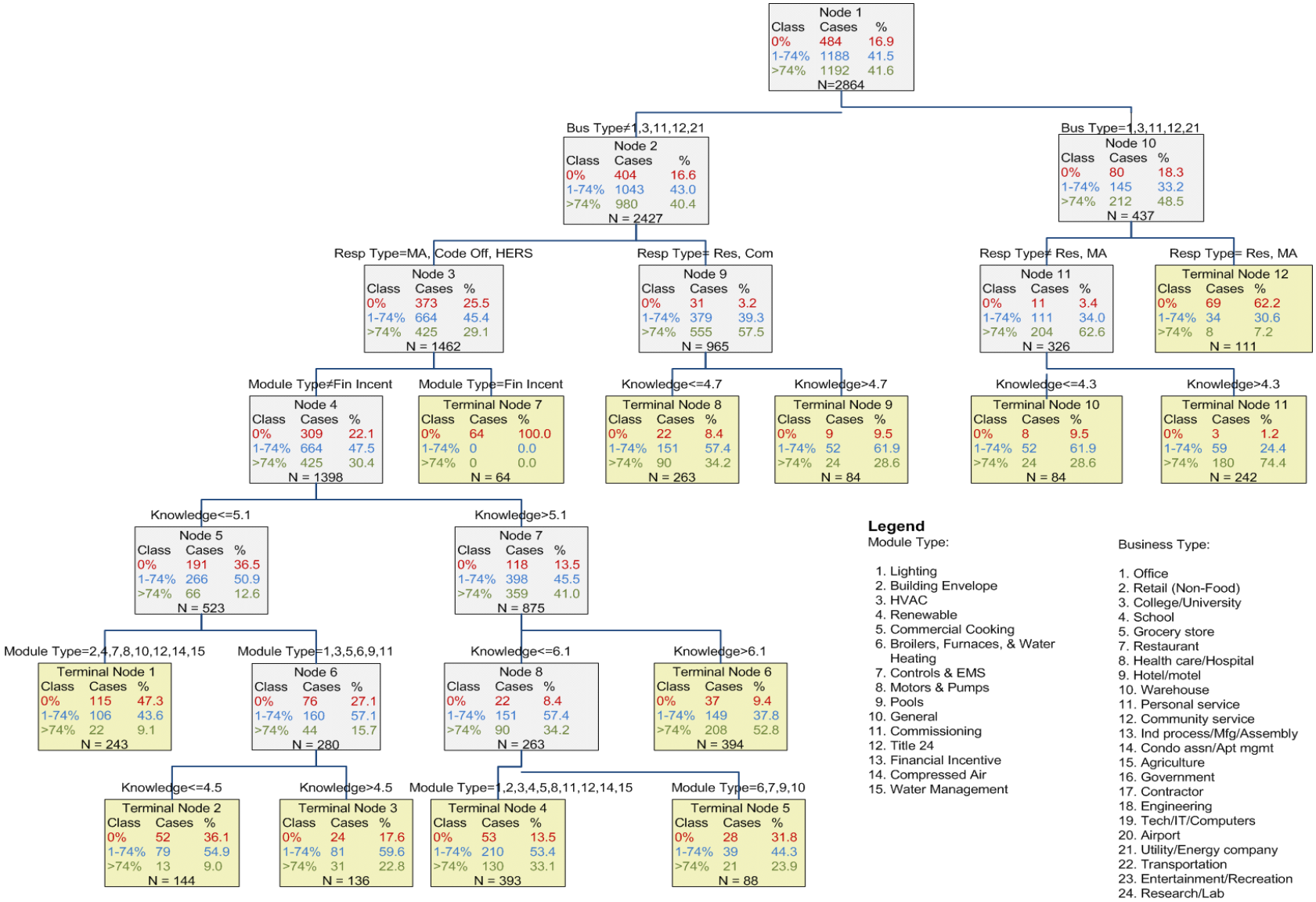


Figure 3 is the tree that CART chose as the optimal one, and it contains 12 terminal nodes. This tree shows about 35% improvement over the root node, which is a very large effect analogous to $f^2 = 0.53$, compared to Cohen's large f^2 effect size of 0.35. In terms of correct classification, those who took no action were correctly classified 68% of the time on the Learn sample, and 66% on the Cross-Validation (Test) sample; those who took 1% to 74% of the actions in the survey were correctly classified by this tree 42% of the time in the Learn sample, and 36% for the Test sample. Finally, those who took 75% or more of the actions were correctly classified 72% of the time and 67% for the Learn and Test samples, respectively. These figures indicate that: 1) high-action participants and no-action participants are best classified, and 2) the results are very stable since the Test and Learn sample results are very similar.

The starting distribution for the action levels are, of course, the same as in the Class variable tree. However, when there are new, individual participant-level variables available, the first splitter is different. The first splitter is the participant's business type and does not result in any terminal nodes, but does create two more parent notes of unequal size. Node 10 then creates a small terminal node (TN12) containing 111 participants that are residential end users or market actors working in one of the following categories: office, college/university, personal services, community services, or utilities, or energy companies. This group has a very high non-action rate. Of those 111 participants, 62.2% are in the lowest category. Those from all other types of participants (Node 11) have a very high level of action. However, they are further split by their self-reported change in knowledge into a very high action group (TN11) or a group with some action (TN10). Specifically, those who indicated a change in knowledge greater than 4.3 (on a 7 point scale) were split into a group of 242, of whom only a small percent failed to take action, while 74.4% took at least 75% of the possible actions open to them in the survey.

The respondent types on the other side of the original split (Node 2) had five more split levels before terminal nodes were found. These splits were also based on type of respondent, type of class, and knowledge gain. Probably the most interesting split was TN7, where all people ended up in the no-action level. These are the people who were in TN6 of the previous tree (Figure 2), but with some of them already removed from the analysis by this point.

The final splits originating from Node 2 are based on the knowledge variable for half and on the type of module for the other half. The knowledge level comes into play at different levels of knowledge gained for different parts of the tree. TN6 comes from a splitting value of 6.1, TN8 and TN9 result from a knowledge rating of 4.7, and TN2 and TN3 come from 4.5. This is an example of the strength of the CART analysis as it brings the knowledge variable into play at multiple times and in differing levels. There were surrogates and competitors in these nodes as well.

Table 2. Surrogates and Competitors for All-Variables Tree by Node

Parent Node	Primary Splitter	Surrogates (used to split when there is a missing value)	Competitors (almost as strong an indicator of a split as the primary splitter)
Node 1	Business Type	No strong surrogate – records with missing values move to the largest group	Type of respondent
			Market actor
			Commercial respondent
Node 2	Respondent Type	Market actor	
		Commercial respondent	
Node 3	Module Type	Length of time in class(es)	Knowledge gained
			Energy savings is a central theme
			Provides detailed ES examples
			Class delivery—group discussion
			Class delivery—hands-on exercises
Node 4	Knowledge Gained	No strong surrogate – records with missing values move to the largest group	Module type
			Provides detailed ES examples
			Length of time in class(es)
			Rebates given brief discussion
			Market actor—HVAC
Node 5	Module Type	Expected expertise: mixed	Knowledge gained
			Class delivery—group discussion
			Provides detailed ES examples
			Rebates given brief discussion
			Handouts—specific how-to
Terminal Node 1	Rebates given brief discussion	Energy savings is a central theme	Class delivery—lecture
			Knowledge gained
			Provides detailed ES examples
			Energy savings is a central theme
Node 6	Knowledge Gained	No strong surrogate – records with missing values move to the largest	Handouts—General
			Class intended for residential sector

Parent Node	Primary Splitter	Surrogates (used to split when there is a missing value)	Competitors (almost as strong an indicator of a split as the primary splitter)
		group	Class delivery—group discussion
			Rebates given brief discussion
			Class delivery—Instructor demo
Node 7	Knowledge Gained	No strong surrogate – records with missing values move to the largest group	Market actor—HVAC
			Provides detailed ES examples
			Length of class
			Market actor—Other equipment
			Energy savings is a central theme
Node 8	Module Type	No strong surrogate – records with missing values move to the largest group	Energy savings is a central theme
			Energy savings is a minor theme
			Class delivery—lecture
			Rebates given brief discussion
Node 9	Knowledge Gained	No strong surrogate – records with missing values move to the largest group	Residential end use customer
			Type of respondent
			Commercial end use customer
			Business type
			Education level of participant
Node 10	Type of Respondent	Commercial end use customer	Type of building lived in
		Knowledge gained	Household income
		Market actor	
		Engineer	
		Course provided new info	
Node 11	Knowledge Gained	No strong surrogate – records with missing values move to the largest group	Module type
			Level of prior knowledge
			Rebates given brief discussion
			Expect expertise of participant—basic
			Business type

In addition to the information that has just been described that comes from the detail of the tree, two larger patterns are important in looking at the two different trees. One is that participant characteristics predict actions far more than class characteristics. Only one class variable entered the tree as a primary splitter, and that was the class topic. The second pattern to note is more methodological, and highlights one advantage of CART over parametric methods: two variables entered the model two or more times, and different cut points or categories were optimal at different levels of the tree. These represent interaction effects that could be missed in a parametric model unless the analyst knew in advance what interactions to test for.

MEMORANDUM

TO: Pamela Wellner, CPUC and Nick Hall, MECT

FROM: ODC Evaluation Team (contacts: Tami Buhr or Bill Norton)

DATE: August 24, 2009

RE: Reach of California IOU Education and Training Centers

This memo provides interim information regarding the ability of the Education and Training Program to affect change that leads to energy savings. Specifically, this memo provides draft findings for two key areas of inquiry:

1. What is the overall reach of the PY2006-2008 Education and Training program?
2. Which markets have the potential to be most affected by the program?

Note that this information draws on the course and participant databases provided by the Education and Training Program for the full program period (PY2006-2008). As of this memo, however, survey data is only available for participants in courses offered during the 18 month period between January 2006 and June 2008. The information in this memo will be updated for the final report when survey data for the full program period is complete.

For the PY 2006-2008 period, the Statewide Education and Training Program spent a total of $80.1 million.[1] The overall reach and information provided under this budget is described below.

The Reach of the Education and Training Program

Overall, a total of 97,997 attendees took courses at the nine Energy Centers during PY 2006-2008.[2] However, a careful review of the Energy Centers' participant databases revealed that many attendees took multiple courses either at the same energy center or across multiple energy centers.[3] Across all nine centers, there were 39,793 unique

[1] Budget estimates provided by IOUs.

[2] This number of attendees excludes utility and Energy Center employees, course instructors, and participants who are missing information about their training activities.

[3] The Centers offer a wide range of training programs including courses, demonstrations and consultations. Our larger evaluation includes all of these. However, this memo focuses primarily on our evaluation of Center courses along with a few additional activities that could be evaluated with a participant survey. For ease of presentation, we will use the term "courses" for all activities evaluated in this memo.

individuals who participated in the utility-sponsored courses funded by the Education and Training Program.[4]

As Table 1 shows, three-quarters of participants took one or two courses, while a handful of participants took ten or more.[5]

Table 1: Number of Courses Taken

Number of Courses	Unique Participants	Percentage
1	24,063	61%
2	6,542	16%
3	2,906	7%
4	1,754	4%
5 – 9	3,065	8%
10+	1,463	4%
Total	**39,793**	**100%**

The breakdown of participants by Energy Center is shown in Table 2. This table also shows the number of unique courses offered by each Energy Center. The overall number of unique participants in Table 2 is greater than that in Table 1 because some participants took courses at more than one Center and therefore are counted in each Center's total. The Centers have varying missions and target markets, which is reflected in the differences in the number of courses and participants across the Centers.

[4] The IOUs provided contact information for each participant including first and last name, company, phone number and email address. We used this information to create our estimate of the number of unique course takers. In most cases, the information provided is sufficient to determine an individual's participation across all courses and centers. However, in some instances a name is not accompanied by an email address, company name or phone number that can be used to set one individual apart from another. In these cases we treated each instance of the name as a unique participant. Therefore our numbers may slightly overestimate the number of unique participants.

[5] Three participants took over 100 courses with one person taking 124 courses over the three program years.

Table 2: Overall Participation by Center

Center	Total Participants	Unique Participants	Unique Courses
PEC	16,541	8,196	159
ETC	16,745	9,650	141
FSTC	1,902	1,515	22
AgTAC	3,686	1,838	105
CTAC	16,850	7,291	116
TTC	979	864	8
SCG ERC	28,763	10,244	119
SDG&E ERC	9,518	3,252	100
CCSE	3,013	1,899	70
Total	**97,997**	**44,729**	**840**

The Wave 1 participant survey contained a series of questions that classified respondents by their occupation or reason for taking the courses. Residential participants are those who intended to apply the course information in their homes or who did not have a specific purpose in mind. Residential participants made up 17% of the respondents. Those who intended to apply what they learned on the job were further broken into two categories: (1) commercial participants were those who would apply the information in facilities their company owned or rented and made up 29% of the respondents, and (2) market actors were defined as those who would apply the information in their client's facilities and made up just over half the participants (54%).[6] Below we provide a description of the reach within each group of participants.

Residential Customers Reached by the Program

Based on our findings to date, the Centers reached approximately 7,000 residential end-users.[7] Compared to other residential education efforts, such as the HEES survey which reached close to 75,000 customers during PY 2006-08, the reach of the Education and Training program is clearly smaller.[8] As noted in our May 2008 Early Feedback memo, the primary focus of the Centers is educating commercial customers and market actors.

[6] We will update these estimates to reflect Wave 1 and 2 survey results in the final report.

[7] We estimated the number of residential end-users, commercial end-users and market actors by applying the Wave 1 participant type percentages to the participant population for the full evaluation time period (January 2006 – December 2008).

[8] Source: Process Evaluation of the SCE 2006-08 Home Energy Efficiency Survey (HEES) Program, August 4, 2009. ECONorthwest.

As shown in the following tables, the residential end-users reached by the program are a well-educated, affluent population, a majority of whom are over the age of 35 and live in single-family, detached dwellings. These residential customers are the ones most likely to take energy saving actions in their homes.

Table 3: Residential Participant Home Type

Home Type	Percent (n=472)
Detached Single Family	76%
Multi-Family	12%
Attached Single Family	9%
Mobile Home	2%
Other	1%

Table 4: Age of Residential Participants

Age	Percent (n=472)
18-34	13%
35-44	17%
45-54	26%
55-64	27%
65+	14%
Refused	3%

Table 5: Education Level of Residential Participants

Education	Percent (n=472)
Less than HS	1%
HS Graduate	4%
Trade School or Some College	23%
College Graduate	34%
Post-Grad	37%
Refused	2%

Table 6: Income Level of Residential Participants

Income	Percent (n=472)
Less than $20,000	4%
$20,000 - $49,999	9%
$50,000 - $74,999	16%
$75,000 - $99,999	15%
$100,000 - $199,999	25%
$200,000+	5%
Don't Know/Refused	25%

Businesses Reached by the Program

In contrast to residential customers, the Centers reached approximately 11,500 businesses in PY2006-2008. This level of participation compares favorably to the Standard Performance Contract (SPC) program, which is a nonresidential retrofit program run by PG&E, SCE and SDG&E. In comparison, during PY2004-2005, SPC reached 1,499 businesses.[9]

Survey respondents were asked to categorize their business, Table 7 presents the range of business types identified. In general, the Centers are reaching a very diverse group of businesses; however close to half of businesses categorize themselves in one of three business types – "Office," "Industrial Process/Manufacturing/Assembly," and "Government."

[9] 2004-2005 Statewide Nonresidential Standard Performance Contract Program Measurement and Evaluation Study: Impact, Process and Market Evaluation Final Report. Itron, Octoboer 2008.

Table 7: Type of Business

Category	Percent (n=843)
Office	16%
Industrial Process/Manufacturing/Assembly	15%
Government	11%
Other	7%
Health Care/Hospital	6%
College/University	6%
Community Service/Church/Temple/Municipality	5%
School	5%
Retail (Non-food)	4%
Contractor	3%
Personal Service	2%
Condo Association/Apartment Management	2%
Restaurant	2%
Warehouse	2%
Agriculture	2%
Utility/Energy Company	2%
Engineering	1%
Hotel/Motel	1%
Entertainment/Recreation	1%
Research/Laboratory	<1%
Technology/IT/Computers	<1%
Airport	<1%
Transportation	<1%
Grocery Store	<1%
Don't Know/Refused	5%

The following tables present additional demographic information about the businesses that are taking courses across the nine Energy Centers. Generally, the businesses are medium to large, have ten or fewer locations and own their facilities. These are the commercial end-users most likely to have the resources and authority to implement energy savings actions in their facilities.

Table 8: Size of Business

	Percent (n=843)
Small	7%
Medium	26%
Large	40%
Not applicable	8%
Refused	4%

Table 9: Number of Locations

	Percent (n=843)
1	35%
2 to 4	16%
5 to 10	11%
11 to 25	6%
Over 25	19%
Don't Know/Refused	13%

Table 10: Own or Lease Facility

	Percent (n=843)
Own	68%
Lease	20%
Both own and lease	5%
Don't Know/Refused	8%

Market Actors Reached by the Program

As noted above, just over half of the course participants are classified as market actors. In all, the Centers have reached approximately 21,500 market actors across the state. Table 11 shows the breakdown of industry areas among market actors from our Wave 1 survey.

Table 11: Industry Area of Market Actors

	Percent (n=1,542)
Engineering or Architectural Design	41%
HVAC	28%
Construction	28%
Lighting	22%
Energy Technology Research/Consulting	21%
Facility Operations or Maintenance	13%
Refrigeration	12%
Motors	9%
Pumping/Hydraulic Equipment	7%
Government Agency/Regulatory/Inspector	5%
Renewables	2%
Boilers/Water Heating Sales	< 1%
Other	14%
Don't Know/Refused	1%

Note: Market actors could select more than one industry area so the percentages sum to more than 100%.

Using the self-reported industry areas in Table 11 and the total number of market actors reached by the Centers, we calculated an estimated number of market actors reached in each industry area. We compared these numbers to the number of market actors statewide[10] to get a sense of the reach of the Centers across different industries. Table 12 presents the estimated proportion of market actors reached by the Centers during the evaluation period by market actor type. Our analysis indicates that the Centers are having particular success in reaching the HVAC/Refrigeration industry area as well as Engineering/Architectural Design.

It should be noted that the employment categories used to estimate the number of statewide market actors do not map directly to the industry areas listed in Table 11. Many categories include several types of workers, only a portion of which would be a direct target of the Energy Center courses. As a result, the number of statewide market actors is often an overestimate. Thus, our estimate of the percent of market actors reached by the Centers is conservative in many cases. In addition, the market actor figures are based on statewide

[10] The California Employment Development Department provides estimates of statewide employment for each of the employment categories in the US Bureau of Labor Statisitcs' Standard Occupation Classification Codes (SOC Codes). In some cases, our estimates are an aggregate of several SOC employment categories.

employment numbers while the Centers only target the portion of California served by the four IOUs.

Table 12: Market Actors Reached by Industry Area

	Market Actors (Statewide)[11]	Estimated Reach by Centers	Percent Reached (Statewide)
HVAC & Refrigeration[12]	19,700	8,595	44%
Engineering/Architectural Design	58,200	8,810	15%
Government Agency/Regulatory/Inspector	12,500	1,074	9%
Lighting	68,300	4,727	7%
Other	55,800	3,008	5%
Construction	161,200	6,017	4%
Motors	49,400	1,934	4%
Facility Operations or Maintenance	163,000	2,793	2%
Boilers/Water Heating Sales	56,000	86	<1%
Energy Technology Research/Consulting	N/A	4,512	N/A
Pumping/Hydraulic Equipment	N/A	1,504	N/A
Renewables	N/A	430	N/A
Don't Know/Refused	N/A	215	N/A

Because market actors have the ability to affect change in a larger number of buildings than a single commercial or residential end-user, the Center's efforts could potentially impact a larger segment of the market through the market actors who attend the courses.

Specifically, market actors who made changes to their services based on what they learned in the courses were asked to estimate the number of times they implemented the changes in 2008. While the number was highly variable ranging from zero to 500 (which reflects the varied nature of their work), in general, it is apparent that the market actors have the ability to extend their reach much further than a single end user (See Table 13).[13]

[11] Source: California Employment Development Department: http://www.edd.ca.gov/. In some cases, these are an aggregate of several SOC employment categories.

[12] HVAC and Refrigeration are combined here in order to compare to employment statistics.

[13] We acknowledge, however, that some commercial end-users may operate multiple buildings.

Table 13: Number of Times Implemented Changes in Past Year
(Among market actors making a change)

Number of times	Number of Market Actors	Percentage
0	56	5%
1-3	215	19%
4-6	239	21%
7-19	208	19%
20+	278	25%
Don't Know/Refused	124	11%

Potential Markets Affected By the Education and Training Program

The nine energy centers offered a total of 840 courses with unique content during PY2006-2008. Many of the courses were offered multiple times during the three years for a total of 1,754 course sessions during PY2006-2008. These courses covered 16 different end-use categories. The number and variety of end-uses is similar to those covered by IOU resource acquisition programs. In fact, many of the trainings sought to channel participants into the utilities' resource acquisition programs. Courses labeled as "Financial Incentives" in Table 14 were focused on explaining program opportunities. Others focused on a specific end-use area but also let participants know about the different programs available in that area. We will address program channeling in a future memo.

The Centers are likely having the greatest impact on the HVAC, lighting, green building and renewable markets. With 149 unique courses, the Centers offered more unique courses on HVAC than any other end-use. Lighting and building envelope were also popular course subjects. In addition to specific end-uses, a number of courses covered energy saving topics of general interest and were classified as "general/other". Examples include courses on the impact of climate change on businesses or advice on how to implement energy efficiency projects. Others covered a wide range of end-uses such as the Technology Update, which gave participants information on the latest energy efficiency technology in HVAC, lighting, motors and a number of additional areas.

In most cases, the end-uses with the most participants were those that offered more unique courses. Renewables is an exception. Only 27 courses with unique content were offered but these courses had the fifth highest number of attendees.

Table 14: End-Use Participation

End-Use	Total Participants	Unique Participants	Unique Courses
HVAC	30,258	9,990	149
General/Other	11,704	8,342	141
Green Building/Envelope	11,027	7,290	100
Lighting	10,032	6,262	120
Renewables	8,134	6,087	27
Title 24	5,769	4,204	50
Commercial Cooking/Foodservice/ Refrigeration	4,951	3,585	58
Boilers/Furnaces/Water Heating	4,790	3,090	43
Motors/Pumps	2,822	2,165	38
Financial Incentives	2,448	2,237	26
Commissioning	1,972	1,117	26
Controls/EMS	1,841	1,483	34
Compressed Air	990	897	11
Water Management	629	603	8
CHP/Gas Engines	363	297	5
Pools	267	254	4
Total	**97,997**	**57,903**	**840**

The overall number of unique participants in Table 14 is greater than that in Table 1 because some participants took courses in multiple end-uses and therefore are counted in each end-use's total. Table 15 shows that 25% of participants took courses in two or more end-uses.

Table 15: Number of End-Uses in Which Courses Were Taken

Number of Courses	Participants	Percentage
1	30,119	75%
2	5,503	14%
3	2,117	5%
4	1,028	3%
5+	1,026	3%
Total	**39,793**	**100%**

HVAC was the most popular course end-use among both market actors and commercial end-users. However, renewable was the leading course subject among residential end-users.

Table 16: Percent of Unique Participants by Type and End-Use

End-Use	Market Actors	Commercial End-Users	Residential End-Users
HVAC	21%	26%	18%
Renewables	16%	9%	29%
Lighting	11%	10%	10%
Title 24	10%	6%	3%
Building Envelope	9%	4%	11%
Boilers/Hot Water	7%	8%	8%
Commercial Cooking/Refrigeration	6%	7%	3%
General	5%	5%	8%
Commissioning	5%	5%	2%
Financial Incentives	5%	7%	3%
Controls/EMS	2%	4%	2%
Motors/Pumps	2%	5%	1%
Pools	1%	1%	1%
Compressed Air	1%	3%	1%
Water Management	0%	1%	1%

Summary of Reach by Market

As shown in Table 14, course participation was highest in the HVAC, Green Building, Lighting and General end-uses. As such, we expect that the largest effects (although not necessarily savings) will be in these markets.

The Centers are successfully reaching their target customers. As shown above, participation numbers for commercial end-users compares favorably to similar programs statewide. In addition, the market actors in the program represent a good portion of the overall number of market actors in the state of California, particularly among HVAC and Refrigeration contractors as well as Architects and Engineers. Finally, while residential end-users are not the focus of Energy Center efforts, a smaller number of end-users are choosing to participate.

Next Steps for Wave 1 Analysis

We have completed the engineering analysis of energy savings actions taken as a result of the Wave 1 Energy Center courses. This analysis will be presented in a future deliverable.